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Strategies and Policies for Systemic Interaction and Convergence in Europe — CONVERGE

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CONVERGE

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EU RESEARCH ON SOCIAL SCIENCES AND HUMANITIES

Strategies and Policies for Systemic Interaction and Convergence in Europe

CONVERGE

Final report

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Preface

Within the Fourth Framework Programme of Research and Technological Development, the Targeted Socio-economic Research Programme (TSER) had as main objectives to increase European knowledge across three targeted areas – evaluation of science and technology policy options, research on education and training and on social exclusion and social integration. Research was undertaken through the funding of translational research networks of high quality, which were sought to provide policy relevant findings that could have an impact on the social and economic development of Europe.

The insights and information that the reader will obtain in the following pages constitute the main scientific findings and the associated policy implications of the research project "CONVERGE - Strategies and Policies for Systemic Interaction and Convergence in Europe" .

This project brought 6 research teams in a collaborative endeavour lasting 20 months.

The abstract and executive summary presented in this edition offer to the reader the opportunity to take a first glance on the main scientific and policy conclusions, before going into the main body of the research provided in the other chapters of this report.

The research reported in this publication should not be viewed in isolation. Over 300 research projects and thematic networks in the wider area of the social sciences have been funded under the Fourth and the Fifth Framework Programmes of Research and Technological Development. These collaborative research efforts involving more than 2000 European research teams have made significant advances to knowledge, support policy-making in Europe and have laid the foundations for the development of a European research community in the social sciences.

The Sixth Framework Programme, through Priority 7 'Citizens and Governance in a Knowledge Based Society', is building on the progress already made and aims at making a further contribution to the development of a European Research Area in the social sciences and the humanities.

I hope readers find the information in this publication both interesting and useful as well as clear evidence of the importance attached by the European Commission in fostering research in the field of social sciences and the humanities.

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Abstract

At the beginning of the project several objectives and questions regarding economic convergence in the EU were put forward. These referred mainly to the assessment of the relative importance of technological accumulation in the catching up of the "Less-Favoured Regions", to the eventual existence and degree of maturation of “innovation systems” in those LFRs, and also to the most adequate strategies to be adopted by the relevant actors to stir up convergence. As a consequence of these initial concerns, the methodological stance was simultaneously analytic and normative.

The theoretical background of the project came mainly from the economics of convergence approaches, even though inputs were also received from the innovation systems literature, economic geography and the sociology of science. A remarkable aspect in the convergence literature is that a significant disagreement exists in what regards the prospects for economic convergence. The views range from the most optimistic, represented by conventional neoclassical models, to the most pessimistic outlook provided by Kaldorian perspectives. However, through the years a general agreement has developed around the idea of "conditional convergence", i.e, that closing the gap is possible if certain prerequisites are met. This is in accordance with historical facts: even though in global terms successful catching up has been more an exception than the rule, several countries have succeeded in approaching or eventually overtaking the income levels of the most advanced economies.

In terms of the empirical facts of convergence/divergence in the EU, contradictory trends are observable. When the national level is considered, a clear convergence among the EU countries happened until the middle seventies, followed by an opposite trend until the middle eighties, and then by convergence again since then. This most recent trend has happened in parallel with the intensification of the Structural Funds policies. However, when looking to the interregional level of analysis, the situation is distinct. Divergence between the EU regions has set in recent years, with the group of richest regions growing faster than the group of the less affluent ones. The former group comprehends normally the capital regions in each state plus a few other regions, where the economic and social power of the country is well represented.

We can summarise much of the discussion about the prospects of convergence in the EU LFRs referring to three basic "trade-offs" which have absorbed the interest of research in this area of economic and technological convergence. The views expressed with regard to each one of those trade-offs are backed up by the analysis and conclusions of the CONVERGE project.

i) The trade-off which several authors have emphasised between "learning" and "structural change" can not be accepted as a choice between alternative paths towards catching up. It has been historically observed that countries develop by gradually substituting traditional sectors by the emerging newer activities, in which increasing returns of scale are more pervasive. But when analysing shorter periods of time, of several years in opposition to several decades, improvements in efficiency seem to be more related to the application of newer methods of production to the existing sectors, and also with incremental changes in those sectors' products. This means that both "structural change" and "learning" are relevant ingredients in the evolution towards higher productivity and income levels.

ii) A similar trade-off has been drawn with regard to the importance of "internal" and "external" factors in the catching up process. Again the empirical observation of successful catching up

processes shows that the combination of both types of *stimuli* is the rule, even though the relative importance of each of them has varied. Historically, many factors have accounted for that variance, namely the size of the domestic market, the scientific and technical education levels at the starting of periods of rapid growth, and the situation and rela tionship with neighbouring countries and regions. What seems clear however from recent cases of catching up is that with the trend for increasing economic integration and deepening of the globalised nature of economic activity, the relative importance of e xternal factors has increased. In this context, we might say that the argument behind the idea of "regional innovation systems" is valid - in the sense that coherence between the actors and activities in regions/small countries is needed - but despite that external *stimuli* and factors are essential for success. These factors refer mainly to external demand, inflows of FDI, and mobility of people and knowledge, including technology transfer.

iii) Another trade-off to be considered is the one that refers to the importance of "accumulation" versus "institutional change". Traditional theory has mentioned for a long time that in parallel to the increase in the active population there was a need to improve rapidly the capital per worker ratio. This argument has been revisited many times since growth theorists put it forward after WW II. Eventually the focus in these many approaches was not on improving investment in fixed capital alone, but on the need of mobilising different types of resources in order to reach certain thresholds needed to adopt the newer, more efficient, technologies. The "learning" argument mentioned above has to a certain extent a relationship with this accumulation idea. Most recently, however, some old arguments about the importance of insti tutional adaptation as a prerequisite for economic change have regained relevance. History, path dependence and culture are central ingredients in the economic development process, according to these approaches. Behaviours and attitudes of economic agents need to be favourable to innovation and change if the region or country is to overcome its economic backwardness.

The debates about convergence possibilities have to a large extent clustered around the points and trade-offs described above. However, thos e debates have been constantly refreshed with the introduction of many aspects associated with recent developments. These include the advancements to a "new economy", the increasing importance of science as a source of technology development, the trends in the relative weight of "codified" and "tacit" knowledge, the deepening of the economic integration processes, the role of EU structural funds and the organisation of the Community Support Framework (CSF) programmes, or the steps towards a European Researc h Area.

The analysis of CONVERGE points to the fact that many of these recent developments will reinforce the trends for unequal development in the EU LFRs. This result suggests that policies much more creative and with greater potential of impact than t hose associated with the present CSF programmes will be needed. The policies that have been implemented under the CSF umbrella fall mainly in the “accumulation and learning” area. They shall in the future move to the domains associated with "structural cha nge" and most particularly with "institutional change". Local (regional or national) innovation policies will be needed to coordinate both the sectoral approaches and the CSF efforts.

The wide dissemination activities that were carried out by the CONVERGE project were in accordance with this need for adaptation in current policy approaches.

Executive Summary

There are at least two good reasons that justify the interest of studying convergence among regions in the European context. First, the political -institutional process of integration in the EU. Since its very beginning, the European Union has had the harmonious growth of standards of living and social well being among its member countries and regions as an explicit goal. The reduction of interregional disparities has been explicitly targeted by active policies in the European Community since the middle 1980s, with the aim of keeping the existing disparities at politically and socially tolerable levels.

The second reason concerns the fact that the int ensification of integration processes all over the world – with the extensive trade liberalisation and factor mobility, and the increasing co -ordination of monetary and fiscal policies – has brought along old debates on convergence. This has stimulated new contributions from different research programs that have helped to gain a better understanding of the mechanisms, factors and barriers to convergence among regions. Particularly, special attention is being paid to the process of technological competence accumulation, and its importance for development in economies where productive knowledge is recognised as an increasingly relevant factor. These new perspectives have brought new insights with normative relevance for the so -called “Less -Favoured Regions”.

The European integration process has been implemented on the assumption that it would bring about increased economic efficiency, as a result of both the elimination of trade barriers and increased competition, production specialisation, the opportunity to exploit economies of scale, and the intensification of knowledge transfers through various means of interchange. Nevertheless, it has been recognised that an increase in overall growth in the EU area does not necessarily lead to a decrease in the inter -regional disparities (on the contrary, it can be associated with a widening of the gap). To a large extent, structural policies in the EU reflect the recognition that problems of adjustment (specially in the less developed and depressed regions) can arise as the integration process intensifies.

Thus, in the CONVERGE project we were interested in analysing the main factors and barriers which shape the convergence/divergence process and its possible future developments in what regards the case of EU Less -Favoured Regions ("LFRs").

1. Initial questions and method

At the beginning of the project several objectives and questions regarding convergence within the EU countries and regions were put forward. These referred mainly to the assessment of the relative importance of technological accumulation in the catching up of the LFRs, to the eventual existence and degree of maturation of “innovation systems” in those regions, and also to the most adequate policies and strategies to be adopted by the relevant actors t o stir up convergence.

As a consequence of these initial concerns, the methodological stance was simultaneously analytic and normative. We defined that the investigation had to be based both on qualitative and quantitative approaches, on the evaluation of the available literature and exploration of new insights, on the access to both secondary and primary sources, on reading documents and interviewing relevant actors. And it was also set in as an objective the intention of stimulating the

debate with those actors about the best possible practices and strategies, in a general framework of “research-action” with a significant “dissemination” interest.

2. The project framework

An extensive literature about the "economic convergence" problem has developed over the second half of the XXth Century. A striking aspect on that literature is the disagreement that the most influential theoretical approaches have shown. In fact, quite different views are observable in the teoretical debates with regard to the possibility of countries or regions actually converging. This disagreement extends to both the possibilities of 'relative' or 'absolute' convergence, and to a series of basic economic indicators, namely GDP per capita and labour productivity.

Traditional neoclassical trade theory forecasts the convergence among integrated economies. This occurs for two reasons. On one hand, factor mobility eliminates income differentials – labour will migrate to the regions with higher wages, capital will flow to the regions with lower wages (where profit opportunities are held to be higher); both movements represent equilibrating tendencies in income levels. Secondly, even in the absence of factor mobility, free trade will assure the most efficient specialisation in production (according to factor endowments), leading to convergence. These conclusions depend crucially on the usual restrictive assumptions of the neo-classical theory, namely perfect competition and the homogeneity of production factors.

In the same vein, neoclassical growth theory also predicts convergence. In this context, the reduction of the gap is explained by the assumption of decreasing returns to capital and the nature of technological knowledge as a public good. The less developed economies (with lower capital intensity) will experience faster productivity growth for identical investment levels. Capital will be attracted by higher returns and income per head will progressively converge.

As an outstanding opponent of the neoclassical tradition, Kaldor in the 1950s rejected the idea that integration eliminates income differentials. In short, his model emphasise the interdependence between the factors of growth (namely investment, innovation and population growth) and the processes of cumulative causation. The later are mainly related to what he coined the Verdoorn law -- the idea that productivity growth is dependent on output growth, due to the presence of economies of scale (both static and dynamic). Thus, Kaldor explicitly considers the importance of increasing returns in explaining growth processes, the impact of which on the present theories of endogenous growth can hardly go unnoticed.

The empirical verification that income gaps between some world regions persisted (and were even widening), while a few other regions were converging (the most obvious example is the convergence of income per head between the US, Europe and Japan, in the post-war period), brought consensus to the idea that convergence is conditional to the presence of particular factors. In a much-quoted paper, Abramovitz (1986) re-formulates the "catching up hypothesis" -- put forward initially by Gershenkron (1962), where backwardness is presented as a potential in itself -- pointing out that the main requirement for a country to catch up successfully is associated with the existence of a "social capability". This relates to flexibility and acceptance/willingness for change among the agents of the development process. The idea of "conditional convergence" can also be found in the New Growth Theory literature, where the negative association between the growth rates in the long run and the initial levels of income per head, depends on the introduction of additional factors – namely, education rates or R&D expenditures. In fact, the 'new growth

theorists' have tested econometrically, with disputable success, the relevance of several factors which are considered as influencing convergence perspectives, including political stability, State intervention, market distortions, international trade, a mong others.

Behind much of these works is the "technology gap" perspective put forward by Posner (1961) and others. Inspired by Schumpeter, this view ascribes a central role to technology, portraying economic growth as the combined result of innovation and diffusion, with the former tending to increase technological gaps, and the latter reducing them. This tradition has experienced an important resurgence recently (e.g., Fagerberg, 1987, 1994), and was explicitly developed into models of catching up and falling behind between economic regions. Most relevant for what concerned us in this project, there were recently attempts to cross those developments with the fertile field of economic geography and its emphasis on the role of agglomeration economies. These economies of agglomeration influence the location decisions of individual firms towards specific industrial centres, therefore adding elements of cumulative causation in the trajectories of growth and convergence among economies.

3. From the theoretical debate to the empirical analysis

But, in the perspective of the CONVERGE project, we might ask, what lessons can be drawn from the theoretical debates and from the historical analyses of successful cases of catching up? What are the most important as pects of the debates and perspectives ensuing from the theoretical literature on convergence? How do the aspects stressed in a literature that has grown over the last half a century fit with the major developments emerging from the last decade or so? And, what are the most critical variables that ought to be observed by a research project as CONVERGE, which was particularly interested in the EU LFRs? In response to these questions there are five aspects that we would like to stress.

a) A general agreement has developed around the idea of "conditional convergence", i.e, that closing the gap and converge towards the levels of development of the most advanced regions/countries is possible if certain prerequisites are met. That agreement is in accordance with historical facts: even though in global terms successful catching up has been more the exception than the rule, several countries have succeeded in their attempts of progressing above the average growth rate of the more advanced economies, approaching or ev entually overtaking their income levels. However, despite that general agreement, some authors have kept stressing the difficulties which exist in fulfilling the necessary requirements. Particularly, many of them have stressed that in the present context s ome of the developments that occurred over recent years make that possibility yet much more difficult than before.

b) The trade-off which several authors have emphasised between "learning" and "structural change" can not be accepted as a choice between al ternative paths towards catching up. It has been historically observed that countries develop by gradually substituting traditional sectors by the emerging newer activities, in which increasing returns of scale are more pervasive. But when analysing shorte r periods of time, of several years in oposition to several decades, improvements in efficiency seem to be more related to the application of newer methods of production to existing sectors, and also with incremental adaptation in those sectors' products. This means that both "structural change" and "learning" are relevant ingredients in the evolution towards higher productivity and income levels.

c) A similar trade-off has been drawn with regard to the importance of "internal" and "external" factors in the catching up process. Again the empirical observation of successful catching up processes shows that the combination of both types of *stimuli* is the rule, even though the relative importance of each of them has varied. Historically, many factors have ac counted for that variance, namely the size of the domestic market, the scientific and technical education levels at the starting of the rapid growth period, and the geographic position of the country and the patterns of interaction with neighbouring countr ies and regions. What seems clear however from the recent cases of catching up is that with the trends for increasing economic integration and for the deepening of the globalised nature of most economic activities, namely those which offer greater value-added and profit margins, the relative importance of external factors has increased. In this context, we might say that the argument behind the idea of "regional innovation systems" is valid, certainly regions (or countries, depending on the level of analysi s) need internal coherence between their actors and activities, but in any case the external *stimuli* and factors seem to be critical for success. Those factors refer mainly to external demand, inflows of FDI, and mobility of people and knowledge, including technology transfer.

d) Yet another trade-off that has been present in most approaches is the one that refers to the importance of "accumulation" versus "institutional change". Traditional theory for a long time mentioned the importance that in parallel to the increase in the active population there was a need to improve rapidly the capital per worker ratio. The same argument has been revisited many times since growth theorists put it forward after WW II. Eventually the focus in these many approaches was not on improving the overall investment in fixed capital alone, but on the need in mobilising different types of resources in order to reach certain thresholds needed to adopt the newer, more efficient, modes of production. The "learning" argument mention ed above, which is related to the acquisition and local development of capabilities, has to a certain extent a relationship with this accumulation idea. Most recently, however, some old arguments about the importance of institutional change and adaptation as a prerequisite for economic change have regained relevance. History, path dependence and culture are central ingredients in the economic development process, according to these institutionalist approaches. Behaviours and attitudes of economic agents ne ed to be favourable to innovation and change if the region or country wishes to overcome its economic backwardness. The focus on these qualitative aspects is certainly important, in contrast with much of the traditional accounts which tended to concentrate on the quantitative aspects.

e) The debates about convergence possibilities have to a large extent clustered around the points listed above. However, those debates have been constantly refreshed with the introduction of many aspects associated with rece nt developments. These include the advancements to a "new economy", the increasing importance of science as a source of technology development, the trends in the relative weight of "codified" and "tacit" knowledge, the deepening of the economic integration processes, the role of EU structural funds and the organisation of the Community Support Framework programmes, or the steps towards a European Research Area.

The aspects a) to e) listed above are all present with different relative emphasis in the chapt ers included in the scientific report of the CONVERGE project. Chapter 1 has an introductory nature, presenting a brief review of the theoretical literature and relevant empirical facts. It covers aspects mostly related to point a) above. Chapter 2 has yet significant theoretical insights, but more on the perspective of the regional economics literature. It brings about questions which are very much in touch with points c) and e) above. Chapter 3 concentrates on the case of regional innovation patterns in I taly, and even though its contribute to the report is mainly of a

methodological nature, it also stresses aspects related to c). Chapter 4 draws a comparison between the Irish and Portuguese catching up processes in recent years, giving emphasis to many aspects which relate simultaneously to points b), c), d) and e). Chapter 5 is dedicated to the reporting of the 12 CONVERGE case-studies, carried out in different European LFRs. It gives emphasis to aspects related to d) (learning and accumulation) and c) (emergence of systemic patterns of innovation at the local/regional levels). Finally chapter 6 is about the policy conclusions and recommendations stemming from the research. It is mainly related to point d) (institutional aspects), but to a extent it also relates to all the other points above. We will now summarize the contents and main findings of each of those chapters.

4. Contributes brought in by each chapter in the Scientific Report

4.1. Some major empirical facts

Chapter 1 («Regional Convergence in Europe: What are the Main Issues?») is dedicated to a brief review of the theoretical literature about economic convergence. A summary of the main traits of that literature was already presented above. But that chapter also presents some basic empirical facts about inter-regional convergence trends in the EU.

That empirical work shows that the results are sensible to the sample configuration and size (inclusion or withdrawing of certain regions affects the signs of the correlation coefficients and the direction of the shifts in the coefficient of variation) and also to the time period selected for analysis.

When one considers the national level, a clear convergence among the EU countries happened until the middle seventies, followed by an opposite trend until the middle eighties, and then by convergence again since then. This most recent trend has happened in parallel with the intensification of the Structural Funds policies. Such intensification occurred in the sequence of the Iberian countries joining the EC and after the German reunification. In accounting for this recent trend, all the four cohesion countries have contributed to it, even though with the outstanding Irish case bringing the most important stake to the overall convergence.

When looking to the interregional level of analysis, the situation is however quite distinct. Divergence between the EU regions has set in in recent years, with the richest regions growing faster and the less affluent ones generally progressing, but at a much slower pace. The former group comprehends normally the capital regions in each state plus some other few regions where the economic and social power of the country is well represented. This trend poses meaningful questions, namely in terms of knowing whether it will intensify in the future.

Given this contradictory trends, it might be important to concentrate the discussion in trying to identify what have been the most important factors in accounting for them, namely which factors have been predominantly associated with “convergence” and which ones with “divergence”.

4.2. The potential for RIS-type strategies

Chapter 2 in the scientific report brings an interesting input by discussing the limits of mainly endogenous-based strategies for regional catching up. It analyses the contents of the

"regionalisation" argument and also the concept of Regional Innovation System (RIS), which have been put forward in recent years to stress the importance of the local context in understanding the dynamics of advancement in th e so-called LFRs.

*«**Regional innovation systems (RIS)** is partly a new theoretical construct in order to analyse and grasp important aspects of the working of regional clusters, a reference to some actual development tendencies in the building of networked innovation architectures in some regions, as well as a tool in policy making to create systems of innovation in support of business competitiveness on a regional scale (Cooke 1998). However, the question remains if regional innovation systems is really an appropriate tool in designing and implementing innovation policy instruments in LFRs of Europe. Regional innovation systems represent mainly an endogenous development model as an attempt to increase innovation capacity and collaboration in firms in a regi on through close inter-firm collaboration, the development and productive use of specific local skills, the synergies of regional knowledge organisations etc. However, we have argued that it may be unrealistic to create working RIS in the way we have defined it in many peripheral regions in Europe, as the necessary requirements in term of regional clusters and knowledge infrastructure are often lacking. We thus strive with 'one of the most difficult and challenging questions in economic development, namely to what extent, if at all, can peripheral regions innovate' (Morgan 1997: 495).» (excerpt from chapter 2)*

Based on evidence which was reviewed in several of the project papers, a typology of regional barriers to innovation is proposed in Chapter 2, focus ed on the main types of fragilities detected in LFRs. In response to those fragilities, it is acknowledged that there is a need of considering *exogenous* development strategies in LFRs. These strategies include attracting investments and firms to a region from outside. Exogenous strategies may have become a more viable option for LFRs due to the fact that transport costs and a host of other costs involved in carrying out market transactions are falling in real terms due to the rapid evolution of information and communication technology. More adequate instruments in this type of regions may be to link regional firms with relevant national and international knowledge resources and firms, and make efforts to attract innovating firms and highly skilled workers to the region.

However, in any case, a prerequisite for LFRs to succeed with exogenous strategies has to do with them simultaneously making efforts to increase the endogenous development capacities. Initiatives to bring coherence to the local structures an d interactions between different types of actors seem to be important. This is an area where policy action of regional authorities might be important, in view of their knowledge of local actors and institutions.

4.3. Is it possible to "measure" regional innovation systems?

Chapter 3 also takes a regional stance of analysis, raising questions which in nature are relatively similar to those ones treated in chapter 2, but by adopting a different methodological perspective. In fact, in this chapter a quantit ative strategy of analysis is developed by using the first Community Innovation Survey data at a regional level. The evidence presented based on the Italian case shows that CIS data are effective in grasping the varied nature of innovative activities and their region-specific nature. More in particular the indicators proposed were able: a) to quantify the contribution of the different regions to Italy's innovation performance; b) to identify the different technological profiles of Italian regions taking int o account the basic structural characteristics of regional industries; and c) to assess the density and quality of systemic interactions between the main institutional actors.

The chapter contribute is particularly relevant in showing the potentiality of CIS data for: identifying the presence of sufficiently coherent region-specific patterns of innovation; verifying

the extent to which the different regional patterns can be interpreted as regional systems of innovation. For this purpose a 17 -variables data set was created. In order to handle and interpret such a large set of indicators without loosing the richness and multidimensionality of the CIS information, the original variables were summarised by performing a factor analysis. Three factors were extra cted, explaining all together more than 75% of the total variance of the original 17 variables considered. The results are summarised in the two boxes below.

Exploration of the Italian CIS data -set by performing a factor analysis

*The **first factor** measures the existence of systemic interactions and more context -related aspects which can favour or hamper innovation activities. The **second factor** measures the relevance of firms' strategies which are not centred upon R&D activities but rather on the ability of designing new products and on less formal forms of knowledge and know -how. The **third factor** measures the technological strength of firms based in each region, resulting from radical innovative efforts and high dynamism of the business sector. A cluster ana lysis was then carried out on the new variables extracted (factors) in order to group regions with a similar technological structure and innovative profile. This statistical technique allowed the identification of four regional categories, which are presen ted in the table below.*

Regions-types	Main characteristics	Emergence of RIS
Technologically backward regions (South) – "no innovation systems"	This cluster includes the most technologically backward regions in Italy (southern regions). Firms located in these regions show the following characteristics: weak technological performances; innovation strategies clearly imitative in nature and oriented to the introduction of process innovation; a strong technological dependence from technologies generated outs ide the regional boundaries.	The lack of a critical mass of both qualified actors (firms and institutions) and interactions suggests that the attribute of 'regional system of innovation' can by no means be identified in these regions.
Moderately innovative regions – "weak innovation systems"	The second regional cluster is constituted by Veneto, Friuli, Trentino (the Northeast) Umbria and Marche (in the Centre) and Basilicata-Calabria (in the South). Compared to what happens in most of the South, innovation in these regions is a much more pervasive phenomenon: firms show a higher propensity to introduce innovation, devote more resources to innovation processes, and show some endogenous technological capacity which is reflected in a higher propensity to introduce product innovations. The most important channel through which firms innovate is the acquisition of new vintage of fixed capital combined with activities such as design, trial production and marketing.	proper RISs cannot be identified within this regional cluster. Systemic interactions can be found only in some district areas and are mostly confined to traditional user-producer interactions.
An evolution of the Third Italy innovative model - "informal learning systems"	The third cluster is composed by Emilia Romagna and Toscana, which represent, with respect to innovation, an evolution of the "Third Italy model". Innovation is often the base of the good economic performances of these regions.	the innovative pattern of Emilia and Toscana is closer to the RSI standards, although linkages and interactions between firms and between the latter and other relevant institutional actors are largely informal in nature and loosely structured.
R&D-based innovative regions - "Science-based systems"	The last regional cluster encompasses all Northwest regions (Piemonte, Lombardia, Liguria) along with Lazio. These are by far the most R&D-intensive regions of Italy. As already pointed out in Section 3.2, Lombardia and Piemonte (and to a lesser extent Liguria) represent the technological heart of Italian industry, while Lazio concentrates a large section of the Italian public R&D infrastructures and activities. Unlike the rest of Italy the introduction of process innovations does not represent the most important technolo gical source used by firms to innovate.	The full range of links and interactions forming the skeleton of an innovation system is visible especially in the case of Lombardia and Piemonte. In these two regions technological links between firms and between them and Universities and research institutes are in fact sufficiently structured. In Lombardia and Piemonte we also find the most favourable contextual conditions to innovation. On the contrary, in Lazio and Liguria systemic interactions do not play such a critical role. Support from local governments is not particularly strong, collaborative relationships between firms as well as other forms of technological linkages are not as frequent as in Lombardia and Piemonte.

The analysis confirmed the presence of a marked technological gap between the North and the South of the country. Few regions (Piemonte, Lombardia, Emilia Romagna and, to a lesser extent, Veneto and Toscana) concentrate not only the bulk of R&D and patenting activities but also the bulk of innovation activities. The Southern regions are confirmed to be located at the very periphery of the Italian system of innovation. However, it was also shown that the traditional North-South distinction is not able to depict the variety of innovation processes at the regional level. The use of the data provided by CIS allowed the identification of a wider spectrum of regional patterns. The latter differ not only according to the specific strategies and performances of firms but also to the density and quality of systemic interactions as well as the presence of contextual factors favourable to innovation.

The identification of this different regional patterns leads us to a central question in the CONVERGE project: can those patterns be interpreted as regional systems of innovation? In the light of the conceptual and definitional criteria reported in the literature the answer is clearly negative, at least for most of the regional clusters identified by the empirical analysis that was carried out. In fact, according to CIS data, only Piemonte and Lombardia (north west) can be defined as proper innovation systems. In Emilia Romagna, Toscana and Veneto the systemic dimension of innovative activities is much more based on informal technological linkages, knowledge flows and learning processes within a rather coherent and cohesive industrial environment. On the contrary, in all less favoured regions (South of Italy) the ingredients needed to identify an innovation system at work, such as a critical mass of innovative firms and institutions and a significant range of interactions among the different actors involved in the innovation process, are not found.

4.4. Learning and structural change

Chapter 4 in the scientific report moves on to the national level of analysis. An important aspect stemming from the discussion in that chapter, which draws a comparison between the Irish and the Portuguese catching up process, is that efficiency improvements associated with intra-industry learning seem to be central in explaining the convergence dynamics of both economies. Investments in capability acquisition and in the development of practical competencies were critical for the productivity rises observed in both countries in the period that was analysed. The evidence analysed showed the importance of investments in human capital and in the dissemination of knowledge, trough the development of education and training, the creation of interface organisations and the development of services responsible for technical support.

However, it is possible to argue that structural change also played a role in this process. When comparing the evolution of both economies, it is clear that structural change was much more pronounced in the Irish than in the Portuguese one. In the former, heavy investments of foreign firms drove the structure of economy towards high technology activities. In the latter, only after a long period of structural stickiness in terms of both manufacturing value-added, employment and international specialisation, a moderate upsurge of the medium-high-tech sectors started to become apparent in the second half of the 1990s.

Another possible conclusion regards the critical relevance of the external stimulus in both economies. This brings us back to the problem of combining endogenous and exogenous elements in spurring on catching up. Openness to world trade and FDI inflows is normally stressed with regard to Ireland, but it was also of great importance for the Portuguese economy,

namely in terms of stimulating the recent s tructural change. Being part of an open trade area also explains the convergence dynamics observed. Exposure to international demand has meant that domestic producers have had access to more sophisticated buyers. The interactions that have occurred in the external markets or through contacts with local branches of foreign firms have also been instrumental in disseminating innovation, advanced norms and procedures among the domestic producers. On the other hand, the participation of both economies in the Sin gle European Market stimulated the multiplying effect of exposure to trade and international demand. In addition to that, the European Structural Funds played a relevant role. This was important not only by the direct and indirect impacts measured in terms of GDP growth, but also by the imposition (together with the discipline associated with the creation of EMU) of certain demands on the organisation of the public policy processes.

4.5. Diversity of trajectories and the need for improving coherence into local systems

Drawing on detailed information presented in the 12 reports that were prepared (one for each set of cases), and on an intermediary comparative 50 -page long document (which is available in the CONVERGE project website), the main findings wer e summarized in chapter 5. As it is pointed out there, providing accurate answers to the research questions that illuminated the empirical investigation based on the very detailed information presented in each of the 12 reports is not easy or straightforwa rd. The case-studies that were carried out covered a diversity of sectors in 4 different countries (Ireland, Portugal, Spain and Italy). The surveyed industries: a) are in different stages of development, display a diversity of organizational patterns; b) rely on very distinct sources of innovation and competitiveness; and c) are embedded in relatively contrasting institutional and structural settings.

Besides such a huge diversity which is inherently difficult to sum up, the case -study methodology presents additional drawbacks. These refer mainly to the difficulties in generalizing to broader universes the findings drawn from specific case -studies. However, the case-study methodology also offers some advantages in relation to other investigation strategie s. As it is known, these include the possibilities of in-depth inquire and observation of the variance behind statistical aggregate figures.

A possible conclusion is that despite the individual case studies reflecting relatively well the overall patterns of convergence of each of the 4 countries or regions were they were carried out, the degree of convergence is not similar across each of the 3 industries studied for each of those countries or regions. In fact, it became clear from our analysis that for th e same country or region some industries perform much better than others in terms of capability accumulation, networking or competitive success.

It is also clear from a transversal look of our case studies that aspects associated with both endogenous and exogenous factors have been present and play specific roles in stimulating the development of the EU LFRs.

Another conclusion is that even when the process of change is mainly induced by internal factors, there is not a common pattern with regard to the agents that lead that process. In some cases it is clear that the autonomous role of local entrepreneurs is decisive for starting change, while in others one observes a collective entity or a measure of public policy as being the trigger of a virtuous evo lution. But here again, one might argue that more commonly there is a combination

of different initiatives, at different levels and often at different time scales that contribute to the progress observed.

This leads us to the matter of the emergence of "innovation systems". The general picture that comes out of the analysis is that networking, within the regions but also across their borders, has been present as a general trend in the regions observed. The use of ICTs, namely in traditional industries related to final markets, has been intensifying in recent years. In some cases local networking and interactions are present, for example, in the relation with sophisticated customers, while at the same time the firms in the industry depend on external suppliers of intangible inputs, such as design, training or specific equipments. The firm tends to be integrated in distinct internal and external logics of transactions and exchange of information and knowledge, that depending on the products and technologies employed, on its position with regard to the industry's life-cycle, or on the localization of its customers being local or global. In some situations it is possible to argue that a cluster dynamics has been established, leading to proto-innovation systems of a strictly local or sectoral nature. However, full-blown innovation systems are not yet recognizable in the regions that were studied. Some critical components seem to be missing in some regions, but more frequently what is happening is that the degree and the quality of the interactions do not reach yet a critical level for qualification of the existing networking practices as proper "innovation systems".

5. Are there additional roles to be performed by public policy in LFRs?

One important aspect that was dealt with by the CONVERGE project had to with understanding how LFRs have been performing in terms of designing and implementing strategies and actions to "catch-up" with the most advanced EU regions. Though not originally addressed as such, the comparative nature of this project's analytical approach allows one to consider it as a "benchmarking" exercise. In fact the policies of LFRs were compared with the equivalent policies implemented in some of the most advanced regions in Europe in terms of innovation and economic wealth. In this line of thought, the CONVERGE project seems to match one of the mainstreams of the European Commission and Member States agenda in relation to research. This exercise was developed along the project by using a combined methodology, with indicators proposed by the European Commission and qualitative approaches.

5.1. Some general conclusions

Within a frame of diversity, the CONVERGE study has allowed to identify a series of common facts and features as the following:

- the critical importance of human resources extends the need for a good science and technical base to the requirement of skilled, well trained personnel for performing satisfactorily all the activities involved in the efficient management of innovation (and R&D) policies;
- the creation of infrastructures and interface institutions in the LFRs has followed an imitative pattern. By leaving aside their own structural deficits with respect to bureaucracy, firms' behaviours and actors' habits, the LFRs may have overestimated the positive influence of mimicking policies and decisions adopted by the more developed countries.

Is there such a thing as a policy "best -practice" to be followed?

«There is a need to adapt innovation policy instruments to take into account the specific problems faced by the regional economy. Thus, there is not one set of policy instruments or 'one -size-fits all' policy portfolio that suits all types of regions. It may be necessary to fit innovation policy instruments to distinctive characte ristics in individual regions. This may involve efforts to lower specific barriers in the regional innovation systems, i.e. hampering factors in the regional industrial milieu, in its institutional set -up, and barriers related to the inhabitants' typical attitude towards innovation and entrepreneurship.»

In this respect, the information gathered by the CONVERGE case studies and summarized in chapter 5 also provides some insights. In some of the analysed cases the presence of public policies and measures i s evident and the agents interviewed recognize that the policies were instrumental in the support of virtuous developments. In other cases, no such correlation seems to exist. In others yet public policies seem to have been only marginally present. However , a possible conclusion is that in some of the more successful cases of capability building up and networking dynamics, public policies intervened through specific measures, tailored according to the needs of the sector or the region that were the object o f support. This means that the use of instruments of a strictly horizontal nature can have a general positive effect over the context of the firms, but something else is needed in order to stimulate more ambitious developments. This also means that no "bes t-practice" is possible to be found, since the key of success seems to be more related to flexibility in adapting each intervention to the needs of the final beneficiaries or users of the policy outcomes.

5.2. Need for an innovation policy in the LFRs

In a "knowledge-based" or "learning" economy it seems reasonable to attribute a central role to innovation activities and to the policies that promote them. This central role of innovation implies that the policies targeted to its promotion have to be co nsidered not as a result of an isolated, autonomous strategy but as the confluence of a series of policies like those related to education, R&D, social cohesion, industry, fiscal and commercial aspects. The sum and/or interactions of the outcomes of these different policies must be taken into account when analysing the possible effects of innovation policies and initiatives. And, more than that, innovation policy has a role in providing a focus for coordination of those sectoral policies. The prevalent mode l of policy organisation has given a prominent role to the financial perspective of coordination, which based on the annual rounds of budget preparation has perpetuated the inertia of ever growing public expenditures. A dual approach, with another pole of governmental coordination, is therefore needed, to empower public policy with a strategic outlook.

5.3. Is ERA a response to the innovation needs of LFRs?

An interesting additional question, from the policy viewpoint, is to understand how the trends that have been observed recently in terms of interregional convergence (divergence, in fact) will continue or evolve in the medium and longer terms.

Our analysis in the project was focused on regional economic development in the EU in the frame of a globalising world economy and deepening political integration in Europe. An important aspect in this context is to consider whether the preliminary steps leading to a EU innovation policy, which have to do with the establishment of the European Research Area (ER A), may raise the innovation capability also in LFRs, and thus contribute to regional convergence in Europe.

The idea with ERA is to build up a European integrated science and technology infrastructure by massively using the principle of networking. In addition to the idea of co-ordinating national science and innovation policies, the ERA project aims at setting up a network of "areas of excellence". Scientific knowledge creation and applied competence building must be mixed in a proper way for promoting innovation. As it is pointed out in chapter 2 in the scientific report, the ideal candidate area for benefiting from EU support and becoming one pillar of the future European research and innovation system is therefore a region combining good academic institutions and efficient productive organisations. Since such ideal mix of tacit and codified knowledge is essential for lasting development (based on both radical and incremental innovations), one can foresee in the long run a concentration of means and production in the few European regions combining, with appropriate geographical density, those endowments in the right proportion and qualitative combination.

This orientation seems that it will only deepen the trend for unequal development observed in recent years, with a possible growing inter-regional divergence in the EU. This result suggests that policies much more creative and with greater potential of impact than those associated with the present CSF programmes will be needed.

5.4. What characteristics shall innovation policy assume in the EU LFRs?

A possible framework for defining the practical features of an innovation policy for the EU LFRs is a matrix combining: a) the main factors and aspects pointed out as relevant by the research literature on economic and technological convergence; with b) the nature of the innovation policy.

The "nature" of the policy has to do with its orientation, which can aim the central actor of the innovation system (the "firm") or, more generally, its environment (consolidation of the "system" as a whole). The first type of action is normally associated with "direct intervention", while the second one with "indirect intervention". These orientations are represented on the left side of the matrix below.

In terms of the main aspects stemming from the research literature, and also from the CONVERGE project own results, there are three groups of factors to be taken into account. These are: "accumulation and learning"; "structural change"; and "institutional change". They are all on the top of the matrix below. The first group comprehends the variables conventionally associated with the accumulation of tangible resources (physical capital and employment), but it also takes into account the aspects that accrue to labour's quality, and more generally the activities related to "learning" – from those occurring informally to basic research activities. The second group refers to six main "structural" aspects: sectoral composition of the economy; size distribution of firms; firms' position in their value chains; organisational models adopted by the individual actors; networking and partnership structures; distribution of activities in geographical space. The third group refers mainly to two areas: individual attitudes and behaviours; and legal and regulatory framework. The policies that have been implemented under the CSF umbrella fall mainly in the area of the "accumulation and learning" column. They shall in the future move to the domains represented by the other two columns, particularly the last one.

Each one of the policy instruments referred to in the matrix below constitute possible examples of interventions aiming at specific objectives. Several of those instruments serve simultaneously

more than one purpose, even though fo r practical reasons they stand in just one of the columns in the matrix.

We must say at this point that the matrix adds little information about the "policy model" to be adopted. In our view that model develops along two main vectors, which are "organisa tion" and "scope". For "organisation" we mean both the degree of centralisation, e.g. depending directly from the prime minister or from separate departments, and the extension on whether each of the relevant sectoral policies become coordinated with innov ation policy. By "scope" we mean the ambition and the degree of strategic intentionality of the policy. This "policy model" might be seen as third dimension of the matrix, not represented below.

Next page a box is presented with practical guidelines for i nnovation policy implementation.

		Factors involved in catching up		
		Accumulation and Learning	**Structural Change**	**Institutional Change**
Innovation Policy	**System Oriented ß à Firm Oriented**	- Subsidies and fiscal incentives - Training schemes - Education system - Demonstration activities - Benchmarking activities - Extension and support programmes - Technology brokerage and TT activities - Info on market opportunities - Economic and technological intelligence - Promotion of technological infrastructure - Strategic and basic R&D - HR mobility programmes - …	- Quality regulation - Consumer protection - Competition law - Regulation affecting firms demography - Sector oriented programmes - Attracting FDI - Cluster and networking promotion - …	- Fiscal law - IPRs policy - Environment protection - Courts and judicial system - S&T culture and information - Labour market regulation - Financial markets regulation - Efficiency of public administration - …

6. Dissemination and/or exploitation of results

The teams involved in the CONVER GE partnership are all characterised by a marked practical orientation in their research activity. They have had relatively distinct trajectories, activities and performances, but they have in common a preoccupation with the additionality coming out from their research. Several members of the teams have acted as consultants in different stages of policy making in the S&T and innovation areas, from the design of new programmes to the evaluation stage. This background represented an important value -added for the work carried out by CONVERGE.

Along the two years and half of project duration several important dissemination activities were implemented. Three open seminars were organised with the participation of both academics and policy-makers. These seminars were organised in Strasbourg (January 2000), Madrid (October 2000) and Lisbon (March 2001).

Two project newsletters were produced in 2000 and early in 2001. The newsletters were carefully prepared in terms of their contents, trying to provide both a practical outlook with regard to the project results and to supply inputs for the strategies of the actors typically aimed at by innovation policies. Each of the issues was distributed widely through the CONVERGE partners' networks.

Another important step in dissemination were the contacts and interviews held over the project implementation, namely those that occurred in association with the organisation of the case studies. On average each case study was based on more than 20 interviews.

(point 6 follows next page)

12 possible practical guidelines for the policy-making process (refers to point 5 of the executive summary)

1. Policies should concentrate their resources more on providing access to sources of information and expertise, rather than primarily subsidising the purchase of equipment.
2. Policies should also devote a significant share of their resources to supporting the development of new firms, rather than concentrating them on supporting existing organisations – this second approach runs the risk of perpetuating the *status-quo* and reinforcing recurrent behaviour patterns. The move from the family-owned, individualistic, firms to new firms with professional, well-trained management seems to be decisive.
3. Creating the conditions for the strengthening of the business services market, namely knowledge-intensive services related to design, R&D, marketing, managerial systems, etc., is a necessary condition for the upgrading of both firms and activities in the regional economies.
4. Solutions should focus on needs and bottlenecks, rather than on developing large-scale infrastructures, which normally encounter difficulties in finding suitable staff and in becoming fully integrated into their contexts. Assistance in strengthening the in-house R&D activities of advanced smaller and medium-sized firms, or in finding them suitable partners for developing new products and solutions, or even in identifying potential customers, might be more relevant, for example, than investing heavily in ineffective infrastructures.
5. Should the extent of 'clusterisation' of the economy be low, public initiatives may be relevant in arranging practical mechanisms for actors a) to meet and interact, b) discuss new projects and solutions, and c) begin to share and disseminate knowledge. This might also help release the sort of energies that will trigger more profound processes of institutional change.
6. Policies should have an "outward-looking" orientation, in the sense that they should encourage contacts with external actors and create the conditions for attracting high quality investments to the region. This would maximise the opportunities for learning and help to shift the focus from supply-side factors to demand-driven strategies for technological improvement.
7. Education and training are long-term activities that need to be pursued constantly in order to develop the qualifications and skills needed for working with both existing and emerging technologies.
8. Policies should be balanced, in the sense of a) creating general and advanced competencies, b) assisting the development of existing technologies and the acquisition of new technologies, and c) supporting applied and fundamental knowledge.
9. Structural funds should be used to improve the mechanisms of policy design, implementation and evaluation, while at the same time helping to develop the competencies of the national and regional bureaucracies responsible for implementing these policies.
10. The capacity and skills required for integrating in the implementation the relevant public policies also need to be improved, to a level that is far above the one currently found in most LFRs – otherwise the effectiveness of these policies will systematically be compromised by partial, non-systemic, approaches.
11. Efficient regulation (competition, quality norms, labour market…) through a well-trained and forward-looking bureaucracy shall be promoted and actively applied.
12. The fiscal policy shall be transparent and effective.

A project site (http://pascal.iseg.utl.pt/~converge/) was installed since the beginning of the second year in the Internet. The site contents were partially fed in with the material published in the newsletters, but also with most of the papers and reports prepared within the context of the project.

Dissemination also occurred through the contacts with the European Inter-University Association on Society, Science and Technology (ESST). This association of European universities was a member of the project's Advisory Committee and acted as an echo chamber for part of the research work, namely that dealing with social and political aspects of innovation. Three papers were prepared for CONVERGE by ESST and presented and discussed in a scientific meeting specially organised for that effect in Strasbourg (October 2001).

Interaction also happened with the individual members of the Advisory Committee, which provided meaningful inputs into several steps of the project implementation.

On the whole about 50 papers and reports were prepared within the context of the project. Many of them are accessible at http://pascal.iseg.utl.pt/~converge/projects.html where they are available for downloading. A great deal of them were presented at international or national meetings, namely those organised within the context of the project. Part of them is already published in academic journals, conferences' proceedings or as book chapters. There is an intention of publishing a special issue of an academic journal with the main results of the project.

Introduction: background and initial objectives of the project

Initial Objectives – General and Specific

The CONVERGE project put forward at its beginning five specific objectives:

1. Assess whether **economic and technological convergence** is occurring in the European Union between Less-Favoured Regions and the most advanced regions. This assessment will address the question of how rapidly have the more backward European regions been catching up, while at the same time it will allow the identification of the most relevant factors which have been slowing down and stimulating the process of convergence.

2. Assess the intensity, quality and sustainability of the interactions between firms, universities, government laboratories, interface agencies, financial institutions, and other relevant agents, to **determine whether "systems of innovation" are emerging** in those European regions, with similar characteristics to those which exist in the more advanced EU regions.

3. Analyse the S&T and innovation policies in the Less-Favoured European regions, with the intention of determining what represents **"best-practice" in terms of policy** design, implementation and effectiveness. There are three levels of policy to consider here: national policies; EU policies (RTD Framework Programmes); and policies which combine EU and national funding (basically the Community Support Framework).

4. Analyse the strategies undertaken by other major agents (private firms, research and technology organisations, universities, etc.) with regard to the acquisition and development of capabilities which may further the competitiveness of their regions and eventually contribute to narrow the gap with the most advanced regions. The intention here is also to find **cases of "best-practice" in terms of strategy**, which may be used for demonstration purposes, both locally and in other E.U. regions.

5. Finally, the fifth specific objective is related to the aim of **involving "end-users"** in several stages of the project, through the implementation of practical measures and initiatives to disseminate the results of the research. Those measures and initiatives include: having an "advisory-group" integrated by invited key decision-makers from the less favoured regions

covered by the project; organise national seminars to discuss the research issues with relevant agents in the fields of S&T and innovation; produce a guide for decision-makers about "best-practice" cases in terms of strategies and policies.

In addition to these specific objectives the CONVERGE project intended to contribute to other, more general, objectives, which are highlighted in the table below.

1. The comparative approach endorsed by the project aimed to enhance the understanding of innovation as a systemic phenomena in which a **diversity** of institutional arrangements and courses of action (rather than a single model) contribute to strengthening the innovative climate and performance of the European Union;

2. The nature of the partnership which supported the project was meant to contribute not only to the development and acceptance of an up-to-date conceptual framework about the nature and characteristics of innovative processes in Europe and to its dissemination both through the involvement of decision-makers and advanced training and post-graduate activities, but also to the **reinforcement of the S&T community in Europe** through the creation of a "knowledge network" linking partners from different member-countries;

3. The comparison of policies in a context of a systemic analysis of innovation generation and diffusion had to contribute to improve policy design and implementation in the Less-Favoured Regions. A new approach was expected to emerge, in which **systemic-oriented policies** shall articulate the promotion of supply-side capacities with the stimulus both to the development of competencies on the demand-side and to the establishing of dynamic interactions between the relevant partners.

The partnership

The CONVERGE project brought together 6 teams from different European regions. The project was led by CISEP (Lisbon), and it involved teams from several European regions displaying quite different economic and technological levels of development. The project tried since its beginning to concentrate on the barriers, opportunities and challenges the so-called less-favoured regions are facing in the transition to a "knowledge-based economy". The teams working on the more advanced regions provided analyses and background information against which the catching up of the less-favoured regions was benchmarked. Below a short description of each of the teams involved and what was its role and activities in the project can be found.

The methodology of research

A dual approach underlined this project: o n the one hand the project assumed a standard research stance, aiming at providing new insights into the mechanisms affecting the conditions of catching up in the so-called "less-favoured regions" in the periphery of a core group of economically advanced regions; on the other hand, the project put a strong emphasis on the involvement of end-users, aiming at the dissemination of the project results among the relevant actors so that they might improve their own policies and strategies regarding innovation an d S&T activities in general.

Given that dual approach, the project was carried out in three methodologically complementary stages: (i) review and analysis of the available literature and information, leading to a systematisation of previous findings; (ii) statistical analysis; (iii) fieldwork. Simultaneously with these three stages, interaction with end -users, dissemination of information and consolidation of views took place.

As stated in the original proposal, interaction with end -users and disseminat ion activities were expected to occur throughout those three stages. The organisation of local/regional seminars was expected to involve end-users in the discussion of the project issues. The materials published by the project were also expected to provide a basis for further dissemination.

Scientific report with policy conclusions

Note: This part of the report is broken down into six chapters, and each chapter is divided into several sections. The main authors responsible for each of these six papers a re identified, even though the present versions were edited by the project's coordinator.

Chapter 1, Regional Convergence in Europe: What are the Main Issues?

Manuel Mira GODINHO
Ricardo Pais MAMEDE

1.1. Introduction

Two sorts of questions justify the interest in studying convergence among the European regions. First, the political-institutional process of integration in the EU. Since its very beginning, the European Union has had the harmonious growth of standards of living and social well being among its member countries and regions as an aim. The reduction of interregional disparities has been explicitly targeted by active community policies since the middle 1980s. The increase in structural funds allocations was parallel with the EU enlargement (Portugal and Spain joined in 1986) and the deepening of the integration process, that has followed the publication of the Single European Act, the setting up of the Single Market and the implementation of the Monetary and Economic Union and the recent introduction of the Euro. Cohesion within the Union is an aim concerned with keeping the existing disparities at politically and socially tolerable levels.

The second question concerns the fact that the intensification of the integration process – with the extensive trade liberalisation and the factor mobility, and the increasing co-ordination of monetary and fiscal policies – has brought along old debates in economic theory on convergence. Namely, the impact of economic integration on productivity, employment, and unemployment disparities. Recent contributions from different research programs help to understand the mechanisms, factors and barriers to convergence among regions. Particularly, special attention is being paid to the process of technological competence accumulation, and its importance for development in economies where productive knowledge is recognised as an increasingly relevant factor.

The European integration process has been implemented on the assumption that it will bring about increased economic efficiency, as a result of both the elimination of trade barriers, production specialisation, and the opportunity to exploit economies of scale. Nevertheless, it is recognised that an increase in overall growth in the EU area will not necessarily lead to a decrease in the inter-regional disparities (on the contrary, it can be associated with a widening of the gap). In a sense, the structural policies in the EU correspond precisely to the recognition that problems of production adaptation (specially in the less developed and depressed regions) can arise as the integration process intensifies.

Thus, we are interested in analysing the recent trends in economic convergence among European regions, and in understanding the mechanisms behind this evolution. The evaluation of the main factors and barriers which presently shape the convergence process – taking into account the policies and strategies of the relevant actors - will help us to forecast the possible future developments.

In line with these interests, we will be presenting next a short summary of the main themes and findings which have been present in the extensive literature recently produced about convergence in Europe and elsewhere. In section 1.2 we concentrate on the theoretical contributions to debate coming from different streams of economic thought. Section 1.3 will be dedicated to the presentation of some main empirical results.

1.2. Theoretical contributions from the "convergence literature"

There has been a long debate in economic theory on whether economic integration among countries/regions brings about convergence or divergence in income levels.

As known, traditional neo-classical trade theory forecasts the convergence among integrated, non-separated by trade barriers, economies. This occurs for two reasons. On one hand, factor mobility eliminates income differentials – labour will migrate to the regions with higher wages, capital will flow to the regions with lower wages (where profit opportunities are higher); both movements represent equilibrating tendencies in income levels. Even in the absence of factor mobility, free trade will assure the most efficient specialisation in production (according to factor endowments), leading to convergence [1].

Traditional growth theory also predicts convergence. In this context, the reduction of the gap is explained by the assumption of decreasing returns to capital. The less developed economies (with a lower capital intensity) will experience faster productivity growth for identical investment

[1] These conclusions depend crucially on the usual restrictive assumptions of the neo-classical theory, namely perfect competition, inexistence of transport costs, and the homogeneity of production factors. Dropping these assumptions can lead to very different conclusions. For example, Krugman and Venables (1990) show that in the presen t of transport costs production may tend to localize in the centre, even when technical efficient is higher in the periphery.

levels. Capital will be attracted by higher returns and income per head will progressively converge.

A different approach to the issue of catching up, is the "technology gap" perspective put forward by Posner (1961) and others. Inspired by Schumpeter, this view ascribes a central role to technology, portraying economic growth as the combined result of innovation and diffusion, with the former tending to increase technological gaps, and the latter reducing them. In consonance with the historical perspective put forward by Gershenkron (1962), backwardness is seen as a potential in itself — countries facing a technological gap may benefit from the technology developed in the leading countries through imitation, increasing their rate of economic growth and converging towards the world frontier without incurring similar development costs.

Opposite views have been expressed by those who emphasise the tendency for divergence of income levels during processes of economic convergence. Myrdal and Kaldor rejected the idea that integration tends to eliminate income differentials, introducing the concept of "cumulative causation", which points to the fact that there are many mutual reinforcing factors behind the processes of growth, making those processes more intensive in the more advanced economies.

For example, when adjustment to income disparities occurs through labour migration from less developed to richer regions, this causes changes not only in supply conditions but also in aggregate demand. Therefore, the poorest regions will experience a reduction in demand, which will benefit the richest ones (where the total labour force will increase). The market dimension in the latter will therefore grow, attracting further investments, causing additional labour inflows, and so on. The integration process will thus reinforce the lead of the advanced regions [2].

Another example is given by the model developed in Kaldor (1957). In this case, cumulative causation is associated with the so-called 'Verdoorn's Law', which explains productivity growth as a result of product growth, due to the presence of scale economies both static and dynamic. In this context, productivity growth will be higher for more developed economies, therefore creating a trajectory of divergence.

[2] One should note that, in this case, convergence in income per head might occur, since part of the population migrating to more developed economies was probably unemployed or under-employed, and their exit will to an

Furthermore, economic geography emphasises the presence of economies of agglomeration, which influence the location decisions of individual firms towards specific industrial centres, as an additional factor promoting divergence. In the Marshallian tradition, the factors which are accounted for those agglomeration economies include labour market pooling, supply of intermediate goods and knowledge spillovers.

The empirical verification that income gaps between some world regions persisted (and were even widening), while other regions were converging (the most obvious example is the convergence of income per head between the US, Europe and Japan, in the post-war period), brought consensus to the idea that convergence among integrating economies is possible but conditional to the presence of particular factors. In a much-quoted paper, Abramovitz (1986) re-formulates the "catching up hypothesis" put forward initially by Gershenkron, pointing out that the main requirement for a country to catch up successfully is associated with the existence of a "social capability". This relates to flexibility and acceptance/willingness for change among the agents of the development process. The idea of "conditional convergence" can also be found in the New Growth Theory literature, where the negative association between the growth rates in the long run and the initial levels of income per head, depends on the introduction of additional factors – namely, education rates or R&D expenditures. [3]

Other sceptical perspectives regarding the possibilities of rapid catching up were put forward in the 1980s by authors close to neo-schumpeterian and evolutionary views. For example, Pavitt (1985) analysing the post-World War II technological catching up of Japan and some European countries toward the “best-practice” levels of the US, stressed that "the international patterns of technological convergence... reflect long-standing international patterns of technological accumulation in the assimilating countries" (p. 15). That is, catching up was portrayed by Pavitt as a long-term endeavour, resulting primarily from a path-dependent process of sequential accumulation of technological knowledge.

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increase in the average incomes of the poorer economy. Still, in this situations the economic relevance of the more advanced regions will increase in absolute terms.

[3] Other factors considered as influencing convergence perspectives include political stability, State intervention, market distortions or international trade.

This brief review of the debate on convergence/divergence between integrating economies is summarised in Table 1.1.

Table 1.1. Theoretical Debate on Convergence/Divergence

Unconditional Convergence	Conditional Convergence	Divergence
§ Traditional neoclassic trade theory - factor mobility - regional division of labour § Traditional growth theory - Decreasing returns to capital - capital flows § Technological gap (Gershenkron, 1962) - Technological backwardness as a potential in itself	§ Abramowitz (1986) - 'social capability' - technological proximity § Neo-Schumpeterian/ /Evolutionary approaches - path-dependent accumulation of technological knowledge - partial tacitness and specificity of economically useful knowledge	§ 'Cumulative causation' (Myrdal, 1957; Hirshman, 1957, Kaldor, 1957) - capital attracts labour; labour increases; demand; demand attracts capital § Economies of scale - Static - dynamic (learning by doing, development of specific know-how, …) § New economic geography - Agglomeration economies (labour market pooling, supply of intermediate goods, knowledge spillovers)

The long debate on the prospects for convergence among regions leads us to the conclusion that processes of economic integration are caricaturised by the presence of several, and frequently contradictory forces.

For example, the forces explaining the flows of tangible and intangible capital between economies are dual in its results: (i) on the one hand, low capital -intensity and low levels of labour income will attract flows of fixed capital and knowledge from more advance regions, increasing the rate of growth in less developed ones; (ii) on the other h and, scale and

agglomeration economies will favour the growth of more advanced economies, increasing the existing regional gap.

Or, in what concerns labour mobility, high income levels attract labour force to more advanced regions, reducing the impact of unemployment in less developed ones. Nevertheless, this will result in the polarisation of economic activity in a few developed regions. Furthermore, when there is a selective labour force mobility, affecting mainly the more qualified workers, there will be a loss of human capital in the less advanced regions, with negative consequences for the prospects of convergence.

But the theoretical debate we summarised above should also have made it clear that the prospects of catching-up for less favoured regions is not only a matter of their comparative position towards the more developed ones. Taking advantage of the opportunities created by economic integration, and reducing the impact of the polarising forces, is dependent on the development of endogenous capabilities through investments in physical and human capital, and adjustments in the existent institutions (the scientific and technological systems, education and training, financial and labour market regulation, industrial and competition policy, among others).

Since the process of convergence among integrating economies is subject to contradictory forces and can be influenced (to some extent at least) by the deliberated actions of public authorities, it is not possible to determine *ex ante* the consequences of integration for the comparative economic performance of the participating regions. This is a matter of empirical assessment, therefore we will discuss the main findings concerning regional convergence in Europe in the following section.

1.3. Empirical evidence on regional convergence in the EU

The European economies have been going through several changes, which strongly influence the mechanisms, factors and barriers that induce and limit regional economic convergence. Besides the effects of the integration process, the evolution of regional economies in the EU has been affected by recent technological changes – pulled by the diffusion of information and communication technologies – and by the transformations in Eastern Europe.

Several studies have been done in recent years evaluating the evolution of income disparities between the EU regions (Abraham and van Rompuy, 1995; Amstrong, 1995; Barro and Sala -i-Martin, 1992; Fagerberg, Verpagen and Caniells, 1997; Neven and Gouyette, 1995). Unfortunately, we cannot conclude unequivocally about the observed trends. This is due to the fact that the authors consider different sets of regions in their analysis (taking into account the available data for different time periods), and use diverse methods to evalua te the pace of convergence. Generally, there seems to be a consensus on the fact that there was a strong economic convergence in Europe in the post -war period until the beginning of the 1970s. From here to the middle 1980s there was a slowdown in the pace of convergence, or even an inversion of the trend towards divergence. Since then, regional convergence has been weak or absent.

Behind these general trends, one can observe a diversity of convergence patterns between different sets of regions. Economic co nvergence between the Northern regions was apparently faster than between these regions and the Southern ones.

The slowdown in the pace of convergence is not related to the exhaustion of the potential for catching-up in productivity. As several studies ha ve noted, disparities within Europe are still much wider then the ones observed in the US or Canada. The lower labour mobility in Europe (stemming from cultural and language barriers, that limit the possibilities of such mobility working as an adjustment m echanism), is often referred to as one relevant factor explaining these differences.

All the studies mentioned above have in common the fact that they try to evaluate regional convergence using income per head as the relevant variable. Some authors limit their work to describing the evolution of disparities in average income (or productivity). Others introduce explanatory variables (such as R&D expenditures, or unemployment rates), assuming – in the context of their models – a linear relationship between t hese variables and the results in terms of economic convergence. The complex interactions between the process of accumulation and development of technological competences, and general economic growth, are usually overlooked. Caniells (1996) gives one step in the direction of understanding those interactions in her study on technological convergence in the EU. Based on the levels of corporate expenditure in R&D, she points out to the existence of a significant heterogeneity in technological

development levels within the EU. Furthermore, it is shown that population density and the levels of economic activity are positively related to the intensity of corporate R&D. These results seem to give support to the theories of imperfect diffusion of technologies and to the processes of "cumulative causation".

1.4. Some results

In this section we present some basic results stemming from the observation of available data sets.

In order to observe the evolution of income disparities in Europe, we started by estimating the coefficient of variation of GDP per head for the EU15, in the period 1960-1995. We used the OECD historical data. As can be seen in the figures presented in the Appendix to this chapter, there was a clear convergence among the EU countries until the middle seventies, when an opposite trend set in until the middle eighties. Since then, and until 1995, convergence seems to be happening again, although this trend is not quite clear.

We take the period since the middle 1980s as our reference for the regional analysis. The source used here is the Eurostat's REGIO database. This source presents some limitations in what concerns availability of data on both some relevant variables (e.g., data on innovation is limited to R&D expenditures and personnel; or, data on education attainment), and time periods (e.g., the possibility to analyse the evolution of innovation variables over the whole period is very limited), particularly for some regions.

The evolution of regional convergence in what concerns GDP per head can be observed in the figures included in the Appendix. Two samples of regions (NUTS1) were considered, one containing 73 regions for the period 1991-1996, and the other including 58 regions over the period 1985-1996[4]. Furthermore, we analysed two kinds of convergence. On the one hand, the coefficient of variation denotes the overall dispersion among the regions considered. On the other hand, β convergence explores the correlation between the initial level of GDP per head and the

[4] We always exclude from our analysis the regions: pt2, pt3, fi2, and fr9, because of data unavailability. The same reason led us to exclude from the analysis 15 other regions for periods before 1991.

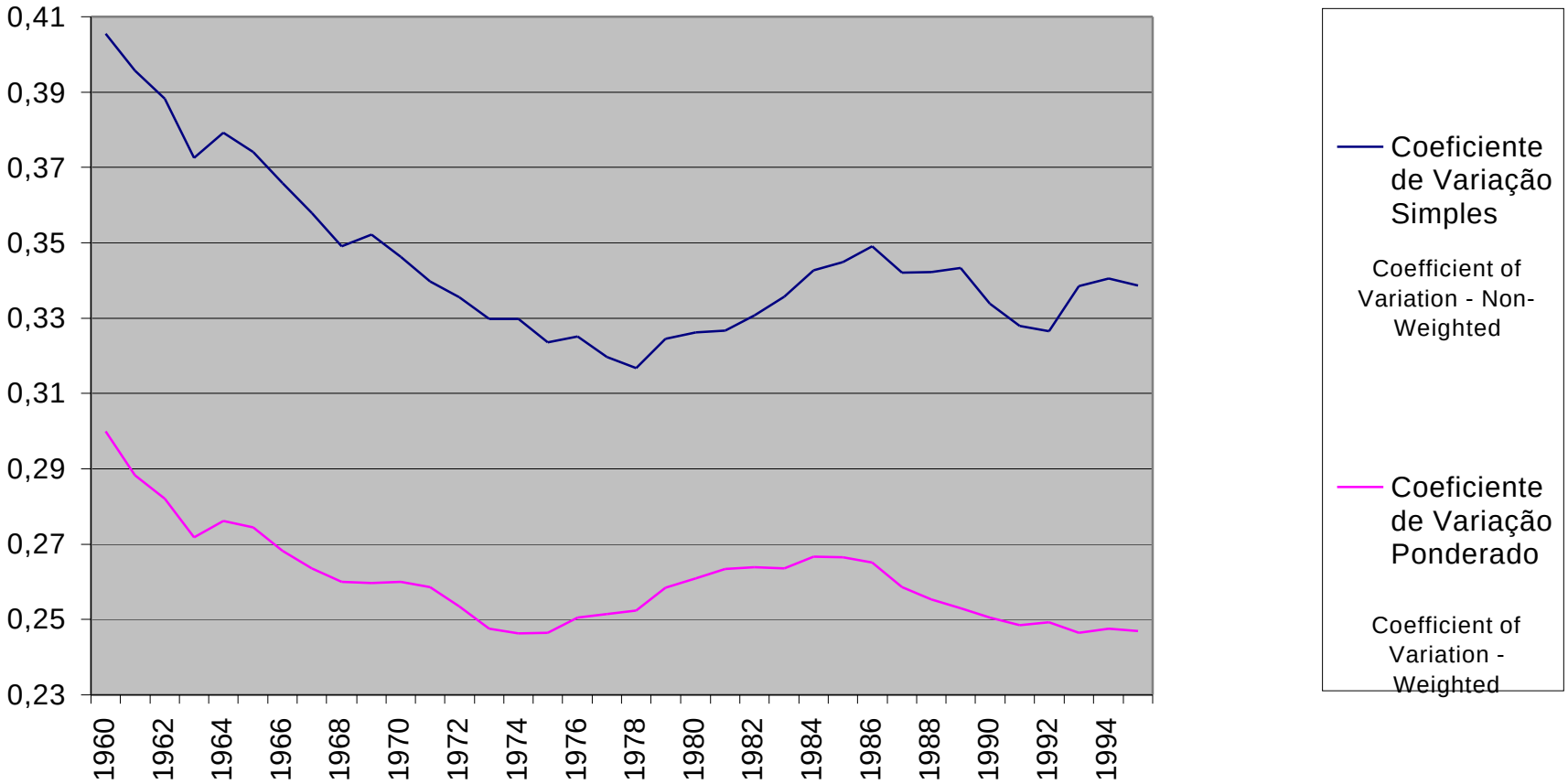
rate of growth in a given period for a group of regions (when the correlation coefficient is negative it indicates that convergence is occurring).

For the time period between 1985 and 1996 (58 regions), we have no clear evidence of convergence in income levels. The coefficient of variation does not present a clear trend and the analysis of β convergence leads us to a similar conclusion. When we consider instead the period 1991-1996 (73 regions), the signs of convergence in regional GDP per head are more evident (although the R^2 in the correlation is not high). The impact of including the 5 Eastern German regions in the sample (they are not part of the 58 regions of the other group) is obvious when looking at the respective graph (see Annex below).

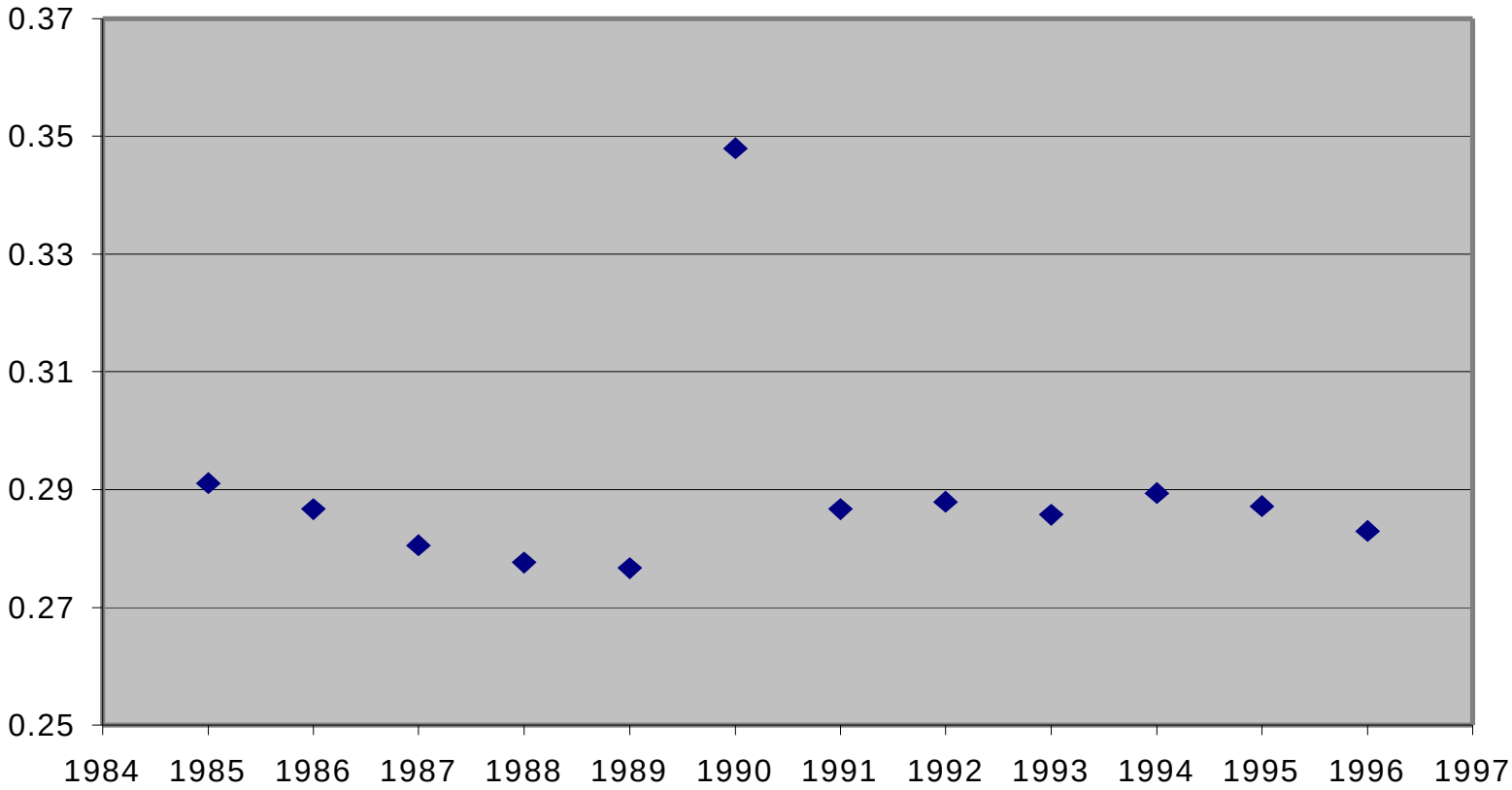
Annex to Chapter 1

Some Statistical Evidence

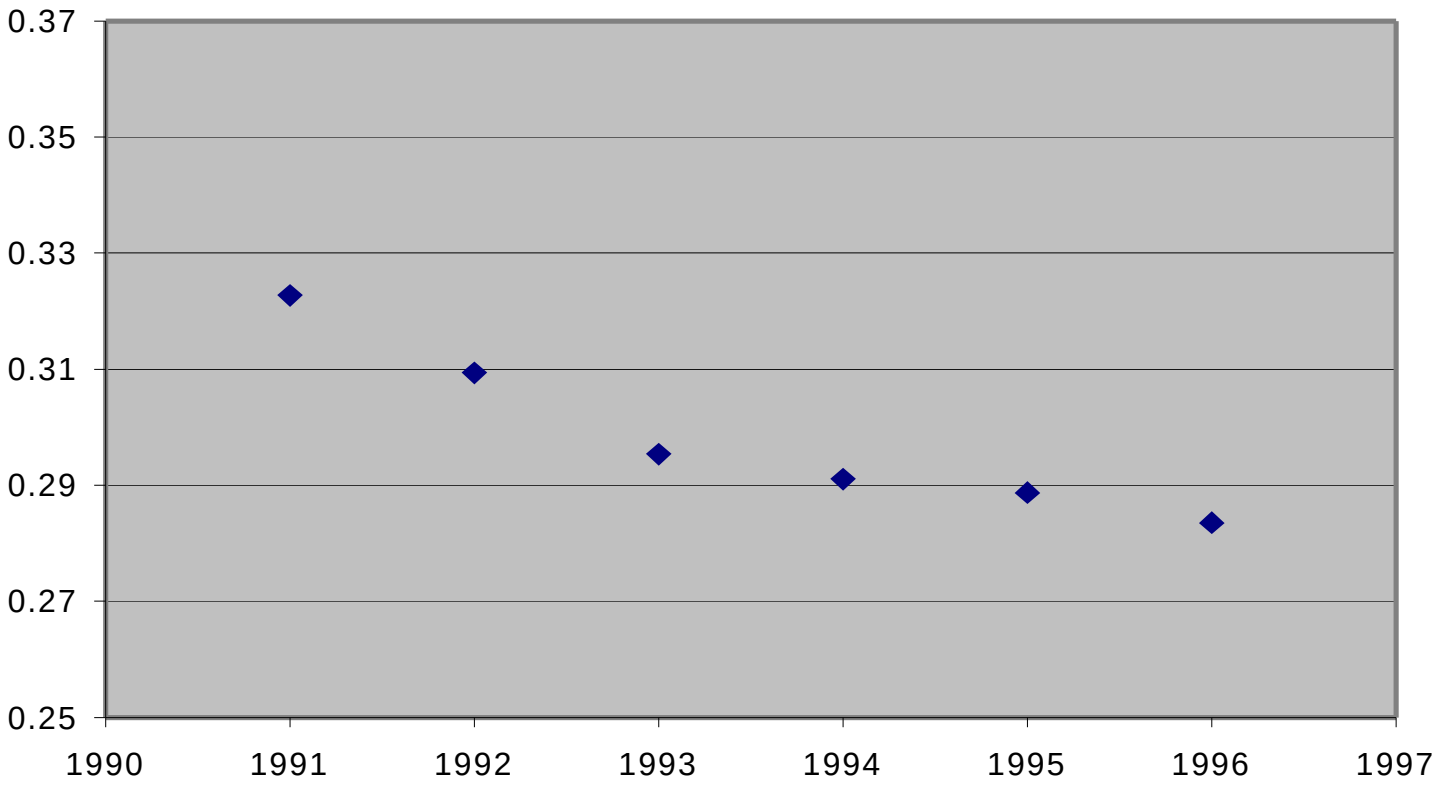
Coefficient of Variation GDP *per capita* in the EU countries
(1990 prices and exchange rates)



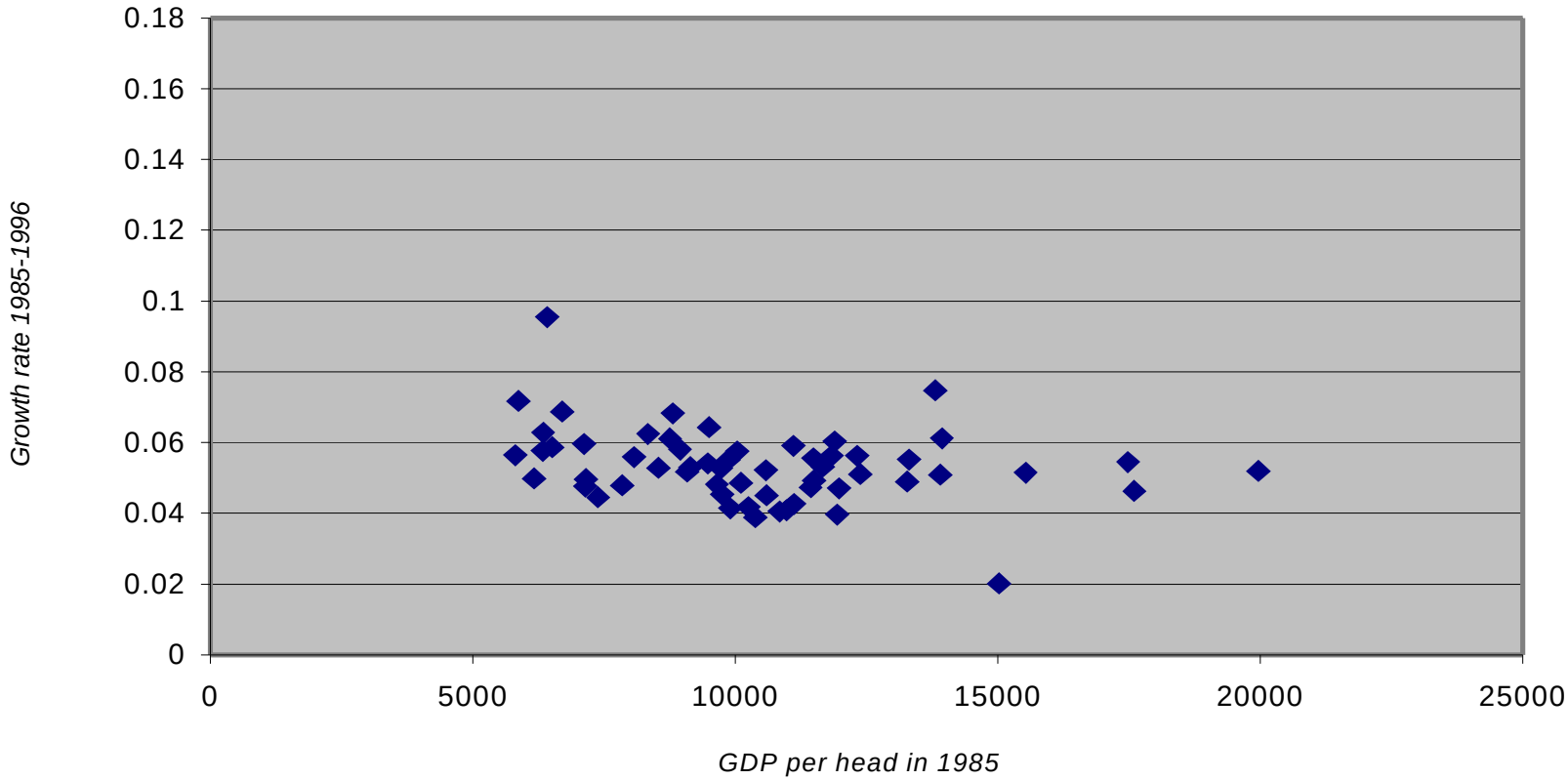
Coefficient of Variation of GDP per head (PPS)
(58 EU Regions - NUTS1)



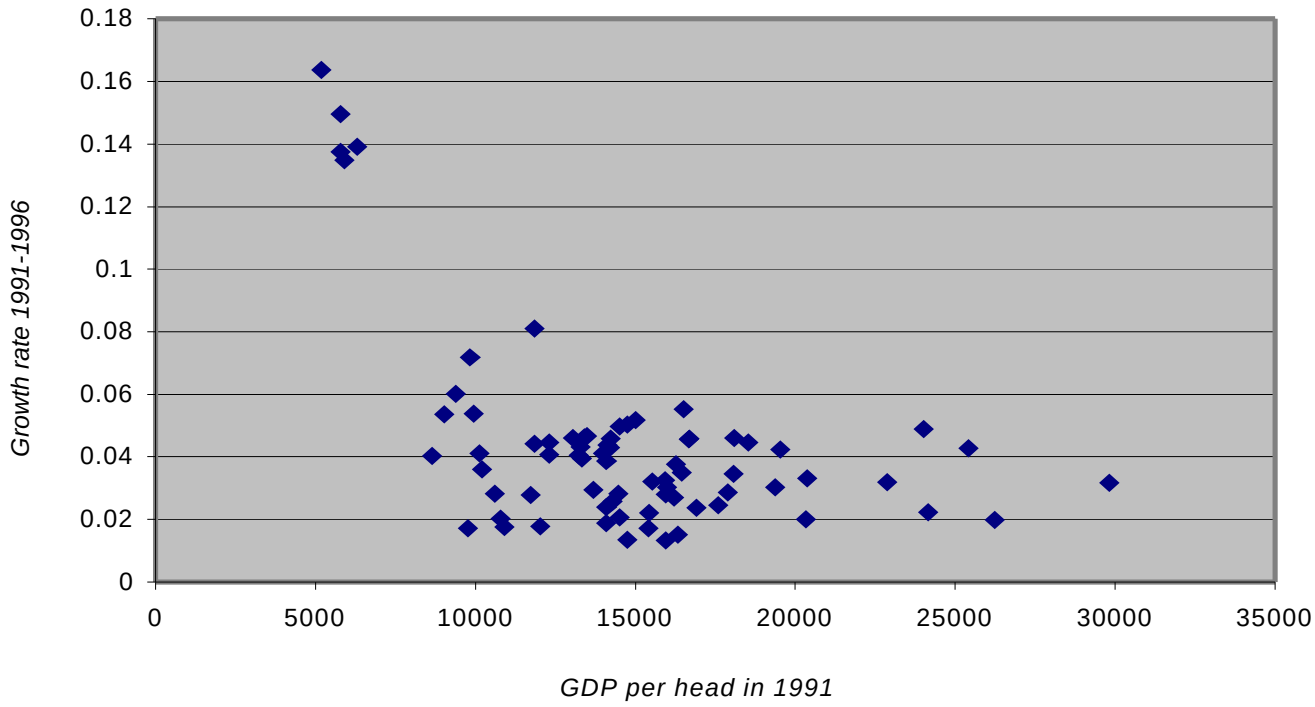
Coefficient of Variation of GDP per head (PPS)
(73 EU regions - NUTS1)



Beta Convergence in GDP per head (PPS) in 1985-1996
(58 EU regions - NUTS1)



Beta Convergence of GDP per head (PPS) between 1991-1996
(73 UE regions - NUTS1)



Chapter 2, Changing nature of knowledge, globalisation and European integration: relevance, effects and opportunities for European less favoured regions

Jean-Alain Héraud
Arne Isaksen

2.1. Introduction

This chapter is focused on regional economic development in the EU in the frame of a globalising world economy. In this context of analysis the present chapter has two main objectives: firstly it aims to establish a sound theoretical basis for the empirical investigations of regional industrial dynamics in the subsequent chapters; and secondly it analyses the typical innovation barriers facing Europe's less favoured regions (LFRs), discussing relevant policy tools to lower the barriers. The discussion refers to the new EU innovation policy, namely the European Research Area, analysing whether this new policy may raise the innovation capability also in LFRs, and thus contribute to regional convergence in Europe.

Innovation policies and regional policies have developed separately during a certain time, in the core EU countries as well as at the European level. The first period after the 2nd World War, around the sixties, is characterised by the (re)construction of the national systems of innovation, focusing on the actors more than on the linkages: creation or reinforcement of key actors such as large firms (national champions), universities and public research institutions. In terms of innovation theory, the vision was *linear*: the output of innovation is developed through increased supply of inputs of research (researchers, equipment and R&D expenditures). At the same period, regional policy aimed at balanced development of all territories. The goal was often formulated as compensating for the geographical discrepancies caused by the global development process. Thus, policies were never though of as co-substantial, they were just complementary in a sense.

In the second period, beginning approximately in the early eighties, the purpose of innovation policies changed, putting more stress on the question of the relations between actors. Agencies were set up for "valorising" the results of public research in the industry, technology transfer was supported between sectors, diffusion-oriented policies were set up, etc. On the regional scene, analysts, researchers, institutional actors and firms started to be aware of some territories' potential role of endogenous (networking) development. The State policy no longer thought of regional planning solely in terms of evenly sharing "the fruits of growth" (using the French expression of the after-war period), but considered more often the innovation potentials of regions as various specific assets on the national scene. The new tendencies towards more administrative decentralisation in many European countries contributed also to reveal self-organised development capabilities of regions.

We can see here a convergence of the two policies. In theoretical terms, the logical scheme is the following: if innovation is now considered as a non-linear *interactive* process, then innovation policy must focus on better networking of the agents within the system; and if networking is the goal, are not regions a more suitable context than nations by the virtue of proximity (geographical, cultural and institutional proximity)? Increasingly, territorial aspects appear as central issues for national development strategies. The change in attitude is noticeable, particularly in countries that had a long tradition of centralisation. To the question "what can the State do to help developing my region?", the following is progressively substituted: "what can your region do, specifically, to contribute to the creativity and competitiveness of the nation ?"

At the European level we observe major changes in the philosophy of both policies too, but in a different context and a different timing. We start from a similar situation: until recently innovation policy was not particularly co-ordinated with regional policy. The first traditionally aimed at promoting Europe's technology level and innovation spirit to the highest world standards - which means catching up with USA and Japan. Cohesion and valorisation of internal variety have always been considered, but as sub-goals of the research and technology development (RTD) policy. If the mechanisms of the innovation policy have to a certain extent contributed to the objective of convergence, this has occurred more in terms of inter-national convergence than of regional convergence. For instance, the introduction of firms and research teams from less favoured countries in the research consortia supported by the RTD Framework Programme is a way to pick up and boost existing key actors of those countries, not to extend best practices to regions lagging behind. The latter function is supposed to be fulfilled by the regional policy.

The new EU innovation policy, started with the European Research Area (ERA) in year 2000, expresses formally the idea that various regional potentials should be enrolled for the sake of global European competitiveness, through the organisation of adequate networks of "centres of excellence". Innovation policy has now an explicit regional dimension but is not a regional policy in itself. At least, it is far from the traditional goal of territorial equity. It could even lead to additional regional unbalances by reinforcing the agglomeration effects. The latter aspect will be particularly crucial in the new context of the "knowledge-based society". We address that issue here because the main orientation of the ERA project, the core of the philosophical change in EU innovation policy, rests on the relationship between scientific knowledge creation and innovation. Given the nature of scientific activity and the types of

knowledge and competence involved to perform basic research and to translate it into industrial activities, one can expect more agglomeration effects than before.

The recent evolution of the EU policy expresses a renewed view of the innovation process. The former policy was implicitly based on a linear vision with clear-cut separation of scientific and innovative activities. The debate about the "European paradox" in the nineties lead to the conclusion that science was well managed at the national level, since Europe's share of the world scientific production was not decreasing. The principle of subsidiarity implies in such a case that EU does not interfere. On the other hand, technological creation, expressed in the share of patent deposits by European actors, has been regularly declining as compared to the total world contribution (i.e. mainly the US and Japanese contributions). Responding to the perceived lack of innovativeness, the RTD framework programmes successively aimed at supporting the diffusion and valorisation of scientific knowledge and technological novelties in industrial activities. The new vision of the ERA is more consistent with the non-linear model of innovation: it is admitted that advances in scientific knowledge and business innovation are closely interrelated in certain fields (precisely the science-based fields that USA developed more quickly and efficiently than Europe in the nineties). It is then impossible to consider innovation policy as distinct from science policy. One core issue of the ERA project is the development of a sort of "unique market" of science in Europe. Beside the co-ordination of national science policies, the major idea is to build a network of the best research poles in all the most promising science and technology fields. Setting up a network of "centres of excellence" will be the European response to the American challenge. Thus, regions (more precisely: a set of scientific districts) are seen as the relevant level of the innovation policy.

Once again, the question of territorial equity and classical regional policy is raised. In that new world of the "knowledge-based society", with a probable high concentration of science, technology and innovation in a few European regions (or *clusters*), what is the future of the average region? What convergence policy must be developed for less favoured regions (LFRs)?

This chapter then discusses the relevance of the new ERA project for the less favoured regions in Europe. The rest of the paper contains three main parts. The following section (2.2) sets out the reason why the regional level may be important in implementing certain kind of innovation policy. This discussion leads in section 2.3 to the conclusion that the ERA project

in particular may stimulate further economic development in Europe's well-off regions. Section 2.4 then analyses the options for LFRs in the globalising learning economy, pointing to some typical innovation systems barriers facing this kind of regions. Finally, section 2.5 analyses what are relevant policy instruments to lower the innovation systems barriers. The section also discusses to which extent the ERA project may contribute in lowering the typical innovation barriers in LFRs and thus contribute to regional convergence in Europe.

2.2. Why geography still matters: 'The regionalisation thesis'

The EU has undertaken numerous initiatives to enhance regional economic development. According to Storper (2000), two principal reasons exist for these initiatives. The first concerns the promotion of convergent economic development between the regions of the EU. The focus is then on how technology and innovation policies can help less favoured regions to catch up with the more developed ones. The second reason serves the first, claiming that regions are generally a good level for implementing certain kind of economic development policies.

The importance of the regional level is often explained with reference to specific regional resources that might enhance innovation, and where place-based policy best stimulates the innovation process. Thus, even in a globalising economy with its increased interdependency between firms in different nations and easy flow of information in transnational firm networks, several authors simultaneously point to an increased importance of place-specific and often non-economic factors in creating competitive advantage and differences in regional economic growth rate. Thus, Porter argues that 'the enduring competitive advantages in a global economy lie increasingly in local things – knowledge, relationships, motivations – that distant rivals cannot match' (Porter 1998: 78).

The crux of this regionalisation argument is that the regional (sub-national) level, and specific local and regional resources are important in firms' effort to obtain global competitiveness. Thus, a wide range of literature has emphasised regionalisation as at least part of the solution to understanding dynamic industrial development in some places as well as solving regional economic development dilemma stemming from the new competition in the globalised economy (Pike and Tomaney 1999). The regionalisation thesis rests on four main building blocks (cf. Asheim and Isaksen 2000a):

1. *Innovation* is increasingly seen as the basis for obtaining competitiveness by firms, regions and nations.
2. Innovation is conceptualised as an *interactive learning* process, emphasising the importance of co-operation and mutual trust in promoting competitiveness.
3. Learning is seen as mainly a *localised* process as much knowledge transfer and interaction are stimulated by geographical (and social and cultural) nearness between persons.
4. As a consequence, agglomeration and *regional clusters* are looked upon as an efficient basis for interactive learning.

The *first* building block in the regionalisation thesis is the by now familiar conceptualisation of the contemporary post-Fordist economy by Lundvall as a globalising learning economy. 'Globalisation has not only increased market competition, but also transformed it into market competition based increasingly on knowledge and learning' (Lundvall and Borrás 1997: 28). While capitalism has always rested on its capacity to create new products and new ways of producing them (Hudson 1996), a common place assumption is that the contemporary economy is less standardised and predictable than in the Fordist heydays, requiring innovation and adaptation to be competitive. Thus, it is the capability to learn and innovate, and the ability to connect the innovative effort to wider markets that increasingly is seen to determine the relative position of individuals, firms, regions and countries. Firms in high costs locations in particular found their competitiveness on the ability to introduce new products, alter existing products, use efficient production equipment, organisation methods etc.

The *second* building block in the regionalisation thesis is the view of innovation as a complex, interactive, non-linear learning process. Learning then includes the building of new competencies and establishing new skills by workers and firms and not only to get access to new information. This view of the innovation process is based on a broad definition of innovation, to include both improvements in technology and better methods or ways of doing things (COM 1995). The broad definition involves a critique of the linear, sequential model of innovation, which focuses on more radical, technological innovations. The broad understanding of innovation means an extension of the range of industries that can be viewed as innovative from typical high-tech industries, often located in central areas, to include also traditional, non-R&D-intensive industries often located in peripheral regions. One of the basic critiques of the linear model is precisely the equation of innovative activities with R&D, giving poor prospects for the often traditional industries in the periphery.

The conceptualisation of innovation as interactive learning furthermore emphasises the importance of co-operation in innovation processes as well as a systemic view of innovation. The build-up of different local organisations and the intensity of interaction between these to create 'institutional thickness' (Amin and Thrift 1994) is emphasised as important in stimulating co-operation, learning and innovative activity. If successful, the institutional thickness of a region may be the basis for an innovative inter-firm division of labour and exchange of information, the provision of critical resources, and the development of a set of norms and values which promote co-operation (Lutz et. al. 2001). Moreover, the concept of innovation *system* is based on the idea that the overall innovation performance of an economy to a large extent depends on how firms manage to utilise the experience and knowledge in other firms, research institutions, the government sector etc. and mix this with internal capabilities in the innovation process (Gregersen and Johnson 1997). Firms combine resources and knowledge by many actors in building unique, firm-specific competencies, that cannot rapidly be imitated by competitors (Maskell et. al. 1998).

With the perspective on innovation as interactive learning, networking and co-operation are considered to be of strategic importance in promoting competitiveness. Co-operation almost always includes interpersonal, human linkages. These linkages are quite different from arms-length, anonymous market transactions, and the existence of social institutions facilitates collaboration and the exchange of qualitative information between actors. Thus, 'in networks and other kinds of "organised" market relations, people develop codes of communication, styles of behaviour, trust, methods of co-operation etc. to facilitate and support interactive learning' (Gregersen and Johnson 1997: 482).

The *third* building block takes the understanding of innovation activities as basically a social process as a departure, which underlines the importance of the cultural and institutional contexts. This also implies that learning to a large extent takes place as a *localised*, and not a placeless, process. This view gives 'particular emphasis to history, routines, influences of environment and institutions' (Cooke 1998: 7), which affect the stock of knowledge and the learning ability in the regional industrial milieu.

In order to explain why learning often is a localised process, it is first useful to make the distinction between two main types of knowledge; formal, codified (scientific or engineering) knowledge and informal, tacit knowledge, which is constituted by skilled personal routines,

technical practises and co-operative relations. Codified knowledge corresponds mainly with Lundvall and Johnson's (1994) concepts of 'know-what' ('facts') and 'know-why' (scientific principles). Tacit knowledge corresponds with 'know-how' (personal skills) and 'know-who' (information about who has specialised knowledge). As a rule codified knowledge is created through systematic research activities in R&D-institutions, universities etc. This knowledge is in principle universally available, and, thus, can be easily transferred outside its context of generation.

Tacit knowledge is seen as 'unarticulated' knowledge as there is no (foreseeable) way to articulate it, or codification may be possible, but has not (yet) been undertaken (Lissoni 2000). This type of knowledge consists of individual skills of a more or less intuitive kind (know-how) that workers must learn in their 'daily' work (i.e. learning by doing and using), and often in interaction with more experienced colleagues as similar to apprenticeship-relationships. The 'know-who' form of tacit knowledge is also seen as a socially embedded knowledge difficult to codify and transfer through formal channels of information. In fact, 'know-who', e.g. knowledge of some key suppliers and 'test customers' and of the competencies and reliability of key employees in them, are seen as the kind of knowledge that most clearly resists efforts of codification (op. cit.). Thus, tacit knowledge is difficult to transfer because it is not stated in explicit form as information, and then it is not a tradable commodity. The labour market is, however, partly a market for know-how, where firms compete in recruiting persons with particular informal (and formal) skills.

By its very nature as 'unarticulated' knowledge the generation and diffusion of tacit knowledge is rather localised and 'sticky'. It is sticky mainly because the knowledge stays where the firms and their employees are located. Tacit knowledge is first of all firm-specific. It is partly anchored in specific routines, norms of behaviour, implicit and shared beliefs and modes of interpretation stimulating communication etc. in organisations, but also in firm networks and local communities (Lundvall and Borrás 1997). This means that tacit knowledge may be 'embedded in a multitude of inter-firm relationships and therefore cannot be taken out of context without losing much of its value' (Malmberg et. al. 1996: 92). Some places hold favourable conditions to develop and diffuse tacit knowledge, in particular industrial milieus with a long tradition in some specific industries and technologies, holding firms with a long history of producing particular goods, and characterised by close co-operation and mutual trust between local actors.

Localised or 'sticky' knowledge, however, is not confined to tacit knowledge only. Important part of the codified knowledge is also the result of localised learning and is geographically immobile, as discussed in more detail beneath. The knowledge is 'sticky' since it may be developed in collaboration between, for example, local R&D-institutions, technology centres and firms. Then the knowledge is partly embedded in local patterns of interaction and in 'know-who'. Generally speaking, the relationship between tacit and codified knowledge is seen to be symbiotic, as tacit knowledge is described as the necessary tool for translating (in particular new) codified knowledge into economically viable innovations.

The *fourth* and concluding building block in the regionalisation thesis concerns agglomerations, and in particular regional clusters, as places where close inter-firm communication, socio-cultural structures and institutional environment may stimulate socially and territorially embedded collective learning and continuous innovation. The crux of the argument is that 'the proximity between different actors makes it possible for them to create, acquire, accumulate and utilise knowledge a little faster than their cost-wise more favourable located competitors' (Maskell et. al. 1998: 59).

In the case of regional clusters localisation economies refer to the co-presence of many firms in the same or adjacent industrial sector, giving rise to economic benefits accruing from proximity. Firms may achieve cost reductions from having access to pools of common factors of production in the region and opportunity to collaborate in bulk purchasing, that is 'a variety of external economies associated with location' (Harrison 1992: 472). Lower unit costs of production is attained because firms build up and have good access to *common* input factors such as skilled labour, specialised service firms, various types of technical infrastructure, and other localised externalities. Firms may join forces, and, for example, co-operate with regional and municipal governments, to overcome common bottlenecks in infrastructure, labour supply etc.

The main explanations of the dynamics of clusters in the (economic geography) literature have, however, increasingly turned from 'economic' reasons, such as localisation economies, to 'social-cultural' reasons, 'such as intense levels of inter-firm collaborations; a strong sense of common industrial purpose; social consensus; extensive institutional support for local business; and structures encouraging innovation, skill formation, and the circulation of ideas' (Amin and Thrift 1994: 12). These are untraded interdependencies; reflecting that a regional capability, rooted in particular patterns of inter-firm networking and inter-personal

connections cannot be transferred to other places. ‘It can only be built up over time’ (Lawson and Lorenz 1999: 310).

2.3 Regionalisation, codified and tacit knowledge: a theoretical basis for the ERA project of the EU.

The regionalisation thesis assumes the existence of local factors facilitating the interactive process of innovation. One important factor is, supposedly, the tacit knowledge involved in the process, since that type of knowledge is particularly embedded in territories. To sum up: proximity matters in proportion of the tacit part of the required exchange of information and transfer of knowledge between actors.

Such a theoretical vision is largely relevant as far as incremental innovations are considered. But concerning radical innovations (whether in science based or in other sectors) it is not possible to discard the central role of codified knowledge in the process of innovation. In the latter context, what is then the status of proximity and of localised settings?

Let us start with the following assumption: tacit and codified knowledge are in fact symbiotic to a large extent (Asheim and Cooke 1998). As stressed above, tacit knowledge is often the necessary tool for translating codified knowledge into economically viable innovations. For the application of *new* codified knowledge (scientific discoveries, high tech inventions,...) the role of that sort of complementary tacit knowledge is even more important than in the case of innovations based on well established scientific or technological information.

The complementary tacit knowledge we are considering here is of the *know how* type, but also of the *know who* type. In the case of new scientific knowledge, the *know who* is evidently crucial. The typical example is the practical knowledge of a scientific researcher that can be used in a firm in order to implement an innovative process based on a brand new application of a scientific discovery: no existing professional skill is available in the labour market for implementing the process in its most specific aspects. A lot of intermediary knowledge in science and technology must be mastered in the framework of scientific research, amounting to a competence that cannot be considered as "common knowledge" outside that specific activity: materials characterisation, various forms of measurement, modelling competence, etc. This kind of knowledge can be called "generic" within a narrow field of scientific research, but not in productive sectors or anywhere in the rest of the society. Therefore, the

access to such individual competence builds up a distinctive advantage for any firm that can use it (whether in applying it to the specific scientific field or for any other purpose where the competence finds an application - performing a spin-off process).

Let us turn to the local/regional level. Here the firms' creativity and absorptive capacities are possibly influenced by the existence of research institutions and other ITIs (Institutions of Technological Infrastructure) within the territory, assuming that proximity gives them privileged access to the activity of these persons contributing to the global codified knowledge base in science and technology (Bureth and Héraud 2001). We can speak in this case of a specific category of *codified and local* embedded knowledge. It is a distinctive asset for local firms (and other organisations) in order to implement radical innovation. It complements the more classical localised tacit knowledge used for incremental innovation. Regions exhibiting the complete set of knowledge types are, in the long run, in a less risky situation than the classical "innovative milieus" since they can also induce radical changes or adapt to radical evolution of the global environment.

Let us conclude in terms of regional policies. Restricting localised knowledge to tacit and practical knowledge is misleading for theoretical analysis, and then for policy making too. We can consider the new EU policy orientation of the European Research Area (ERA) project, as an equivalent political expression of the theoretical ideas developed here.

Research activity, including all its forms - from purely basic codified knowledge creation, to targeted and applied creation - is recognised as "one of the basic driving forces behind economic and social progress and a key factor in business competitiveness, employment and the quality of life" (COM 2000: 3). In order to enhance the competitiveness of Europe and to adapt it to the new "knowledge based society", the EU innovation policy must be transformed in a way integrating research (basic as well as targeted) at the core of the instrumental setting. We tend to interpret that first point as the official recognition in terms of policy of the theoretical model of the interactive innovation process: a non linear process mixing in a complex way basic/applied and tacit/codified knowledge.

The modalities of the new policy are the second aspect to examine. It is first stressed in the EU documents that the increased "structuring" role of the European policy must be fulfilled by linking national activities. In other words, 15 autonomous national science and innovation systems should be replaced by a more coherent, and therefore efficient, system. The latter

must respect the basic principle ("enshrined in the Treaty") of complementarity between EU research activities and Member States' research activities, but the European level is given a *key role of co-ordination*.

Another crucial modality to underline is the *regional dimension*. Two aspects are mentioned concerning the EU policy:
- it must encourage "full use of the dynamic and potential of the regions by networking their capacities and activities with regard to research, innovation and technology transfer (...)"
- It must take into account "regional, geographical or economic specificities in the carrying-out of research activities in Europe" (COM 2000: 7).

The last instrumental modality we want to underline in the ERA project: the RTD Framework Programme is one key instrument, but others will contribute, like Structural Funds, regional initiatives and European Investment Bank activities. All these instruments are to be used in a way enforcing ERA's "structuring" philosophy. The forms of support will be oriented towards the constitution of *infrastructures* and are evolving from the pure "support for project" model as given at present, to more permanent "institutionalised" initiatives.

Let us summarise the ERA vision from our theoretical point of view. The idea is to build up a European integrated science and technology infrastructure by massively using the principle of networking. In addition to the idea of co-ordinating national science and innovation policies, the ERA project aims at setting up a network of "areas of excellence". Scientific knowledge creation and applied competence building must be mixed in a proper way for promoting innovation. The ideal candidate area for benefiting from EU support and becoming one pillar of the future European research and innovation system is therefore a region combining good academic institutions and efficient productive organisations. Since such ideal mix of tacit and codified knowledge is essential for lasting development (based on both radical and incremental innovations), one can foresee in the long run a concentration of means and production in the few European regions combining, with appropriate geographical density, those endowments in the right proportion and qualitative complementarity.

The next question is to consider the possible futures of the other regions, particularly the LFRs, within that planned European knowledge based society. The new innovation policy is supposed to address this question too, through the development of networks and shared infrastructures, or at least it will be co-ordinated with the regional policy (in a more classical

sense). But there is still a significant risk of contradiction between ambitious innovation policy, picking and networking the winners (regions or even smaller territories), and traditional goals of regional policy (Héraud 2000).

2.4 Regional innovation systems: An option for European LFRs?

The regionalisation argument have led to increasing focus on the terms *regional cluster* and *regional innovation system*. Thus, regions are seen as important bases of economic coordination at the meso-level: 'the region is increasingly the level at which innovation is produced through regional networks of innovators, local clusters and the cross-fertilising effects of research institutions' (Lundvall and Borrás 1997: 39).

Regional innovation systems (RIS) is partly a new theoretical construct in order to analyse and grasp important aspects of the working of regional clusters, a reference to some actual development tendencies in the building of networked innovation architectures in some regions, as well as a tool in policy making to create systems of innovation in support of business competitiveness on a regional scale (Cooke 1998). However, the question remains if regional innovation systems is really an appropriate tool in designing and implementing innovation policy instruments in LFRs of Europe. More than core regions, LFRs need appropriate policies to overcome obstacles to learning and innovation and to find new ways of mobilising regional resources (Lagendijk 2000). However, do LFRs in general have the necessary requirements to develop regional innovation systems? That question demands that we 'unpack' the concept of RIS.

Regional innovation systems are seen to consist of two main types of actors and the interaction between them (Asheim and Isaksen 1997). The first type of actors are the firms belonging to the main industrial clusters of a region. Secondly, an institutional infrastructure must be present, (the infrastructure consisting of formal organisations such as research and higher education institutes, technology transfer agencies, vocational training organisations, business associations, finance institutions and public agencies). This conceptualisation of regional innovation systems corresponds with the one found in Cooke et al (2000). In their words any functioning regional innovation system consists of two sub-systems: (i) the knowledge application and exploitation sub-system, principally occupied by firms with vertical supply-chain networks; and (ii) the knowledge generation and diffusion sub-system, consisting mainly of public organisations.

This way of conceptualising regional innovation systems means that the term is not a relevant instrument for the analyses or the formulation of innovation support structures and policies in all kinds of regions. One may analyse innovative activity, as well as develop innovation policy instruments for many kinds of firms and regions. However, a learning based strategy of endogenous regional development based on a regional system approach cannot be applied across the board. The necessary requirements concerning socio-cultural and socio-economic structures (as regional clusters) and the sufficient techno-economic and political institutional structures (as research universities and knowledge transfer institutes) are to be found mainly in relatively well-off regions (Asheim 1998).

Then, policy makers should not focus uncritically on creating *regional* systems to support firms' innovation activity in all areas irrespective of the local conditions. Policy makers should be advised to assess their existing industrial structure and cluster structure accurately, and design a strategy around them rather than committing to fashionable strategies of regional innovation systems. We see a danger to generalise too broadly about the extent and potential of regional innovation systems on the basis of only a few well-known empirical cases. Maillat and Grosjean (1999: 2) for example maintain that 'not all regions have (dynamic territorial production systems); this is why some grow whilst others are in crises'. However, other roads to economic development and welfare may exist other than creating *regional* clusters or *territorial* systems. Thus, Marcussen (1996) claims that most of the rapidly growing agglomerations in industrialised and industrialising countries do not exhibit the characteristics of the industrial districts of the Third Italy or the high-tech American variant.

The above arguments point to the need to adapt innovation policy instruments to take into account the specific problems faced by the regional economy. Thus, there is not one set of policy instruments or 'one-size-fits all' policy portfolio that suits all types of regions. It may be necessary to fit innovation policy instruments to distinctive characteristics in individual regions. This may involve efforts to lower specific barriers in the regional innovation systems, i.e. hampering factors in the regional industrial milieu, in its institutional set-up, and barriers related to the inhabitants' typical attitude towards innovation and entrepreneurship.

In principle, possible deficits in the regional innovation system that may hamper the innovation activity of firms can be of three types (Table 2.1). The classification is based on the above conceptualisation of RIS. We now first present the three typical innovation systems

barriers. The next section then discusses what are relevant policy instruments to lower the barriers, as well as to what extent the ERA project may be relevant in this respect.

Table 2.1. The classification of some typical regional innovation system barriers

Regional innovation system problems	*Type of problem*	*Type of regions often suffering from the typical innovation barriers*
Organisational 'thinness'	Lack of relevant local actors	Peripheral areas
Fragmentation	Lack of regional co-operation and mutual trust	Some regional clusters
Lock-in	Regional industry specialised in outdated technologies	Old industrial regions and raw material based peripheral areas

The first barrier relates to the fact that in a lot of areas a regional innovation system does not exist due to a lack of relevant regional actors (i.e. *organisational 'thinness'* characterises the region). The lack of actors creates important gaps in the value-added chain, and points also to the fact that not all regions are important units for economic coordination. To attain such importance will require a sufficient number of collaborating firms as well as a knowledge infrastructure in order to enable collective learning. A lack of collective learning may be the main weakness, particularly in peripheral regions with small industrial milieus and located a long distance away from relevant knowledge organisations. Thus, many peripheral areas often have too few firms in the same industrial sector or local production system to constitute a regional cluster, and then an important condition for local networking and interactive learning is missing. However, regional organisational 'thinness' also points to the fact that regions differ in their capacity to build up relevant organisations to stimulate firms innovation activity, this stems from their decision-making power, financial resources and policy orientation (Tödtling and Kaufmann 1999). A general conclusion is that European LFRs often may lack the requirements to develop RIS.

In other areas the relevant actors may be present without forming a working regional innovation system (i.e. *fragmentation*). The region may have industrial specialisations holding quite many firms as well as relevant knowledge organisations. However, the actors may not collaborate to any significant degree, thus not forming a regional system, reflecting a lack of social capital. Then, what counts is not only the number of actors that potentially may benefit from collaboration, but the intensity and quality of actual interaction between them, and to which extent the interaction stimulates learning and innovation. The interactive practices of

innovation nearly always involve some forms of qualitative communication, i.e. interpersonal linkages. The existence of informal institutions such as routines and conventions may facilitate collaboration and the exchange of qualitative information between persons. By speaking of informal institutions we mean that firms may enter into different kinds of co-operation without always requiring written contracts, as persons know and follow the same established practices, routines and unwritten rules of business behaviour and rely upon trustful relationships. However, in some regions both dense interaction is missing and informal institutions absent, leading to a fragmented system.

The fragmented system resembles territorial production systems of type A and B in the typology of Maillat and Grosjean (1999). In these systems there are no relations between small firms or branch plants in a region (type A), or between large vertically integrated firms and other regional actors (type B). Typically, either type A or B production system do 'not favour endogenous development, because it does not engender a collective learning process in the region, nor does it favour the development of resources which are specific to the territory' (Maillat and Grosjean 1999: 5).

In the third kind of regions in Table 2.1 regional innovation systems exist, but the systems are too closed and the networks too rigid resulting in a *'lock in'* situation. Thus, the other side of cumulative learning and path-dependency that often characterises strong innovation systems is the institutional, social and cultural 'lock-in' of business behaviour. This may be the case if a region historically has had a strong regional innovation system based on R&D-institutes and vocational training organisations with specialised activities dedicated to the declining technology. Such a regional production and innovation system, which has become technologically mature, must upgrade the knowledge base and promote product innovations in order to break path dependency (Cooke 1998). There is also an inherent danger of 'lock-in' in regional innovation systems owing to a homogenisation of 'world views' (Grabher 1993), and these views may become an obstacle to adjustment when technological trajectories and global economic conditions change. This often creates situations where politicians, labour unions etc. argue for protecting and subsidising firms in declining industries.

Some LFRs may also typically be characterised by 'lock-in' situations. In particular regions with a strong foothold in the extraction and processing of raw materials (as mineral ores, agricultural products, fish and forest) may be 'locked in'. The region may have several organisations serving the need of their traditional industries, and the way of thinking and

acting by inhabitants and the community are strongly influenced by the traditional way of life. Cultural and political habits and attitudes are often seen as the most tricky obstacle to overcome in breaking out of 'lock-in' situation in LFRs.

2.5 Opportunities and challenges for LFRs, and the relevance of the ERA project

Regional innovation systems represent mainly an *endogenous* development model as an attempt to increase innovation capacity and collaboration in firms in a region through close inter-firm collaboration, the development and productive use of specific local skills, the synergies of regional knowledge organisations etc. However, we have argued that it may be unrealistic to create working RIS in the way we have defined it in many peripheral regions in Europe, as the necessary requirements in term of regional clusters and knowledge infrastructure are often lacking. We thus strive with 'one of the most difficult and challenging questions in economic development, namely to what extent, if at all, can peripheral regions innovate' (Morgan 1997: 495).

LFRs will often be of the 'organisationally thin' type of regions in the classification in Table 2.1. Policy directed towards creating a supportive system of innovation centred on the regional scale is in particular seen as misguided in this type of regions. This point relates to a broader issue that 'placing the emphasis on local knowledge can be catastrophic if that's not where the essential knowledge is located' (Storper 2000: 24). Local learning is seen to be particularly limited in 'organisationally thin' region.

More adequate instruments in this type of regions then may be to link regional firms with relevant national and international knowledge resources and firms, and make efforts to attract and retain innovating firms and highly skilled workers to the region. This points to the need for broker organisations in the regional policy portfolio (Nauwelaers and Wintjes 2000). The situation in organisational ‘thin' regions also underlines that ‘systems’ should be understood both in a territorial and functional sense. In a functional sense firms draw on ideas, know-how and complementary assets from customers, suppliers, consultants, universities, funding and training organisations, independent of geographical location (Tödtling and Kaufmann 1999). Thus, firms may innovate successfully without belonging to a regional innovation system as long as they find relevant competence milieus in national or international innovation systems. 'Improving cooperative relationships and building networks that reach outside of the region

may prove more productive for some localities than concentrating on indigenous firms' (Marcussen 1996: 309).

These arguments point to the need of also considering *exogenous* development strategies in LFRs. These strategies include attracting investments and firms to a region from outside. Exogenous strategies may have become a more viable option for LFRs due to the fact that transport costs and a host of other costs involved in carrying out market transactions are falling in real terms due to the rapid evolution of information and communication technology. The idea is that firms more easily can locate in remote areas as they have access to much information and knowledge providers on the web and easily can communicate with clients, suppliers and knowledge via internet and e-mail.

An assessment of the possibility of Europe's LFRs to attract outside investments, however, demands analyses of important tendencies in the ongoing globalisation process. Are exogenous strategies really a realistic alternative for Europe's less favoured regions? Very briefly two parallel tendencies can be identified in the global economy (Asheim and Isaksen 2000b). Firstly, a substitution of local systems with global systems takes place, partly caused by the increasing importance of transnational companies (TNCs), and partly by the globalisation and codification of knowledge. Economic globalisation refers to the development of the world economy in the direction of increasingly supranational, functional integration run by TNCs (Dicken et. al. 1997). Large numbers of firms, and also formally independent firms, are linked together in networks that are directly or indirectly controlled by the TNCs. Secondly, a transition from production systems to learning systems is occurring as a result of the increased knowledge intensity of products. Both the whole value chain of a product and the relevant knowledge infrastructure have to be taken into consideration when determining the knowledge intensity of a product. Knowledge that is relevant to an industry may be distributed across many sectors or agents. Thus, Smith (2000) introduces the concept of 'distributed knowledge bases' for industries. Taken together the two tendencies represent a development from local production systems (e.g. industrial districts) to global learning systems, often orchestrated by transnational companies (TNCs).

When viewed against these two development tendencies, the industrial activity and production system in regions (less favoured as well as highly-performing ones) have to be analysed as parts of a globalised learning economy. Important questions are then (i) how LFRs can compete on attracting firms that participate in global value chains, as well as (ii)

how LFRs may develop 'sticky' knowledge and dense relations between local actors in such a way that firms find it profitable to continue to be located in the region, even if they increasingly participate in global production and learning networks.

The first alternative of attracting firms entails that regions look at their particular set of resources (industries, skills, knowledge infrastructure) and identify packages that match the locational requirements of corporate activities or other firms. However, the only possibility 'organisationally thin' regions have, in attracting firms from outside is often to match local production conditions to those in the competitor places, lowering wages and reproduction costs to the lower common denominator. The need for LFRs to mainly compete in offering low costs impedes the use of endogenous ('high road') strategies in these areas. The regions are in danger of attracting exactly the same type of firms that often moved to assisted areas in the 1960s and 70s; i.e. firms utilising regional policy instruments, an abundant supply of relatively low paid and unskilled labour, and firms with few links to the rest of the local economy, and often relocating or closing down after a while (Amdam et. al. 1995).

Alarmed by the welfare implications of such a strategy, and to avoid past mistakes, alternative strategies are required. One way to refine the 'old' exogenous strategy is to make particular efforts in attracting new investments from companies that may have a greater propensity to develop specialised regional production complexes, in particular by using local suppliers (Amin et. al. 1992). Such a strategy requires to attract firms that match the existing industrial structure of a region. Difficult as this may be, it is more likely to develop unique and local 'sticky' knowledge when for example codified knowledge or corporate knowledge in attracted firms are linked to existing, experience based skills in the region.

The two general tendencies in the globalisation process require a multi-level approach to innovation systems and policy. Different types of knowledge must be accessed at different geographical scales. The seemingly increased importance of codified knowledge may generally lead to less significance of regional innovation systems for the innovation activity and competitiveness of firms as compared to the linking up to global value chains. Nevertheless, regionalisation may be seen as one aspect of the globalisation process as some innovative regional clusters have key roles in global networks. Clusters may constitute neo-Marshallian nodes in global networks (and) act as "centres of excellence" in a given industry' (Amin and Thrift 1992: 577). Corporations link up in different ways to specialised firms and knowledge organisations in dynamic and innovative clusters as they need to connect their own

knowledge base with other specialised knowledge, that may often be developed in innovative regional clusters. In that way, the global economy may be seen as a mosaic of regional clusters and innovation systems linked by the flow of goods, information and knowledge (Saxenian 1994). This points to the continued importance of geographical nearness, localised learning, dense human relations etc. in stimulating some kind of innovation activity. It also points to the importance of combining endogenous and exogenous development strategies. Thus, one of the main reasons for TNCs to go to certain localities is precisely to tap into local advantages of these regions.

Then, a prerequisite for LFRs to succeed with exogenous strategies may seem to simultaneously make an effort to increase the endogenous development capacities. LFRs may look at emerging clusters, cluster fragments and industries which have long roots in the region's skill and capabilities base, and ask what new infrastructure would support the innovation and learning in up-coming cluster. The focus on clusters also in LFRs, which may have severe difficulties of building cluster and RIS, is based on the general belief of economic specialisation as 'the only way to overcome the 'globalisation trap', that is, outrunning the risk of being outcompeted across the board' (Lagendijk 2000: 167).

Moving on to the 'fragmented regions' in Table 2.1, the first task in order to strengthen firms' innovation activity in this type of regions may be to improve relational assets that may lead to closer collaboration between regional actors. Asheim (1998) refers to empirical studies demonstrating that trust and co-operation between regional firms can be intentionally created. An important strategy in that respect may be the development of regional 'club goods', which are assets that are accessible and beneficial to specific group of firms and organisations in a locality, and which sustain the collective learning capability of regional clusters (Lagendijk 2000). 'Club goods' are collective assets in a region, often organisations as centres of services that offer subsidised and specific knowledge-oriented services to local firms. 'Club goods' are seen as crucial to the intertwining of policy and business learning. While 'club goods' often are the product of self-organisation, it is important to keep in mind the long-term effort needed in the changing of routines. Then building trust and relational assets as 'club goods' cannot be achieved overnight. Relevant strategies to fuel co-operation may be to invite and engage firms and knowledge organisations collectively in helping to formulate a regional innovation strategy, create other nodes for local co-operation and collective organisation, as well as providing bridge between firms and S&T knowledge resources. Thus, it is mainly in 'fragmented' regions that the endogenous strategies are relevant

The third type of regional innovation systems barriers, 'lock-in' situations, may also characterise some LFRs. In such a case it may be relevant to ‘open up’ strong regional networks, restructure local organisations, fuel local mobilisation to clear local communities away from obsolete attitudes and knowledge, and foster access to resources outside of the region. Policy tools may also aim to restructure the technology support infrastructure in the region towards new technologies and sectors and stimulate new firm creation as spin-offs from existing organisations. The political issues are complex since questions of collective identities are concerned here and not only economic and technological dimensions. Strong political will is particularly required. A mixed strategy could help, using exogenous policy tools (like in Type 1 regions) to prepare the ground and test several opportunities of redevelopment in the long run.

2.6. Conclusion

The increasing importance of knowledge in the new economy (and in the context of the new innovation policy at global level like the European Research Area) leads us to reconsider regional policy. For the most advanced regions, typically characterised by one or several efficient science-based industrial clusters, the regional policy is easily defined in connection with innovation policy. No major contradiction could arise between regional, national and European objectives concerning such territories. They are natural partners of all systems of innovation whatever the level. What is good for them is also good in principle for all governance structures above them.

The real problem is the development trajectories of the other types of regions. It is evident that science-based systems of innovation cannot be developed in every context, and globalisation will necessarily lead to a few sets of specialised innovating cluster-regions. Then, applying the same policy orientation to LFRs and to MARs (more advanced regions) would certainly be an error (whatever the difficulty to convince a lot of LFR’s policy makers on that point). The problem is even more difficult since there is nothing such as a unique type of region outside the most advanced type. We have proposed a broad typology of three sorts of regions with specific “innovation barriers”. Within each of these three broad types a whole variety of situations certainly exists, but we think the proposed typology is a good starting point for designing innovation-related regional policy to supplement the new ERA strategy. For most of the EU LFRs we conclude that in order to promote innovation and convergence

with the 'more advanced regions', approaches inspired by both endogenous and exogenous development strategies will be required.

Chapter 3, Measuring regional systems of innovation: The potentialities offered by CIS data

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3.1. Introduction

The discussion in Chapter 1 highlighted two major empirical facts:

- there is a good deal of evidence showing the presence of wide economic and technological gaps between regions within the European Union; and
- the process of convergence in GDP levels across the EU regions, which was observed during most of the post-war period up to the 1970s, has tended to slow down in the later part of the 1980s.

It is clear that economic gaps among regions, such as those that have been observed among EU regions, do reflect differences in the regions' ability to compete, which increasingly depends upon the innovative capacity of firms and regional systems as a whole (see, among others, Neven and Gouyette, 1994; Quah, 1996; Fagerberg and Verspagen, 1996; Fagerberg, Verspagen and Caniëls, 1997). In particular, it has been shown that technological variables are able to explain a good deal of the diverging trends in the economic growth across European regions (Fagerberg and Verspagen, 1996).

The general indications, drawn from the recent theoretical and empirical literature in this field, state that the process of technological accumulation takes place at local or regional level, even in the era of globalisation, and that technological spillovers tend to be highly concentrated at the geographical level (see previous chapter). All this explains why regions have become fundamental units of analysis in the cost/benefit evaluation of the EU economic integration and in the studies which look at the process of economic convergence (or divergence) in Europe.

Despite this, the empirical analysis of innovation activities at a sub-national scale is still at an early stage and this is in large part due to the lack of data able to represent the complex and differentiated phenomenon of innovation at a regional level.[5] In particular, the availability of figures on the role and performance not only of firms, but of the multitude of actors and institutions which shape an innovation system is even more severe than at the national level. This has constrained so far the possibility of exploring the existence and characteristics of regional systems of innovation on the basis of statistically robust evidence (Braczyk, 1998).

The first target of this paper consists of assessing the capacity of the Community Innovation Survey (CIS) to explore the variety of regional innovative patterns. The second target consists of assessing empirically whether innovation systems can be found and how they operate at a

[5] The few studies which have used CIS data at a regional level include Iammarino et al., 1995,1999.

sub-national scale. The empirical analysis is based on the use of the Italian section of the of CIS1 data set.[6]

The next section provides an overview of the extent and nature of technological gaps between economically advanced and less favoured regions in Italy using data provided by the first Community Innovation Survey. In section 3.3 the regional variety in innovation is further explored and then synthesised into a few distinct regional patterns. The extent to which the latter can be interpreted as proper regional systems of innovation is also explored. The concluding section summarises the empirical findings of this chapter.

3.2. Extent and nature of regional technological gaps in Italy

It is well known that Italy is characterised by strong regional technological and economic imbalances which have been usually measured by traditional indicators such as R&D and patent statistics. Strengths and weaknesses of R&D and patent indicators are well-known (Archibugi and Pianta, 1996; OECD, 1996). Perhaps the most serious weakness of R&D and patents statistics has to do with their inability to represent more "down-stream" forms of innovation activities, such as incremental improvements of products and processes, as well as the adoption of technologies embodied in new equipment. This kind of "bias" is even more serious when R&D and patent statistics are used to measure the technological performance of backward regions, in which formal R&D activities and patents are usually not the main technological inputs and ways through which the results of innovation activities are "appropriated" by firms.

The need of collecting a more comprehensive set of data on the multi-faceted nature of innovation activities led to the design and actual implementation of the two Community Innovation Surveys which have followed the guidelines indicated in the OECD "Oslo Manual" (OECD, 1992, 1996). The Oslo Manual and CIS have put in practice most of the recent advancements in our understanding on the nature and organisation of innovation activities within the firms and in the economic system as a whole. In particular, they have overcome the view of the innovation activities as a linear, R&D centred process in favour of a perspective encompassing the systemic nature of the innovation process consisting of plurality of sources, actors and channels through which technological knowledge is acquired, generated and diffused (Kline and Rosenberg, 1986; Archibugi et al., 1997).

One of the basic indicators provided by CIS consists of the number of firms which have innovated (i.e. introduced at least a technological innovation) in the period covered by the

[6] It should be pointed out that the Italian data-set represents the bulk of the total CIS1 sample. More than half of the CIS1 questionnaires refers to Italian firms (Evangelista et al., 1998).

survey (1990-92). This indicator gives an accurate picture of both the regional distribution of innovators and of the propensity of firms to innovate in the different regions. The regional breakdown of total innovating firms (and their innovation expenditures) presented in Table 3.1 (first and third column) shows the presence of strong geographical concentration of innovation activities in the North of Italy, where 80% of total innovative firms (and innovation expenditures) are located. Along with the overwhelming role of Lombardia and Piemonte it is worth noticing the large presence of innovating firms in Emilia Romagna and Veneto (located in the Northeast of the country), each accounting for around 15% of total Italian innovating firms. In the Southern regions only a small number of innovating firms is found: in particular, Basilicata-Calabria, Sicilia and Sardegna account each for less than 1% of total Italian innovating firms and total innovation expenditures.[7] These data therefore suggest that the strong regional technological polarisation emerging from R&D and patent statistics does not turn out to be mitigated when looking at a broader indicator such as that based on the number of innovating firms and on the expenditures sustained to introduce innovation.

The lack of innovators in the South is heavily affected by the weak industrial basis of these regions. However, also the average propensity of regional firms to introduce innovation (an indicator not dependent on the size of the region) tends to considerably differ across regions (see the fourth column of Table 3.1). 36% of total firms located in the North introduced at least a technological innovation during the period 1990-92, against an average share of 20% in the case of the Southern regions (the least innovative regions are once again Basilicata-Calabria and Sardegna).

The type of innovative activities carried out by firms also differ considerably across regions. A crucial dimension in this respect is represented by the relative importance of product and process innovations in firms' strategies. The product/process orientation of regional innovation patterns can be proxied by the percentage of firms which, in each region, introduced either a product or process innovation (Table 3.1). Firms in Southern and Central areas show a clear propensity to introduce process innovations, while a more balanced pattern characterises firms located in the North of the country. This in turn is likely to indicate the prevalence in the South of more "defensive" and "imitative" innovation strategies.

[7] This weakens the statistical robustness and reliability of the figures referring to these regions (on this point see Evangelista et al., 2001).

Table 3.1. Innovative firms and total innovation costs by region (1990 - 1992)

Region	Number of innovative firms	% of Innovative firms	Total innovation costs (%)	% of innovative firms on total firms in the region	% of firms introducing only product innovation	% of firms introducing only process innovation
Northwest	**3416**	**45,2**	**62,5**	**36,5**	**17,2**	**19,0**
Piemonte-Valle d'Aosta	874	11,6	24,0	38,1	14,5	17,7
Lombardia	2431	32,2	36,1	36,1	18,0	19,5
Liguria	111	1,5	2,4	34,7	21,6	18,0
Northeast	**2649**	**35,1**	**16,5**	**36,0**	**17,7**	**19,7**
Trentino- Alto Adige	175	2,3	0,7	42,1	15,4	16,6
Veneto	1181	15,6	4,6	33,7	14,6	21,3
Friuli Venezia Giulia	224	3,0	1,9	34,2	20,5	16,1
Emilia Romagna	1069	14,2	9,3	38,2	21,0	19,3
Centre	**999**	**13,2**	**14,3**	**27,1**	**16,6**	**24,2**
Toscana	419	5,5	5,2	24,2	18,6	23,4
Umbria	92	1,2	0,4	31,0	18,5	18,5
Marche	274	3,6	0,9	27,6	13,5	28,5
Lazio	214	2,8	7,8	32,2	16,4	22,4
South	**489**	**6,5**	**5,1**	**20,5**	**12,1**	**25,6**
Abruzzo-Molise	109	1,4	0,4	21,6	15,6	24,8
Campania	144	1,9	2,9	22,4	10,4	20,8
Puglia	114	1,5	0,1	18,4	7,9	25,4
Basilicata-Calabria	26	0,3	0,1	18,7	11,5	38,5
Sicilia	67	0,9	0,7	21,1	17,9	32,8
Sardegna	29	0,4	0,9	18,1	10,4	24,1
ITALY	**7553**	**100**	**100**	**33,1**	**17,0**	**20,4**

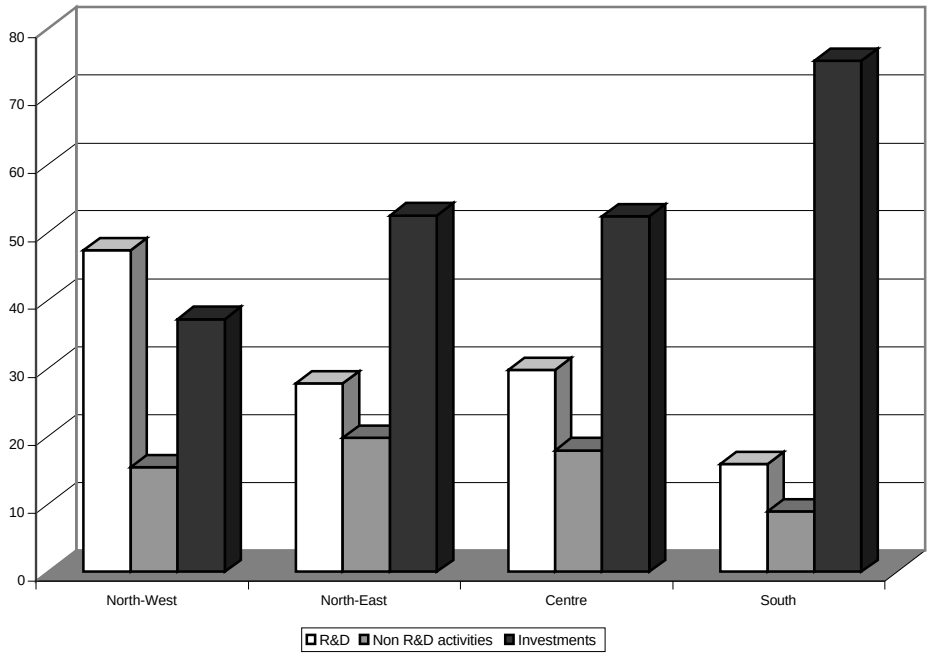
Source: ISTAT, 1995.

A further crucial dimension of regional innovation profiles is represented by the type of technological source used by firms to generate technological knowledge and introduce innovations. Following the OECD Oslo Manual (OECD, 1992), CIS1 has adopted an enlarged perspective on the innovation process. Firms have in fact been asked to indicate not only their R&D expenditure but also the resources devoted to activities such as design and trial production, investment or the acquisition of patents and licenses.

The relative importance of each technological source is shown in Figure 3.1, which reports the internal break-down of total firms' innovation expenditure for the Northwest, Northeast, Centre and South of Italy. The picture which emerges from that Figure is clear-cut. In the South more than 70% of total innovation costs consists of the acquisition of technologically new machinery and equipment, while R&D activities absorb little more than 10% of total

innovation costs. An even smaller share of resources is devoted to innovation activities such as trial production, design and acquisition of patents and licenses. A completely different innovation pattern characterises the firms located in the Northwest, where the largest share of innovation costs is devoted to R&D activities, which account for over 45% of total innovation expenditure. Firms located in the Northeast and in the Centre show an "intermediate" profile, with investment still representing the largest part of total innovation costs but the other innovation inputs also playing an important role in firms' innovation strategies. In particular, it is worth highlighting the relatively high share of resources spent on design and trial production activities in the Northeast regions. This can be explained by the crucial role played by more incremental and less-formalised forms of innovation in specialised suppliers sectors, which are highly represented in this geographical area.

Figure 3.1. The breakdown of innovation costs by macro-regional areas (% values)



To what extent regional differences in industrial structure can explain the variety of regional performances emerging from our analysis?

CIS data allow us to start addressing such a complex issue breaking-down the innovation indicators used so far jointly by region and sector (*à la* Pavitt). The indicators taken into account are those measuring the average propensity of firms to innovate (Table 3.2), the importance of product innovation (Table 3.3), the relative importance of R&D, investment and other inputs in total innovation costs (Table 3.4). Data in Table 3.2 show that marked regional differences in the propensity of firms to innovate remain in all sectoral groupings *à la*

Pavitt. In particular, compared to the firms located in the North, firms operating in Southern regions show a much lower propensity to innovate in all industries. For instance, in the North the percentage of innovative firms in science-based industries is almost 60%, while in the South innovative firms operating in the same sector are just above 40% of total firms. Similar regional gaps in the propensity to innovate are found in the other sectors.

Table 3.2. Innovative firms by macro-region and Pavitt's sector (% on total responding firms by sector)

Pavitt's sector	Northwest	Northeast	Centre	South
Science-based	57,3	55,6	53,5	42,9
Specialised suppliers	41,0	38,4	33,6	24,6
Scale intensive	44,8	51,6	41,4	23,4
Supplier dominated	27,5	28,5	20,5	17,0

Source: ISTAT, 1995.

Broad sectoral regularities in the importance of product innovation and in the role played by R&D and investment as part of innovation costs are found in all macro-areas taken into account in our analysis emerge clearly in Tables 3.3 and 3.4. However, the same data show that regional specificities in the patterns of innovation, as well as technological gaps across regions, do not disappear when the sectoral specificities in innovation are controlled for. In particular, in the South the percentage of firms introducing product innovations is lower than in the North, and this is true not only in supplier dominated and scale intensive industries, but also in the most innovative industries (Table 3.3).

Table 3.3. Firms introducing only product innovation by macro-region and Pavitt's sector (% on total innovating firms by sector)

Pavitt's sector	Northwest	Northeast	Centre	South
Science-based	28,2	19,1	34,9	14,8
Specialised suppliers	27,4	31,8	26,5	16,4
Scale intensive	12,8	12,3	9,3	14,1
Supplier dominated	12,6	12,8	14,9	9,3

Source: ISTAT, 1995.

Similarly, data on the relative importance of R&D, investments and other innovation inputs as components of total innovation costs (Table 3.4) suggest that the differences in the innovative profile of regions found at an aggregate level are confirmed also at a more desegregated level. In particular, and for all industries, innovating firms located in the South rely much more on external sources of technology and show a smaller propensity to carry out R&D activities.

Table 3.4. Break-down of innovation costs by macro-region and Pavitt's sector

Pavitt's sector	% R&D				% Investments				% Other innov. inputs*			
	N-W	N-E	Centre	South	N-W	N-E	Centre	South	N-W	N-E	Centre	South
Science-based	66,6	46,9	60,4	34,7	12,6	28,1	10,2	38,4	20,8	25,1	29,4	26,9
Specialised suppliers	38,9	27,6	11,4	3,8	50,6	54,5	73,4	90,7	10,5	17,9	15,1	5,5
Scale intensive	33,5	38,4	30,8	43,1	35,5	32,1	30,1	38,6	31,0	29,5	39,1	18,3
Supplier dominated	36,5	13,3	34,5	25,5	49,2	68,6	50,6	66,1	14,3	18,1	14,9	8,4

Source: ISTAT, 1995.
**: It includes design, trial production, acquisition of patents and licences and marketing.*

It is therefore possible to conclude that, despite the marked industry-specific character of innovation, other regionally localised factors seem to play a relevant role in influencing both the propensity of firms to innovate and the type of innovative strategy pursued by firms (Evangelista et al., 2000, 2001).

3.3. Regional patterns of innovation or regional innovation systems?

In this section we want to make a step forward and get to the core of our empirical agenda which consists of showing the potentiality of CIS data for:

- identifying the presence of sufficiently coherent region-specific patterns of innovation;
- verifying the extent to which the different regional patterns can be interpreted as regional systems of innovation.

For both purposes we will use an enlarged set of variables provided by CIS. In particular, along with the data used in the previous section we will include qualitative indicators which measure "system-related" aspects of the innovation process as well as the presence of "contextual" factors which favour or hamper innovation activities at the firm level and in the region as a whole. Data provided by CIS can in fact be used to build two main categories (see Table 3.5 for a complete list of the indicators used in our empirical analysis):

Firms' performance indicators measure the regional technological performance which is directly related to the innovative strategies of firms (amount of resources devoted to innovation, the type of innovation activity performed as well as type of innovative output);

Systems' performance indicators measure the existence and importance of technological interactions between firms and between the latter and the other relevant institutional actors as well as the rate of diffusion of innovation among firms.

Table 3.5. Lists of variables used in the factor analysis

Innovative aspect investigated		**Acronym**	
Firms' performance	**Type of innovation activity**	REDPAT	% of innovation costs devoted to R&D and patents
		DES	% of innovation costs devoted to design
		TRIALP	% of innovation costs devoted to trialp production
		MARK	% of innovation costs devoted to marketing
	Innovation intensity	INNINT	Innovation expenditure per employee
	Process/product orientation	PROD	% of firms introducing product innovations
	Innovation strategy	OBJREP	% of firms attributing no importance to: replacing products being phased out
System's performance	**Diffusion of innovation**	INN	% of innovative firms on total responding firms
	Information sources		*% of firms attributingimportance to:*
		INFCOMP	competitors
		INFCONF	conferences and exhibitions
		INFCUST	customers
		INFSUP	suppliers
		INFUNIV	Universities and public research institutes
	Obstacles to innovation		*% of firms attributingimportance to:*
		OBSINF	lack of information and/or markets
		OBSLEG	legislative constraints
		OBSTES	lack of technological services
	Technological attractiveness	TECHATTR	% of innovation expenditure sustained by resident firms in the region of residence on total expenditure sustained by the same firms

In order to handle and interpret this large set of indicators (listed in Table 3.5), without loosing the richness and multidimensionality of the CIS data-set, we have summarised the original variables by performing a factor analysis. Three factors were extracted, explaining all together more than 75% of the total variance of the original 17 variables considered.[8]

The interpretative meaning of the three factors can be summarised as follows:

the **first *factor*** measures the existence of systemic interactions and more context-related aspects which can favour or hamper innovation activities. Indeed, this *factor* is strongly related to the importance attached by firms to interactions with suppliers (INFSUP), customers (INFCUST), competitors (INFCOMP) and universities (INFUNIV), and to the importance of various hampering factors to innovation (OBSINF, OBSLEG, OBSTES). This factor is also positively related to the rate of diffusion of innovation in the region, as resulting from a combination of the presence of innovative firms (INN) and their propensity to define a positive strategy (product-oriented) in the firms pattern (OBJREP);

the **second *factor*** measures the relevance of firms' strategies which are not centred upon R&D activities but rather on the ability of designing new products and on less formal forms of knowledge and know-how. In fact, this factor is correlated to the shares of total innovation costs devoted to design (DES), trial production (TRIALP) and marketing activities (MARK). This factor is also correlated to product innovation (PROD);

the **third factor** measures the technological and R&D strength of regions. It is positively related to the share of total innovation costs devoted to R&D and patents (REDPAT), to total innovation costs per employee (INNINT) and to the level of technological attractiveness of the regions (TECHATTR). This factor is therefore likely to measure the technological strength of firms based in each region, resulting from radical innovative efforts and high dynamism of the business sector.

A cluster analysis was then carried out on the new variables extracted (factors) in order to group regions with a similar technological structure and innovative profile. This statistical technique has allowed us to identify four regional categories.

Technologically backward regions (South) – "no innovation systems"

This cluster includes the most technologically backward regions in Italy (southern regions). Firms located in these regions show the following characteristics: weak technological performances; innovation strategies clearly imitative in nature and oriented to the introduction

[8] For more details on the results of the factor and cluster analysis see Evangelista et al., 2000.

of process innovation; a strong technological dependence from technologies generated outside the regional boundaries. R&D capabilities are very poor in these regions and the parallel lack of public R&D facilities contributes to weaken their endogenous capability to generate and develop new technologies. Systemic interactions are rare and of little relevance. Other unfavourable factors to innovation are also present in these regions, such as a poor technological infrastructure and ineffective innovation and industrial policies. The technological and economic backwardness of these regions is heavily affected by their model of industrial specialisation. The bulk of the firms in the South is small in size and operates mainly in the most traditional sectors. In short, the South of Italy emerges as the most backward area in Italy. Its weakness does not refer only to the poor technological performances of firms but also to the complete absence of any systemic dimension of the innovation process.[9] Firms carry out their innovation activities in isolation, showing little contact with other firms, R&D institutes and the broader institutional context. The lack of a critical mass of both qualified actors (firms and institutions) and interactions suggests that the attribute of 'regional system of innovation' can by no means be identified in these regions.

Moderately innovative regions – "weak innovation systems".

The second regional cluster is constituted by Veneto, Friuli, Trentino (the Northeast) Umbria and Marche (in the Centre) and Basilicata-Calabria (in the South). Compared to what happens in most of the South, innovation in these regions is a much more pervasive phenomenon: firms show a higher propensity to introduce innovation, devote more resources to innovation processes, and show some endogenous technological capacity which is reflected in a higher propensity to introduce product innovations. The most important channel through which firms innovate is the acquisition of new vintage of fixed capital combined with activities such as design, trial production and marketing. The innovation process is, thus, accomplished with only modest efforts in R&D. The public R&D system is also rather poor. Accordingly, knowledge flows and systemic interactions in innovation take the form of inter-firm user-producer interactions, which are particularly dense in those industrial areas organised as districts. Such technological links are enhanced by spatial proximity and by an economic and cultural homogeneity based on localised competencies. Regions in this cluster are also characterised by a rather weak technological and R&D infrastructure: two third of the firms identified the lack of technical services as the most important barrier to innovation. This reflects the large presence of small firms and their problems of accessing external technological services and support. All in all, proper RISs cannot be identified within this

[9] While in many respects the whole Mezzogiorno could be considered as a "uniform" macro- region which could be hardly depicted as a macro-regional innovation systems, in some areas there are signs of the emergence of local systems of innovation.

regional cluster. Systemic interactions can be found only in some district areas and are mostly confined to traditional user-producer interactions.[10]

An evolution of the Third Italy innovative model - "informal learning systems"

The third cluster is composed by Emilia Romagna and Toscana, which represent, with respect to innovation, an evolution of the "Third Italy model". The industrial structure of these regions is dominated by small and medium-sized firms operating in traditional industries (such as, for example, textiles and clothing), as well as in mechanical and electrical/electronics sectors. Innovation is often the base of the good economic performances of these regions. Innovation activities carried out by firms rely upon on a mix of codified knowledge (engineering skills) as well as local-embedded competencies which are a result of long lasting cumulative learning processes. Firms located in these regions tend to develop long term links with both suppliers and customers which often have a technological content. These linkages are at the same time facilitated by a high product specialisation of firms as well as by tightly integrated organisational models of production. The rate of innovation in this cluster is also positively affected by favourable context-specific conditions, represented by a plurality of active institutional actors such as specialised business services, government-supported local agencies, knowledge-centres, technology-transfer agencies, private business associations, chambers of commerce and training agencies. Most of these institutions are regarded by firms as important sources of technological information. In comparison with the previous two regional clusters, the innovative pattern of Emilia and Toscana is closer to the RSI standards, although linkages and interactions between firms and between the latter and other relevant institutional actors are largely informal in nature and loosely structured.

R&D-based innovative regions - "Science-based systems"

The last regional cluster encompasses all Northwest regions (Piemonte, Lombardia, Liguria) along with Lazio. These are by far the most R&D-intensive regions of Italy. As already pointed out in Section 3.2, Lombardia and Piemonte (and to a lesser extent Liguria) represent the technological heart of Italian industry, while Lazio concentrates a large section of the Italian public R&D infrastructures and activities. Unlike the rest of Italy the introduction of process innovations does not represent the most important technological source used by firms to innovate. Firms' strategies are in fact much more oriented toward the introduction of technologically new or improved products. The industrial and technological bases of Liguria and Lazio are not as strong as the one found in Lombardia and Piemonte. All four regions are characterised by a good scientific and technological infrastructure due to the high concentration of most university centres and private research institutions. The good R&D

[10] This result is partly affected by the limits of CIS in capturing more informal and local specific technological linkages.

infrastructure of these regions make them also very attractive for the localisation of innovation facilities from firms based in the rest of the country and from abroad.

The full range of links and interactions forming the skeleton of an innovation system is visible especially in the case of Lombardia and Piemonte. In these two regions technological links between firms and between them and Universities and research institutes are in fact sufficiently structured. In Lombardia and Piemonte we also find the most favourable contextual conditions to innovation. Firms in these regions perceive the lack of technological information and services, as well as legislative constraints, as weak obstacles to innovation. This result confirms the presence of a good scientific and technological infrastructure, the presence of diffused networks of technological services and an active role of regional innovation policies. On the contrary, in Lazio and Liguria systemic interactions do not play such a critical role. Support from local governments is not particularly strong, collaborative relationships between firms as well as other forms of technological linkages are not as frequent as in Lombardia and Piemonte. The most frequent forms of collaboration are in fact those found between a restricted number of science based firms and public and private research institutes.

3.4. Concluding remarks

In this chapter we have assessed the capacity CIS data offer to represent the innovation phenomenon at a regional level. For this purpose, an articulated set of indicators measuring the different dimensions of regional technological patterns and performances has been proposed.

The evidence presented based on the Italian case shows that CIS data are effective in grasping the varied nature of innovative activities and their region-specific nature. More in particular the indicators proposed were able to quantify the contribution of the different regions to Italy's innovation performance, to identify the different technological profiles of Italian regions taking into account the basic structural characteristics of regional industries, and the density and quality of systemic interactions between the main institutional actors.

As expected, our analysis has confirmed the presence of a marked technological gap between the North and the South of the country. Few regions (Piemonte, Lombardia, Emilia Romagna and, to a lesser extent, Veneto and Toscana) concentrate not only the bulk of R&D and patenting activities but also the bulk of innovation activities. The Southern regions are confirmed to be located at the very periphery of the Italian system of innovation. However, we have also shown that the traditional North-South distinction is not able to depict the variety of innovation processes at the regional level. The use of the data provided by CIS has

allowed us to identify a wider spectrum of regional patterns. The latter differ not only according to the specific strategies and performances of firms but also to the density and quality of systemic interactions as well as the presence of contextual factors favourable to innovation.

Can the different regional patterns identified in our empirical analysis be interpreted as regional systems of innovation? In the light of the conceptual and definitional criteria reported in the literature our answer is clearly negative, at least for most of the regional clusters identified by our empirical analysis. In fact, according to CIS data, only Piemonte and Lombardia (north west) can be defined as proper innovation systems. In Emilia Romagna, Toscana and Veneto the systemic dimension of innovative activities is much more based on informal technological linkages, knowledge flows and learning processes within a rather coherent and cohesive industrial environment. On the contrary, in all less favoured regions (South of Italy) we do not find the necessary ingredients needed to identify an innovation system at work, such as a critical mass of innovative firms and institutions and a significant range of interactions among the different actors involved in the innovation process.

Chapter 4, Internal and External Factors in the Catching-up of European Less Favoured Regions: comparative study of Portuguese and Irish Growth experience

James Mc Devitt
Joe Cogan
Manuel Godinho

4.1. Introduction

The objective of economic and social cohesion, aimed at reducing disparities between Member States, regions and individuals is laid down in article 158 of the Treaty of Rome. It has been given increased emphasis since the late 1980s with the introduction of a portfolio of initiatives and instruments ranging from Community Structural Funds to Investment Loans. The goal of reducing income disparities is predicated upon the economic proposition that, under certain conditions, the spatial dispersion of per capita incomes declines over time and poor economies will grow faster than rich ones and converge to the same levels of income per capita, or at least, to their own equilibrium level of income. Testing the validity of this proposition is of major importance for the present catching-up economies and will be a crucial issue in the context of eastern enlargement.

The aim of this paper is to calibrate and interpret the convergence experience of Ireland and Portugal over the past decade. Internal and external factors associated with the catching-up of these two economies will be highlighted and their relative impact assessed. The period under review was characterised by a pro-active EU cohesion policy, channelled mainly through Cohesion and Structural Funds, to augment national policies aimed at enhancing growth and productivity. The impact of these financial supports is of particular interest.

Before turning to the empirical aspects of comparing the Irish and Portuguese cases, it is important to distinguish between international convergence and interregional convergence. At the EU level the former applies to convergence of the less developed Member States with the rest of the Union (national convergence towards the EU average). The latter targets convergence of the less developed regions, be it to the EU average or, within a country, to the national average. Recent research (Cappelen et al 1999) suggests that international convergence within the EU since 1980 was accompanied by inter-regional divergence. In what regards the group of the “cohesion countries”, this finding has been confirmed in the case of Ireland and Spain (EU Economic Review 2000) for the period 1991-1997. Portuguese data for the same period, however, show a move towards regional convergence. This is attributed to the below average growth of the richest region, Lisboa e Vale do Tejo. The EU report suggests that a growth in regional disparities is usual in "catching-up" economies, particularly in the early stages of rapid international convergence, but this tendency then goes into reverse.

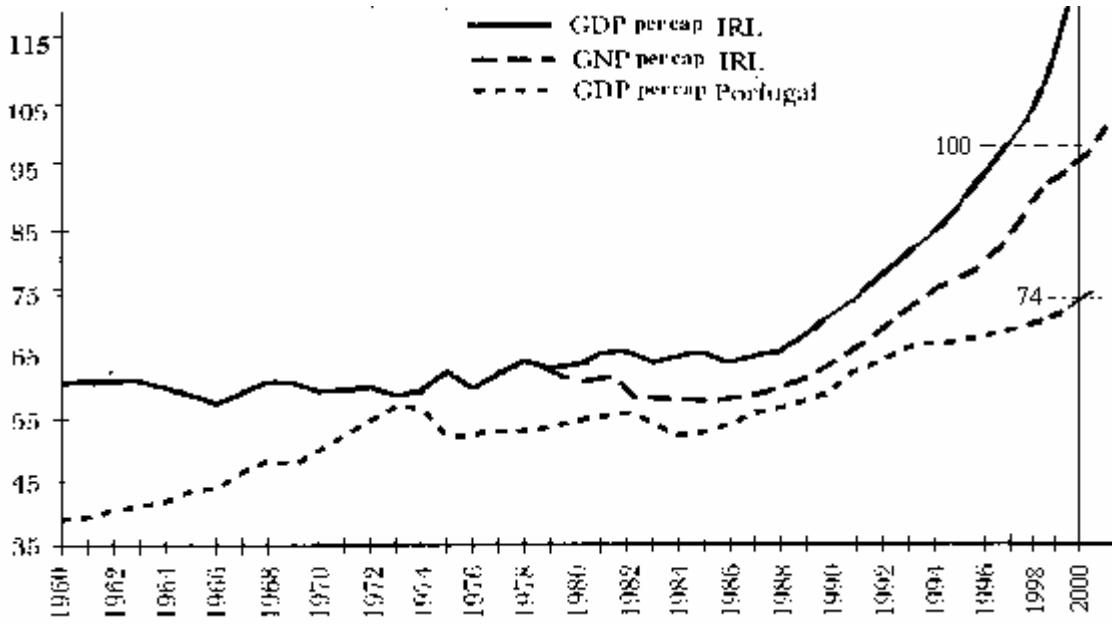
The analysis which will be carried out in the remaining of the paper takes into consideration the theoretical perspectives and the debates about the factors that have underlied economic convergence over recent decades. A theoretical frame similar to the one which was put forward in Chapter 1 of this part of the report could therefore be seen as a reference for the analysis in the forthcoming sections.

In the sequence of this introductory section, we will turn now in section 4.2. to presentation of the quantitative data on convergence for the Ireland and Portugal. The period covered is the decade and a half since the initiation of the EU cohesion policy in the mid-80s, and the emphasis is on economic convergence as measured by the GDP per capita and productivity levels of the two economies. The decisive internal factors driving convergence, through the productivity route, are the acquisition and enhancement of capabilities and developing competencies within all sectors and the expansion of the proportion of national output associated with the dynamic, more knowledge-intensive, sectors of the economy (structural change). These are the topics covered in sections 4.3 and 4.4, respectively. A number of external factors also operated during the 1990s to create conditions conducive to convergence, with particular reference to the peripheral EU economies. These included an upsurge in world trade, enhanced flows of foreign direct investment, the establishment of a Single Market and a pro-active EU cohesion policy, supported by the transfer of resources to laggard countries. The impact of these external factors is discussed in section 4.4 while section 4.5 examines the extent to which "social capability" should be factored in to the equation. The paper concludes with an assessment of the future convergence prospects of the two economies.

4.2. Economic Convergence: Growth and Productivity Indicators, Portugal and Ireland Compared

Figure 4.1 depicts how the Irish and Portuguese GDP per capita (in parities of purchasing powere) evolved as a proportion of EU-15 income per capita over the four decades since 1960. The Irish figures remained almost constant at 60% from 1960 up until 1973 when Ireland joined what was then the EEC. There followed a modest growth differential over the next decade such that Ireland stood at 65% of the EU average in 1983. The 1983 oil shock and a crisis in public finances brought progress to a temporary halt.

Fig 4.1 Convergence Experience of Ireland and Portugal 1960-2000



Sources: Frank Barry (1999) Understanding Ireland's Economic Growth, Macmillan Press: London; Eurostat and DG ECFIN.

From 1987, however, Ireland's relative GDP per head raced ahead reaching 80% by 1993. Headway was accelerated during the 1993-1995 recession as Ireland embarked on its 'Golden Age' of economic growth. Relative GDP per capita had reached 94% by 1996 and shot up to 104% in 1997. In 2000 Ireland's relative GDP per capita stood at 118% of the EU average

Portugal, like Ireland, also achieved growth above the EU average since its accession to the EU in 1986, though at a more modest rate. On joining the EU it experienced large inflows of foreign investment and a marked increase in exports, both of which stimulated growth. In part as a result of this and as a consequence of the appreciation of the Escudo which raised real income levels, GDP per head increased from 55% of the EU average in 1986 to 68% by 1990. Portugal was particularly badly affected by the 1993-1995 recession during which period its GDP per head remained largely unchanged relative to the EU average and had only reached 71% by 1996. At the end of the decade Portugal's real income level stood at 74 % of the EU average.

The driving forces behind the convergence story, namely improved productivity and, in the Irish case, a major expansion in employment-related inputs, are illustrated in Table 4.1.

Table 4.1. Economic Growth (1988-1998)

	GDP 10^9 USD		GDP per capita 10^3 USD			Employment (10^3)			Labour Productivity 10^3 USD		
	1988	1998	1988	1998	GR	1988	1998	GR	1988	1998	GR
Ireland	43.3	85.9	12.24	23.18	6.6	1091	1495	3.2	39.7	57.5	3.8
Portugal	91.3	119.4	9.17	11.97	2.7	4354	4703	0.8	21.0	25.4	1.9
EU15		9198.2		24.57			152541			60.3	

Source: calculations based on OECD, National Accounts. All monetary figures are expressed in 1995 constant prices and exchange rates. Note: GR stands for annual growth rate in the period.

This table gives comparative employment and productivity figures for Ireland and Portugal for the decade 1988 - 1998. Irish GDP per capita almost doubled for the period, placing it at virtual parity with the EU15 by 1998. The explanation for this can be seen in the productivity increase of 45% and the employment-related increase of nearly 40% that occurred during the same period. By 1998, Irish labour productivity, in absolute terms, was close to the EU average.

The performance of Portugal was more modest for the same period. Output increased by about 20% in real terms over the decade, and income per capita rose by 31% which still left it at less than 50% of the EU15 average. Employment input increased by only 8% and labour productivity by 21%. For Portugal the absolute level of labour productivity was only 42% of the EU15 average in 1998.

In order to explain the disproportionately high increase in GDP per capita for Ireland in the period 1988-1998 (6.6% per annum) *vis a vis* Portugal, it is necessary to factor in the employment effect. Employment growth for Ireland in the 1988-1998 period averaged 3.2% per annum compared with 0.8% for Portugal. Nearly all of the Irish employment growth accrued from reducing unemployment and improving labour force participation. Table 4.2 shows the growth performance of the business sector of Portugal, Ireland and the EU 15 for the periods 1980-1990 and 1990-1998.

The growth of the Business Sector in the Portuguese and Irish economies only for the period 1990-1998 closely mirrors the growth performance of the overall economy for the same period in respect of increases in GDP per capita, employment and productivity (see Table

4.1). However, the major novelty in Table 4.2 regards the figures on multi-factor productivity (MFP).

Table 4.2. Business Sector growth (per cent per annum)

	GDP		Employment		Labour productivity		MFP	
	80-90	90-98	80-90	90-98	80-90	90-98	80-90	90-98
Ireland	4.0	6.6	-0.1	3.4	4.2	3.2	3.4	3.5
Portugal	2.7	2.4	0.8	0.2	1.9	2.2	1.7	1.8
EU15	0.6	1.3	0.4	1.3	0.8	0.8	0.8	1.0

Source: Stefano Scarpetta, Andrea Bassanini, Dirk Pilat and Paul Schreyer (2000), Economic growth in the OECD area: recent trends at the aggregate and sectoral level, OECD working paper.

A comparison of performance between the 1990s and the earlier decade shows that the annual growth in MFP was remarkably stable in all three areas across both periods, with Portugal achieving double the EU rate and Ireland approximately four times the EU rate. Therefore, in addition to the employment factor, the growth of labour productivity and particularly the increase in MFP are relevant factors in accounting for the superior performance of the Irish economy.

While Irish labour productivity had almost reached the EU 15 average by 1998 it remained some way behind the US level. Table 4.3 shows the labour productivity convergence performance of all the cohesion countries relative to the US. The interest of this table lies mainly on the fact that it provides historical figures for the 2nd half of the XXth century.

Table 4.3. Evolution of labour productivity (US=100)

	1950	1973	1985	1992	1998
Ireland	32	46	60	77	86
Portugal	20	42	42	48	50

Source: Stefano Scarpetta, Andrea Bassanini, Dirk Pilat and Paul Schreyer (2000), Economic growth in the OECD area: recent trends at the aggregate and sectoral level, OECD working paper.

Portugal performed better than Ireland over the 1950-1973 period albeit from a lower base. But while Ireland continued to make progress relative to the US following its accession to the EU in 1973, Portugal's progress stalled apart from a brief surge following its own accession in 1986. Overall, however, comparisons with the US show the peripheral EU economies in a less favourable light

4.3. Impact of Structural Change on Labour Productivity Growth

Labour productivity can in principle be separated into two components: the part taking place within sectors (or firms) and the part that is due to structural change arising from a growing employment share of sectors (or firms) with high levels of productivity and a corresponding relative decline in others. For the decade 1988-1998 labour productivity was found to increase (Section 4.2) by 45% (3.8% per annum) and 21% (1.9% per annum) for Ireland and Portugal respectively. The question being investigated here is how much of this productivity increase was due to structural change as opposed to improved productivity within sectors (or firms).

Historically much of the increase in output per employee for the Irish and Portuguese economies has resulted from a broad inter-sectoral shift from agriculture into industrial and service employment.

Table 4.4. Structural Change (Agriculture, Industry and Service, shares in %, 1988-1998)

	Employment						Gross Value Added					
	1988			1998			1988			1998		
	A	I	S	A	I	S	A	I	S	A	I	S
Ireland	15.4	27.8	57.0	9.1	29.2	62.3	9.9	38.4	51.8	5.7	43.4	51.0
Portugal	20.7	35.1	44.2	13.6	36.0	50.4	5.5	35.4	59.1	4.1	35.7	60.2
EU15	7.3	33.1	59.7	4.8	29.4	65.9						

Source: OECD, National Accounts.

Table 4.4 shows that during the past decade Irish agriculture's share of gross value added fell to 5.7% and that of Portugal to 4.1%, greatly reducing the scope for further contraction. The corresponding employment figures in 1998 were 9.1% and 13.6% respectively, underlying the relatively low value added per employee in agriculture. In future years the numbers employed

in agriculture will eventually fall further towards the EU average (4.8%) and the contribution of agriculture to overall national output growth will continue to decline.

In the case of Ireland the balance of economic output moved strongly towards industry while in the case of Portugal the smaller decline in the share of agricultural output was absorbed by a similar increase in service sector output. Both these sectoral shifts reinforced the relative lead in terms of industrial productivity in the Irish case and of services productivity in the Portuguese one. In addition to that, those sectoral shifts impacted positively on national productivity (Table 4.4).

Calculations carried out by the Irish Central Statistics Office (Keating 2000) confirm the impact of this structural shift on labour productivity. At this broad level of aggregation, they show that the impact was 0.3% per annum during the decade of the 1990s. This represents up to 10% of the recorded national annual productivity increase during the period. It is not unreasonable to speculate an impact of similar proportions in the case of Portugal.

But, of course, structural change also takes place within each of the three broad sectors. One of the main intentions of the EU structural funds was to re-orient industry in the peripheral economies towards higher value added activities, so that they could compete in the harsher competitive climate of the Single Market (1992). Using a 13 subsector industry disaggregation for the period 1991-1998, Keating (2000) calculated that the structural change component of Irish industry productivity was about 0.9% per annum. This would have the effect of adding another 0.3 % to overall national productivity. Hence the overall structural effect for Ireland, ignoring any contribution from internal changes in agriculture or services, is in the order of 0.6 % per annum or about 20% of the recorded annual labour productivity during the 1990s.

Corresponding data on intra-industry structural shifts are not available for Portugal but, based on the OECD STAN database, Godinho and Mamede (2001) provide evidence on the phenomenon. They analysed structural change in the Portuguese manufacturing sector using a four way categorisation of industry: high tech, medium high-tech, medium low-tech and low tech. Industry subsectors are allocated to one of these four categories in line with their R&D intensity. According to their calculations the contribution of the structural effect only accounted for 8% and 4%, respectively in 1985 and in 1994, of the productivity gap between

the Portuguese manufacturing sector and the equivalent average concerning the 4 largest EU economies. The remaining differentials were related to intra-sectoral efficiency differences.

As data for Ireland, however, were not available from the same source, comparable data were assembled for the years 1991, 1994 and 1998 using the Irish Census for Enterprises. Furthermore, similar information was gathered for Portugal from national sources for 1997.

Table 4.5. Employment in Manufacturing (in %)

	Ireland			Portugal		
	1991	1994	1998	1991	1994	1997
Low-tech	48.1	45.8	40.2	58.5	59.4	63.2
Medium-low-tech	17.8	17.7	17.2	26.2	25.0	19.0
Medium-high-tech	25.3	25.2	27.4	12.4	12.6	15.5
High-tech	8.8	11.3	15.2	2.9	2.9	2.5
Total (in %)	100.0	100.0	100.0	100.0	100.0	100.0
(10^3)	194.4	205.6	242.2	1157	1038	1018

Sources: OECD STAN for Portugal and Census of Enterprises for Ireland.

Table 4.6. Value Added in Manufacturing (in %)

	Ireland			Portugal		
	1991	1994	1998	1991	1994	1997
Low-tech	46.7	43.0	32.5	58.9	61.4	48.3
Medium-low-tech	11.6	10.8	8.9	20.9	19.9	27.7
Medium-high-tech	28.7	31.2	41.5	14.4	14.2	19.2
High-tech	13.0	15.0	17.2	5.4	4.8	4.9
Total (in %)	100	100.0	100.0	100.0	100.0	100.0

Sources: OECD STAN for Portugal and Census of Enterprises for Ireland.

Tables 4.5 and 4.6 confirm Keating's findings that, in the case of Ireland, significant structural shifts towards higher value added activities took place within manufacturing industry in the past decade. A gain of 17 percentage points, between 1991 and 1998, in the combined value added share of the high tech and medium high tech categories, is impressive when one considers that it started from a high base of 42%. The employment share of these two categories increased by 8.5 percentage points over the same period and the difference between this and the 17 percentage points for value added reflects the fact that these are high productivity activities.

The picture of structural change in Portuguese manufacturing that emerges from Tables 4.5 and 4.6 is less encouraging. Over the period 1991-1997 value added in the combined high tech and medium high tech sectors increased by just 4 percentage points from a base of 20%, while the corresponding employment share increased by 3 percentage points. At the same time contradictory changes in employment and value-added occurred in the Portuguese low and medium-low-tech sectors. While employment shares rose in the former and decreased in the latter, an opposite movement was observed in what regards value-added shares. Altogether, however, the intra-industry component of structural change is much smaller in the case of Portugal than it is for Ireland.[11]

Table 4.7 gives the export specialisation pattern for Ireland and Portugal during the 1990s and reflects the extent to which structural change in manufacturing exports towards higher value added activities has occurred in both countries.

Table 4.7. Export Specialisation Pattern
(Structure of exports according to technological intensity)

	Ireland			**Portugal**		
	1991	1994	1998	1991	1994	1996
Low-tech	36.6	34.2	28.2	59.8	55.5	48.6
Medium-low-tech	9.5	7.8	5.0	13.8	15.6	13.1
Medium-high-tech	28.6	30.0	36.5	21.6	23.4	32.4
High-tech	25.3	28.0	30.2	5.0	5.4	5.7
Total (in %)	100.0	100.0	100.0	100.0	100.0	100.0

Sources: OECD STAN for Portugal and Census of Enterprises for Ireland.

The data for export specialisation in Table 4.7 confirm the message coming from the earlier tables. Ireland performs very well in the export of high tech and medium high tech products, expanding the combined share of these two categories from a 54% share of exports in 1991 to a 67% share in 1998. The export specialisation for Portugal in combined high and medium high tech products was a 27% in 1991 increasing to 38 % in 1996. However, when compared to both the employment and value-added shifts that were observed before, the relative export pattern shift is much more significant in the Portuguese case.

[11] Even though the aggregation into the four groups was carefully carried out, the Portuguese data needs to be interpreted with caution since the source for 1997 is different from that for the other years.

4.4. Impact of Internal Factors on Labour Productivity Growth

Notwithstanding the structural change that is manifest in the economies of both Portugal and Ireland over the past decade, the conclusion from the previous section must be that growth in labour productivity is predominantly (to the extent of 80 to 90%) a function of capability enhancement within sectors (and firms). The OECD STI Outlook (2000) and Scarpetta et al (2000) both support the proposition that the *intra-sectoral* effect is the most important factor in productivity growth and will become even more dominant in the future.

In this respect empiricism aligns itself very closely with Endogenous Growth and Technology Gap theories in so far as it postulates that growth is pre-eminently achieved through the acquisition and development of enterprise capabilities, mediated through physical but more particularly intangible investment. OECD (1992) recommends that intangible investment should be targeted towards (i) investment in technology and learning leading to competence in introducing new products and processes and (ii) enabling investment in human resources. Indicators of the resources allocated to capacity-buiding in both these areas are in universal use and, more importantly, indicators of output and impact have been developed more recently.

4.4.a) Intangible Investment in Technology for New Products and Processes

Investment to create a flow of new and improved products and processes has, for many decades, been equated with the *input* of R&D expenditure but since the early 1990s innovation performance or *output* indicators have also been compiled on a consistent basis for all EU countries

Input Indicators

R&D expenditure is the flagship input indicator for intangible investment in promoting a capability in new products and processes. The part of R&D performed in the private sector (BERD) is usually distinguished from the gross expenditure on R&D (GERD) because the former is a better indicator of the innovation potential of the business sector. Relative to the other cohesion countries (Tables 4.8 and 4.9), the Irish business sector finances a much higher

proportion of GERD, an indication of the current importance of technology in Ireland's private sector.

Table 4.8. GERD (cohesion countries and EU average)

	GERD/GDP	GERD/GDP	GERD Growth % p.a.	GERD Financed by Business (%)
Ireland	0.9 (1990)	1.4 (1997)	14.6 (90-97)	61
Portugal	0.5 (1990)	0.6 (1997)	5.1 (90-97)	20
EU 15	2.0 (1990)	1.9 (1998)	1.2 (92-98)	

Source: EC (2000), Key Figures 2000 and European Report on S&T Indicators, 1997.

Table 4.9. BERD (cohesion countries and EU average)

	BERD/GDP	BERD/GDP	BERD Growth % p.a.	BERD Financed by Business (%)
Ireland	0.5 (1990)	1.1 (1997)	18.5 (90-97)	86
Portugal	0.1 (1990)	0.1 (1997)	2.4 (90-97)	81
EU 15	1.3 (1992)	1.2 (1998)	1.7 (92-98)	

Source: EC (2000), Key Figures 2000 and European Report on S&T Indicators, 1997.

Tables 4.8 and 4.9 illustrate a sustained increase in Irish GERD and BERD over the decade. BERD grew from 0.5 % of GDP in 1990 to 1.1% in 1997 coming close to the EU level (1.2 %) and approaching the OECD average (1.5%). Portuguese BERD as a percentage of GDP showed little growth over the same period, remaining at about 10% of the EU15 relative level.

Because of the distinctive characteristics of knowledge as articulated in endogenous growth theory, in-house R&D must be complemented by technology acquisitions because "catching-up" economies are particularly dependent on technologies generated outside their borders. In the case of Ireland and Portugal, FDI is one important potential source of such transfers. Data on international receipts and payments for technology indicate that foreign subsidiaries in Ireland spend about the same amount of resources in acquiring technology from their home base as they spend on R&D in Ireland. But there is no consistent data on the extent of technology spill-overs to indigenous firms from multi-national branch plants in Ireland or Portugal.

Output (Performance) Indicators

Surveys of the level of product and process innovation in the business sectors of all EU countries, initiated in the early 1990s, provide valuable output indicators that purport to capture the extent to which investment in R&D and in technology acquisition is reflected in innovation performance. Comparative data for Ireland and Portugal from the most recent Community Innovation Survey (CIS II) are shown in Table 4.10.

Table 4.10. Innovation Performance (cohesion countries and EU average)

	Innovation expenditures as % of turnover		% of innovations with co-operation		% of innovating enterprises		% of novel innov-ators	% of turnover from products new to the market
	Manu	Serv.	Manu	Serv.	Manu	Serv.		
Ireland	3.3	2.1	36	23	73	58	27	32
Portugal	1.7	1.1	20	23	26	28	7	14
Average 12 European countries	3.8	2.7	26	24	53	41	21	31

Source: Eurostat, Key Figures 2000

Table 4.10 confirms that Ireland's innovation performance across a range of indicators is closer to the average for the non-cohesion EU countries than it is to Portugal and Spain. This accords with the greater commitment of the Irish business sector to technology, manifest in Tables 4.8 and 4.9.

Other performance indicators compiled on a uniform basis for EU countries relate to international patenting and scientific publications. It is consistent, however, with the "catching-up" status of cohesion countries that the European Report on S&T Indicators (p. 264,1997) makes the comment that "almost no activity is going on in any of the [cohesion] countries" with respect to these indicators.

4.4.b) Enabling Intangible Investment in Human Resources

Investment in human resources, including education and firm-based training and skill formation, is the scond major instrument of national anf firm capability-building. Table 4.11 contains selected indicators of personnel working in R&D. The figures reinforce earlier evidence of Ireland's comparative success during the past decade in improving enterprise capabilities. The relatively high figure for RSEs in the business sector is consistent with the rapid growth in Irish BERD during the 1990s (Table 4.8). This contrasts with the situation in Portugal where the number of RSEs employed in government is three times as many as in the business sector.

Table 4.11. R&D Personnel Indicators for cohesion countries

	Ireland	**Portugal**
R&D Personnel (per 1,000 active popln)	6.96	3.27
Graduates (per 1000 -20 to 24 years old)	38.58	7.45
RSEs (per 100 in active popln), Working in:		
Firms	1.88	0.20
Government.	0.40	0.58
Higher Ed.	1.11	1.11

Source: Second European Report on S&T Indicators, 1997.

Turning to investment in education more broadly, public expenditure in Ireland has more than doubled over the 1990s, with educational expenditure in relative terms accounting now for 5.5% of GDP (OECD average is 4.9%). Fitzgerald et al (2000) have quantified the average annual rise in education per worker and its (weighted) contribution to the growth of productivity (and output) for the two five-year periods since 1990 (Table 4.12). The continuous growth in education per worker over the decade contributed a very significant one half of one per cent to annual productivity growth.[12]

[12] Indicators of investment in firm-based training and skill formation provide further evidence of an upgrading of competencies in the Irish workforce. A recent survey (IBEC 2000), based on figures for 1998, reveals that the average cost of training as a percentage of payroll was 3.01% for all companies, more than a doubling since the previous survey published in 1994. The average number of days training per employee was between 5 and 6, but a significant minority of firms provided over 10 days training per annum. After a slow start these figures now

Table 4.12. Ireland's Growth rates of Education per Worker and its Contribution to growth of Output and Productivity (percent p.a.)

	Growth in Education per Worker	Contribution to Productivity Growth
1990 - 1995	0.94	0.54
1995 - 2000	0.81	0.43

Source: Fitzgerald and Kearney (2000).

The Portuguese education and training systems grew significantly in the 1980s and 1990s. Between 1989 and 1996 the proportion of people on work holding a higher education degree raised by about 7% (8% in Ireland). According to Conceição (2002), the improvements in educational levels were the most important determinant of growth in labour productivity per hour of work in the period 1985-1996. Quoting a OECD report published in 2000, Conceição (2002) points out that Portugal is the only of 16 OECD countries (including Ireland) where productivity growth in that period can be totally explained by educational improvements. Despite this, however, the overall panorama in terms of education has continued relativelly bleak, with only 20% of the adult population holding a higher secondary or tertiary education degree, a figure that compares with a OECD average of about 60%. Also the participation of adult population in annual training activities (14%) is yet well below the OECD average (35%).

4.5. Impact of External Factors on National Competitiveness of Portugal and Ireland

Any analysis of the forces influencing the convergence experience of Portugal and Ireland must include factors relating to external shocks and stimuli and the manner in which the two economies participated in the international division of production. The decade of the 1990s saw the confluence of a number of economic developments that impacted very favourably on the potential of the weaker EU economies to "catch-up". First, there was a major upsurge in world trade; secondly, the globalisation of technology and production led to a quantum

compare well with the EU average. This survey also found that training had become more structured and that there was a new focus on management and IT/technology training and on customised training programmes specific to particular economic sectors.

increase in the flow of foreign direct investment (FDI) into Europe; and thirdly, the establishment of the Single European Market (SEM) was not only beneficial in itself, but precipitated a complex of measures, subsidised by the stronger member countries, designed to improve the productive efficiency and to upgrade the infrastructures of weaker EU regions and countries. To a great extent these developments were interrelated and mutually reinforcing. The improvement in Europe's economy in the 1990s, and particularly the dramatic increase in import elasticity with reference to GDP, was linked to the establishment of the SEM. The doubling of US FDI annual inflows into the EU-15, between 1984 and 1990, was also stimulated by the potential of the SEM. And US FDI inflows continued to constitute the vast bulk of the overall flows into Europe since 1990. On the demand side a strong growth in US imports, underpinned by buoyancy in word trade, provided an attractive market for EU exports.

4.5.a) Upsurge in World Trade

Internal attempts at capability enhancement can be frustrated by a downturn in the business cycle. On the other hand, the "Golden Age" economic growth rates experienced for a couple of decades before the first oil crisis in 1973, are associated with rapid 'catch-up' by several European and Asian economies. A second 'golden age' of GDP growth and import expansion characterised the world economy in the 1990s (Table 4.13). The US economy was particularly buoyant and the volume of goods imports by the EU returned to the rapid growth rates prevailing before the 1973 oil crisis (even though EU growth rates were relatively modest). The Single Market is the decisive factor in the EU import performance since 1992.

Table 4.13. International growth rates of GDP and Goods Imports for various periods (% per annum)

	1963 -73	**1973 - 80**	**1983- 90**	**1993 -2000**
GDP Growth rates (volume)				
United States	4.0	2.2	2,3	4.1
EU - 15	4.7	2.3	1.9	2.5
Total OECD	5.0	2.5	2.4	3.0
Goods Imports (volume growth)				
United States	9.1	2.7	6.7	12.1
EU - 15	8.7	3.1	3.7	8.1
Total OECD	9.2	2.8	4.5	9.4

Source: OECD Economic Outlook (various) and Kennedy (2001).

The extent to which Ireland and Portugal benefited from these buoyant markets is captured in Table 4.14.

Table 4.14. Irish and Portuguese Export Performance: Growth Rates (% per annum)

	Volume	Market	Performance
1988 - 1993			
Ireland	9.2	4.1	4.9
Portugal			
1993 - 2000			
Ireland	16.5	8.0	7.8
Portugal			

Source: OECD Economic Outlook, various issues. Note: Export performance is measured as the difference between the growth of a country's exports and the growth of its markets. The export market facing each country is calculated on the basis of a weighted average of import volumes in each exporting country's markets, where the weights correspond to trade flows in a designated year.

4.5.b). Foreign Direct Investment

Table 4.15 illustrates how Ireland and Portugal benefited from the upsurge in total FDI flows into Europe, attracted to a significant extent by the potential of the SEM. Portugal's share of the increased pool of foreign investment expanded in the period 1985-1994 and then contracted more recently in 1994-1998, while Ireland's share expanded continously since 1985.

Table 4.15. Trend in the flow of FDI into Ireland, Portugal and Spain

	1985-94		1994 - 98	
	10^6 USD (p a)	**Percent GDP**	**10^6USD (p a)**	**Percent GDP**
Ireland	578	1.3	2516	3.5
Portugal	1337	2.0	1592	1.5
Spain	8270	2.0	7401	1.3

Source: Miguel Lebre de Freitas (2001).

The OECD Survey (1999) stated bluntly that FDI was "the single most important factor in determining Ireland's economic growth" during the 1990s. FDI has a direct impact on GDP per capita whenever it is instrumental in utilising unused capacity, helping to eliminate unemployment or improve labour force participation. Indirect benefits include the development of a labour pool with specific skills and spill-overs of knowledge and technology across firms and input-output linkages. Irish economy expenditures by MNCs on materials and services create significant secondary employment. Spin-off benefits may include a role as incubators for new entrepreneurs. A study on clustering in indigenous industry finds that in the software sector one-third of Irish entrepreneurs had worked in foreign firms immediately before the start-up of the new firm, while two-thirds of entrepreneurs had worked in foreign firms at some stage in their careers (Clancy *et al.*, 1997).

Finally, FDI contributes to increasing national productivity because it fosters structural change. It was observed earlier (Table 4.6) that, over the past decade, the

proportion of added value accruing to the high and medium-high tech segments of Irish industry increased by 17 percentage points for Ireland. A structural shift of this magnitude is attributable to a selective policy of attracting FDI in specific high value added sectors, namely electronics, software, pharmaceuticals and healthcare.

Also in the Portuguese case the attraction of FDI was instrumental in starting to change a structure of manufacturing production and export specialisation which had remained mostly unchanged until the mid-1990s. The rise of 9 percentage points in the exports of the medium-high-tech group of industries between 1994 and 1996 (Table 4.7) is mainly an effect of a significant joint Ford-VW investment in the early 1990s. The large facility that was created stimulated the emergence of a diversified network of automotive componentes suppliers.

4.5.c) Benefits arising from EU Membership

The benefits arising from EU membership pertinent to this discussion are those pertaining to the integration of the individual national markets of the EU member states, culminating in 1992 as the Single European Market (SEM), and the program of supports introduced by the Commission to counter any increases in regional disparities that might follow from such market integration.

The Cecchini Report (1989), on the basis of detailed micro and macroeconomic studies, predicted that in the medium-term EU GNP would increase by about 4.5% per cent, as a result of market integration. It was postulated that the small open economies of the EU periphery would not benefit to the same extent as the core economies, hence a programme to accelerate structural reform and social cohesion. Monti (1996) and others have found, however, that the process of integration has allowed the poorer states to grow faster than the richer ones. An Irish study, (ESRI 1996), analysed the impact of the SEM on the four cohesion countries and found that the SEM could make Ireland's GDP 9% higher by 2010 and boost Portugal's GDP by 7.5% but would have almost no impact on Greece or Spain. Overall the single market has been very positive for Ireland and Portugal. If induced FDI flows were considered these positive impacts would be substantially higher for Ireland.

The transfer of resources from the Community centre to the peripheral economies took place in two tranches. The first ran for the five years 1989-93, and the second spanned the six year period 1994-99. These are referred to as CSF I and CSF II, respectively. Before analysing the extent of these transfers and their impact on GNP growth in Ireland and Portugal it is appropriate to state their purpose:

- to develop the physical infrastructure with a view to improving competitiveness
- to improve marketing and innovation in the productive sector
- to enhance human capital

Table 4.16. Allocation of resources to Ireland, Portugal and Spain under the two CSFs and the Cohesion Fund

4.16.a) CSF I (1989 - 1993)

	Total 10^6 ECU	**Per inhabitant**
Ireland	3672	1048
Portugal	6958	705
Spain	9779	420
EU12	36200	387

4.16.b) CSF II and Cohesion Fund (1994 -1999)

	Total 10^6 ECU	Per inhabitant	% GDP of Objective 1	Cohesion Fund 10^6 ECU
Ireland	5620	1604	2.1	1359
Portugal	13980	1417	3.2	2724
Spain	26300	1130	2.2	8348
EU 12	93809	1028	1.8	15150

Source of a) and b): CEC. Note: The second CSF was supplemented by a further allocation of ECU 30,000 x 10^6 of 'non-structural' funds for all Objective 1 regions, under the rubric Cohesion Fund.

Aggregating Tables 4.16 (a) and (b) we see that over an 11 year period Ireland received a total of ECU 10,650 m. and Portugal some ECU 23,660 m. On a per capita basis Ireland fared about 25% percent better than Portugal but as a proportion of GDP Portugal fared better. The purely financial long-term impact of Structural Funds on Irish GNP has been modelled by the Irish Economic and Social Research Institute (ESRI 1993). Total CSF investment, after termination in 1999, is calculated to raise the level of GNP by about 2% above the level it would otherwise have been. Thus the 'permanent' contribution of the CSFs in the Irsih case, on this reckoning, is significantly below that of the Single Market.

As for Portugal, the country has remained below the EU 15 average income per capita, thus entitling for continued support from the structural funds for an additional 7 year period starting in 2000. According to the available information, the supply side impact of the 2nd CSF (1994-1999) was a long-term increase of 1.6% in GDP in comparison to the scenario where structural funds had been absent (DGDR 2000). A similar rise resulted from the 1st CSF (1989-1993). With regard to the 3rd CSF (2000-2007), different estimates have been presented (based on different models: DPP/MODEM 4A, ESRI/HERMIN, CEC/QUEST II) but they agree on the impact being a possible long-term increase of the GDP around 2 percentage points (DGDR 2000). A possible rise in real exchange and interest rates may however stimulate imports and crowd out private investment, thus reducing the expected impact.

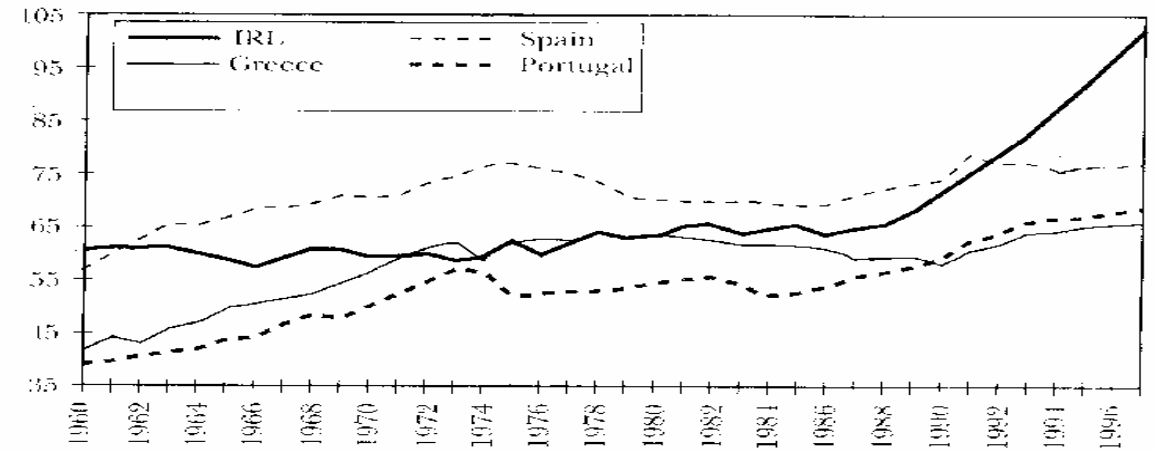
It could be argued that the economic and social impact of CSF investment is critically dependent on how the investment is allocated within the context of the three objectives listed above. We know from our earlier discussion that investment in human capital has significant

externalities leading to a high social rate of return. It is not without significance that 42% of Irish CSF investment over the two periods was committed to improving human capital, compared with 27% in the case of Portugal. Investment in innovation and improved efficiency in the productive sector, if properly focussed, also can have knowledge spillovers while investment in public sector infrastructure though necessary to remove barriers to competitiveness tends to have a lower economic return. Estimates, therefore, of the 'permanent' contribution of the Structural Funds to the level of GNP are conservative, in so far as they are based on largely linear economic models that undervalue the effects of externalities.

4.6. Social Capability and Institutional Learning

Given that all the peripheral EU economies benefited from the external stimuli discussed in the previous section, and given that the achievement of economic and social cohesion is a core EU objective (Article 138), it is imperative that this study should at least speculate as to why the performance of the four cohesion countries diverged so widely over the past decade. If the major external stimuli to catch-up are dated from 1989, when the EU CSFs were introduced, Figure 4.2 illustrates that the four cohesion countries started from a comparable economic base: all four were within a narrow band (55% to 70% of the EU15) with respect to national income per capita. In the following decade all the four countries made progresses but only Ireland succeeded in closing the gap with the EU15 average. Of the remaining, Portugal was the one that showed a more consistent progress.

Figure 4.2. The convergence experience of the cohesion economies: national income per capita in purchasing power parity terms; EU15=100



Source: Barry (1999).

The convergence hypothesis tell us that one element governing countries relative growth potential is the size of their starting productivity differentials but that is obviously not a significant factor in the current case. The convergence theories also admit the possibility of *conditional technological convergence* according to which countries and regions gravitate towards different levels of equilibrium income. The latter situation arises because of the uneven manner in which the frontiers of technology advance and the fact that the *system of innovation* in laggard countries may not conform to what is needed to exploit the new technological opportunities. There are strong forces making for persistence in the effects of past choices and for path-dependence in the evolution of technological and organisational systems. Sections 4.3 and 4.4 of this paper addressed the modalities by which Ireland and Portugal have attempted to overcome this inertia and achieve *technological convergence*.

There is a body of literature, however, that differentiates between the limitations of a purely technological convergence and another set of matters affecting catching up that has been labelled s*ocial capability* (Ohkawa and Rosovsky, 1972). Abramovitz (1994) refers to the later as *persistent* differences in national characteristics that inhibit a laggard country from exploiting the opportunities that being behind would otherwise present. Prominent among his inhibitors are "deeper elements of national culture that limit the responses of people to economic opportunities" as well institutions that reduce the rewards for effort, enterprise or investment. Mjoset (1992) attributed Ireland's failure to exploit earlier opportunities for catch-up to institutional and sociological factors that condemned the country to a *vicious cycle of underdevelopment.*[13]

Social capability is mediated through social and institutional change that is often gradual and systemic and only fully recognised in retrospect. Looking back it is clear that both Ireland and Portugal experienced a period of rapid social and institutional learning starting around the early mid-eighties. While these developments do not fit neatly into categories it is proposed to comment briefly on them using the labels political adjustment, policy learning and social partnership.

4.6.a) Political Adjustment

[13] Eichengreen (1995), in an extensive study of Europe's rapid recovery after WWII, put forward the thesis that "Europe's growth miracle was delivered by a tailor-made set of domestic and international arrangements that solved problems of commitment and co-operation that would otherwise have hindered the resumption of growth".

A major political adjustment occurred in Ireland in the late 1980s coinciding with the deepening of European integration. Given the stagnation and looming insolvency in the country in the early and mid-1980s and the lack of nostalgia for a traditional dependency on a large neighbour, it is not surprising that Ireland embraced the new dispensation with particular enthusiasm. The European Monetary System and the path to EMU provided a new discipline in the public expenditure process and a sheet anchor for Irish macroeconomic policy. The constraints placed on domestic monetary and fiscal policy were welcomed. An important part of the deepening of integration was the European internal market program that played a key role in the re-orientation and recovery of the Irish economy. Ireland correctly judged that the prospects for a small peripheral economy were better in a deeply integrated economic, monetary social and political union than in a loosely linked free trade area.

As for Portugal both internal and external disruptions affected the smooth development of the economy in the decade after the first oil shock. The country joined the EC in the aftermath of several stabilisation plans negotiated that had been negotiated with the IMF with the purpose of controlling inflation, the external deficit and a growing public debt. While the old industrial establishment had been wiped out by the 1970s nationalisations, a new class of entrepreneurs emerged, both in traditional manufacturing and in several branches of services, stimulated by the Escudo's devaluation and a growing private demand in urban centres. The integration of the EU was meant to represent a new institutional paradigm, in the sequence of the democratisation and decolonisation processes.

4.6.b) Policy Learning

The integration experience induced a new culture of policy learning and experimentation. The process of negotiating structural funds and close interaction with EU fonctionnaires and institutions engendered rapid institutional and organisational learning. In Ireland a Minister with specific responsibility for Science, Technology and Innovation was appointed, supported by a dedicated department of government and a range of new institutions. An ambitious initiative was taken to reform and improve the management of the Public Sector. The approach to market and social regulation was significantly re-shaped and a range of independent regulatory agencies established for services and utilities. In brief, several innovative and experimental policy initiatives have been undertaken under the influence of deepening European integration.

In Portugal some policy learning also happened as a result of EU integration. The discipline brought by the structural funds negotiation and by the successive evaluations of their use put a positive pressure on the public administration bureaucracy. However, a policy of persistent belittling of the public sector downgraded the civil service's technical comptency and deepened existing systemic failures.

4.6.c) Social Partnership

In the period since 1987 social partnership has transformed Ireland's internal system of interest mediation. Irish partnership was born out of national crisis and the threat of economic disintegration and differs from earlier attempts at tri-partite wage bargaining in Ireland and elsewhere. It is based on a shared understanding of the problems facing the Irish economy and an appreciation of the interdependencies between all sectors. The initial concerns were to achieve macroeconomic balance and cost control and while these issues are still important the scope of partnership is now considerably wider, including industrial policy and areas such as training, education, technology and social exclusion. This is reflected in the rich variety of working groups, task forces and committees established under the partnership program. In summary, partnership has greatly increased the coherence and innovation of Irish social and economic policy.

With regard to Portugal, the number of new organisations and committees dedicated to bring together and stimulate communication between different groups and social interests also multiplied since the 1980s. The translation of EU directives into national law also contributed to update the legal framework. However, all these initiatives were not as yet enough to abosrb some of the existing endemic weaknesses. The efficiency of public services, and by contagion of many private ones, remains well below their potential. The difficulties in stimulating effective partnerships and collaboration among different actors has also hindered the capacity to exploit adequately the value chain segments closer to the market and the final consumers.

4.7. Concluding remarks

An important aspect stemmming from the discussion above about the recent evolution of the Irish and Portuguese economies is that efficiency improvements associated with intra-industry

learning seem to be central in explaining the convergence dynamics. Investements in capability acquisition and in the development of practical competencies were critical for the productivity rises observed in both countries in the period that was analysed. The evidence analysed showed the importance of investments in human capital and in the dissemination of knowledge, trough the development of education and training, the creation of interface organisations and the development of services responsible for technical support. However, it is possible to argue that structural change also played a role in this process.

When comparing the evolution of both economies, it is clear that structural change was much more pronounced in the Irish than in the Portuguese one. In the former, heavy investments of foreign firms drove the structrure of economy towards high technology activities. In the latter, only after a long period of structural stickness in terms of both manufacturing value-added, employment and international specialisation, a moderate upsurge of the medium-high-tech sectors started to become apparent in the second half of the 1990s. Despite the relevance of intra-industry efficiency improvements, several recent case studies of Portuguese industries make however clear that the externalities derived from the presence of high-tech firms and sectors may not be overlooked (Godinho 2000, Moreno 2001, Diogo 2001, Mamede 2001).

Another possible conclusion regards the critical relevance of the external stimulus in both economies. Openess to world trade and FDI inflows is normally stressed with regard to Ireland, but it was also of great importance for the Portuguese economy, namely in terms of stimulating the recent structural change. Being part of an open trade area also explains the convergence dynamics observed. Exposure to international demand has meant that domestic producers have had access to more sophisticated buyers. The interactions that have occured in the external markets or through contacts with local branches of foreign firms have also been instrumental in disseminating innovation, advanced norms and procedures among the domestic producers. On the other hand, the participation of both economies in the Single European Market potentiated the multiplying effect of exposure to trade and international demand. In addition to that, the European Structural Funds played a relevant role. This was important not only by the direct and indirect impacts measured in terms of GDP growth, but also by the imposition (together with the discipline associated with the creation of EMU) of certain demands on the organisation of the public policy processes.

Despite this progress, systemic failures have remained, namely in the Portuguese situation, in terms of a shortage of competencies in public administration. This has negatively affected the

public services' efficiency and has as result severily damaged the capacity to adequately support initiatives taken jointly with the private sector. Furthermore, the systemic interactions have not reached the density which is characteristic of mature innovation systems.

To understand the superior Irish performance in relation to that observed in the Portuguese case one has to take into account, in addition to the growth in the labour force and the cultural proximity to the US, two particular behavioural aspects. They concern firstly the higher rates of investment in education and training, and secondly the endogenous capacity to exploit the full opportunities afforded by a favourable external environment.

However, it is clear that also in the Irish situation some fragilities remain. Despite the very positive recent increases in R&D outlays and the good innovative performance reflected in the CIS II data, a long distance separes yet Ireland from the most advanced economies in terms of patenting. The capacity to locally invent and fill for new patents is an aspect that reveals the limits of a catching up process significantly based on taking advantage from external factors and conditions.

In balance, one may conclude that in both countries (even though in a much clearer and distinct way in the case of Ireland) clear progresses were achieved in the most recent decades. The observation of those progresses show not only that important economic advances have happened, but also that the emergence of a "social capability" has been an essential element in explaining those advances. However, it seems prudent to end this discussion precisely with a caveat regarding "social capability". Historical experience from Japan and Europe suggests that this particular attribute may be subject to the natural law of growth and decay. Eichengreen suggests that the sudden collapse of the European Golden Age in the early 1970s was brought about by the onset of 'Olsonean sclerosis', resulting from the ambush of the economy by powerful self-interest groups. Eichengreen's thesis is that when the scope for catch-up diminishes, growth rates slow sharply and the spirit of partnership that flourished in the good times soon dissipates, and with it the benign era of wage moderation.

Chapter 5, Evolving Dynamics, Convergence Trends and Public Policies: Concluding Remarks from the CONVERGE Case-Studies

Victor Corado Simões
Manuel Mira Godinho

5.1. Introduction

The objective of this paper is to present a possible balance of the case studies which were carried out under the scope of the CONVERGE project. Based on detailed information presented in the 12 reports that were prepared (one for each case study), and on intermediary comparative 50-page long document (which is available in the CONVERGE project website), we will try now to summarize the main findings in view of the initial questions which animated our fieldwork. To recall, these questions addressed issues such as:

- «What are the main characteristics of the processes of capability building up in the EU less-favoured regions?»;
- «Are these regions converging, in terms of competitive competences of their actors, towards the leading edge in their respective sectors and technologies?»;
- «Are there "innovation systems" emerging in these regions?»; and
- «What has been the role of public policies and the strategies of the remaining actors in the regional dynamics of change?».

Providing accurate answers to these questions based on the very detailed information presented in the 12 reports is not easy or straightforward. The case-studies that were carried out covered a diversity of sectors in 4 different countries (Ireland, Portugal, Spain and Italy). The surveyed industries are in different stages of development, display a diversity of organizational patterns, rely on very distinct sources of innovation and competitiveness, and are embedded in relatively contrasting institutional and structural settings. Besides this huge diversity, which is inherently difficult to sum up, the case-study methodology presents additional drawbacks. These refer mainly to the difficulties in generalizing to broader universes the findings drawn from specific case-studies.

However, the case-study methodology also offers some advantages in relation to other investigation strategies. As it is known, these include the possibilities of in-depth inquire and observation of the variance behind statistical aggregate figures. In view of these advantages, we will try to concentrate on the main drivers of change in the sectors and regions which were the object of our investigation -- this focus on the sources of change would have been more difficult in case we had followed other conventional methodological approaches. In a final section we will turn to possible main conclusions and policy recommendations.

5.2. Drivers of Change

What the analysis in the previous chapters shows is that there are not a precise set of factors which are common in accounting for the dynamics of change of the different cases which were examined. In addition to that, that dynamics and the relative speed of convergence differ according to the specific conditions of each industry and region.

A first aspect which we can observe refers to the fact of the impulse for development and catching up becoming mainly from within or from outside the region. In the 12 reports produced by the CONVERGE team, one observes a very diverse pattern of situations. In the Irish case, it is clear that in the most dynamic of the 3 sectors studied (the software industry), FDI and the access of national firms to the US market have played an important role. However, one can argue that the education policy and the training schemes offered by the Irish government were critical in supporting the development of this sector, and also that the emergence of a new, well prepared, class of entrepreneurs have also been critical in the development of the national firms. In contrast, the other two Irish sectors which were studied (mould making and clothing) have had a slower progress and the evolution of both has been mainly related to endogenous aspects. The difficulties faced by the clothing industry have been to a large extent related to changes in relative factor prices (wages' increases), while traditional family ownership of most firms in both industries has not helped the upgrading of competences and the progress towards a more competitive position.

In the Portuguese cases which were investigated, very different situations were found. The development of the motor car filiére in the country over the last decade has brought a significant degree of structural change, both in terms of employment, production and exports, contradicting the stickiness observed in the manufacturing industry in the previous decades. A wave of FDI in the late 80s and early 90s gave a decisive impulse to a sector which was already present in the country, leading to the establishment of many new firms, some of them as joint ventures, but many also started by national investors. The development of these medium-tech sectors was an opportunity to establish networks of suppliers and stimulating the dissemination of norms and knowledge through the intensification of interactions. However, here again one can state that the public policies, namely those related to the use of the European structural funds, also played a decisive role, in this case stimulating the new investments in this sector. The evolution of the Portuguese footwear industry indicates a more balanced pattern with regard to the factors affecting its change. There was also some FDI in

this sector, but it was more significant in earlier decades. The external factor was here critical by the access granted to Portuguese exporters, first to the EFTA markets and more recently to the EC market. This, together with the low wages paid in the sector, allowed for a very significant expansion of the industry. But the changes which happened over the 1990s were more of a qualitative than of a quantitative nature. And these have a lot to do with endogenous dynamics of a group of domestic leading firms, the industry's business association, the sectoral technological center, the suppliers of equipments and also the support of public policies. In this case, the systemic nature of the interactions that emerged is mainly related to internal factors. Finally, the third Portuguese sector which was studied was the IT business services industry. This is also an interesting case of development of a sector in a new area of the economy. The origin of this industry's firms is diverse in terms of both their sectoral origins and nationality. Some of the largest are related to international consultancies, but there also several important domestic firms whose background can be traced out to university spin-offs or to the informatics departments of the largest utilities companies. As in the Irish software industry, the role of a new class of entrepreneurs, some of them with a previous academic background, was critical. What remains to be seen, in relation to the future of this sector, is whether the Portuguese firms will be able to internationalize, or in view of the maturation of the industry they will be condemned by a deficit both in terms of economies of scale or critical competences to get along with more demanding technological advancements.

In relation to the 3 Spanish cases also a mixed record, in terms of combination of internal and external factors, can be found. The fish-farming industry, which clusters geographically mainly in the Northeast region of Galicia, is a very interesting case of a predominantly endogenous origin. As it is known, Spain is a fishing power, with the value of her yearly caught just behind Japan and Russia. For this reason, competencies in this area developed earlier, with the organization of public laboratories and educational and training schemes in this area. Several strong and well-organised firms act in the fishing sector. This stimulated an interest in fish farming, partially as a component of a wider fishing business controlled by Spanish firms. For this reason a competences base of domestic origin developed. Presently biologists and other graduates make a significant proportion of the employment in the industry, and several firms declare themselves to be actively involved in R&D activities, both by their own or cooperating with other organizations. For this reason, fish farming in Spain can probably be best characterised now as a medium tech business, rather than as a low tech activity which it was intended to stand for when it was selected for analysis. In relation to the second sector which was observed, the car parts industry in the Comunidade Autonoma de

Madrid, the perception of the role of FDI is less positive than in the Portuguese case. This industry has a longer history in Spain, and the domestic companies sector has been traditionally more important. Although this may partially explain why the proportion of first tiers with significant design and technological strengths is larger in the Spanish case, it may also account for the fact that firms are being pushed now harder to restructure through downsizing or merging. The absence of both public measures of support and dedicated infrastructures can also be a part of the story of why this industry is seemingly facing a more difficult situation in Spain. The third sector that was studied in this country was the biotechnology industry. The Spanish biotech firms have mainly two origins, the R&D departments of larger chemical companies and university research. Overall the biotechnology business still stands for less than half of the turnover of the surveyed firms. The main challenge that this industry is facing now is internationalization, since for the moment its output is still mainly sold in the domestic market.

In Southern Italy, which was also researched as part of the EU less-favoured regions, two of the cases show very interesting dynamics of improvement and competitive success, while the third sector, the business services industry, displays a less positive performance. The difficulties of this last sector stem partially from a demand in the Italian region of Calabria that seems not to be as sophisticated as required. In this kind of business services industries interactions with demanding customers are vital to push suppliers to search for adequate innovative solutions. In the Portuguese IT business services sector that was studied, that condition of proximity is being met, since almost all the sector's firms are located in the two cities (Lisbon and Oporto) where the headquarters of the most relevant Portuguese financial companies and distribution chains are concentrated, and where the top government departments are sitting as well. We may conclude, therefore, that a kind of "virtuous" (or "vicious") circle may arise in this type of industry, since it depends for its own development on a sophisticated demand, but its existence may also be critical for the dissemination of certain types of advanced knowledge among the organizations operating in a given territory. The other two industries which were investigated, clothing and wine processing, share with the business services industry the fact that FDI has played so far virtually no role within them and also the fact that public policies can not be accountable for most of their respective performances. The clothing industry developed significantly in recent years, in part as a result of an internal delocalisation of the industry in the country, from the northern and central regions to the south. But an interesting phenomena has also been happening in association with this industry in the southern region of Puglia, with the emergence of the so-called "smart

entrepreneurs". Their core competences lie in the areas of logistics and marketing. While economies of scale have not been traditionally important in clothing manufacturing, they are becoming more relevant as the importance of those two areas tends to increase. These "smart entrepreneurs" have specialized in the coordination of large networks, purchasing some intangible inputs such as design from consultants in the north while contracting out most of their production needs to smaller local companies. With regard to the wine processing industry in Irpinia, this is a case of successful upgrading with similarities to the recent evolution of the Spanish fish-farming industry. Traditional tacit knowledge has been combined with recent (mainly codified) knowledge advancements in both viticulture and wine transformation processes. This modernization has advanced along with the recruiting of graduated technicians. However, despite the positive performances of both clothing and wine processing, both reports suggest that despite a trend for networking and more intense communication, namely through the adoption of advanced ICT equipments, so far no proper innovation system has been emerging in relation to these industries. Family ownership has remained a characteristic in these sectors' firms, and individualistic attitudes continue to resist any significant changes in terms of more open methods of coordination and information sharing. Also in technological terms, these industries have remained basically dependent on their suppliers.

5.3. Possible conclusions and policy recommendations

From the brief summary of the drivers of change in each of the 12 cases studied, one may infer the difficulty in drawing clear-cut conclusions about the dynamics of change overall. On the other hand, one shall also reckon that there are cases in which some sort of convergence is present according to certain criteria, but at the same time one finds cases where convergence is happening with regard to another different set of criteria. That is the situation, for example, of the recent evolution of the Irish clothing industry that contrasts with what has been happening with the same industry in Puglia. While in the former case there has been a convergence towards the EU clothing industry mainstream, with a decrease in overall employment, in the latter one might also argue that convergence has happened, since a general improvement in terms of organization and efficiency has been observed. Even with regard to a given case study, there are certain areas where convergence is felt, but others where convergence is lacking or less intense. That is the situation, for example, of the Portuguese footwear industry, that has felt a significant improvement in technological terms,

but where the competencies in terms of marketing and the capacities to access directly final consumers have been faulty or not improving at a similar rate.

This diversity of situations makes any single or simple conclusion quite difficult. The sources, or drivers, of change have a very diversified nature. In some cases the impulse for development comes predominantly from outside the region or the country. In other cases, its origin is mainly from within the borders of the region. However, it becomes clear from a transversal look of our case studies that aspects associated with both endogenous and exogenous factors have been present and play specific roles in stimulating the development of the EU LFRs.

Another possible conclusion is that even when the process of change is mainly induced by internal factors, there is not a common pattern with regard to the agents that lead that process. In some cases it is clear that the autonomous role of local entrepreneurs is decisive for starting change, while in others one observes a collective entity or a measure of public policy as being the trigger of a virtuous evolution. But here again, one might argue that more commonly there is a combination of different initiatives, at different levels and often at different time scales that contribute to the progress observed.

This leads us to the matter of the emergence of "innovation systems". The general picture that comes out of our analysis is that networking, within the regions but also across their borders, has been present as a general trend in the regions observed. The use of ICTs, namely in traditional industries related to final markets, has been intensifying in recent years. In some cases local networking and interactions are present, for example, in the relation with sophisticated customers, while at the same time the firms in the industry depend on external suppliers of intangible inputs, such as design, training or specific equipments. The firm tends to be integrated in distinct internal and external logics of transactions and exchange of information and knowledge, that depending on the products and technologies employed, on its position with regard to the industry's life-cycle, or on the localization of its customers being local or global.

In some situations it is possible to argue that a cluster dynamics has been established, leading to proto-innovation systems of a strictly local or sectoral nature. However, full-blown innovation systems are not yet recognizable in the regions that were studied. Some critical components seem to be missing in some regions, but more frequently what is happening is

that the degree and the quality of the interactions do not reach yet a critical level for qualification of the existing networking practices as proper “innovation systems”.

Another conclusion from our analysis is that the individual case studies which were carried out reflect relativelly well the overall patterns of convergence of each of the 4 countries or regions, in terms of both GDP per capita or labour productivity. However, it is interesting to stress that for each country or region the degree of convergence is not similar across each of the 3 industries studied. In fact, it became clear from our analysis that some industries perform much better than others in terms of capability accumulation, networking or competitive success for the same country or region. In this respect, the Irish cases are exemplary.

A final word shall be said about the effectiveness of public policies in relation to the relative success of the cases which were the object of analysis. Here again no single pattern seems to apply. In some cases the presence of public policies and measures is evident and the agents interviewed recognize that the policies were instrumental in the support of virtuous developments. In other cases, no such correlation seems to exist. In others yet public policies seem to have been only marginally present. However, a possible conclusion is that in some of the more successful cases of capability building up and networking dynamics, public policies intervened through specific measures, tailored according to the needs of the sector or the region that were the object of support. This means that the use of instruments of a strictly horizontal nature can have a general positive effect over the context of the firms, but something else is needed in order to stimulate more ambitious developments. This also means that no “best-practice” is possible to be found, since the key of success seems to be more related to flexibility in adapting each intervention to the needs of the final beneficiaries or users of the policy outcomes.

In relation to the policies that affect capability building up and networking in the European LFRs, there are different areas of intervention that the analysis of the CONVERGE case studies may lead us to consider. We list below those areas, as 12 possible practical guidelines for the policy-making process.

1. Policies should concentrate their resources more on providing access to sources of information and expertise, rather than primarily subsidising the purchase of equipment.

2. Policies should also devote a significant share of their resources to supporting the development of new firms, rather than concentrating them on supporting existing organisations – this second approach runs the risk of perpetuating the *status-quo* and reinforcing recurrent behaviour patterns. The move from the family-owned, individualistic, firms to new firms with professional, well-trained management seems to be decisive.
3. Creating the conditions for the strengthening of the business services market, namely knowledge-intensive services related to design, R&D, marketing, managerial systems, etc., is a necessary condition for the upgrading of both firms and activities in the regional economies.
4. Solutions should focus on needs and bottlenecks, rather than on developing large-scale infrastructures, which normally encounter difficulties in finding suitable staff and in becoming fully integrated into their contexts. Assistance in strengthening the in-house R&D activities of advanced smaller and medium-sized firms, or in finding them suitable partners for developing new products and solutions, or even in identifying potential customers, might be more relevant, for example, than investing heavily in ineffective infrastructures.
5. Should the extent of 'clusterisation' of the economy be low, public initiatives may be relevant in arranging practical mechanisms for actors a) to meet and interact, b) discuss new projects and solutions, and c) begin to share and disseminate knowledge. This might also help release the sort of energies that will trigger more profound processes of institutional change.
6. Policies should have an “outward-looking” orientation, in the sense that they should encourage contacts with external actors and create the conditions for attracting high quality investments to the region. This would maximise the opportunities for learning and help to shift the focus from supply-side factors to demand-driven strategies for technological improvement.
7. Education and training are long-term activities that need to be pursued constantly in order to develop the qualifications and skills needed for working with both existing and emerging technologies.
8. Policies should be balanced, in the sense of a) creating general and advanced competencies, b) assisting the development of existing technologies and the acquisition of new technologies, and c) supporting applied and fundamental knowledge.

9. Structural funds should be used to improve the mechanisms of policy design, implementation and evaluation, while at the same time helping to develop the competencies of the national and regional bureaucracies responsible for implementing these policies.
10. The capacity and skills required for integrating in the implementation the relevant public policies also need to be improved, to a level that is far above the one currently found in most LFRs – otherwise the effectiveness of these policies will systematically be compromised by partial, non-systemic, approaches.
11. Efficient regulation (competition, quality norms, labour market…) through a well-trained and forward-looking bureaucracy shall be promoted and actively applied.
12. The fiscal policy shall be transparent and effective.

Chapter 6, Policy implications – Roles of regional, national and EU policies in the development and catching up of LFRs: main conclusions and possible recommendations

Emilio Muñoz*

6.1. Introduction

One of the first goals of the CONVERGE project was to get a proxy explanation of the process of convergence in Europe. The present part of the report aims to analyse the influence of policies related to science, technology and innovation in the economic development and convergence of the EU Less Favoured Regions (LFRs).

Different instruments and policies have been proposed to correct the structural deficits that account for the existing economic and technological gaps. On one side, some experts have proposed measures such as the introduction of greater flexibility and liberalisation in the labour and service markets. On the other side, others have advocated the need of more innovation, R&D activities and civil infrastructures together with the necessary requirement of structural reforms in institutional, R&D and education policies.

By the very nature of the CONVERGE project, the work of the partners has focused on the analysis of the relevance of the innovation policies in their countries and regions for economic development, in agreement with the second line of initiatives that was described above as an instrument for the catching-up of the less developed Europe.

Therefore, the present chapter aims to analyse the outcomes of the innovation policies and their effects on several European catching-up countries and regions, namely Ireland, Portugal, Southern Italy and Spain. In this analysis we will consider Norway and the Alsace and Baden regions as benchmarks for a comparative exercise. The theoretical frame supporting the analysis refers to the current concepts of "knowledge-based economy" and "systems of innovation", which are adequate to analyse development and convergence processes that are all but uniform or linear through the different regions and countries

The next section will be dedicated to the presentation of some concepts and ideas necessary to establish an analytic framework. In section 6.3 a common template of analysis will be presented and used to consider the innovation policies which have been promoted in the selected regions. Then in section 6.4, based on the previous sections, a qualitative synthesis referring to the effects of those policies on convergence will be presented. Finally section 6.5 will be dedicated to some concluding remarks.

6.2. Concepts, indicators and criteria for the assessment of innovation policies

6.2.a) Knowledge economy and systems of innovation

As stated by an increasing number of authors (see for instance Remoe, 2000), the term "knowledge economy" is increasingly used to focus on the causes, driving forces and consequences of the current transformation of the world economy. The OECD has actively promoted several comparative studies on the different performance of countries and for this aim is contributing to develop indicators for the broader notion of knowledge that is embodied in the perspective of "knowledge economy". This concept represents an attempt of accounting for the relevance that science, higher education, investment in intangibles, and learning processes within and between firms and institutions have in the more advanced economies.

The concept of "knowledge economy" is so tightly linked to the concept of National Systems of Innovation that has been gaining also wide support in the last decade as an explanatory variable of the size, role and performance of innovation within the economy of each country and region. This System of Innovation concept considers the interplay between a series of actors whose actions and interactions are influenced by a set of factors: the financial system, the management of firms, the legal frame, the regulations, the skills of human resources, their mobility, the social relations and the negotiation practices[14]. In summary it can be said that the National Systems of Innovation integrates the instruments required to perform in the knowledge-based economy.

The concept of National Systems of Innovation relies on a view based on the complexity of the socio-economic activities in accordance with the processes of production, diffusion and use of knowledge. These processes are highly dependent on the national economic structure, its pattern of economic specialisation, and other cultural and political factors. The schemes used to depict the concept of the National Systems of Innovation give account of this complexity and, in spite of some existing drawbacks, show the importance of critical factors such as the organisation of the university research system, the characteristics of the public research centres (research institutions and Government laboratories) and the nature and type of firms existing in each economic sector.

[14] In spite of the attempts to include within the concept of National System of Innovation the social relations and the negotiation practices as influenced by and affecting the demand and the market forces, there are, in the opinion of the main author (E.M.) of this review methodological and practical limitations for their measurement and incorporation into the concept.

It is worth noting that the literature about innovation systems has also considered the concept of national systems of innovation also include the concept of Regional Innovation Systems (RIS). The RIS concept stems from related concepts such as "regional innovation policies", "regional innovation potential", "innovation networks", together with "technopoles" and "high technology complexes" that have been present from the early eighties and have been treated and developed along the last two decades (Cooke, 1998).

6.2.b) Measurement and indicators

There are still great challenges in assessing the dimensions that are expressed by the "knowledge-based economy" and "systems of innovation" concepts. We will turn now to four aspects which must be considered when trying to account for the measurement and assessment of those dimensions.

b.1) Building up 'Capacity for Innovation'. The ability to measure the "knowledge economy" is still insufficiently developed as it directs attention to a variety of intangibles. Currently, the "knowledge economy" is measured by a number of old and new indicators (Remoe, 2000). On the other hand, the main outcome of the Innovation Systems is to create a (National or Regional) "capacity for innovation" which is able to influence the performance of the countries (or regions) in terms of growth, employment and competitiveness. This outcome of an effective "capacity for innovation" must be reached through the combination and interaction of the basic elements or actors that build up the Innovation System. These basic elements -- public research organisms, science system, firms, interface and support institutions -- can be assimilated to the classical elements of the R&D systems -- whose inputs and outputs have been analysed with the conventional OECD indicators. To those conventional indicators new ones have been added to measure innovation performance, essentially thanks to the Community Innovation Survey (see on this the Evangelista et al. Paper in this report).

b.2) Co-operation and interactions. These indicators have to take into account the shift in paradigm, from a linear model of innovation towards an interactive one as well as the increasing importance of SMEs in relation to their regional localisation. A key feature of the new paradigm is the interactive learning, which must be incorporated in the behavioural strategies of firms (see on this the Héraud and Isaksen paper in this report - Chapter 2 above).

b.3) the increasing involvement of SMEs. As it has been observed, SMEs are becoming an important player within the innovation systems. They are responsible for an increasing part of the employment growth from the last decades as well as of the economic wealth of countries

and regions. Some confluent reasons may contribute to this situation. SMEs are expanding in some specific sectors, namely those associated to the new services sectors. The growth of small firms reflects the rationalisation strategies and restructuring of large firms, which started as an effect of the recessions from the 1970s onwards rather than the action of the small firms sector by itself. The growth of the SMEs is also a reflection of the downsizing strategies of the large firms which led to outsourcing from several types of suppliers and subcontractors. In accordance to the evolution of the industrial structure of the economy towards a more networked form, it has been stressed the increased need for co-operation between firms and knowledge producing organisations and the inadequacy of viewing SMEs "as a distinct group of firms and as a separate target group for innovation policy" (Isaksen and Remoe 2001).

b.4) Territorial dimension ("regionalisation"). The increasing involvement and relevance of SMEs in the performance of the innovation systems and their becoming an important target of innovation policy imply a greater relevance of the regional level for the analysis of the innovation outcomes. In fact, the need for intermediary organisations that may help in the transfer of knowledge and technology from universities and public research institutes to SMEs can be better satisfied through "local" organisations and "regional" policies. The idea that innovation activity is a territorial phenomenon has been present in the literature on innovation and has gained relevance with the notion of Regional Innovation Systems. As Isaksen and Remoe have stated (2001) the emergence of regional innovation policies and the development of systems of innovation has been laid out from the experiences and policy instruments of "success stories" such as those from Italian industrial districts or Baden-Wurttemberg. In these cases, innovation in SMEs is seen as taking place around geographic clusters of small firms (OECD 1998, referred to in Isaksen and Remoe, 2001).

In order to account for some of the most relevant dimensions and to compare the situation in innovation in Europe, the European Council held in Lisbon in March 2000 asked for the elaboration of a set of indicators. Communication (2000) C gave in its an annex a first list of indicators, grouped into four categories as follows: human resources, production of new knowledge, transfer and application of knowledge, and financing of innovation, results and markets.

Table 6.1 offers a summary of these indicators and allows a first comparative analysis of the situation and performances of the countries involved in the CONVERGE project. It shows that the innovative disparities among them have no relationship with country size. Ireland, which is a rather small country in the European context, emerges as a relative highly innovative economy according to these indicators, whereas bigger economies like Italy and Spain qualify poorly in this respect.

Table 6.1. The comparative perspective: The Converge Project countries vs. the EU averages in terms of innovation-related indicators

N.	*Description of indicator*	*Source / Year*	*EU*	*Norway*	*France*	*Italy*	*Ireland*	*Portugal*	*Spai*
1	**Human resources**								
1.1	Proportion of graduate students in science and technology in the higher education sector	Eurostat (Statistics on Education) 1997	37		31	32	39	28	3
1.2	Percentage of active population holding a higher education degree	OECD 1996	13	19	10	8	11	7	1
1.3	Share of employment in medium and high technology industries	Eurostat (R&D Statistics) 1998	7.7		7.0	7.5	7.4	3.5	5.
1.4	Share of employment in high technology services	Same source 1998	3.0		3.6	2.6	2.4	1.4	1.
2	**Knowledge production**								
2.1	Government (public) expenses in R&D as % of GDP (GERD)	Eurostat, OECD 1998	0.70	0.8	0.90	0.53	0.32	0.44	0.3
2.2	Business expenditure in R&D as % of GDP (BERD)	Eurostat, OECD 1998	1.20		1.38	0.55	1.03	0.14	0.4
2.3	Number of patents in high technology required per million inhabitants	Eurostat, OECD 1998	14.9		16.3	4.2	0.9	0.0	1.
3	**Transfer and application of knowledge**								
3.1	Share of industrial SMEs involved in innovation	Eurostat (Innovation survey) 1996	44.0		36.0	44.4	36.0	21.8	
3.2	Share of industrial SMEs with cooperative projects	Eurostat (Innovation survey) 1996	11.2	15.6	12.0	4.7	23.2	4.5	4.
3.3	Total expenses in innovation of the industrial sector as % of total turnover	Eurostat (Innovation survey) 1996	3.7	4.3	3.9	2.6	3.3	1.7	1.
4	**Financing of innovation, results and markets**								

4.1	Risk capital invested in technology-intensive sector (%GDP)	European Association of Risk Capital 1999	0.06		0.07	0.02	0.08	0.01	0.0
4.2	Capital investment in new markets (% GDP)	International Federation of Stock Markets 1999	3.4		4.7	1.1	0.4	0.2	
4.3	Share of sales of innovations in the manufacturing sector market	Eurostat (Innovation survey) 1996	6.5	7.8	7.9	13.5	8.4	7.2	9.
4.4	Proportion of Internet users per 100 inhabitants - (%)	Eurostat (International Union of TICs) 1999	14.9	37.8	9.7	8.7	11.8	7.0	7.
4.5	Proportion of TIC Markets (% GDP)	European Observatory on Information Technology 1997	5.0		5.0	4.7	5.7	4.9	3.
4.6	Changes in the share of the total production of OECD in high technology sectors	OECD 1996			-15	-12	-	-	

Source: "La innovación en una economía del conocimiento", Innovación y transferencia de tecnología (Número especial), Comisión Europea, Programa Innovación/PYMES, Noviembre 2000, with the exception of the Norway data, in which case the source is For Norway, Remoe (2000),.

Notes:
1. Medium and high technology sectors are: chemistry (NAAB 24), office equipment (NAAB 30), electronic equipment (NAAB 31), telecommunications equipment (NAAB 32), optical and precision instruments (NAAB 33), automobile (NAAB 31), aerospace and other transport (NAAB 35);
2. The technology-intensive sectors include: telecommunications, internet, informatics, software, services, semi-conductors, other electronic components, medical supplies, biotechnology.

6.2.c) Approaches to the identification of best practices in innovation policy

European level

The European Commission has been strongly involved in the promotion of the merits of innovation in the European Union. The Green Paper on Innovation published in 1995 rang the bell about the fragility of innovation in Europe and represented a first step in the intention of promoting a European innovation policy while suggesting a wide field of action for innovation in the world of firms More recently, in years 2000 and 2001, a series of documents published by the Unit on Communication and Public Awareness of the EU Commission Innovation DG, , under the heading "Innovation and Transfer of Technology", have been echoing the relevant role of innovation in the current processes of globalisation and advancement towards a "knowledge-based economy".

The EU Commission recognised that a policy for business firms (or an "industrial policy") should include today a strong component aiming at stimulating the innovation strategies and capabilities of firms. Such a policy is expected to include measures or steps oriented to foster the creation and development of highly innovative firms, the transfer of new ideas, knowledge and technology, , and promote an environment that may facilitate the thriving of firms. In addition to that, the European Commission has recommended the application of learning processes of "best practices" as a way to improve the level of innovation capacities and to correct for the existing gaps.
However, in spite of this endeavour, the global level of innovation performance within the European Union has remained low and rather inadequate to compete with the main competitors of European firms abroad.

Analysis of national and regional cases in Europe

The recognition of the quality and relevance of innovation for the economic wealth of developed countries has led to searching for permanent "best practice" policy valid across different countries and regions. This was also an underlying aim of the CONVERGE project, with the implicit argument that there might be a "recipe" of policy instruments that would help the LFRs to succeed in catching up.

However the analysis of the cases that we have explored at European, country and regional level reveals that the variety of geographical contexts, the organisation of the R&D base, the firms' abilities, attitudes, acting as forces and barriers towards innovation are preventing the finding of such "best practice". This confirms the findings of other recent research carried out with similar aims.

The SMEPOL project was carried out under the "Targeted Socio-Economic Research" programme as a collaborative project of 7 academic groups from Austria, Denmark, Italy, The Netherlands, Norway, Spain and UK. That project attempted to answer several key questions relating the relevance of the policy instruments to theory, real needs from companies, correspondence between aims and instruments, efficiency of the instruments, achievements, impacts and level of co-ordination of the innovation policy instruments with the rest of the policy system (Nauwelaers and Wintjes, SMEPOL report). The conclusion of the SMEPOL about the difficulties in identifying such "best practices" in a context of complexity shows the distance that exists between wishes and realities. In fact, the key message is that there is no "one-size-fits-all" policy portfolio. The regional differences in innovation capabilities are driving to the necessary blend of policy instruments and the development of "policy intelligence" as a means to obtain the best results from a confrontation between theory, ideas and reality.

6.3. Analysis of policies. The comparative frame of the CONVERGE project

The purpose of this section is to analyse the innovation policies that have been developed in the "less-favoured" European regions and countries which were compared under the CONVERGE project frame (Ireland, Southern Italy, Portugal and Spain). As referred to before, a benchmark group of more advanced European regions and countries (Alsace and Baden plus Norway) was also selected for the comparative purpose. This analysis has attempted to go beyond the comparison in terms of the macroeconomic nature of the concept of "normal" convergence by exploring the effects of a series of related policies on innovation capacity and performance.

A common template was used by each CONVERGE project partner in the identification of the policies' characteristics and effects in their regions/countries. The aspects which were dealt with are as follows:

a) Which are (were) the arguments underlying the establishment of the policies under consideration (historical, cultural, external)? What is the context in which those policies have operated?

b) Which are (were) the goals (at least at macro and meso levels) of these policies?

c) Who have been the main stakeholders in the process of designing and implementing of these policies?

d) What have been the main outcomes?

The analysis that will be presented in this section is two-fold. On the one hand, there is a quantitative analysis of the positions of the countries referring mainly to the indicators presented in Table 6.1. On the other hand, a description by using a common frame of the actual policies carried out by the regions/countries studied provides additional grounds to qualify the quantitative analysis and the relative position of the regions/countries.

For comparative reasons, the dynamics of the policies was analysed according to a common frame exploring: the arguments underlying the establishment of policies; their goals; who and what have been the main stakeholders; and what have been the outcomes of those policies and instruments. This provides grounds for the assessment of the policies' impacts that will be attempted in section 6.4.

6.3.1. The Irish case

a) Arguments

Ireland has been progressively recognising since the 1980s that the World Economy is technology driven. Policies and socio-economic efforts have been aimed to fill the gaps in R&D, education and innovation of the country with respect to the more successful smaller industrial nations in Europe to compete in the global economy. When it comes to R&D spending, the need to increase it was deemed essential. The accumulation of human capital to increase the coverage and "productive-orientation" of the internationally respected Irish education system has been considered a strategic goal.

Throughout the 1980s and early 1990s, Irish Industrial Policy has, through the operational goal of export-led manufacturing output growth, sought to achieve its core underlying objective of jobs creation to reduce Ireland´s high unemployment figures (a result of late industrialisation and continuing flow of manpower out of agriculture) and stem the flood of emigration. With the marked economic turnaround from 1993 and the advent of virtual full employment the focus of Enterprise Policy has shifted from jobs creation to a drive for enhanced productivity and international competitiveness and a structural shift to more value-added industries and sectors to fend off the threat from newly industrialising competitors. The new remit for enterprise development agencies is to share the risk with competitors who seek to develop their capabilities in key areas such as business strategy, human resources (management and staff skill sets), R&D and innovation, and e-business.

b) Goals

- Increase investment in R&D in line with national development policy.
- Supporting the key technologies.
- Promote more collaboration between the actors of the National System of Innovation.
- Provide a highly productive and profitable enterprise sector to act as the main engine of economic growth.
- Boost the supply of highly skilled, creative and flexible workforce.
- Encourage moves from unemployment to employment and participation in the labour force. Increase the level, relevance and quality of private sector training.
- Make finance more readily available to enterprise, especially to SMEs and start-ups.
- Review tax and benefit systems to actively supporting employability and job creation.

c) Stakeholders

Ministerial Departments (Education & Science, Enterprise Trade and Employment, Social Welfare.
Development Agencies (FORFAS, Enterprise Ireland, IDA)

d) Outcomes

- Public funding for R&D as a percentage of total government budget increased steadily from 1990 to 1999. Business Expenditure on R&D (BERD) is on par with EU average and with economies such as Norway, Denmark, Netherlands.
- GNP per capita converged from 79% of EU average in 1994 to over 90% by 1999.
- The unemployment rate fell by some 9 percentage points in the five years to April 1999. Unemployment was down to 5% by 1999.
- The value of manufacturing exports climbed significantly from 16.5 billion euro in 1991 to 47 billion euro in 1981. Foreign direct investment (FDI) performance was again to fore.
- Employment in internationally traded services grew from 10,000 in 1991 to 40,000 in 1998, and the FDI component increased from 58% to 70%.
- The gross value added (GVA) of the manufacturing sector grew by 95% in real terms from 1991 to 1998, powered by a vigorous output performance of the FDI cohort which was concentrated in two sectors, Chemicals and Electrical Equipment.

- Irish-owned industry reversed the decline in employment that prevailed since the mid 1960s. Productivity (net output per person) in *indigenous* industry grew 4.2% per year in real terms in the late 1990s, helping to boost average indigenous profitability to 8.8% of *sales* by 1998. This is less than a quarter of the profit rate achieved by FDI manufacturing companies and reflects the persistent heavy bias of Irish-owned industry in traditional low-productivity sectors. Moreover, comparing productivity in individual Irish-owned sectors with the performance of indigenous industry in other EU countries reveals substantial deficits.
- Indicators related to knowledge intensive activities reveal a positive trend and place Ireland well down in the league tables in the company of the other Cohesion LFR regions, though growing fast.
- The venture capital supply has been growing in Ireland along the 1990s but is concentrated too narrowly in Communications, Electronics and Biotechnology sectors.
- The total tax burden was significantly reduced in the recent period.
- Ireland characterises by a low corporate tax strategy. One downside of this strategy has been that it tended to discourage FDI from performing tax-allowable activities such as R&D in Ireland. The government is reconsidering this "disincentive".

e) General assessment

Ireland is performing well in educating skilled personnel and in their employment as well as in the behaviour and commercial success of firms. The low rate performance corresponds to the efficiency in the production of knowledge and its transfer to technology and innovation firms' activities.

6.3.2. The case of Portugal

a) Context and arguments

Portugal started to emerge from a long lethargic period of isolation and backwardness in the 1960s. It is possible to locate the foundations of a modern S&T policy in that period, particularly after the setting up of the National Board of S&T (JNICT) in 1967.

Portugal has meanwhile registered important advances, from its initial situation as a declining colonial power to the more recent status as an European catching up country. In fact, the Portuguese economy has been characterised as in a trajectory of convergence since joining the EC: while in 1986 GDP per capita (in ppp) was only 55% of the EC average, the most recent data indicate that the value of this indicator is now about 75% of the average. However, despite these advancements, the structure of activities and the international specialisation have remained concentrated in low-tech sectors. In addition to that, when measuring the relative labour productivity of the manufacturing industries without the ppp "filter", one finds that it remained stuck below 40% of the EU average during the 1990s (Godinho and Mamede, 2001).

b) Goals

In that context S&T have mainly addressed the structural backwardness problems, with an implicit overall objective of contributing to the country's development, namely through the preparation of human resources holding advanced qualifications.

Despite that overall implicit goal, it is possible to identify as a prominent characteristic of those policies that they have not remained stable, in both terms of their strategic orientation and in terms of their specific goals. This lead us to consider four main policy periods since the 1960s. In what follows we will identify those periods and refer briefly to the specific goals that were pursued in each of them.

Stage 1 (late 1960s/early 1970s). The central goal had to do with the creation of a "national S&T system". For that purpose investments were directed to support the development of the national R&D laboratories and research facilities in the universities. There was an aim of acquiring minimal critical masses in some areas, through the training of young scientists abroad and the establishment of teams in specific research areas. At the same time JNICT acted as a funding agency and started to promote the co-ordination machinery needed to provide coherence to the whole S&T system.

Stage 2 (late 1970s/early 1980s). In this second period a clear preoccupation arose of gearing the existing institutions towards addressing social and economic needs. Strategic ("practical") goals were defined and there was an attempt of developing and strengthening the R&D capabilities around the main economic specialization poles and also in the emerging high-tech areas (IT, biotechnology and new materials).

Stage 3 (late 1980s/early 1990s). In combination with the industrial policy, efforts were developed in this period in order to create a technological infrastructure and mechanisms for university-industry collaboration. There was a perception in this period that the country could leapfrog into the "new paradigm" taking advantage of the existing windows of opportunity. At the same time new policy actions to support private business R&D were implemented.

Stage 4 (late 1990s). The major goal in the most recent period has been the internationalisation of Portuguese research, through the attainment of standards of excellence. The professionallization of academic R&D has also been sought through the introduction of systematic evaluation procedures.

Despite these pronounced variations of policies' orientation, two common goals have been present throughout these 4 stages. Firstly, a significant part of the financial resources has always been devoted to advanced training of scientists and engineers. Secondly, a share of those resources has also been consistently oriented towards the support of academic research activities.

c) Stakeholders

We must clarify that the "S&T policy" we have been describing has basically been – with the partial exclusion of stages 2 and 3 above – a "science policy". The country's "technology policy" on the other hand has been associated mainly with the industrial policy, even though this has never been assumed in an explicit way. The assumption of the need of a technology policy, addressing the needs of firms and the industrial sectors, has been particularly present since the PEDIP interventions were implemented as part of the 1st and 2nd Community Support Framework programmes (1988-1999). The rationale underlying the PEDIP interventions, in what regards technology policy aims, was relatively convergent the intentions of the S&T policy in stages 2 and 3, even though harmonisation and full coherence between both the S&T policy and industrial policy was never fully attained. This situation is in part a responsibility of clashing cultures between the bureaucracies of the S&T department (more recently with a status of Ministry) and the Industry Ministry (see on this Caraça, 1999).

Other problems have also hindered the possibility of a persistent S&T policy, with strategic goals and continuity throughout the most recent decades. The bureaucracy within the S&T department has not been stable, what has hindered the possibility of continuity in procedures and policy approaches (Henriques, 1999). More importantly, the relatively low technological dynamism of the prevailing economic activities has meant that the private sector has not performed an active role in the selection of the national S&T priorities. This situation also accounts for the fact that specific interest groups have been able to capture the S&T policy in different moments, driving it according to their partial needs and interests (Godinho, 1993). As a result, we arrived into the late 1990s with S&T and industrial policies relatively at the odds of each other, without consistent common objectives and without combined interventions. This has led to a situation that has been characterised as of "systemic failure", in the sense that the major stakeholders have not been able to collaborate in the setting up of a proper innovation system geared towards adequate goals.

d) Outcomes

Despite the highlighted problems, some progress has been reached in terms of acquisition and accumulation of technological capability. FDI outlays into the country have given a positive contribution with respect to that. Another exogenous factor – the disciplines imposed by the EU within the CSFs – was relevant in stimulating the development of systematic mechanisms to evaluate national policies (Godinho et al. 2000).

Other major outcomes include:
- development of a professionally staffed university, with a continuously growing number of students (22 thousand in 1960, 367 thousand in 2000);
- creation and strengthening of a few areas of academic excellence, with several teams integrated in leading international networks;
- setting up of a technological infrastructure (the components of which show an uneven degree of effectiveness);
- development of some poles of advanced technological endogenous capabilities (even though heterogeneity remains in this respect the dominant characteristic);
- emergence in a few areas of systemic innovation dynamics (yet a full "national innovation system" remains to be developed).

6.3.3. The Case of Spain

a) Context and arguments

Spain has been holding a laggard position in science and technology issues and related indicators when compared to most wealthy countries, essentially after correcting for the demographic factor. There have been difficulties for developing an internationally competitive scientific community -- Spain did not enjoy a "golden century for science" -- and there has been a lack of tradition in recognising the political and economic relevance of science and technology as factors necessary for growth and development.

In critical moments, namely during the technocratic reform in the 50s, the democratic transition with the upsurge of the Socialist Party to governance in the 80s, and after the integration of Spain into the European Community in 1986, the discourse of "modernisation" has paid attention to science and technology as instruments for a process of modernisation.

b) Goals

The policies and related instruments put into force for reforming the situation on science, technology and innovation aimed at:
- developing the size of the system of research and innovation in both the public and private sectors;
- introducing science and technology issues in the political agenda;
- correcting for structural deficits at the institutional, organisational and geographic levels.

Under the great political goal of improving the coordination between resources and political actors, the specific aims were the following:
- to increase the public resources devoted to R&D activities, with the hope to drive also an increase in the research and innovation efforts of the private sector;
- to promote the competitiveness of the scientific community in the world context;
- to introduce the culture of research and innovation into business organisations and management;
- to foster the links between the science realm and the industries, in order to allow for a better use of the knowledge produced by universities and public research organisms;
- to favour dialogue and collaboration between the political actors of the central government and the regions.

c) Stakeholders

One of the most important tools has been the Law for Scientific and Technological Development, known popularly as the “Law for Science”, enacted in 1986. The goals of this law were implemented by the successive editions of the National Plan for Research and Development which was designed as its functional and operative instrument. Its first edition was launched in 1988 and lasted until 1991. Two other editions, corresponding to the 1992-1995 and 1996-1999 periods, have followed. Regional R&D Plans for different regions have also been launched. The role of relevant representatives from academia and the scientific community has been decisive for these political initiatives.

After the general elections of 1996, the conservative Partido Popular took the lead. The new government introduced some changes in the organisation of the science and technology management system. While keeping the spirit of the "Law for Science" and attempting to correct for one of the main limitations at institutional level of the system such as it is the lack of coordination between the institutions responsible for the programmes, the science and technology policy agenda was placed under the direct responsability of the Prime Minister. An Office for Science and Technology (OCYT from its name in Spanish, Oficina de Ciencia y Tecnología) was established and set under the authority of the Ministry of Presidency, chaired by a Vice-Prime Minister in charge of the coordination of the Ministerial Cabinet. The main tasks of OCYT have been the management of the Third National Plan and the design and elaboration of a new National Plan, which has shifted and enriched its scope towards the innovation process as it has been defined as a plan for research, development, and innovation (R+D+I).

Before the implementation of the new National Plan, the first one incorporating innovation as a clear target, the elections of year 2000 (won again by Partido Popular) led to a new reorganisation, with the creation of the Ministry for Science and Technology. In this last period, academia and scientific community seem to have been loosing influence. In any case, business and political actors have played a limited role.

d) Outcomes and general assessment

All the analyses, data and indicators, support the contention that the efforts carried out in Spain over the second half of the twentieth century have led to the building of a System of Research and Development with satisfactory scientific outputs. However its outcomes in relation to the building of innovation capacity in the productive sector have been rather limited. The public R&D system and the business innovation system have followed separate paths.

One might conclude that Spain do possess a National R&D System but the country is still in need of a specifically built National System of Innovation, shaped according to the main characteristics of the country. However, there are patches of systems of innovation in some of the Spanish regions (Cataluña, País Vasco, perhaps Madrid), precisely the most industrialised ones.

Economic criteria do not allow a grouping of the regions of Spain in terms of innovation capacities and assets. Non-Objective 1 regions are characterised very differently according to their research and technological efforts. Three of them (Madrid, Cataluña and País Vasco) are the leaders in these efforts, whereas Baleares and La Rioja which are the leaders in economic wealth are the laggards in these efforts.

The data on employment profiles of the regions point out in the same directions: high heterogeneity; lack of correspondence between the wealth of regions and the prevailing employment rates in traditional innovative sectors; similar shares of employment rates between sectors in regions with marked differences in their wealth status.

Objective 1 regions share a predominant role of the public sector in their R&D efforts, although there are also marked differences between them. In general, it can be said that Spanish less-developed regions do possess incomplete, “primitive” systems of innovation.

There is a poor correlation between the degree of economic convergence with Europe and the level of research and technological efforts (potential innovation capacity) as illustrated by the cases of Baleares and La Rioja or by the positive economic performance during the last years of some Objective 1 regions (Castilla-León, Castilla-La Mancha, Extremadura…) grounding their positive trajectory essentially in the agricultural (agro-food) sector.

The percentage of innovative firms in Spain is lower than those of most European member countries. Moreover, the Spanish innovative firms are less active in R&D activities than their European counter parts. The trend seems to be changing to a slight increase in the number of innovative firms and essentially to a strong increase in the R&D vocation of those firms.

The most innovative sectors in Spain are those behaving as such since long (agriculture and manufacturing industries are showing better performance than the services, energy and building sectors)

Among the innovative sectors, the industries belonging to areas of innovative tradition standing at least for twenty years -- pharmaceuticals, electronic and optical material and equipment and transport material -- are the most prone to perform R&D activities and programmes.

Spain is moving towards convergence with the EU in both economic, innovation and technology indicators. However, the paths of convergence for these two parameters have been quite different and do not match across the geographical space.

6.3.4. The case of Italy

The Italian partner addressed the case of the LFRs in the southern part of the country.

a) Context and arguments

Innovation policies specifically designed to foster R&D and innovation in LFRs have traditionally been rather limited in the case of Italy and implicitly contained in the main industrial-oriented policy scheme. Innovation policies have been un fact indirectly contained in the "intervento straordinario", the latter being by far the major policy action carried out during the period 50-80s to tackle the historical backwardness of the South of Italy. This broad policy scheme was based on large infra-structural investments, financial support to private investments and settling of public owned firms in capital intensive sectors. Such form of public intervention has largely failed.

This was a result of the isolation of the industrial settlements (the so called "cathedrals in the desert"), the progressive sclerosis of the productive system, the low responsiveness of the latter to the market dynamics and last but not least the presence of severe management failures. During the 80's the logic behind the "intervento straordinario" has progressively changed starting to take on board specific measures to sustaining R&D and innovation (the 64/86 law). This was a natural result of the growing awareness among policy makers of the importance of technology and innovation for sustaining economic growth and catching up processes. Another specific tool introduced in the 80's has been the inclusion of quotas for LFRs in the main financial schemes supporting innovation projects (the 46 laws).

Probably the most effective set of industrial and technology policies introduced were those sustaining investment in fixed capital which have been a major instrument to modernize the productive structure of Italian industry in general and southern firms in particular. However the extremely favourable conditions offered to firms to purchase new vintages of capital have led firms to over-expand their production capacity instead of strengthening their internal innovative capabilities. In the last decade industrial and technology policies for the LFRs have been heavily shaped by European policies directed to Objective 1 regions and in particular by the European structural funds.

The dominant role that the central government has historically played in the design and implementation of industrial and innovation policies mentioned above has prevented local administrations from developing the necessary policy-designing and -making capabilities. This is probably the most negative and long lasting heritage of the "intervento straordinario", especially in the light of the on going devolution process of policy functions and responsibilities from central government to regions. Also the recent experience of EU structural funds in Italy shows that their actual utilization and effectiveness has crucially depended on the competencies of local policy makers and administrators. In fact, EU structural funds ion order to be effective require the presence of a well structured and coherent policy strategy by local regional authorities. Only in this case it is possible to channel the structural funds towards those policy targets leading to local value added in terms of economic growth.

b) Goals

In the light of the considerations made above it is possible to state that till very recently no explicit goals were targeted by national or regional policies in the areas of R&D and innovation. Nevertheless in the middle of 70's a few specific initiatives have been launched such as schemes to favour University-industry links and the emergence of technological centres. More recently the 64/86 law has introduced special schemes to support University research centres, local R&D and innovation networks as well as the setting up of scientific infrastructures in LFRs. This actions were stopped at the beginning of 90's when a general plan to set up 13 science parks in different Italian LFRs was implemented

c) Stakeholders

On a formal/official ground the main stakeholders in the process of design and implementation of industrial and innovation policies have been the central government, the relevant ministers and regional authorities. However, a much more substantial role has been played by the leading economic and political actors operating in the various regions: large firms, local lobbies, influential politicians. Such actors have acted outside a structured and coherent policy framework. It is also interesting to point out the increasing importance over the last few years of "collective actors". An effective legislative measure recently introduced in Italy is one setting up the "patti territoriali" (territorial pacts) which through an articulated set of incentives aim at mobilising local private and public resources and institutions in the design and implementation of programmes of industrial development at a local level. This measure has been adopted at the European level with the introduction of the "territorial pacts on employment".

d) Outcomes

The general outcome of such policies, whenever successful, have been a reduction of the economic and technological gap between LFRs regions and the much more developed regions in the north of the country. The results have been rather uneven across LFRs with a few areas witnessing rapid industrial growth and others continuing lagging behind. As far as innovation is concerned this catching up process has largely consisted in an alignment to technological and productive best practices. This was again a result of the predominant role of policy schemes supporting firms' investment in fixed capital.

6.3.5. The cases of ALSACE and BADEN

The contribute of the French partner to the CONVERGE Project consisted of, in what regards of innovation policy, an evaluation of the case of Alsace, taking as a contrasting reference the neighbouring region of Baden in Germany.

a and b) Context, arguments and main goals underlying the establishment of policies

Alsace is relatively rich (in GDP per head and household income) and has a good level of technological knowledge and general education for European standards. A significant contrast with neighbouring German regions like Baden can nevertheless be observed, mainly in terms of technological output (as measured with patents statistics for instance) and firms' innovative behaviour which has traditionally been very strong in the South-West of Germany -- at least in the second half of the XXth century.

Key characteristics of innovative behaviour in Alsace are as follows:

- Academic institutions are strong. ITIs located in Alsace are relatively specialised in basic research. This scientific supply does not match ideally with the local knowledge demand, since regional economic activities are not often "science-based". Thus, Alsace has no real *regional system of innovation.* Important elements of an innovation system, like public labs or branch plants, are located within the regional territory, but these actors are not regionally linked in a coherent system.
- Business attitudes are positive towards incremental innovation and international development. The typical Alsatian firm is a relatively efficient SME in a "medium tech" activity. There are also a lot of (sometimes large) branch plants depending on external (national or international) governance, drawing their knowledge and strategic factors from networks that are external to the region.
- The regional authorities have always strongly favoured Direct Foreign Investment (FDI), and this policy revealed very successful. As a result, industrial activity and employment are satisfying (for French standards). However strategic decisions are less and less taken at the region's level: Alsace tends to be a *medium tech production platform.*

In this context the goals of innovation policy have been:

- *increasing involvement of science*: inciting university labs and other ITIs to develop more contacts with firms, to transfer technology and knowledge, to take into account the social and economic environment when designing their research strategy;
- - *networking the firms for innovation*: inciting SMEs, particularly in traditional sectors, to regroup and develop collective strategies; they are supposed to learn innovative attitudes with the help of ITIs (typically: interface organisations between public research and industry, like CRITT specialised in new materials, lasers, production technologies, etc.) but also by co-operating with other firms ("filieres" policy for instance).
- *transfer of technology through mobility of personnel*: transferring S&T knowledge to a SME is often difficult insofar as such knowledge is in a complex codified form; psychological attitudes within the firm (also at the head) add to the difficulty of the transfer; the right way to induce such innovative learnings (learning technologies, and learning to learn which means accepting innovation) goes through the transfer of personnel: in the case of a traditional Alsatian firm, younger technicians appear to be the ideal vector (CORTECHS procedure), rather than engineers or scientists.
- *exogenous development*: maintaining ambitious FDI policy in order to help renewing the industrial fabric.

As regards Baden, the region belongs to the powerful Land of Baden-Wurtemberg, in the midst of the European industrial and innovative core. S&T level is high, thanks to firms' as well as ITI's activities. A long tradition of intermediation organisms and a clever governance strategy have helped to link actors into a real regional innovation system. The knowledge basis and knowledge production are relatively applied in nature. This leads to very good results in medium technology activities, but concerns are increasingly quoted in the field of new science-based domains like biotechnologies, ICTs, etc.

Is the Baden-Wurtemberg traditional innovation system (including mental attitudes) fit for the new vintage of innovative sectors? The educational and training system has been very efficient until now, but starts showing some drawbacks: too strong professional identities, leading to insufficient flexibility and difficulties to organise necessary business reshaping or adapt to technology convergence (in nanotechnologies for instance).

In comparison with Alsace, we can consider the following specificities:

- noticeable efficiency of traditional institutions like *Steinbeis Foundation*, in informing and supporting firms for innovative projects; it is not easy to imitate such a model, since institutional setting is quite different in a French region, that has developed local applications of standard models of institutions and procedures designed by the central State; but it is worthwhile noting that *Steinbeis* started recently to operate in Alsace, in co-operation with local institutions.
- more important role of KIBS (knowledge-intensive business services) in sharing and capitalising innovative knowledge between actors; these private firms significantly contribute to the efficiency of the innovation system in Baden; one policy recommendation for Alsace could be to help indirectly firms through supporting KIBS' creation and development;
- the policy has been more focused on firms' creation than on supporting existing firms; this is the way chosen for renewing the economic environment and changing general attitudes towards radical innovation; this is also possibly a political orientation to favour in Alsace.

c) Stakeholders

The stakeholders in the process of design and implementation of the policies are in a typical multi-level space in the case of a French region like Alsace: to a significant extent, the policy is designed in co-operation (or negotiation) between regional institutions and central government organisms. Policy setting is completely different in Germany since innovation policy is a clear responsibility of regions (Länder).

In the case of Alsace, private stakeholders are also largely external actors because of the very high level of FDI. About half of Alsatian employees in industry depend on foreign capital. This is a logical consequence of the continuing policy of "territorial marketing" of regional authorities, whose positive aspects are low unemployment rate and constant renewal of economic activities' portfolio, but that has also some potential negative aspects in terms of local governance.

University and other ITIs play an increasing role on the regional innovation arena, but they are still involved in networks extending largely outside the region.

d) Outcomes

- The policy of technology transfer through personnel (technicians) movement is a success.
- The policy of networking firms is only partially a success.
- Increasing the involvement of the scientific community seems to be a long process; one of the problems for the regional authorities is that such involvement is not mainly local.
- Exogenous development (including innovative aspects) through FDI seems to be a sort of *de facto* policy paradigm in Alsace.

Remark for Baden: the ambitious policy of firms' creation is probably a good model (complementary to the policy of supporting existing business), but the outcomes are considered sometimes as slightly disappointing, at least in comparison with the level of policy efforts.

6.3.6. The case of Norway

The paper prepared by the Norwegian partner about innovation policy in Norway (Isaksen and Remoe 2001) evaluated three policy tools; TEFT (Technology diffusion from research institutes to SMEs); RUSH (Regional development between state owned colleges and SMEs) which has in part been carried out in the form of REGINN (Regional innovation systems); and NT (The innovation and new technology programme in Northern Norway). The information beneath concerns these three policy tools

a) Arguments underlying the establishment of the tools

TEFT: The basic argument was the perceived need for firms to enhance their technological capability. SMEs (in Norway firms with less than 100 employees) in particular were the target group, as these usually have weak internal resources and a low capability to handle technological development on their own. These firms therefore need increased contact with R&D-institutions to enhance their competence and innovation activity. Collaboration between SMEs and research institutions, however, was seen to be hampered by barriers regarding competence and 'culture'. Thus, broker were seen as needed to link research institutions and firms, leading to establishing the technology attaché system in the TEFT programme.

RUSH: The arguments behind RUSH resemble those of TEFT of strengthening the innovation capability of SMEs. The idea was to develop an organisational model that could provide the regionally based colleges in Norway with the means to interact better with the regional industry, and thus be an important node in a regional innovation system. The programme funded only the efforts of the colleges to change their way of behaviour, i.e. stimulated the college staff to enter into contact and development work for regional based firms. Project in firms had to be funded from elsewhere. Behind this effort to strengthen the role of colleges was also the idea that these institutions were seen as under exploited as instruments for regional economic development. Experiences from the Steinbeis Stiftung in Germany were seen as good lessons in transforming the colleges to be more actively engaged in regional industrial development.

RUSH was an experimental programme, lasting for 4 years (1994-98), and covering only 4 colleges. The REGINN programme, initiated in 1997, took over the mandate of RUSH, covering the whole country and both regional colleges and research institutions. Still the argument was to increase co-operation between regional knowledge organisations and the industry, however, REGINN targeted specific industries or clusters in a region.

NT: The programme targets industry in Northern Norway. This region has a comparatively traditional industry, with a low level of R&D. In the mid 1980s a committee was set down to propose a strategy to develop Northern Norwegian industry, which focused strongly on growth through R&D and innovation. The NT programme was the main initiative that was implemented from the plan of the committee. Thus, the main argument was to raise the R&D-intensity and innovation activity in Northern Norwegian firms as a way to develop the region

b) Goals

All the evaluated tools aim to stimulate different aspects of innovation activity in firms, most notably technological innovations. All of them also aim to stimulate co-operation between R&D milieus and firms (mostly SMEs). RUSH and REGINN aim to stimulate co-operation between firms and regionally located research organisations and regional colleges; TEFT aims to improve collaboration between SMEs and five largest technological research institutions in Norway; finally NT aims to strengthen contact between what the programme refers to as 'centres of competence' in different parts of Norway and abroad and firms in Northern Norway.

More specific aims:

- TEFT shall develop firms' ability to become a continuous customer of the R&D system (at least 25% of the firms that have concluded a technology project in TEFT shall within 2 years contract new services from a research institution), and help R&D institutions to reorient themselves towards activities more relevant for SMEs.
- RUSH shall generate 'additionality' in the colleges, i.e. contribute to improved business relations beyond what the colleges would engage in anyway. The goals were related to mobilisation of college staff in projects for regional industry and the number of students' projects. REGINN is explicitly aimed at contributing to improved co-ordination between all the existing knowledge institutions in an area, as well as other policy technology and policy instruments, in stimulating increased innovation capability in important industries or clusters in the region.
- NT shall contribute in developing the best firms in Northern Norway by investing capital, contribute with competence as well as develop networks between firms and between firms and knowledge institutions.

c) Main stakeholders

The initiative for the TEFT programme (and its forerunner) came from the demand side, i.e. the largest technological research institution in Norway (SINTEF). The idea was a support programme to enhance the transfer of technology from SINTEF itself to SMEs. The initiative may be seen in the light of the criticism meeting SINTEF (particularly in the 1980s and beginning of 1990s) of being too much oriented towards big firms and of little value for Norwegian SMEs. SINTEF may also be in need of new customers as it has a rather low basic funding. The programme, and the development of it, was (and is still) supported by the Ministry of Local Government and Labour and the Ministry of Trade and Industry.

RUSH: The initiative came from the Norwegian Industrial Association, and the idea developed in co-operation with this Association and the Norwegian Research Council. In particular the Norwegian industrial attaché in Stuttgart in Germany brought back the idea of the Steinbeis Stiftung. The development of the following REGINN programme were initiated by the Ministry of Local Affair and Labour and the Norwegian Research Council.

NT: The main stakeholder was the Ministry of Local Government and Labour, responsible for regional development in Norway. The responsibility to implement and develop the programme was given to the Norwegian Research Council and the Norwegian Industrial and Regional Development Fund. An independent programme secretariat was set up in Northern Norway that has been very important in developing the programme since its start in 1987.

d) Main outcomes

Typical outcomes of the programmes are:

- *TEFT*: Improvement of existing product, development of a new product or improved production technology in the firm as the result of a joint project between the firm and researchers. The co-operation between the firm and the research institution sometimes continues in new innovation projects (about 30% of the firms engage in a new procurement from their own initiative within 2 years after completion of a technology project).
- *RUSH/REGINN*: Development of new process technology, organisation methods, knowledge etc. jointly between a local network of firms in the same industrial sector and a regional college or research institution. The project will also likely lead to more extensive and closer collaboration between the firms and the college/research institution in the future. The RUSH programme to some extent managed to mobilise more college staff to enter into project for the regional industry. The concrete results of this interaction have not been assessed, even though they seem to be fairly meagre.
- *NT*: Introduction of a new product or process on the market, resulting from a project co-financed by the NT programme. NT staff often acts as a broker to couple the firm with both research institutions and other firms in accomplishing the project. The programme seems to be successful in hitting its target group of quite resourceful firms, increase the innovation activity and capability in these firms, which result in new innovations on the market. This is achieved with a comparatively high cost per project.

6.4. Summarising the effects of the policies

In the sequence of the assessment of the policies carried out in each of the CONVERGE regions/countries, which was presented in the previous section, we think it may be helpful to summarise the impacts and results of those policies according to a limited number of major dimensions.

The purpose of this section is precisely to carry out such a summarising exercise. The analysis that will be presented now is merely exploratory and we are certainly aware of its limitations. We think however that, as it was noted in section 6.2 above, in a context where rigorous measurement is not possible by using the indicators currently available, an approach such as the one taken in the present may have some merit in providing a synthetic view about the effects of the main policies analysed.

6.4.a) Mapping the innovation capabilities of the CONVERGE project countries and regions

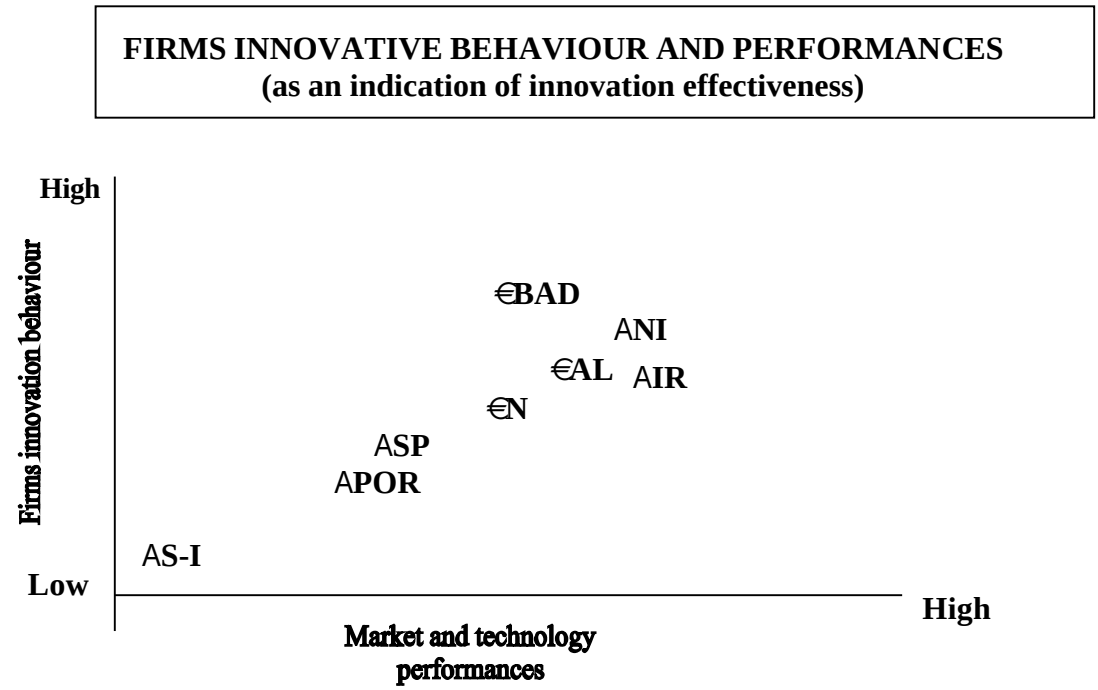
Figures 6.1 and 6.2 map the position of the observed countries and regions with reference to the four main group of indicators of innovation in Europe which were presented in table 6.1, as well as with respect to other relevant dimensions which were identified along the study.

Figure 6.1 illustrates the positions regarding the functioning of the business sector on the basis of two indicators such as the behaviour of firms in innovation and the effects on market and technology development (table 6.1 offers more details on these indicators which in essence express the degree of influence of innovation and industrial policies).

Figure 6.2 registers the relative positions of the regions and countries studied in the CONVERGE project with respect to the institutions of technological support, as deduced from the application of two indicators, human resources and knowledge intensity and efficiencies (see table 6.1 for a detailed description of such indicators). These indicators basically reflect the intensity and effectiveness of R&D and education policies.

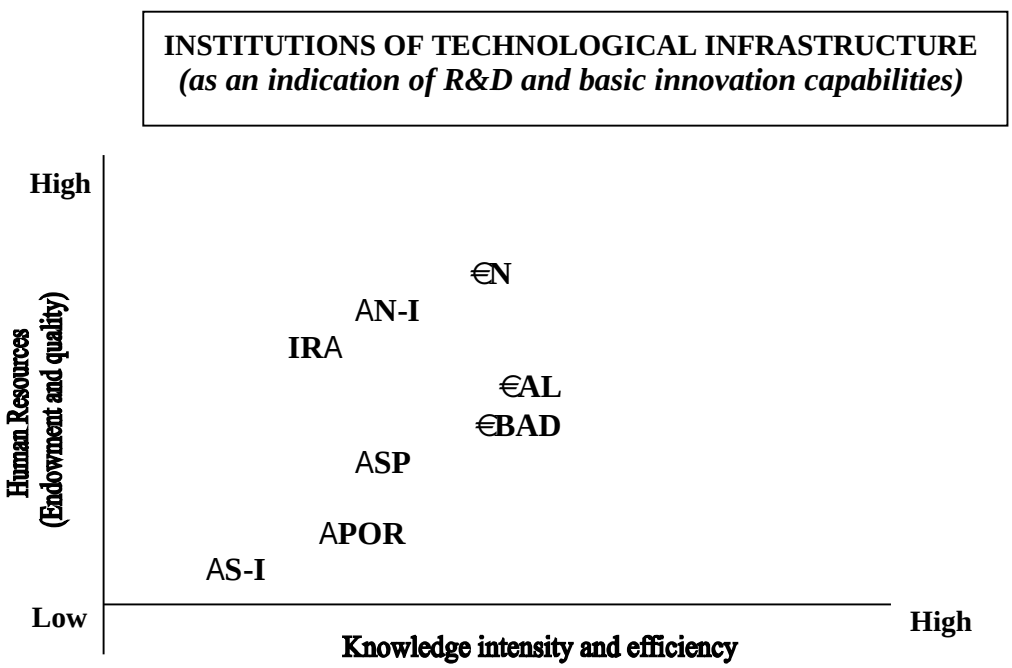
Among the LFRs Ireland occupies the most positive position in general terms, in spite of her lagging in knowledge intensity and efficiency (share of scientific production and patents). The relatively better position of Spain and Portugal with respect to this indicator is not reflected however in the innovation behaviour and success of their respective business sectors. The well known splitting between Northern and Southern Italy is once more put into evidence.

Figure 6.1 . Relative position of the CONVERGE countries and regions in relation to firms innovation behaviour and results



N - Norway **AL - Region of Alsace** **N-I - Northern Italy** **POR - Portugal**
BAD - Baden region **IR - Ireland** **S-I - Southern Italy** **SP - Spain**

Figure 6.2. Position of the CONVERGE countries and regions with respect to their technological infrastructure



6.4.b) Policies under consideration for the "catching-up" process

The CONVERGE project has attempted to undertake a preliminary, though yet subjective, exercise in order to assess the influence of several policies (education/training, R&D, industrial and innovation) in a series of indicators related to innovation performance and growth, factors that may be helping to the catching-up of the Less Favoured Regions. This exercise has been carried out by taking into account the following definitions regarding the scope of each policy shown in Table 6.2.

Table 6.2. Sectoral policies and innovation

Innovation policy

Refers primarily to the action that address the funding and other resources needs of innovation strategies or R&D projects of the firms aiming to apply science, basic knowledge and technology (tacit and codified) resulting either from internal activities or external collaboration with public research centres or universities.

Examples within the EU: Space, Energy and TIC sectors, former BRITE programme, Green Book initiative.

Main indicators: innovation performance, firms behaviour.

R&D policy

Aims to foster the promotion of the science base, codified knowledge and the infrastructure for research in both the public and the private sectors.

Examples within the EU: Life Sciences, Health, Environment (can include part of the Structural Funds).

Main indicators: knowledge intensities and efficiencies.

Education and training policy

In the present analysis concerns those policies and actions that address the development of the higher education sector with specific actions, such as the training of graduates in science and technology, the promotion of postdoctoral exchanges as well as those of highly skilled people between countries or between institutions.

Examples within the EU: Marie Curie scheme, Shared R&D projects.

Main indicators: human resources

Industrial policy

Refers to the instruments and tools aiming at the stimulation of industrial competitiveness ant at the creation of an adequate regulatory framework. Among other tools it uses and develops IPR and fiscal incentives.

Examples within the EU: Patents, Single Market

Main indicators: Indicators of structural changes in economy and of market and technology conditions (market shares, patenting…)

Table 6.3 which considers each of those four policies draws on the information gathered along the CONVERGE project and was elaborated during a meeting held in Madrid (October 2000). That meeting was held with the specific aim of exploring the possibilities of carrying out an assessment of the influence of policies on the development of the four countries involved in

the CONVERGE project, that either qualify as a whole as "less-favoured" country or possess "less-favoured" regions. The qualifications on Table 6.3 about 'very positive', 'positive' and 'neutral' effects of the policies are self-explanatory, while the qualification 'counter effects' reflect a mismatch between the goals and the outcomes of a given policy (that could be, for example, the case of a policy leading to the training of skilled personnel whose skills do not fit to the demands of the internal labour market)

This attempt of assessing the impact of different policies has taken into account the potential benefits for regions or countries as a whole in terms of convergence and observed the period covered by the Community Support Framework programmes.

As it is recorded in table 6.3, none of the policies appears to show a complete, integral positive influence profile on the whole of the factors. There are evident differences between the four countries, thus giving additional support to the "importance of diversity" in the shaping of Europe. Nevertheless, two of the policies -- those related to R&D and innovation -- show the greater degree of homogeneity and positive influence among the countries, with the exception of their potential effects on inducing structural changes in economy. It is obvious to acknowledge that the exercise of assessing the policies related to innovation and their influences on economic factors is not an easy one, as it depends on the potential beneficiaries and on the time scale of reference.

Table 6.3. Assessment of the impact of several policies on some of the key factors that influence the economic wealth in the EU LFRs/countries

Policies		*Innovation performance*				*Education/Qualified employment*				*Firms behaviour*				*Structural changes*		
		Ir	***It***	***P***	***Sp***	***Ir***	***It***	***P***	***Sp***	***Ir***	***It***	***P***	***Sp***	***Ir***	***It***	***I***
Innovation	Regional		+		+		+		o		+		+		+	
	National	+	+	+	o	o	+	o	o	++	+	+	o/–	+	+	c
	European	++	+	+	+	o	–	–	–	+	+	+	+	+	+	+
R&D	Regional		+		+		+		+		+		+		–	
	National	+	+	+	+	+	+	+	+	++	+	+	++	++	–	-
	European	+	+	+	+	+	+	+	+	+	+	+	+	+	–	-
Education Training	Regional		o		o		o		+		o		o		o	
	National	+	o	+	o	+	+	+	++	o	o	o	–	+	o	c
	European	o	o	o	o	+	+	+	o	o	o	o	o	o	o	c
Industrial	Regional		+		+		o		o/–		+		+		+	
	National	+	+	o	+	+	o	o	o/–	+	+	+	+	+	+	+
	European	+	o	o	o	o	o	o	o	o	o	–	–	+	o	c

++ : very positive; +: positive; o: neutral; – : counter effects

Source: own elaboration (CONVERGE project)

Note: In the Irish and the Portuguese cases, the regional level was not filed in the table, since the relevant policies are not designed and implemented at this level.

6.5. Some final remarks and considerations

a) The CONVERGE project aimed at learning how the less developed European regions (LFRs) have been performing in terms of designing and implementing strategies and actions to "catch-up" with the most developed regions of the European Union. Though not originally addressed as such, the comparative nature of this analytical approach makes the project to be considered like a "benchmarking" exercise. In fact the policies of LFRs were compared with the equivalent policies implemented in some of the most advanced regions in Europe in terms of innovation and economic wealth. In this line of thought, the CONVERGE project seems to match one of the mainstreams of the European Commission and Member States agenda in relation to research. This exercise was developed along the project by using a combined methodology, with indicators proposed by the European Commission and qualitative approaches.

b) In a "knowledge-based" or "learning" economy it seems reasonable to attribute a central role to innovation activities and to the policies that promote them[15]. This central role of innovation implies that the policies targeted to its promotion have to be considered not as a result of an isolated, autonomous strategy but as the confluence of a series of policies like those related to education, R&D, social cohesion, industry, fiscal and commercial aspects. The sum and/or interactions of the outcomes of these different policies must be taken into account when analysing the possible effects of innovation policies and initiatives.

c) In the context of a "knowledge-based" economy and in an increasing global world, the concept of National System of Innovation (NSI) -- or its regional counterpart, RSI -- provides an adequate conceptual ground for our analysis. In this frame it is possible to assess the indicators of the input factors and outcome elements ("strengths") that measure the ability of a country or region to cope with the requirements (or challenges) imposed by the current socio-economic context. In order to evaluate the level and degree of the construction of an efficient NSI (RSI) for each country or region, a series of traditional input and output indicators as well as the data derived from the Community Innovation Survey have been used.

[15] In a Conference held in Brussels (15-16 March, 2001) under the title "The contribution of socio-economic research to the benchmarking of RTD policies in Europe", Bengt Aake Lundvall who was the leading discussant made the provocative statement that innovation should be, in the present context, the dominant issue in the political agenda of EU. He went further in the final session of the Conference to raise the utopian proposal that Europe should shift the focus of policies from economy to innovation. Accordingly (Lundvall dixit), innovation (and RTD) policies at the European level should be placed under the direct responsability of the President of the Commission. In our opinion, this may introduce the innovation issues at the centre of interests of the EU Parliament and could attract more media attention.

d) Within a frame of diversity, the CONVERGE study has allowed to identify a series of common facts and features as the following:

- the critical importance of human resources extends the need for a good science and technical base to the requirement of skilled, well trained personnel for performing satisfactorily all the activities involved in the efficient management of innovation (and R&D) policies;
- the creation of infrastructures and interface institutions in the LFRs has followed an imitative pattern. By leaving aside their own structural deficits with respect to bureaucracy, firms' behaviours and actors' habits, the LFRs may have overestimated the positive influence of mimicking policies and decisions adopted by the more developed countries;
- there exists difficulties in identifying when and where both the benefits stemming from innovation and from its spillovers occur -- this is so because the analytical approach is applied in a given geographical context, to a complex system where there is coexistence of backward regions and firms, high technology firms and emerging technologies, each having its specific rules of emergence and holding different dynamics.

Dissemination and exploitation of results

The teams involved in the CONVERGE partnership are all characterised by a marked practical orientation in their research activity. They have had relatively distinct trajectories, activities and performances, but they have in common a preoccupation with the additionality coming out from their research. Several members of the teams have acted as consultants in different stages of policy making in the S&T and innovation areas, from the design of new programmes to the evaluation stage. This background represented an important value-added for the work carried out by CONVERGE.

Along the two years and half of project duration several important dissemination activities were implemented. Three open seminars were organised with the participation of both academics and policy-makers. These seminars were organised in Strasbourg (January 2000), Madrid (October 2000) and Lisbon (March 2001). In the intermediary reports to the TSER programme, full lists of the participants and detailed descriptions of the seminars' programmes were presented.

Two project newsletters were produced in 2000 and early in 2001. The newsletters were carefully prepared in terms of their contents, trying to provide both a practical outlook with regard to the project results and to supply inputs for the strategies of the actors typically aimed at by innovation policies. Each of the issues was distributed widely through the CONVERGE partners' networks.

Another important step in dissemination were the contacts and interviews held over the project implementation, namely those that occurred in association with the organisation of the case studies. On average each case study was based on more than 20 interviews.

A project site (http://pascal.iseg.utl.pt/~converge/) was installed since the beginning of the second year in the Internet. The site contents were partially fed in with the material published in the newsletters, but also with most of the papers and reports prepared within the context of the project.

Dissemination also occurred through the contacts with the European Inter-University Association on Society, Science and Technology (ESST). This association of European universities was a member of the project's Advisory Committee and acted as an echo

chamber for part of the research work, namely that dealing with social and political aspects of innovation. Three papers were prepared for CONVERGE by ESST and presented and discussed in a scientific meeting specially organised for that effect in Strasbourg (October 2001).

Interaction also happened with the individual members of the Advisory Committee, which provided meaningful inputs into several steps of the project implementation.

On the whole about 50 papers and reports were prepared within the context of the project. Many of them are accessible at http://pascal.iseg.utl.pt/~converge/projects.html where they are available for downloading. A great deal of them were presented at international or national meetings, namely those organised within the context of the project. Part of them is already published in academic journals, conferences' proceedings or as book chapters. There is an intention of publishing a special issue of an academic journal with the main results of the project.

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This project would not have been possible without the incentive and financial support brought in by the EU TSER programme.

The initial stimulus from a ESST meeting in Lisbon in 1998 was also a necessary condition for this project starting. In addition to that, the intellectual framework provided by ESST over the implementation of the project was relevant. The role of Kristine Bruland and Patrick Llerena shall, in this respect, be refferred to.

The support of the institutions that locally provided the logistic conditions for the project activities, namelly for the organisation of the seminars that were held in Strasbourg, Madrid and Lisbon, shall also be mentioned. In this context, the assistance provided by people like D. Maria Manuel, Madame Flasaquier, Dominique Opfergelt and Miguel Correia Pinto need to be acknowledged.

The great number of people that allowed to be interviewed, or which provided positive inputs for the project at different points in time, both in private companies, business associations and policy-making bodies, were essential for the project successful completion.

The positive contribute of the Advisory Committee members at different steps deserves also a word.

Finally, the interaction and positive feefdbacks received from DG Research, in particular through the contribute of Virginia Vitorino, were also decisive for the success of CONVERGE.

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Annexes

i. List of papers

ii. Project Newsletters

List of papers and reports prepared within the CONVERGE project

BETA-ULP

(1) Jean-Alain HÉRAUD, Emmanuel MULLER, Anne SANDER, Andrea ZENKER (1999).
The role of policies and institutions in the regional innovation capabilities: a functional analysis of Alsace (France) and the neighbouring German regions.
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(2) Jean-Alain HÉRAUD, Francis MUNIER and Patrick RONDÉ (1999).
Innovative potential of the regions and firms' competencies for innovation: a contribution to the process of convergence.
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.
Presented at the workshop "Innovation and Diffusion in the Portuguese Economy", ISEG/UTL, Lisbon, 24-25 January 2000.

(3) Jean-Alain HÉRAUD, René KAHN, Emmanuel MULLER, Anne SANDER and Andrea ZENKER (2001).
Institutions and regional innovation capabilities: a functional mapping of knowledge interactions in the case of Alsace and Baden.
Paper presented at the 3rd CONVERGE meeting, CSIC, Madrid, 5 Oct. 2000.

(4) Jean-Alain HÉRAUD, Caroline HUSSLER, Francis MUNIER and Patrick RONDÉ (2001).
Theoretical and empirical aspects of economic and technological convergence: toward the concept of competent region.

CISEP

(5) Fernando B. GONÇALVES and João M. G. CARAÇA (1999).
A framework for analysing government S&T policy interventions.
Paper presented at the 1st CONVERGE project meeting, ISEG/UTL, Lisbon, January 1999.

(6) Manuel Mira GODINHO and Ricardo Pais MAMEDE (1999).
Technological Convergence in Europe: what are the main issues?
Paper presented at the 1st POSTI Conference, May 29-30 1999, EPFL, Lausanne, Switzerland.
Published as *Working Paper* WP 8/1999 do Departamento de Economia do ISEG/UTL.

(7) Manuel Mira GODINHO and Ricardo Pais MAMEDE (1999).
The prospects for technological convergence: An attempt to model the main factors. Paper presented and published in the proceedings of the "Conference on Regional Innovation Systems in Europe", Donostia - San Sebastian, Spain, 30 Sept.-2 Oct. 1999.
Presented also at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(8) Vitor Corado SIMÕES (1999).
Strategies and policies for systemic interaction and convergence in Europe: A methodological note on sectoral case studies.

Paper presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(9) Fernando B. GONÇALVES, Manuel Mira GODINHO and João M. G. CARAÇA (1999).
Políticas de C&T e Inovação em Portugal: Trajectória, Passado Recente e Perspectivas.
Paper presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000
Presented also at the workshop "Innovation and Diffusion in the Portuguese Economy", ISEG/UTL, Lisbon, 24-25 January 2000.

(10) Manuel Mira GODINHO and Ricardo Pais MAMEDE (2000).
A profile of the innovative firm in the Portuguese economy: learning activities and systemic interactions.
Paper presented to the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.
Presented also at the workshop "Innovation and Diffusion in the Portuguese Economy", ISEG/UTL, Lisbon, 24-25 January 2000.

(11) Manuel Mira GODINHO and Ricardo Pais MAMEDE (2000).
Critical factors in the catching up of European LFRs: Evidence from the Portuguese case.
Paper presented at the EUROPOLIS workshop 1, Maastricht, April 13-14 2000.
A second version of this paper (Structural convergence and the role of medium- and high-tech industries in the Portuguese economy) was also presented at the «9º Encontro de Economia Industrial», Escola Superior de Tecnologia e Gestão de Leiria, 15-16 Dez. 2000.

(12) Manuel Mira GODINHO, Fernando B. GONÇALVES and João M. G. CARAÇA (2000).
Effectiveness of evaluation exercises in moulding new policy perspectives: The case of S&T and innovation policies in Portugal.
Paper presented and published in the proceedings of the Conference E3i "Politiques Technologiques: Fondements et Perspectives", Bordeaux, 27-29 Sept. 2000.
Presented at the 3rd CONVERGE meeting, CSIC, Madrid, 5 Oct. 2000.
It was also presented at the DG Research Workshop on «The regional level of implementation of innovation and education and training policies», Brussels, 23, 24 November 2000

(13) Manuel Mira GODINHO and Ricardo Pais MAMEDE (2000).
Factores de convergência da economia portuguesa: mudança estrutural e eficiência sectorial.
Paper presented and published in the proceedings of the workshop "Mudança Socioeconómica – 10 anos do DINÂMIA – Uma Experiência Interdisciplinar", DINÂMIA/ISCTE, Lisbon, 23-34 November 2000.

(14) Ricardo Pais MAMEDE (2001).
IT professional services in Portugal.
Case-Studies Report.

(15) Pedro MORENO (2001).
The Portuguese Footwear Industry (Portuguese Version).
Case-Studies Report. This report was prepared in partnership with INOFOR.

(16) Vitor Corado SIMÕES and Manuel Mira GODINHO (2001).
CONVERGE case-studies - the comparative perspective: Main issues arising and possible policy implications.

Paper presented at the 4th CONVERGE meeting, ISEG/UTL, Lisbon, 30 March 2001

(17) Manuel Mira GODINHO and Ricardo Pais MAMEDE (2001).
Evolução da produtividade, Mudança Estrutural e Convergência Económica nos 'Países da Coesão' da UE.
Paper presented and published in the proceedings of the IV Conferência Sobre Economia Portuguesa, CISEP/ISEG, Lisboa, 4 e 5 de Maio de 2001.

(18) José Castro Caldas, Manuel Mira Godinho and Ricardo Pais Mamede (2001).
Simulating the prospects of technological catching up.
Paper presented at the «DRUID's Nelson and Winter Conference», 12-15 June 2001, Aalborg University, Denmark.

CNR-ISRDS

(19) Rinaldo EVANGELISTA, Simona IAMMARINO, Valeria MASTROSTEFANO and Alberto SILVANI (1999).
The regionalisation of data on technological innovation: some empirical evidence from the Istat (Italian CIS) survey.
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(20) Rinaldo EVANGELISTA, Simona IAMMARINO, Valeria MASTROSTEFANO and Alberto SILVANI (1999).
Technological Innovation and Regional Clusters in Italy.
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(21) Stefano TORRISI and Mary BRAGA (1999).
The evolution of regional innovation policies in Italy: direct interventions and the role of European Structural Funds.

(22) Rinaldo EVANGELISTA, Simona IAMMARINO, Valeria MASTROSTEFANO and Alberto SILVANI (2000).
Regional systems of innovation in Italy – Evidence from the Community Innovation Survey.
Paper was presented at the 6th RSAI Congress World 2000: Regional Science in a Small World, Lugano, Switzerland, May 16-20 2000

(23) Mary Cruz Braga (2000).
Regional instruments for innovation in Italy: direct interventions and the role of European Structural Funds.
CONVERGE Report.

(24) Bianca POTÌ and and Roberto BASILE (2000).
Differences in innovation performance between advanced and backward regions in Italy. The role of firms' strategies, organizational factors and institutions.

(25) Simona IAMMARINO and Grazia D. SANTANGELO (2000).
The Evolution of Trade and Technology in the Italian Regions – An analysis of *leading* and *lagging-behind* conditions of most advanced and less favoured regions.

(26) Rinaldo EVANGELISTA, Simona IAMMARINO, Valeria MASTROSTEFANO and Alberto SILVANI (2001).
Measuring the regional dimension of innovation. Lessons from the Italian Innovation Survey. (Abstract available)
Forthcoming in *Technovation.*

(27) Caterina ERRIGO, Piera MAGNATTI, Paolo PRATICÒ, Concetta RAU (2001).
CALABRIA/LOCRIDE.
Case Studies-Report (Prepared under the supervision of Rinaldo Evangelista).

CSIC-UCP

(28) Emilio MUÑOZ RUIZ and J.E. ESPINOSA DE LOS MONTEROS and Victor DÍAZ (1999).
Innovation policy in Spain: Technology, innovation and economy in Spain-National and regional influences.
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(29) Víctor Díaz BENITO, Emilio MUÑOZ RUIZ and Juan ESPINOSA DE LOS MONTEROS (2000).
Biotechnology in Spain (Madrid and Cataluña regions).
Case-Studies Report.
(30) Víctor Díaz BENITO, Emilio MUÑOZ RUIZ and Juan ESPINOSA DE LOS MONTEROS (2000).
Motor Vehicle Components in Spain (Madrid region).
Case-Studies Report

(31) Víctor Díaz BENITO, Emilio MUOZ RUIZ and Juan ESPINOSA DE LOS MONTEROS and Antonio RUIZ MOLINA (2000).
Fish-farming in Spain (Atlantic Arc and Mediterranean Coast).
Case-Studies Report.

SPRC-UCD

(32) Joe COGAN and Jim McDEVITT (1999).
Technological and Economic Convergence: The Irish Case. (Abstract available).
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(33) Joe COGAN and Jim McDEVITT (1999).
New Innovation Indicators for a Knowledge-based Economy. (Abstract available).
Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(34) Dermot O'DOHERTY (1999).
Science, Technology and Innovation Policies in Ireland: Performance and Evaluation.

Presented at the 2nd CONVERGE project meeting, Strasbourg, Université Louis Pasteur, 6-8 January 2000.

(35) Joe COGAN and Jim McDEVITT (2000).
Policy Evaluation in Fields of S&T and Innovation: the Irish Case.
Paper presented at the workshop "Innovation and Diffusion in the Portuguese Economy", ISEG/UTL, Lisbon, 24-25 January 2000.

(36) Joe COGAN and Jim McDEVITT (2000).
Science, Technology and Innovation Policy & Science, Technology and Innovation Policy Evaluation: The Irish Experience.
Paper presented at the 3rd CONVERGE meeting, CSIC, Madrid, 5 Oct. 2000.

(37) SPRC (2001).
The Irish clothing industry.
Case-Studies Report.

(38) SPRC (2001)
Mould-making in Ireland.
Case-Studies Report.

(39) SPRC (2001).
The Irish Software Industry.
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