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Study Programme on European Spatial Planning

Strand 1: Spatial Criteria and their Indicators

Theme 1.2. Economic Strength

Main report

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0. EXECUTIVE SUMMARY

0.1. Introduction

The term "Economic strength" was used in the Noordwijk draft of the ESDP to describe one of the seven most important dimensions of spatial phenomena with which to conduct spatially relevant analysis. The document identified three areas of further work as follows: “to establish a more solid comparative evaluation of territorial strengths, weaknesses, opportunities and threats, agreement needs to be reached on the spatially **relevant criteria and their indicators**. These criteria, both individually but especially in combination, are also necessary to develop different **typologies of areas** and to assess spatial impacts of **long term European scenarios**. On the basis of such a set of criteria, it can be established on a comparative basis whether different cities, towns or areas of Europe enjoy, with the respect to the three fundamental goals of the ESDP, a relatively stronger or weaker outlook for spatial development." (ESDP 1997: 42)

The Noordwijk draft sets out a framework for the criteria, requiring one or more quantitative and/or qualitative indicators for each criterion and methods for their combined assessment. Criteria for economic strength are described in the document. “Economic strength in a spatial context expresses the relative (international, national and regional) economic position of a city, town or area, the ability to sustain or improve its position and the intensity of spin-off effects. There is no simple indicator available for economic strength in this respect. A sustainable high level of economic strength would involve at least a more than average economic output and/or a more than average per capita income, a less than average rate of unemployment, a favourable, modern and diversified sectoral structure and (a potential for) intensive trade relations with other (world) regions." (ESDP 1997: 49)

This reference gives guidance for the further elaboration of the current study. Studies in the broad field of economic strength are already existent but they do not cover the entire range of aspects suggested in the given framework of the ESDP. The aim of this study is to find an approach on economic strength that considers the demands outlined above by making use of existent theories and studies. Restrictions in the time frame and data do not allow the empirical application of all the useful approaches but it is feasible to put in place a framework, with early research results, which can be applied in a more in-depth analysis in future studies. As a final part of this study, policy conclusions will be drawn and an assessment of further research provided to satisfy the demands of the Noordwijk approach.

The aim of this theme is to analyse European spatial development on a statistical basis using economic strength indicators. In doing so, the study examines the inter-relationship between the causal factors and effects of the various concepts on a regional level. The analysis takes cognisance of the broader policy aims of the European Commission set out in Article 2 of the Maastricht Treaty, namely to promote harmonious and balanced economic development, sustainable growth and economic and social cohesion. These goals are further refined in the ESDP (1999) document which outlines the need for new concepts in urban-rural relations, which are increasingly operating at a regional, rather

than a settlement level. The document promotes the polycentric development model as a mean of ensuring a more evenly distributed spatial balance in Europe[1]. These interlinked goals are taken into account in this theme by the introduction of spatial classifications complementing the statistical analysis of the regions.

0.2. Indicators, Concepts and Results

0.2.1. The Approach

The introduction has outlined the broad orientation of the Noordwijk report towards the criteria of economic strength. Reviewing the approaches (not only the theoretical but also the empirical studies which go beyond case studies) that have been used in the European context, it is clear that they concentrate on the question of economic strength in the wake of the Single European Market. Prominent research includes the "blue banana" study by a French team of researchers (Brunet et al. 1989) which was based on a questionnaire aimed at enterprises (Nam et al. 1990) and further developed towards "European grapes" and other developments such as the opening of the East (Kunzmann 1996). Most of these studies concentrated on competitiveness issues rather than developing the comprehensive approach required by this study. Further approaches, also concentrating on the competitiveness of regions, have been developed by some German groups of researchers (Irmen/Sinz 1989, Schmidt/Sinz 1993). Other studies concentrated on the impact of the single market. While addressing the problem of economic strength they do not clearly define conditions and indicators in the sense addressed above (see for example European Commission 1997). A further research based source concerned with economic strength is provided by the European Commission who published the "Cohesion report" (European Commission 1996b) and the "Sixth Periodic Report" (European Commission 1999). In those reports, particularly the latter, a more comprehensive approach is used to describe the situation of areas in different contexts. This current report develops a more comprehensive framework by addressing all of the regions based on the reviews of previous approaches. In contrast, the Cohesion Report is concentrated more on the Cohesion Countries and, therefore, provides a more restricted view in terms of the aims of this study. The conclusion of this very brief overview suggests using the cited studies as building blocks towards the realisation of the more comprehensive study required for the Noordwijk approach on economic strength.

Different concepts on economic strength cover a wide range of indicators. For instance, a wide variety of indicators are available to describe the economic strength of regions and areas in the broader context just by single indicators. Core indicators usually comprise output and labour force statistics but also include the economic potential based on infrastructure and innovation capacities. In recent years the EU has a preoccupation with regard to competitiveness, with adaptation (firms and labour) and with modernisation. The European approach to economic development places emphasis on the role of institutions, including the EU itself, in supporting and guiding economic development.

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[1] For further discussion and definitions on urban-rural relations and polycentricity within this study programme see Theme Study 2.1 on the *Main Trends Shaping the European Territory*.

Employing the broad concept of economic potential of regions can create overlapping with other criteria investigated in this study program. Therefore, it is important to delineate the criteria in order to avoid the multiple use of single indicators within different spatial criteria. The approach proposed in this study considers input and output variables', taking into consideration that strength covers not only the ability of regions to be competitive, but also to provide wealth to the population of the territory. Many intervening variables are also addressed. Not only are single indicators addressed, but concepts of single indicators have to be recognised also. Problems occur, in particular, with indicators such as the institutional capacity or institutional support framework in terms of the quantitative and qualitative dimension and the disposable income in the simple availability of data on the European level. The fiscal system of the Member States deviate in such a way that comparable data on a spatially disaggregated level are hard to achieve.

The following list is not supposed to be comprehensive but, as a first step, it should cover the most important indicators to describe the variety of areas in the European territory.

Single classics - these were used in more complex analysis in combination with other spatial criteria. They are representative of the broad range of factors behind economic strength. Taking account of dynamic development in regions such as south-west Germany, north-central Italy, Ireland etc., regional development theory has acknowledged that no one single factor can be attributed to the success of a region. Instead, regional development has to be examined in terms of a wide range of variables, which include resource endowment, market forces, location, social cohesion, vertical integration, and the division of labour, innovation and general industrial relations.

Globalisation/territorial rootedness of production – Integrating markets lead to an increasing equalisation of conditions for production. The term foot-loose industry indicates that there are industries that do not rely much on specific local or regional conditions for production. A hypothesis suggests that spatial units, which provide conditions for a specific kind of production, are able to bind industries to their territory and thereby create the base for a strong sustainable economy.

Modernisation/Diversification – Modernisation examines the innovative capacity and future orientation of spatial units. Modernisation and competitiveness can to some extent be seen as sequential in that the basis for competitiveness is laid down in the modernisation indicators.

Competitiveness – This explores the ability of spatial units to maintain their position in an increasingly integrated and competitive market. It represents the most comprehensive approach followed by the study and provides the basis for the integration of all approaches.

The typologies identify different types of economic regions based on a number of variables related to the concepts of territorialisation, modernisation and competitiveness. In seeking to add value to the study both the inputs and outputs of the factors of modernisation and competitiveness were defined. Correlation analysis of these indicators of cause and effect aided in the interpretation of the factors of development within a

region. Further factor analysis and cluster analysis was used to build the typologies and produce maps based on spatial classifications. From the outset the choice of indicators was limited to some degree by the availability of data on a regional level. This had two main effects a) where a particular indicator was identified as representative of a concept it was not always possible to measure it and b) where indicators were generally available but did not cover all the regions or were only available using different base years.

0.2.2. Classic Indicators

0.2.2.1. Indicators

The choice of indicators for this concept has been influenced by the broad theories of regional economic development. The classic indicators are simple single indicators representative of the range of factors that are considered important measures of economic success (see paragraph 1). The classic indicators are discussed in depth in the 6th Periodic Report and as a result only a limited number of the most important ones were presented in this study (see table 1). Furthermore, it was felt that while a review of the classic indicators served as a useful background to the rest of the report, greater value would be added by concentrating on the more complex indicators that followed.

Table 1: Classic indicators*

	Indicator	***Description***	***Data base/source***
1.	Productivity	GDP/employee	Eurostat -Regio
2	Sectoral structure	Share of employment in the agricultural sector	Eurostat - Regio
3	Future orientation	Share of R&D employment out of the total employment	Eurostat - Regio
4	Wealth	GDP per head	Eurostat - Regio
5	Labour Market	Unemployment rate	Eurostat - Regio

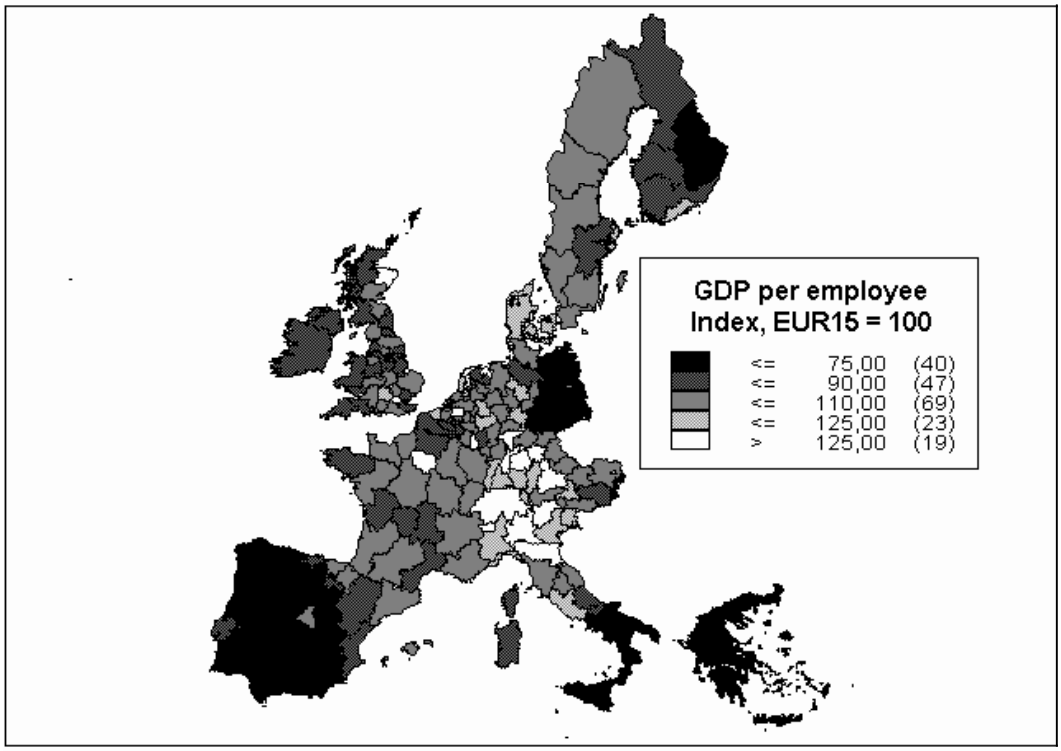
*For full list of potential indicators and data availability refer to main report.

0.2.2.2. Presentation

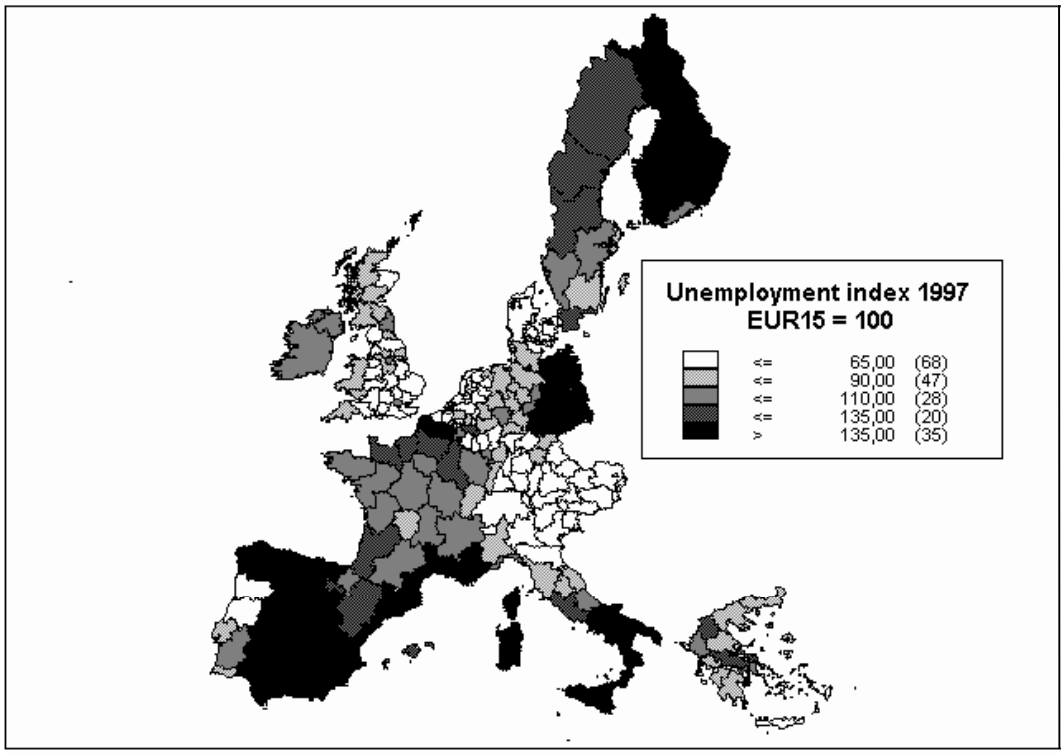
Using single indicators based on the causes and effects of economic strength in a region, a number of maps were produced, two of which are illustrated here. The first, GDP/employee or productivity (map 1) represents an input indicator while map 2 demonstrate the spatial distribution of unemployment across the EU and represents an output indicator. It can be seen from these maps that low unemployment rates do not necessarily correlate strongly with high productivity, e.g. regions of Portugal and Greece[2]. The indicators and maps produced in this section provide a basis for the more complex indicators associated with the concepts of modernisation and competitiveness.

[2] The sources of variation in the relationship between productivity and labour market conditions have been examined by M. Dunford (1996) Disparities in Employment, Productivity and Output in the EU: The roles of Labour Market Governance and Welfare Regimes in *Regional Studies* 30 (4) 339-357

Map 1: Productivity in the EU 1995-97



Map 2: Unemployment rate 1997



0.2.2.3. Results

Using a classification of urban, rural and intermediate areas it was possible to identify a general core-periphery divide based on core urban and remote rural regions. A core group of urban regions, including what the ESDP has defined as the 'pentagon' displayed high GDP per employee (map 1), a low share of employment in agriculture and a high share of R&D employment as a percentage of total employment. The output indicators revealed higher than average GDP per head and low to average unemployment levels. At the other end of the distribution poorly developed rural regions were largely located in the South of Europe and the East German Länder. In general these regions display low GDP per head, a high share of employment in agriculture and low productivity levels combined with high unemployment. Portugal and regions of Greece are exceptions in that their unemployment rates are low in spite or because of poor productivity (map 2). However, in Greece the rate of unemployment is increasing which may reflect the early stages of structural changes.

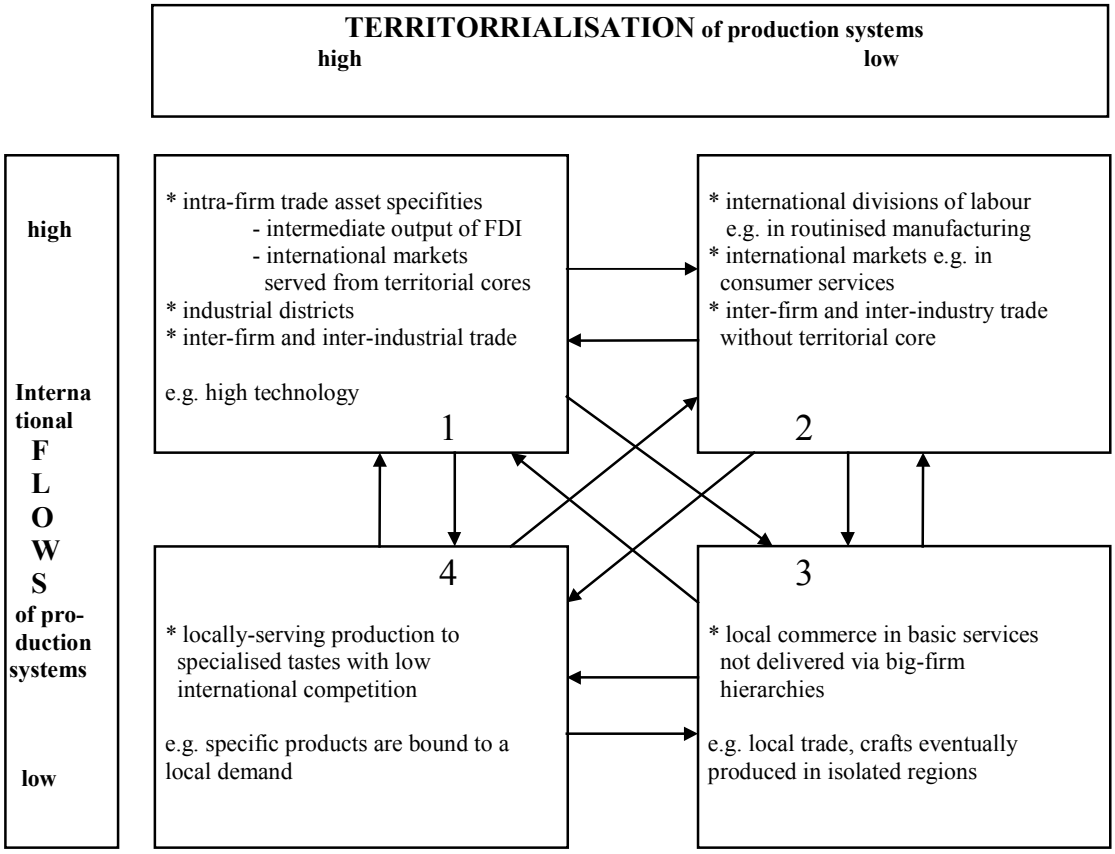
Old industrial regions were found to occupy an economic position close to the developed core regions. There were, however, large differentiations in the performance of these regions for different indicators. For instance, Merseyside (UK) and Limburg (B) decreased their unemployment rates significantly over the 1987-97 period but while GDP per capita decreased over the ten-year period in Merseyside, it rose to over the EU average in Limburg. Over the same period Hainaut (B) showed a slight improvement in both GDP/capita and unemployment rates. The question arises as to whether this differentiation is simply due to different stages of structural change dependent on the growth cycle or whether specific regional policies and institutions have influenced their development.

0.2.3. Globalisation/Territorial Rootedness

0.2.3.1. Indicators

The issue of globalisation is addressed here by the identification of firm-related specificities in a region rather than looking at the meso- or macroeconomic regional indicators. The indicators used for this concept were based on a model introduced by Storper (1995). In analysing the effects of globalisation and liberalisation he distinguished between the two dimensions of territorialisation on the one hand and international flows of production systems on the other. In choosing indicators to represent this concept the aim was to measure the degree to which the production and consumption of goods and services are linked with regional specific resources and conditions and are not simply coincidental in their location. The indicators for the international flows of production were relatively straightforward and are based on the observation of current practice. It was more difficult to capture the territorial dimension without repeating many of the indicators used for the flows. It was felt that territorial differentiation is most apparent when standard products are mass produced that do not have a specific need to be produced in a particular region. The resultant indicators are proposed but because of the lack of readily available data and the restrictions on resources in this study, it is suggested that the concept be used for further research (see figure 1).

Figure 1: Territorialisation and Internationalisation of production systems



Source: Storper 1995, 280 with own adaptations

0.2.3.2. Presentation

Table 2 identifies the indicators that have been derived from the approach outlined. It is obvious that the data is too poor to elaborate an adequate analysis. Nevertheless, it is the intention of the authors to earmark the necessity for further empirical research in this field. The territorial rootedness of production and services is perceived as an important counterweight to the increasing globalisation and integration of the world economy, in particular, when observing development on a regional level.

0.2.3.3. Results

As a result only an example could be given taken from the Sixth Periodic report. This tries to address the question of FDI in the context of the investigation of competitiveness in the EU regions (European Commission 1999: 155), but only on the national level. The report identifies the cohesion countries as benefiting considerably from FDI but at different scales. "Relative to population, apart from Belgium/Luxembourg, the largest inflows were into Ireland, followed by Spain and Portugal, while inflows to Greece were substantially lower. The UK, which also had a level of GDP below the Union average, though by much less, was a recipient as well, while Finland, Germany and the Netherlands were the largest net exporters of capital" (European Commission 1999: 119). This short citation gives evidence of the complexity of the problem. It is, indeed, an outflow of capital that marks strong regions, but it is also a strength to attract investments as an inflow of capital. The result is perhaps a trade-off between capital income and employment, but capital

income can also have the effect of producing employment. Also, additional demands by new employment can initiate further multiplier effects. The quality of investment into certain sectors is essential to assess the effects of the whole investment. Therefore, it is necessary to address the wider picture but this was not to achieve given the time frame of this study.

Table 2: Proposed indicators for Globalisation/Territorial Rootedness

Indicator	Description	Database
"International flows of production systems"		
Trade Flows	Sectoral composition of trade; ownership of traded commodities (foreign v indigenous); destination of exports; diversification of trade destinations over time; exports/imports; exports/ total output by sector	Eurostat - Regio
Role of FDI	Share of total investment in manufacturing and traded services; total employment and total output/region; measure trend from early '80s to late 90s	n.a. in Eurostat
Location of company HQ	Number of regional companies in Fortune 1000 list (or equivalent); location of HQ of top 200 companies	n.a. in Eurostat
IT indicators	ISDN lines; telephones; fax lines per 1000 population	n.a. in Eurostat
"Territorialisation"		
Persistence of enterprise in non-IT branches	Formation and closure of enterprise in non-IT branches	n.a in Eurostat
Indicator	**Description**	**Database**
Share of enterprises with HQ in particular region	Share of enterprises with HQ in particular region	n.a in Eurostat
Enterprise size in non-IT branch	Enterprise size in non-IT branch	n.a in Eurostat
Productivity/value added	Productivity/value added	Eurostat - Regio
Investment/Output FDI/Investment	Investment/Output FDI/Investment	n.a in Eurostat
Regionally available natural resources	Regionally available natural resources	n.a in Eurostat

0.2.4. Modernisation/Diversification

0.2.4.1. Indicators

Indicators for this concept have been chosen to assess the level of structural development of a region and the degree of diversification that it exhibits. Justification for the choice of indicators is based on the available research, which outlines a number of prerequisites for economic diversification. These can be measured in terms of the sectoral structure of a region, its capital endowment, human capital, the labour market, and innovation capacity. Wealth is considered as an output and GDP is measured using purchasing power standards (PPS) per capita. Based on these indicators the economic strength of the regions is further analysed by segregating the variables into inputs and

outputs (table 3). This enables the examination of the capacity of regions to modernise based on their existing endowments and the resulting outputs.

Table 3: Indicators of Modernisation/Diversification

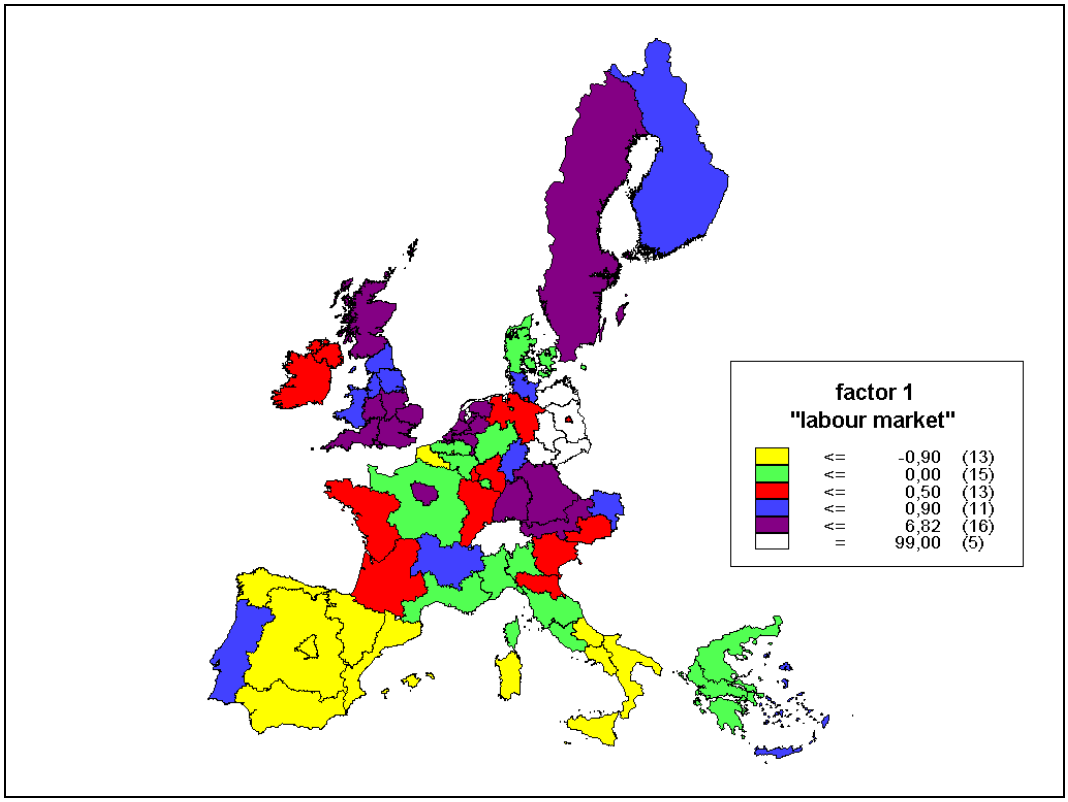
Inputs	Outputs
Existing sectoral structure • Employment in agriculture as a % of total (agemp) 1997 • Employment in services as a % of total (servemp) 1997	*Sectoral productivity* • GVA at factor cost for agriculture as a % of total (gvaagfc) 1994 • GVA at factor cost for market services as a % of total (gvamsfc) 1994
Education • Percentage of total 25-59 year olds with higher educational attainment (highed) 1997	*Employment* • Long-term unemployment as a % of the working population (unemp) 1997 • % of the female working population in relation to the total female population (emptot). 1997 • % of the working population in relation to the total population. (empfem) 1997
Research and Development (R&D) • % of active population employed in R&D in business enterprise sector (rdemp) 1995 • expenditure by government on R&D as a % of total (rdgov) 1995 • expenditure by private sector on R&D as a % of total (rdpriv) 1995	*Research and Development* • Number of patents per 100,000 inhabitants (pattot) 1997
Infrastructure • Persons per kilometre of motorway (road) 1996 • Persons per kilometre of railway lines (rail) 1996	*Standard of living* • Number of persons per private car (carscap) 1994 *GDP* • Measured in power purchasing standard (PPS) per capita/head (ppscap) 1997

0.2.4.2. Presentation

As a means of reducing the variables on this concept a factor analysis was conducted using an orthogonal varimax rotation. Five thematic factors were produced which represented 83% of the total variance. Each of the themes – employment, sectoral structure, physical infrastructure, innovation and living standards – displayed a basic core-periphery divide (map 3 and 4). Within this divide there were exceptions for almost all of the themes. For instance, map 3 illustrates the exceptions in the first factor on employment where some of the Greek regions, Portugal and Ahvenanmaa/Aland (Finland) score highly due to their low unemployment rates. In the case of the Finnish region a high GDP further influences its strong score.

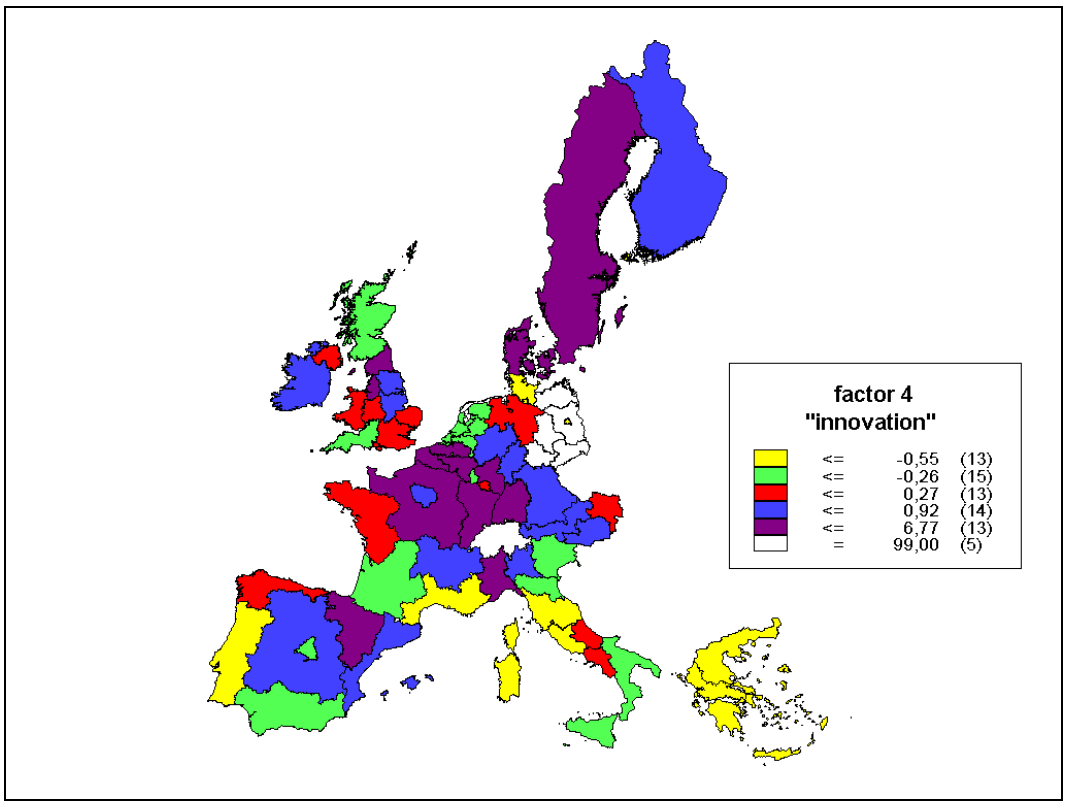
High business sector expenditure on R&D and low government expenditure largely influences the theme on innovation (map 4.) Again, a basic core-periphery divide is evident but this analysis reveals regions in the core that go against the general trend by receiving large amounts of government expenditure on R&D. Similarly, regions in the periphery that receive a high proportion of R&D expenditure from private business e.g. Noreste, Spain are also identified.

Map 3: Labour market



© TAURUS 1999; Note: The value of 99 for the 5 East German Länder indicates missing values due to a lack of data

Map 4: Innovation



© TAURUS 1999, Note: The value of 99 for the 5 East German Länder indicates missing values due to a lack of data

In a further effort to spatially evaluate the levels of modernisation with regional types, typologies were built comparing the distribution of factor scores to the settlement structure based on Eurostat's spatial classification[3]. Urban regions in the core scored consistently higher than rural regions in either the core or the periphery while intermediate regions were varied in their distribution.

Further spatial analysis was conducted by mapping a cluster analysis based on the five factor scores. Eight clusters were identified using the Ward method.

0.2.4.3. Results

This section of the study examined the existing level of development within the regions based on the most recent data available from Eurostat. The results provided further evidence of the centre-periphery spatial division between European regions and Member States with the general exception of the capital regions. In almost all of the five factors analysed the regions of Greece (with the exception of Athens), large parts of Spain, Portugal and Southern Italy consistently appeared in the low scoring section of the factor distributions. Spatially these regions are almost all classified as rural. However, exceptions to this general observation were apparent, particularly in the employment factor for large urban regions.

The output/effect variables on employment were the most significant indicators on the level of modernisation in the regions. These were further related to the outputs of GDP per capita and the number of patents granted. On the input/cause side there was a correlation with high private expenditure on R&D and a high percentage of the active population employed in R&D. Portugal and the Greek regions (particularly Nisia Aigaiou, Kriti) emerged among the regions with positive employment statistics, thus diverging from the general core-periphery trend. The results from the classic and competitiveness analysis confirm the finding that productivity (GDP/employee) is not necessarily related to high employment rates. On the other hand, some urban regions with a high GDP per capita did not score well on employment and long-term unemployment variables demonstrating that unemployment issues cross the rural-urban divide.

The broad core-periphery dichotomy persisted through the factor themes of sectoral structure, physical infrastructure, innovation and living standards. Theories on the benefits of physical infrastructure in the context of a core-periphery divide are elaborated in themes 1.1 (Geographical Position) and 1.4 (Spatial Integration).

The factor on sectoral structure deals with regions that have high employment in market services and low employment in agriculture with a correspondingly high and low GVA in each sector. Capital cities emerge very strongly across the territories. The analysis also identifies relatively high scoring regions with low GDP such as those in Southern Italy and the Mediterranean. Previous research by the European Commission[4] has found that the highest density of enterprise occurs in the South of the Union but they consist of small family run businesses concentrated in less capital-intensive sectors. In many less

[3] Classification based on the Eurostat classification of areas of dense (urban), intermediate and sparse (rural) populations.

developed regions of the EU a high density of SMEs is sometimes considered as evidence of a relatively weak and out-dated economic structure. In contrast, some highly urbanised core regions emerged in the lower end of the distribution, this can be attributed to the fact that their activity is concentrated more in manufacturing and non-market services than in market services (e.g. Baden-Württemberg, Bayern).

While the factor on innovation provides further evidence of a spatial divide in the European economy it also identifies national policies based on government expenditure on R&D. Government expenditure on R&D can be sub-divided into two broad categories. Expenditure in regions where policy is aimed at encouraging innovation and attaining the critical mass necessary to reach R&D potential, and strong regions with high human and capital endowment where government expenditure is based on hard research. The Noreste region of Spain scored very highly in this factor. This may be partly a reflection of a series of framework programmes, which sought to strengthen the innovative capacity of institutions and businesses in this region, in particular in Pais Vasco. It would be interesting to assess this region in relation to other regions also receiving assistance that do not seem to have developed their innovation capacity to the same degree.

0.2.5. Competitiveness

0.2.5.1. Indicators

This concept measures the economic strength of spatial units based on the potential and actual performance of the regions in globalised markets (see table 4). The approach sought to include a broader range of success variables than simply the level of GDP/capita. A number of approaches were examined including the research undertaken by Cambridge Econometrics[5] for the Sixth Periodic Report published by the European Commission (1999). They sought to identify the most significant indicators that contributed to variations in regional GDP per capita and identified four main factors - the structure of economic activity, the level of innovation, the degree of accessibility and the educational attainment of the workforce - which explained almost two thirds of the variation in regional GDP per capita.

A further model for the analysis of competitiveness is that of Irmen/Sinz (1989). They developed two sets of indicators based on the *level* of development and the *dynamics* of development. While the approach explained the situation of the regions it did not fully explain the reasons for competitiveness. The current study further elaborates an approach taken by Schmidt/Sinz (1993) for the BBR. They tried to develop a comprehensive model that integrated various approaches. Their approach is used here as the basis for considering not only the causal variables and preconditions but also for correlating the effects and consequences of competitiveness within a broader framework.

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[4] See European Commission, *Employment in Europe 1998*, Part II, Section I

[5] Cambridge Econometrics (1998) *Regional Competitiveness Indicators,* unpublished study for the Commission.

Table 4: Indicators of Competitiveness*

Indicator	Description
1. Productivity, value added	Productivity: average GDP (mio ecu)per employee, 1993-95 (EU15=100)
2.Causes/preconditions	
2a. Regional economic frame conditions	
Labour costs, energy costs, taxes, rates	Labour costs in manufacturing sector in 1996.
Existing sectoral structure	Share of employees in agricultural sector in 1997
Human and invested capital	Employment age (share of the 15-35 year old in 1997)
R&D Activities	Share of R&D employees in private companies to total R&D employment in 1995. Share of R&D investment (in all sectors) to GDP in 1993.
2b. Locational Factors	
Settlement structure	
Infrastructure	*Regional location* – Average road travel time to the next centre (22 selected centres) *Location in the EU context* – Average travel time using combined transport to all centres in minutes. *Transport accessibility* – average speed in a direct line to all centres using rail transport. *Infrastructure endowment* – Motorway length in km per square km (area)
Local political system	None
3. Effects/consequences	
3a. Regional economic effects	
Growth	Average change of GDP (mio ecu) between 1995-97
Income and employment	Employment trend: average change of employment between 1995-97
Sectoral change	
Innovation	See concept on modernisation as an effect. Change of R&D activities see above
3b. Effects on the labour market	
Labour market participation	
Unemployment	Unemployment rate in 1997. Unemployment trend: change of the unemployment between 1991-97
3c. General disparities	
Development of population	Population trend: population change between 1990-96
Migration	Cumulated balance of migration between 1990-95 per 1000 inhabitants
Age structure	Share of the 60+ year olds in 1996

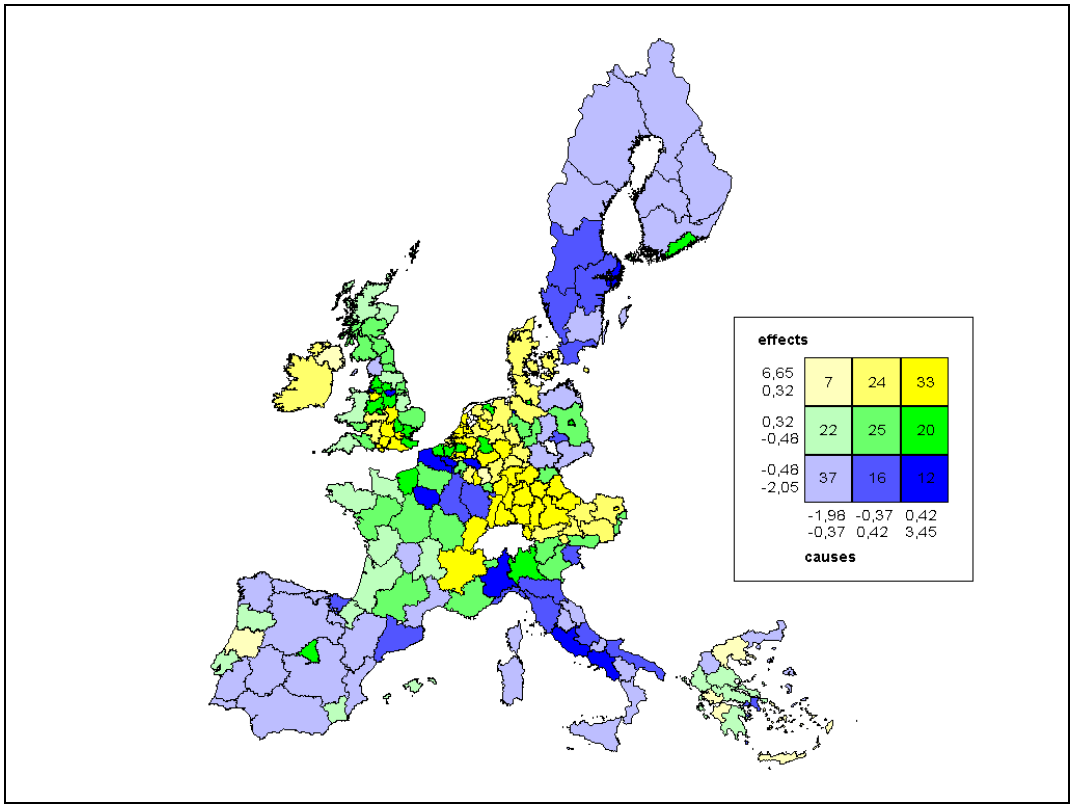
Source: Schmidt/Sinz 1993 with additions.
* For full table containing sources and comparison with Schmidt/Sinz see main report

0.2.5.2. Presentation

Mapping of the causal variables of competitiveness showed a very strong EU wide centre-periphery pattern on a regional scale. By contrast the effects variables displayed a more diverse pattern of economic development. This clarified the weak relationship between the single causal factors and single effect factors (see main report). In a first step a manual index based on a multiplicative combination of the standardised indicators for both the

cause and effect sides was compiled. The multiplicative method was chosen over an additive one in that it allows for regional extremes in the indicators. Furthermore, limited substitution of the factors was preferred to the full substitution necessitated by the additive method. A cross-table of the cause and effect variables was produced using a 3x3 matrix (see map 5), which identifies regions which are doing better than expected and those that are doing worse on the basis of the causal variables.

Map 5: Manual cross table of causal and effect indices (multiplicative compilation)

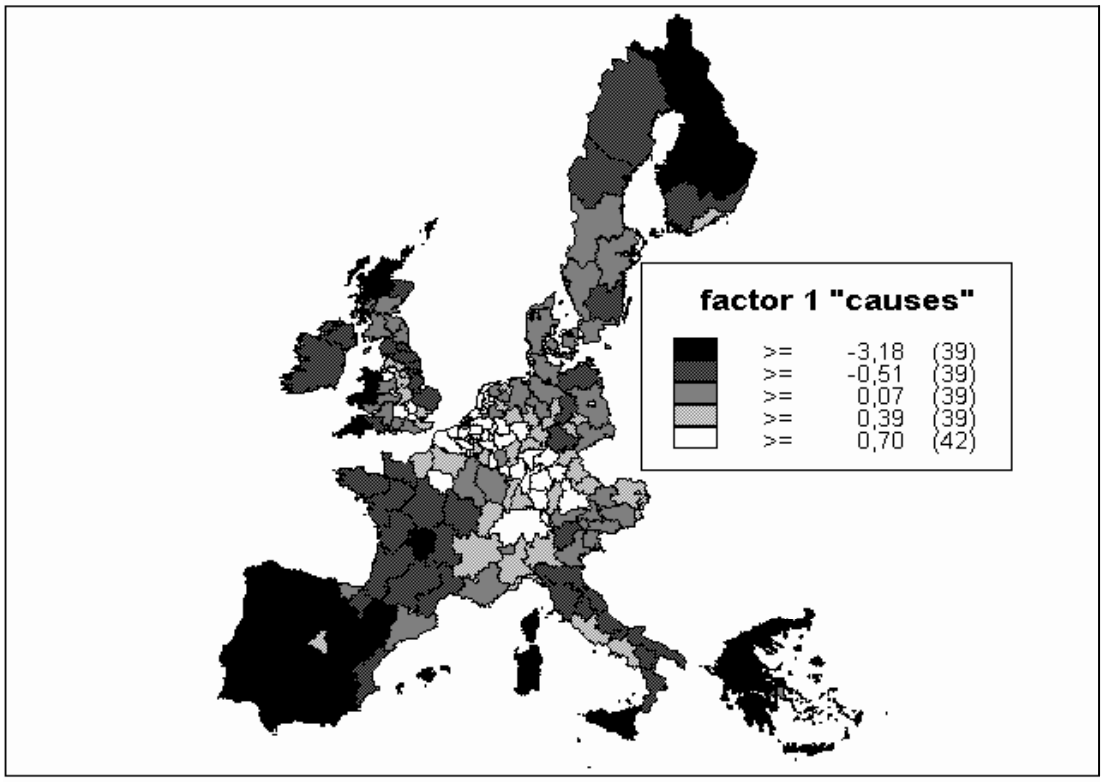


As a further step thematic maps were produced based on the clustering of regions. These were derived from the factor analysis that had been used to reduce the number of variables by combining the principal component method of extraction with varimax rotation. The first factor was strongly related to all causal variables. In contrast, the following four factors represented the effects of competitiveness such as employment, population, labour and growth. The full sets of maps are reproduced in the main text of the report but map 6 demonstrates the causal effects of competitiveness represented by the first factor.

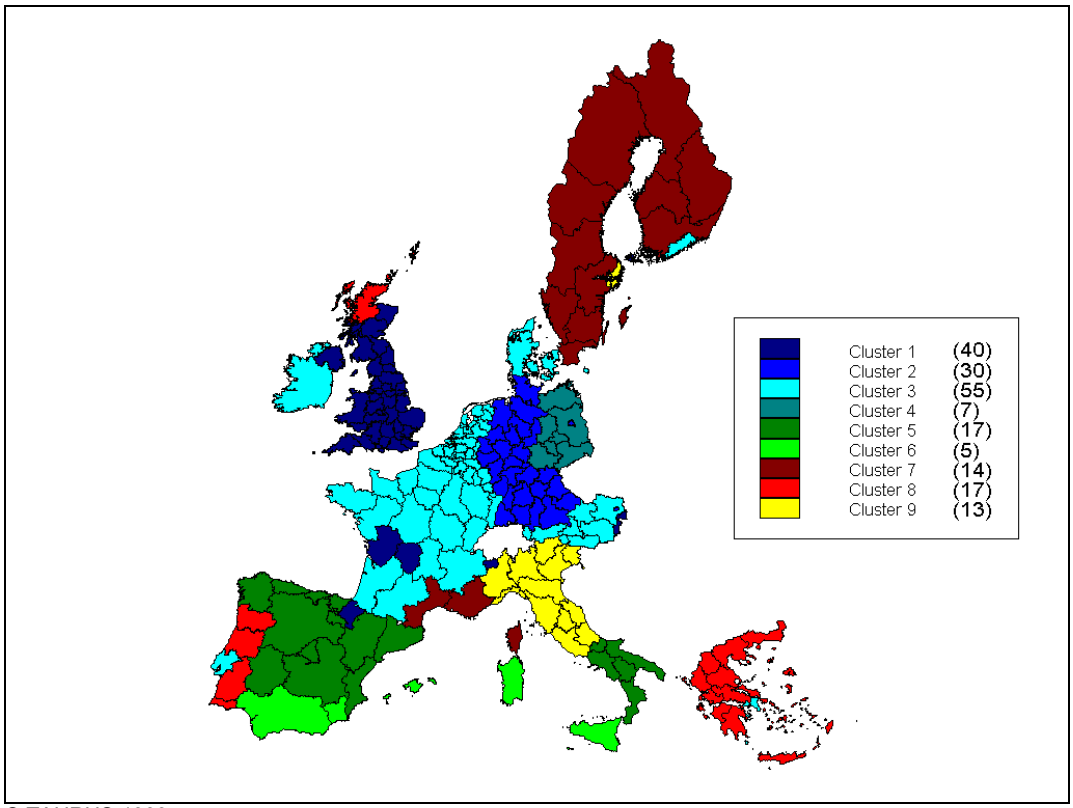
A cluster analysis was conducted which classified the regions based on the five factor values (see map 7). Nine groups were identified using the Ward method.[6] A number of features emerged, namely the dominance of national characteristics, strong national divides e.g. North-South Italy, E-W Germany, and the centre-periphery pattern in countries on the outer edge of the EU. The individual clusters are further described in the main text.

[6] In contrast to other methods this one produced relatively evenly populated clusters.

Map 6: On the factor values 1 (causal effects)



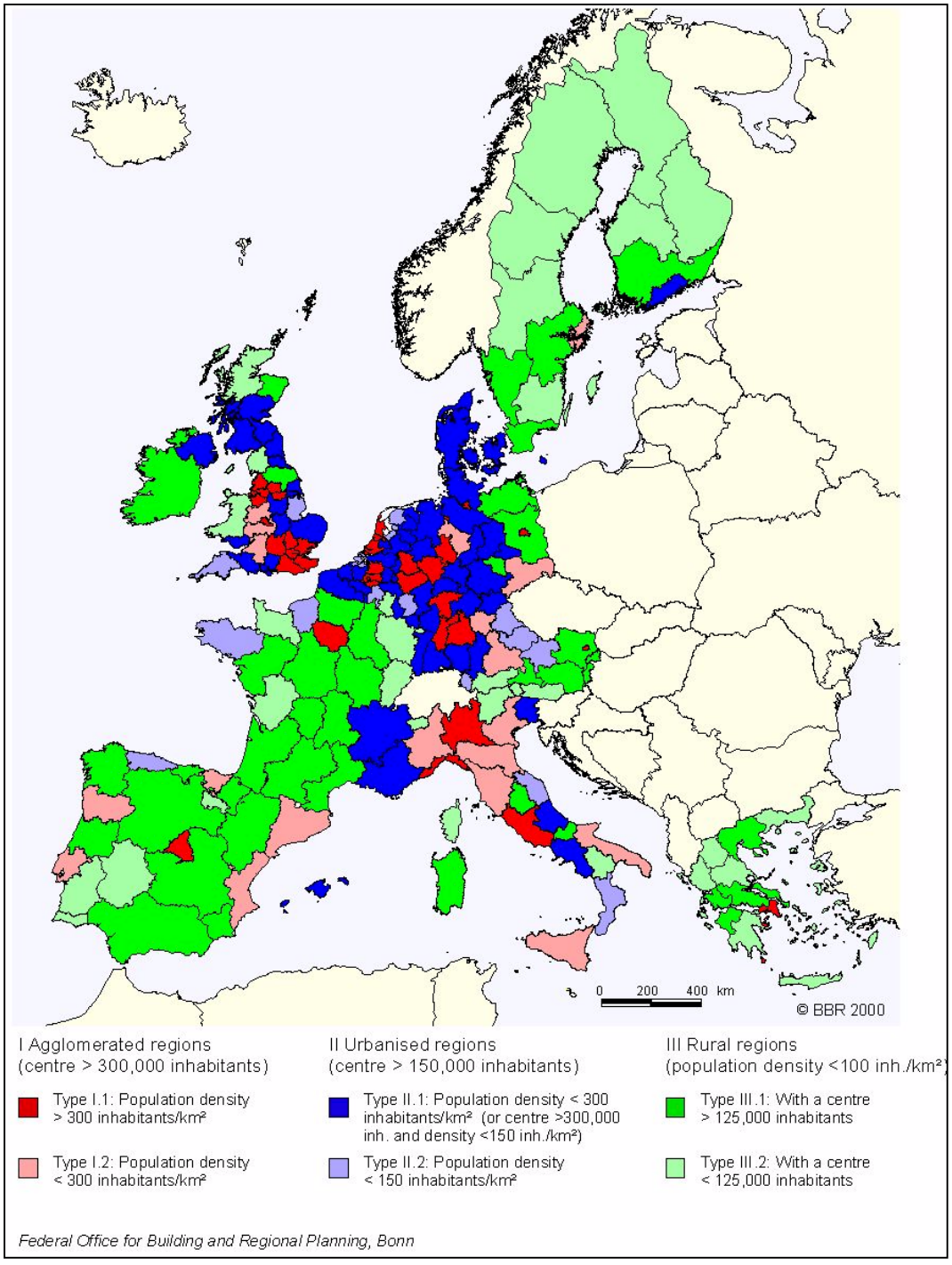
Map 7: Clusters of regions on the base of the factor analysis (five factors



Finally, a preliminary analysis was undertaken to distinguish different types of settlement structure and relate this to their potential and actual competitiveness based on a

classification of six types of region by Schmidt-Seiwert (1997), (map 8). The mean values of the causal and effect indicators for the core and the periphery were listed alongside the settlement types and mapped in order to assess the spatial influences on competitiveness (One can distinguish the core including Germany, Belgium, Nethertlands, Luxembourg, France, England/Wales, Denmark, Austria, North Italy and the periphery with the other countries and regions).

Map 8: The settlement structure of the EU's territory - distinction of core and periphery



Classification from Schmidt-Seiwert 1997

0.2.5.3. Results

The analysis of competitiveness sought to measure both the potential and actual performance of the regions in globalised markets. It was found that the causal factors (table 4 and map 6) were more highly inter-correlated than the effects of competitiveness. The causal factors followed a strong centre-periphery pattern with the exception of the capital regions. The effect factors also followed this general trend but they showed exceptions particularly towards a better economic performance.

The factor analysis with clustering revealed three distinct patterns. The first confirmed the strong interrelation of causal factors. The second pattern suggested that the effects of competitiveness expressed themselves as individual blocks i.e. either there was a strong relationship with developments on the labour market, or employment ratio, or growth per capita etc. but there was seldom a strong crossover between them. The third pattern revealed the strong influence of national policies and regulation on the performance of the regions.

To enhance the study's value for spatial planning the cause and effects of competitiveness were related to settlement structure[7] (six region types were identified based on agglomerations, urban regions and rural regions) which was further broken down into core and peripheral regions. Within the core, urbanised regions perform better then agglomerations when evaluating their actual competitiveness (effects) against their potential (causes). This can be explained by their geographic location between the hinterland on the one hand and the agglomerations and urbanised regions with centres on the other, leading to positive spillover effects. This suggests that there is a relationship between different types of neighbouring regions. It also enhances the hypothesis that national clusters exist.

The small number of urbanised regions (type II 1) hampers interpretation of the periphery. Taking this into account, they perform better than the other settlement types especially in the relationship between cause and effect. The dominant settlement types in the periphery are agglomerations and rural regions. Rural regions performed better than the former with respect to the causal factors. They also performed better than the core regions in the relationship between cause and effect.

0.3. Conclusions

0.3.1. Policy Implications

All of the concepts analysed in this study on economic strength have confirmed the existence of a centre-periphery divide within the EU, albeit some regions were performing better than expected when the effect factors of competitiveness were analysed. The strong interrelation of the causal factors would suggest that policy-makers should identify the weakest causal factor in a balanced range of factors and strengthen it as a basis for further development. This strong interrelationship also suggests that a range of complementary policies should be considered for spatial development rather than relying on one policy to enhance competitiveness. The results also identified a strong national

trend influencing the development of the regions. While the level of development of the regions is influenced by the Member State's development stage and growth cycle it can also be related to institutional structure which can hinder or accelerate regional development. Therefore, the type and level of governance operating in each member state can influence the direction of economic potential and the success of policy implementation. The importance of governance against the background of developing urban-rural relations and polycentricity is discussed in Theme 2.1 (Main Trends) but it was apparent in this study that the role of agglomerations, urbanised regions and rural regions differ in the core and the periphery of the EU.

Research on the modernisation indicators supports the view that single policies aimed, for instance, at increasing the expenditure on R&D in weaker regions, needs to be accompanied by a broader policy framework given the interrelationship between the different causes of modernisation and their effects. In rural peripheral regions, in particular, high agricultural employment correlated negatively with all of the other inputs to modernisation except government expenditure on R&D, indicating that this latter variable is not enough on its own to create a modernised economy. To some extent this has been recognised in the most recent programming period. Priorities were changed from an emphasis on the intervention of public sector supply of facilities to more emphasis on building R&D skills alongside the stimulation of demand and promotion of innovation through partnerships. Policies following this direction would help the development of a polycentric model of spatial development and encourage the spread of economic strength outside the capital regions.

0.3.2. Further Research

The research on this theme has provided a spatial analysis of the economic performance of the regions of the EU. In investigating the level and dynamics of the regional economies it has sought to both identify and give reasons for the spatial differentiation associated with economic strength indicators. While a broad core-periphery divide was evident throughout the research, certain regions were identified as out-performing others in spite of starting with the same baseline potential. Given these findings from a macro point of view, it would be interesting to conduct **case studies** on those regions focusing on a number of factors including;

- Institutional frameworks – investigating their structure, the level at which policy decisions are made for the region and who makes them.
- The role of urban-rural relations in determining the regions economic performance. To what extent do spillover effects influence the economic performance of regions and are urban-rural partnerships a successful mechanism to maximise any benefits?
- Examine whether regions that have performed less well than expected would benefit from a spatial planning policy that encourages the development of a polycentric model of development. Should this model be based on multiple linkages and nodal points, bearing in mind that the regions that have performed most poorly are rural regions

[7] Classification based on Schmidt-Seiwert (1997), For full classification refer to main report.

with a small centre? How feasible would it be to implement such a policy? Research could be linked to the role of urban regions, as distinct from agglomerations, in enhancing economic performance given that they emerged as the most successful regions for the indicators of competitiveness.

- The dimension of core and periphery in the EU taking into account population densities ought to be further investigated. The roles of the system of balance payments between regions need to be further highlighted in that context.
- The further investigation of territorial rootedness of production and service systems in the frame of the increasing globalisation and the enlargement of the EU.

It emerged from this study that more data, regularly updated, needs to be provided for the indicators of economic strength. This data should be widely available at a minimum of NUTS II level for all indicators and regions. As much of the information may already be available through research organisations within individual member states it could be useful to establish new working networks between Eurostat and data facilitators.
Such an arrangement would enhance further research into economic strength, in particular into the concept on territorial rootedness. Both a model and indicators were outlined for this concept in the main report but there was a dearth of available data on a range of indicators including:
Role of FDI; Location of company HQ; IT indicators – ISDN lines, fax lines per 1000 inhabitants; Persistence of enterprise in non-IT branches; Share of enterprise with HQ in a particular region; Enterprise size in non-IT branches.

Finally, future research on the economic strength of regions will be of greatest value if it continues to be complemented by research on the other themes in this study (i.e. social, cultural, land use and environmental issues). In this way a holistic interpretation of the processes which form regional identity will provide a broader framework for the evaluation of the spatial pattern of individual criteria.

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MAIN REPORT

1. INTRODUCTION (Luxembourg/Ireland)

The aim of this theme is to analyse European spatial development on a statistical basis using economic strength indicators. In doing so, the study examines the inter-relationship between the causal factors and effects of the various concepts on a regional level. The analysis takes cognisance of the broader policy aims of the European Commission set out in Article 2 of the Maastricht Treaty, namely to promote harmonious and balanced economic development, sustainable growth and economic and social cohesion. These goals are further refined in the ESDP (1999) document which outlines the need for new concepts in urban-rural relations, which are increasingly operating at a regional, rather than a settlement level. The document promotes the polycentric development model as a mean of ensuring a more evenly distributed spatial balance in Europe[8]. These interlinked goals are taken into account in this theme by the introduction of spatial classifications complementing the statistical analysis of the regions.

The term "Economic strength" was used in the Noordwijk draft of the ESDP to describe one of the seven most important dimensions of spatial phenomena with which to conduct spatially relevant analysis. The document identified three areas of further work as follows: “to establish a more solid comparative evaluation of territorial strengths, weaknesses, opportunities and threats, agreement needs to be reached on the spatially **relevant criteria and their indicators**. These criteria, both individually but especially in combination, are also necessary to develop different **typologies of areas** and to assess spatial impacts of **long term European scenarios**. On the basis of such a set of criteria, it can be established on a comparative basis whether different cities, towns or areas of Europe enjoy, with the respect to the three fundamental goals of the ESDP, a relatively stronger or weaker outlook for spatial development." (ESDP 1997: 42)

The Noordwijk draft sets out a framework for the criteria, requiring one or more quantitative and/or qualitative indicators for each criterion and methods for their combined assessment. Criteria for economic strength are described in the document. “Economic strength in a spatial context expresses the relative (international, national and regional) economic position of a city, town or area, the ability to sustain or improve its position and the intensity of spin-off effects. There is no simple indicator available for economic strength in this respect. “A sustainable high level of economic strength would involve at least a more than average economic output and/or a more than average per capita income, a less than average rate of unemployment, a favourable, modern and diversified sectoral structure and (a potential for) intensive trade relations with other (world) regions." (ESDP 1997: 49)

This reference gives guidance for further elaboration of the current study. Studies in the broad field of economic strength already exist but they do not cover the entire range of

aspects suggested in the ESDP framework. The aim of this study is to find an approach on economic strength that considers the demands outlined above by making use of existent theories and studies. Restrictions in the time frame and data do not allow the empirical application of all of the useful approaches but it is feasible to put in place a framework, with early research results, which can be applied to a more in-depth analysis in future studies. As a final part of this study, policy conclusions will be drawn and an assessment of further research provided to satisfy the demands of the Noordwijk approach.

The report is structured in the following way - section 2 develops the approach for the study and selects fields of in-depth research in specific fields and dimensions of economic strength, section 3 elaborates the selected approach and section 4 draws some policy conclusions on the whole approach.

[8] For further discussion and definitions on urban-rural relations and polycentricity within this study programme see Theme Study 2.1 on the *Main Trends Shaping the European Territory*.

2. ECONOMIC STRENGTH - THE GENERAL APPROACH

(Luxembourg)

2.1. Describing economic strength by indicators

2.1.1. Previous approaches

The introduction has outlined the general thinking of the Noordwijk report on the criteria of economic strength. Reviewing the approaches (not only the theoretical but also the empirical studies which go beyond case studies) that have been used in the European context, it is clear that they concentrate on the question of economic strength in the wake of the Single European Market. Prominent research includes the "blue banana" study by a French team of researchers (Brunet et al. 1989) which was based on a questionnaire aimed at enterprises (Nam et al. 1990) and further developed towards "European grapes" and other developments such as the opening of the East (Kunzmann 1996). Most of these studies concentrated on competitiveness issues rather than developing the comprehensive approach required by this study. Further approaches, also concentrating on the competitiveness of regions, have been developed by some German groups of researchers (Irmen/Sinz 1989, Schmidt/Sinz 1993). Other studies concentrated on the impact of the single market. While addressing the problem of economic strength they do not clearly define conditions and indicators in the sense addressed above (see for example European Commission 1997). A further research based source concerned with economic strength is provided by the European Commission who published the "Cohesion report" (European Commission 1996b). The "Sixth Periodic Report" (European Commission 1999) uses a more comprehensive approach to describe the situation of areas in different contexts. In this report we seek to build on this by developing a more comprehensive framework which addresses all of the regions based on the reviews of previous approaches. In contrast, the Cohesion Report is concentrated more on the Cohesion Countries and, therefore, provides a more restricted view in terms of the aims of this study. The conclusion of this very brief overview suggests using the cited studies as the basis for the comprehensive study required by the Noordwijk approach on economic strength.

2.1.2. Spatial indicators

Different concepts on economic strength cover a wide range of indicators. For instance, a wide variety of indicators are available to describe the economic strength of regions and areas in the broader context just by single indicators. Core indicators usually comprise output and labour force statistics but also include the economic potential based on infrastructure and innovation capacities. In recent years the EU has a preoccupation with regard to competitiveness, with adaptation (firms and labour) and with modernisation. The

European approach to economic development places emphasis on the role of institutions, including the EU itself, in supporting and guiding economic development. The following list is not supposed to be comprehensive but should cover the most important indicators that begin to describe the variety of areas in the European territory.

Employing the broad concept of the economic potential of regions creates an element of overlapping with other criteria investigated in this study program. Therefore, it is important to define the criteria in order to avoid the multiple use of single indicators within different spatial criteria. This is particularly true for the indicators of infrastructure, which reflect accessibility and are, therefore, strongly connected with the criteria "geographical position". Infrastructural indicators might also reflect the "spatial integration" criteria of regions in terms of infrastructure networks. Overlapping also exists with the criteria "land use pressure" in terms of the availability of industrial sites and with "social integration" in terms of the quality of the workforce. As a sub-criteria of "economic strength" agglomeration indicators could also be used in relation to "land use pressures". The criteria "economic strength" should, therefore, avoid using these indicators, in particular, when a combination with other criteria is envisaged. If care is not taken the indicator will count twice and distort the results. In terms of future economic strengths it seems to be advisable to agree on a limited number of combined key indicators such as competitiveness, modernisation, etc. which concentrate on the core indicators of economic strength.

The list in table 2.1.2.1. sets out a set of single indicators that describe the main issues of economic strengths and potentials without creating overlaps with other spatial criteria. The list considers input and output variables' taking into account that strength covers not only the ability of regions to be competitive but also to provide wealth to the population in the territory. Many intervening variables are also addressed. The problem with this list of indicators is that not all of them can be operationalised, which means that some single indicators cannot be addressed, but their concepts must be recognised. Problems occur with the availability of data at the European level, particularly with indicators such as the institutional capacity or institutional support framework in terms of their quantitative and qualitative dimensions and the disposable income. The fiscal system of the Member States differ in such a way that comparable data on the spatially disaggregated level is hard to achieve. As a first step in describing the economic strength of areas in the European context a number of single indicators were selected. This was considered a particularly useful way of linking the economic approach with the other spatial indicators. The selection of single (classic) indicators needs to consider core economic strengths if it is to avoid overlapping with other criteria. However, more conceptual indicators or indices need to be employed to describe the sophisticated issues on the questions of economic strength.

Table 2.1.2.1.: Overview on selected spatial indicators of economic strength

1. Output	GDP, per cap., GDP by sector, productivity, export rates, share of agriculture.
2. Income	Disposable income, distribution, poverty lines.
3. Labour force	Unemployment rates (by age groups, by term), participation rates (by education, skills/occupation level, age groups, gender), employment by sector, number of persons dependent on social security. Levels of investment in education, in training and re-training per persons in the labour force. Role of active labour market policies, including community based partnership initiatives.
4. Capacity in innovation	R&D investments (by industry, public/private), R&D employment. Could be opened up to include process as well as product innovation and emphasise innovations in services as well as in industry.
5. Infrastructure	Roads/rail roads/harbours/airports of regional, national and international importance, technology (-transfer and access such as ISDN), number of persons accessible in a certain time, utilities, industrial sites available, education and training facilities, health care, leisure facilities. Could focus more strongly and explicitly on the criteria relevant to "post-industrial" economies including measures of information intensity such as contact potentials, headquarters functions, higher education facilities, concentrations of R & D activities.
6. Fiscal indicators	Dependency on fiscal transfers, orientation of public investment programmes,
7. Regional Trade	Balances, including measures of regional export performance could be useful and meaningful.
8. Institutional Support Frameworks	Including the role of social capital, extent of public-private partnerships, balance between hard and soft supports for enterprise, levels of investment in networking, co-ordination and integration.
9. Enterprise characteristics	Might be expanded to have regard to considerations of firm size, the ownership of enterprises, the sectoral composition and orientation of firms, regions or localities, the levels of technology in firms and the expert performance of regions.
10. Agglomeration	Population density, degree of urbanisation and settlement structure.

Source: own compilation

2.1.3. Concepts of indicators

Table 2.1.2.1 indicates the emergence of concepts of more complex indicators or indicator systems that are needed to achieve a more refined analysis. Some topics, such as the capacity of innovation, require a more refined approach. Indicator systems that are of importance for such an analysis are based on theories of regional (economic) development. A systematic approach to select the most important concept suggests the need to review all of the scientific literature on economic development. This approach would allow the identification of all of the relevant concepts but would also distort the picture in one of the following two ways - a) The importance of certain concepts change over time as the framework for economic development changes and; b) there is a changing pattern of political awareness about the importance of certain concepts. As an aim of this study programme is to bridge the purely scientific view with the European policy's point of view, a combined, pragmatic approach is needed. Therefore, the Focal Points of the study programme selected a range of concepts in a discussion process at the second meeting of the ESPON study program network in Stockholm in Feb. '99 - as a kind of work hypothesis - which are in principle considered as important concepts for the description of economic strength[9] (see table 2.1.3.1).

[9] Deduction and description of these concepts follow in section 3.

Table 2.1.3.1.: **Selected concepts to be elaborated for the description of the spatial economic strength**

1. Single "classics"	Single classic indicators that can be used in more complex analyses in particular in combination with other spatial criteria. The indicators should include one "representative" for input, output, sectoral structure, future orientation, labour market, fiscal strength
2. Globalisation and Territorial rootedness of production	Integrating markets lead to an increasing equalisation of conditions for production. The term foot-loose industry indicates that there are industries that do not rely much on specific local or regional conditions for production. The hypothesis emerges that spatial units that provide conditions for a specific kind of production and therefore are able to bind industries to their territory obtain the base for a sustainable economic strength.
3. Modernisation and Diversification	Modernisation aims on the innovative capacity and future orientation of spatial units, which is conceived as the key factor for a long-term economically sustainable development. Modernisation is strongly connected with a balanced enterprise structure. Most emerging are features such as size, sectoral structure and the function division of labour between spatial units and types of regions.
4. Competitiveness	The ability of spatial units to maintain their position in increasingly integrating and therefore increasingly competitive markets. The most relevant indicators in order to describe competitiveness need to be identified in order to specify this most comprehensive concept for economic strength.

Source: own compilation

From a scientific viewpoint this approach does not take from the task of proving the significance of the proposed indicator concepts. The approach proposed in this study considers input and output variables', taking into consideration that strength covers not only the ability of regions to be competitive, but also to provide wealth to the population of the territory. Many intervening variables are also addressed. Not only are single indicators addressed, but concepts of single indicators also have to be recognised.

Single classics - these were used in more complex analysis in combination with other spatial criteria. They are representative of the broad range of factors behind economic strength. Taking account of dynamic development in regions such as south-west Germany, north-central Italy, Ireland etc., regional development theory has acknowledged that no one single factor can be attributed to the success of a region. Instead, regional development has to be examined in terms of a wide range of variables, which include resource endowment, market forces, location, social cohesion, vertical integration, and the division of labour, innovation and general industrial relations.

Globalisation/territorial rootedness of production – Integrating markets lead to an increasing equalisation of conditions for production. The term foot-loose industry indicates that there are industries that do not rely much on specific local or regional conditions for production. A hypothesis suggests that spatial units, which provide conditions for a specific kind of production, are able to bind industries to their territory and thereby create the base for a strong sustainable economy.

Modernisation/Diversification – Modernisation examines the innovative capacity and future orientation of spatial units. Modernisation and competitiveness can to some extent be seen as sequential in that the basis for competitiveness is laid down in the modernisation indicators.

Competitiveness – This explores the ability of spatial units to maintain their position in an increasingly integrated and competitive market. It represents the most comprehensive approach followed by the study and provides the basis for the integration of all approaches.

The typologies identify different types of economic regions based on a number of variables related to the concepts of territorialisation, modernisation and competitiveness. In seeking to add value to the study both the inputs and outputs of the factors of modernisation and competitiveness were defined.

Due to tight constraints in time and resources within this project not all of the suggested concepts can be fully elaborated. This applies in particular to the concept of globalisation and territorial rootedness where data is not widely available. The aim is to at least describe the concept and make links to the other outlined concepts while leaving the realisation of the empirical research to a later project in the wake of studies for the ESDP.

2.2. Some technical remarks

2.2.1. About the methodology

It is obvious that the compiled comprehensive list of indicators needs to further defined bearing in mind that the whole exercise is aimed at the development of different typologies of areas for the European territory. A distinction between **simple and complex indicators** is most apparent. Simple indicators such as choosing a single or a few indicators are easy to understand but may not cover the whole issue envisaged. Complex indicators or indices may allow for the inclusion of more information but they may lack the conciseness and clarity preferred for ease of interpretation at the political level.

In terms of **simplicity** the most common methodology is to choose a set of indicators such as GDP per capita, the rate of unemployment, or employment in the agricultural sector. An example is given by the European Commission's proposal for Structural Funds (EUROPEAN COMMISSION 1998). In order to select eligible areas for Structural Funds the reform proposal suggests the following single indicators for the regions covered by Objective 1 status; GDP, measured in power purchasing parity, less than 75% of the Community average (NUTS II).

Under Objective 2 status a set of indicators is applied in relation to the eligible industrial areas on NUTS III-level. These are, first, an average rate of unemployment over the last three years above the Community average. Second a percentage share of industrial employment in total employment equal to or greater than the Community average in any reference year from 1985 onwards. Thirdly, an observable fall in industrial employment

compared with the reference year chosen in accordance with the second indicator. Rural areas under Objective 2 (NUTS III) status are eligible when they satisfy the following criteria. Either a population density of less than 100 people per sq.km, or a percentage share of agricultural employment in total employment which is equal to, or higher than, twice the Community average in any reference year from 1985. Secondly, either an average unemployment rate over the last three years above the Community average, or a decline in population since 1985 (European Commission 1998: 46ff).

The typology of areas requires **classes** to be constructed on the basis of indicators. The best way to do this is to identify clusters of areas for each indicator. The classes can be **cross tabled** in order to define types of areas in terms of their economic strength - e.g. high unemployment and relatively high GDP may indicate an old industrialised area (for typologies see below).

The compilation and computation of a range of indicators can build a complex index. Indices allow the combination of different indicators which enrich the existing information but can also lead to a reduction of information through a reliance on statistical calculations deciding the importance of given indicators. As a first consideration combining indicators in an index allows for the **substitution** of values of single indicators. The question arises as to whether minimum standards of the indicators should be defined in an effort to avoid losing information on extreme values. In addition, the **calculation** of the index emphasises extreme deviant values: e.g. given standardised indicators, multiplying would allow extreme (such as high or low) values a stronger effect than adding up the indicators. Furthermore, indices provide the opportunity to **weight** indicators e.g. to include a doubled value of GDP and a single value of unemployment. Classes can be built that identify clusters in the same way as the simple approach.

Finally methods for the compilation of indicators and indices must be addressed. The broad range of concepts for this study and their overlapping makes it necessary to employ more **complex methods of compilation**. These will enable the correlation of indicators and indices to be examined and also the use of multivariate analysis such as factor and cluster analyses to identify the best fitting indicator for the spatial criteria of economic strength and to keep redundancy as low as possible.

Correlation analysis of these indicators of cause and effect aided the interpretation of the factors of development within a region. Further factor analysis and cluster analysis was used to build the typologies and produce maps based on spatial classifications.

2.2.2. About the data

The application of different methodologies requires that data is available on various spatial levels. The main source of regional indicators are provided by Eurostat, "Regions - Statistical Yearbook" and the database "REGIO".

The **Regions - Statistical Yearbook** is updated every year and provides harmonised and comparable statistical data on the main economic characteristics of the EU regions - population, employment, unemployment, economic data, research and development,

agriculture, transport, energy. Data is mainly given on NUTS 2 level, although some are only available for NUTS 1 regions or even member states level (NUTS 0).

The **REGIO database** is specifically dedicated to statistics on economic life in the member states and regions of the European Union. It represents the most comprehensive source of regional data available from Eurostat. The database contains about 100 tables, divided into the following subjects: demography, economic accounts, unemployment, labour force sample survey, energy statistics, agriculture, transport, research and development. Data are given on different NUTS-levels, they are generally more detailed than in the 'Regions - Statistical Yearbook'. The database is only available from the Eurostat Data Shops network.

Another source is the databases used for the preparation of the Cohesion Report. (European Commission 1996b) and the Sixth Periodic Report (European Commission 1999). The Commission prepared the main part of the analysed data for these documents. For example, the employment data originates in the national accounts of the Member States.

From the outset the choice of indicators was limited to some degree by the availability of data on a regional level. This had two main effects a) where a particular indicator was identified as representative of a concept it was not always possible to measure it and b) where indicators were generally available but did not cover all the regions or were only available using different base years.

3. PROPOSED CONCEPTS AND INDICATORS

3.1. "Classic" indicators (Ireland)

3.1.1. Concept and indicators

There is no complex theory/concept behind the proposed structure for the classic indicators or any resulting indicators and as a result the methodology and data are straightforward. The classic indicators should be easy to understand and use readily accessible data. They examine not only the current level or state of the indicators but also the dynamics of each indicator. A form of standardisation of these indicators is advisable, using the EU average or a percentage share, for comparability and transparency.

In terms of a widely accepted **input** indicator the total **investment in relation to the GDP** is suggested. Capital intensive production is still an important indicator for the economic strength of a spatial unit. However, data is not readily available for this indicator at an EU level. An alternative indicator is **GDP per employee**, which can be used to measure the productivity of a region. This provides a measure of economic growth that has been achieved by raising the output of each person employed. Without opening the discussion about the quality of the GDP as a suitable indicator, in general, one has to keep in mind that the GDP consists of many expenditures of a defensive nature and does not include any inherent environmental costs. There has been a great deal of discussion about this problem and measures such as additional (environmental) accounting indicators are in the process of being developed mainly at the national level.

There could also be an argument to using GDP per employee as an **output** indicator for regional productivity, bearing in mind the difficulties with the concept of GDP. However, difficulties arise because this measure for the output does not consider how much of the GDP is used to nurture the total number of people within a given spatial unit. Consequently, **wealth** is better measured by the GDP per capita. This measure is the outcome of a number of factors including GDP per employee, employment growth, participation rates and the level of dependency. The greatest problem with this indicator is that it does not tell anything about the disposable income and its distribution, which would be a better indicator in reflecting the wealth of a region. Due to the accessibility of the data we suggest using **GDP per capita**. While this identifies the wealth of a region it should be noted that other concepts such as the distribution of income using quintiles would provide a more appropriate picture of the social situation in practice[10].

Another very basic indicator used to display the advancement of an economy is the **sectoral structure** of a territorial unit. The sectoral structure usually comprises agriculture, industry and the service sector. One might compile the share of these sectors on the basis of employment of GDP data. The output in terms of added value of the

[10] See also concepts of the World Bank and the OECD.

agricultural sector is very low in particular in remote regions because of low productivity. Although (or perhaps because) a high share of employment is found in this sector, it is advisable to use employment shares rather than the output shares. Low shares of employment in the agricultural sector indicate an advance economic structure. In contrast, a high share of employment in the service sector is usually considered indicative of an advance economic structure. This is not true in every case. There are many service sector jobs that do not necessarily indicate an advanced economic structure. On the other hand, a highly productive industrial sector does not necessarily point at a weak economic structure. In addition to these conceptual problems, there are also problems in interpreting the data as companies included as industrial may incorporate a high share of service occupations. Taking account of these considerations we recommend using the **share of employment in the agricultural sector** as an indicator keeping in mind that it displays the degree of remoteness rather than the degree of advancement of a territorial unit. The **future orientation** of industries is another key indicator of economic strength. Future orientation is used as a guide to indicate the innovative capacity of firms. The indicators most commonly used are those such as R&D investments per employee or as a share of all investments or the output and the **share of R&D employment from the total employment**. Data availability suggests using the employment indicator, which also has fewer problems of definition.

The most comprehensive indicator for the **labour market** is the **unemployment rate**. Using only the unemployment rate means losing information about the quality of unemployment, in particular the unemployment of young people and long-term unemployment. Other indicators such as the labour market participation rates are also very interesting in qualifying the information on the labour market but nevertheless, the unemployment rate can be used to identify participation levels as they differ in Member States and also certain types of regions.

Finally, a **fiscal and/or institutional indicator** would be beneficial in identifying the capacity and ability of spatial units to influence economic development. Two dimensions are important to address, both of which are difficult to measure. The fiscal dimension would consider the financial means available for economic development, which should include, apart from the regionally available financial resources, the financial flows from the national level to each spatial unit for the purpose of economic development policies. The other dimension examines the institutional capacities response to the demands of active regional policies. Both indicators are hard to operationalise as institutional and financial arrangements differ considerably in the Member States. One possible indicator to use in this respect could be “fiscal sources” for value added taxes which are known at regional level from Eurostat files[11]. A list of classic indicators is given in Table 3 1.1.1.

[11] The values have been published by Decroly and Vandermotten in 1990.

Table 3.1.1.1.: Overview on classic indicators

	Classic Indicators Indicator	Description	NUTS level	Data base/source	Also other concepts
1.	Input	Investment/GDP		n.a. in Eurostat	
2.	Output/Productivity	GDP/employee	Nuts 1 & 2 & 3	Eurostat - Regio - Databank	compet.
2a.		Gross value added by sector	Nuts 2	Eurostat - Regions	Mod/div
3.	Wealth	GDP/capita	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	compet. Mod.
3a.		Employment	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	
4.	Sectoral Structure	Share of employment in the agricultural sector	Nuts 1 & 2 Nuts 2	Eurostat - Regions Eurostat - Regio - Databank	compet. mod
4a.		Income by sector	Nuts 2 Nuts 3	Eurostat - Regions Eurostat - Regio - Databank	
4b.		Employment by sector	Nuts 2 Nuts 2 Nuts 3	Eurostat - Regions: classified into 6 categories[12] Eurostat - Regio: Database - classified into 21 categories[13]; and classified into 3 sectors (agriculture, industry, services)	mod
5.	Future Orientation	Share of R&D employment of total employment	Nuts 1 & 2 Nuts 2	Eurostat - Regions Eurostat - Regio - Databank	compet. mod
5a.		R&D investments (by industry)	Nuts 1	Eurostat - Regions Eurostat - Regio - Databank	compet. mod
5b.		R&D employment	Nuts 1 & 2 Nuts 1 & 2	Eurostat - Regions Eurostat - Regio - Databank	mod
6.	Labour market	Unemployment rate	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	compet.
6a.		Participation rate by age	Nuts 2	Eurostat - Regions Eurostat - Regio - Databank	
6b.		Participation rate by gender	Nuts 2 Nuts 3	Eurostat - Regions Eurostat - Regio - Databank	mod
6c.		Long-term unemployment	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	mod
6d.		Unemployment by gender	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	
6e.		Unemployment by age	Nuts 2 Nuts 2 & 3	Eurostat - Regions Eurostat - Regio - Databank	
7.	Fiscal/institutional indicator	Fiscal source for VAT		n.a. in Eurostat	
7a.		Transport (streets, railways, waterways) by km	Nuts 1 & 2	Eurostat - Regions	mod
8.	Regional Trade	Goods transport (street, railway, waterway)	Nuts 2 Nuts 1 & 2	Eurostat - Regions Eurostat - Regio - Databank	

Source: own compilation

[12]classification: agriculture and forestry, energy and water, industry, building and construction industry, market services, non-market services

[13]classification: agriculture, forestry and fishery, industry, market services, energy, ores and metals, minerals, chemical products, metal products, machines and electrotechnical products, means of transport, food, beverages and tabac-products, textiles, clothing, leather and shoes, paper and printing products, different industrial products, building and construction industry, recycling and repair, trade, catering trade, accommodation, transport and telecommunication services, market services, banking and insurance services, other market services, non-market services.

3.1.2. Regional profiles of classical indicators

Five variables have been chosen to represent the classic indicators of economic strength in a region. These five are taken from the list of indicators on Table 3.1.1.1. They were chosen for two reasons, taking into account that a reduced number of indicators was preferred for this study. The first is that they were considered to be the most important and representative indicators based on what we were seeking to describe e.g. wealth, sectoral structure etc. The second reason they were chosen was their ready availability at EU level. This last requirement meant that while an indicator for fiscal/institutional concepts would have enhanced the study it was not practical given the data availability. The concept behind the indicators used has been outlined in section 3.1.1. Three of the indicators are considered as inputs – GDP per employee (productivity), share of employment in the agricultural sector (sectoral structure) and share of R&D employment out of the total employment (future orientation). The other two indicators – GDP per head (wealth) and the unemployment rate (labour market) – are considered as outputs of economic development.

For the most part these indicators have been well researched in existing literature. As a result this section will not repeat analysis where it is already available in existing studies[14]. In particular the Sixth Periodic Report on the Social and Economic Situation of the Regions of the European Union published by the European Commission in 1999 provides recent analysis of most of the indicators outlined above. An exception is the indicator on R&D employment out of the total employment and data for this was analysed using the Eurostat Regio database.

The following paragraphs outline the situation with regard to the indicators in the European Union regions and Member States. The indicators are assessed over a ten-year period, 1986-96 was the baseline for output and GDP data at the regional level. For employment and unemployment the baseline time series was 1987-97 as data for 1997 is available.

GDP per employee (input)

The indicator GDP per employee has been used to measure the output or productivity of a region. GDP per head can be viewed as a combination of GDP per employee (productivity) and employment growth as well as other factors such as the employment/unemployment rate, participation rates and dependency rates. In the EU growth has mainly been achieved by raising the output of each person employed rather than by increasing the number of people in work. As a result, even in regions that have a

[14] European Commission (1999) Sixth Periodic Report on the Social and Economic Situation and Development of the Regions of the European Union Luxembourg
Dunford, Michael (1996) Disparities in Employment, Productivity and Output in the EU:The Roles of Labour Market Governance and Welfare Regimes *Regional Studies* 30 (4), 339-358
Cambridge Econometrics (1998) A report on Regional Competitiveness Indicators submitted to DG XVI of the European Commission.

similar GDP per head, there are significant variations in the relative contribution of GDP per employee and growth in the number employed.

Portugal has a low GDP per head and around 60% of the EU average in productivity but it also displays a low level of unemployment. The South of Italy has an output of around 90% of the EU average, with the exception of Calabria, which is just over 80%. However, the number in employment is very low, about 40% of the working age population. Like Spain, low GDP per head is mainly attributable to low levels of employment.

In the new German Länder the opposite is the case. They have employment rates just above the EU average but the output per person employed is generally 60% or less of the EU average.

Ireland is unusual in that over the baseline period it performed strongly in both output and employment growth. GDP per person employed has increased to above the EU average and in 1997 employment was 58% of working age population, up from 51% in 1988 and just under the EU average of 61%. Significantly, over the same period the participation rates were also up and the dependency ratio decreased. The combination of these factors has ensured that the growth rate has been maximised within this period. The only other regions that experienced a significant rise in both output and employment were Northern Ireland and Centro in Portugal. Flevoland also recorded high growth in both GDP per employee and employment but because a large proportion of its population works outside the region it is not a true reflection of the productivity of the region.

Greece shows one of the poorest performances with low productivity and employment levels. In the interior regions productivity is typically about 60% of the EU average and while this is similar to many of the regions in Portugal it does not display the low unemployment rates of the Portuguese regions nor does it have the high productivity growth. Although employment growth was just above the EU average a high proportion of jobs remained in the weaker agricultural sectors.

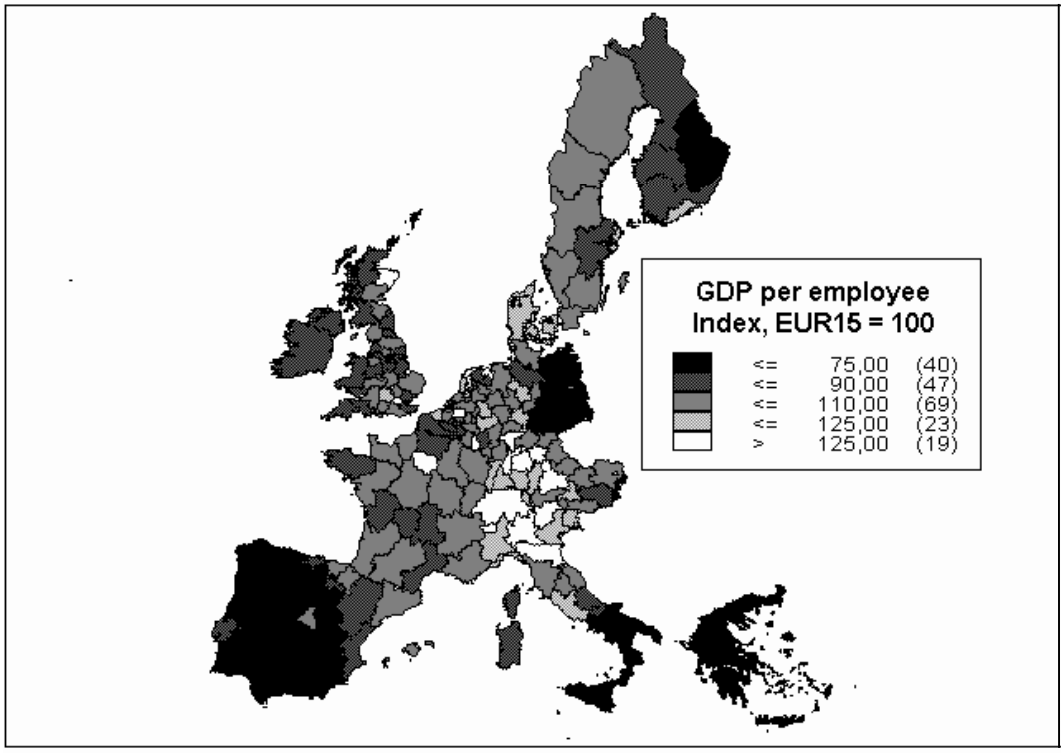
Both Finland and Sweden were hit badly by the recession in the early 1990s. The Ita-Suomi region in Finland went from traditionally high employment rates to only around 55% of the working age population in employment. On the other hand, the slump left productivity growth largely unaffected, and in some cases even higher, as industry restructured.

While there are many regions in which productivity has increased by more than the EU average since 1988, there are no regions where the employment rate has risen significantly without a corresponding high growth in productivity. Therefore, while productivity growth is a precondition for sustained growth of employment it is not sufficient in itself. In some cases, for instance Basilicata in Italy and Sterea Ellada in Greece, productivity increased from below the EU average to above it but the employment rate went down and unemployment rose in 1997.

In any given region a combination of factors must occur over a given period if GDP per head is to grow. Ireland is an example where productivity growth has been higher in the past but because it was not accompanied by a rise in participation rates and employment

and a fall in the dependency rate it did not result in an equivalent rate of growth in GDP per head.

Map 3.1.2.1. Productivity in the EU 1995-97



Share of Employment in the Agricultural Sector (input)

In Objective 1 regions a major difference in the structure of employment is the persistence of high employment in agriculture where it accounts for about one in ten jobs, twice as many as in other parts of the Union. Objective 1 regions have been less successful in creating jobs and reducing unemployment than they have been in raising productivity and increasing GDP per head.

Employment declined in agriculture and manufacturing between 1987 and 1997 but increased in services. Of all sectors, agriculture has experienced the greatest decline in employment with just under four million jobs which represented a loss of 39%. The regions with the highest concentration of agricultural employment had an unemployment rate of four percentage points above the EU average at 14.7% in 1997. Areas that maintain a high reliance on agriculture are particularly in danger of falling behind economically. Greece is an example where unemployment is still below average but employment in agriculture is as high as 30-40%. There is already evidence of the difficulties of economic restructuring in Greece. The change in employment rates between 1987 and 1997 reveal that unemployment rates in all of its regions have risen. The long-term unemployment, an indicator of structural disadvantage, is also high in 1997.

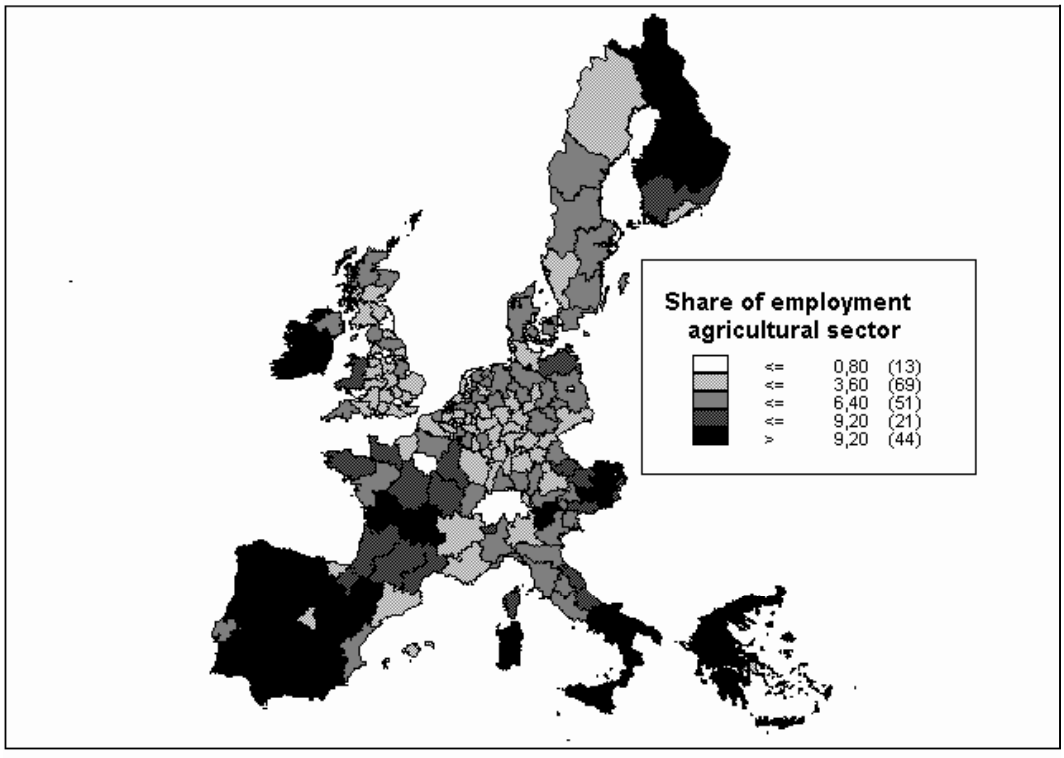
Those regions with the highest employment in agriculture are to be found to the north and west of Spain (Galicia, Castilla y Leon, Estremadura), Portugal (Centro and Alentejo),

Greece, Southern Italy (Molise, Basilicata, Calabria), Sardinia and in Finland in the regions of Vali-Suomi and Ahvenanmaa/Aland. When compared with GDP per head in 1996 the majority of these regions had GDP per head of less than 75% of the EU average. Only one region, Castilla y Leon, had a GDP per head of 75-90% of the EU average.

There are regions such as Emilia-Romagna and East Anglia where agriculture is concentrated in high value sectors and in these cases GDP per head is above average. In rural areas as a whole unemployment is below the EU average and in some cases very low. These rural regions tend to be more diversified and do not rely solely on agriculture. To a large extent a high share of employment in the agriculture sector is a measure of remoteness of a region.

Another element to take into account when examining employment in the agricultural sector is the level of underemployment. Increasingly agriculture is carried out in conjunction with another job or on a part-time basis. Unlike urban areas where part-time work is a choice, in rural areas 42% of part time workers would prefer a full-time job.

Map 3.1.2.2. Sectoral structure 1997



Share of R&D Employment as a Percentage of Total Employment (input)

The highest share of R&D employment is to be found in major urban areas in the core regions. These include regions such as Stuttgart (1.13%), Bremen and Oberbayern (2.35%) in Germany, Ile de France (1.63%), Piemonte (0.84%), East Anglia (1.47%) and the South of England. All of these regions also display a higher than average GDP per capita. The Nordic countries show an unusually high share of R&D employment in relation to total employment, in particular, Finland where Uusimaa has a share of 3.64%, the

highest in the EU. It is also high in Elele Suomi (2.51). Stockholm has the highest share of any Swedish region at 1.75%. Stockholm also displays a higher than average EU percentage of employment in services at 83% but this is seldom the case with the other regions.

There are also regions within the core areas which have a very low share of R&D employment. These include regions such as Niederbayern (0.21%) which is within the same NUTS 1 region as Oberbayern. The number of patent applications for Oberbayern per one million inhabitants is almost three times greater. The GDP per capita of Niederbayern is 96.8% of the EU average compared to Oberbayern, which has a GDP per head of 158%.

The new German Länder have a low share of R&D employment. These regions tend to have a higher share of their total employment in agriculture. In France this same pattern can be seen in the regions of Languedoc, Ouest and Limousin. In the UK, Wales and Northern Ireland have the lowest share of R&D employment at 0.19 and 0.20% respectively. These regions have a lower GDP per capita and higher employment in agriculture than other regions in the UK. R&D employment as a share of the total was also low in Yorkshire, the North of England and Scotland.

There is no data available for Greece, Luxembourg or Austria. The Netherlands only has data available at a national level and in this respect is similar at 0.59% to Belgium at 0.64%.

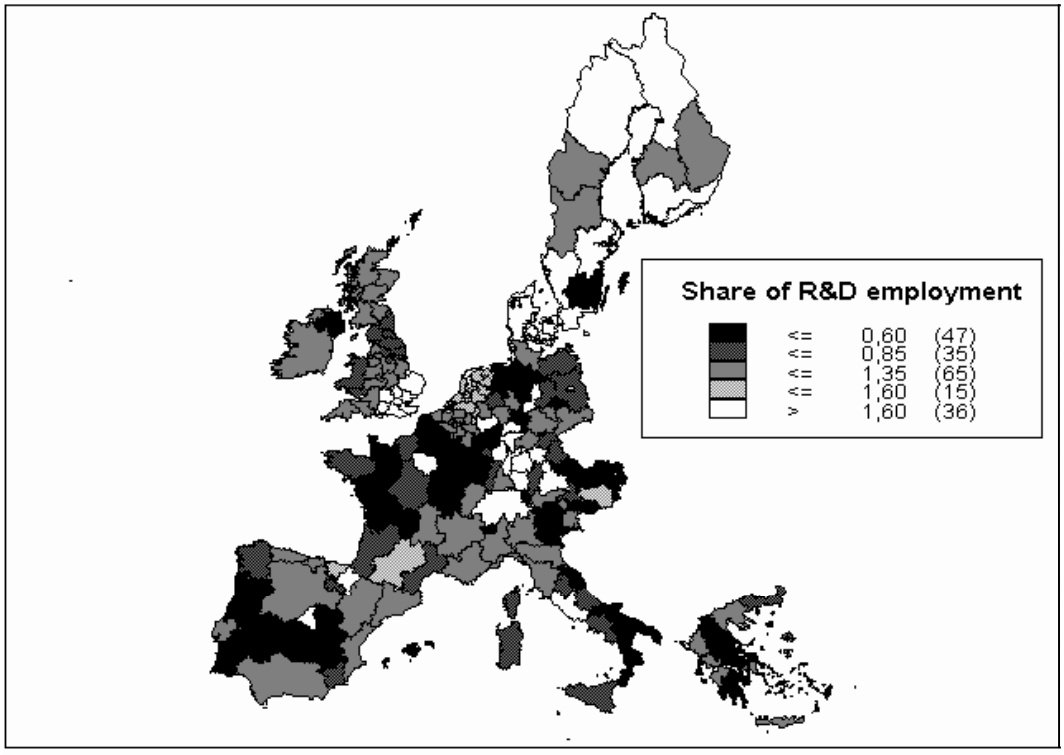
There is a marked divergence between those Member States with the lowest R&D share of employment and those with the highest. Objective 1 regions, in particular, record very low levels. In Spain the highest share of R&D employment is in Madrid and Pas Vasco but when compared to other regions it is still low at 0.49% and 0.56% respectively. In all there are nine NUTS 2 regions in Spain with less than 0.10% employment share in R&D. Portugal records even lower levels. Lisbon has the greatest share of the regions with 0.09%.

Italy, especially the South and Central areas, has low R&D employment levels. The regions of Calabria and Molise have almost no share of employment in R&D at all. Regions such as Emilia-Romagna also show low levels at 0.3%

Ireland, with data for one NUTS 1 level region only, records R&D employment shares of 0.5%. There is a high probability that this is concentrated mostly in the east of the country and that there would be a high regional disparity.

As an indicator of future orientation the share of employment in R&D as a percentage of total employment would suggest that concentration will continue in the core regions and that Objective 1 regions in particular have a long way to go in restructuring their economic base.

Map 3.1.2.3. Share of R&D employment 1995



GDP per Head (output)

Using this as an indicator of economic strength, measured in power purchasing standards (PPS), regional disparities are apparent. The GDP per head in the ten poorest regions taken as a whole increased from 41% of the EU average in 1986 to 50% in 1996. Relative GDP per head in the ten richest regions has declined over the same period from 3.7 times the level in the ten poorest ones to 3.1 times. Eight of the ten poorest regions remained from 1986 to 1996 and included the French overseas dominions, some Greek regions (Voreio Aigaio and Ipeiros) and the Portuguese regions of Centro and Alentejo. Similarly, the ten richest regions changed very little and included Brussels, Ile de France, Wien, London and four regions in Germany – Hamburg, Bremen, Oberbayern and Darmstadt.

Disparities are increasingly within Member States rather than between them. In the four Cohesion countries in particular, relatively rich urban centres contrast strikingly with poorer rural regions. An important factor in disparities in GDP stems from the effect of economic restructuring. Regions, for instance in the Northern Member States, which are dependent on declining industries, show lower GDP per head. An example is Hainault in Belgium which was 81% of the EU average in contrast to the northern regions in Belgium which were as high as 137% (Antwerp) of the average in 1996. Similar low GDP per head levels exist in Merseyside in England and in Burgenland in Austria which are also suffering from the effects of restructuring and associated urban and social problems. In contrast regions which specialise in growth sectors are above average GDP per head.

In Portugal growth has been concentrated in the urbanised regions of Lisboa (88% of EU average) and Norte. While the poorer regions and the interior are catching up significant differences remain, for instance Alentejo, which is in the same NUTS1 region as Lisboa, is only 60% of the EU average.

In Spain growth has been high in Madrid and Cataluna where it is level with the EU average. Growth is also strong in the poorer southern regions so that Extremadura has risen from 44% in 1986 to 55% in 1996 and Castilla-la-Mancha has risen from 54,5% to 66% in 1996. However these regions are still heavily dependent on agriculture and remain in an economically fragile position. In general, growth in the northern Spanish regions remains slow.

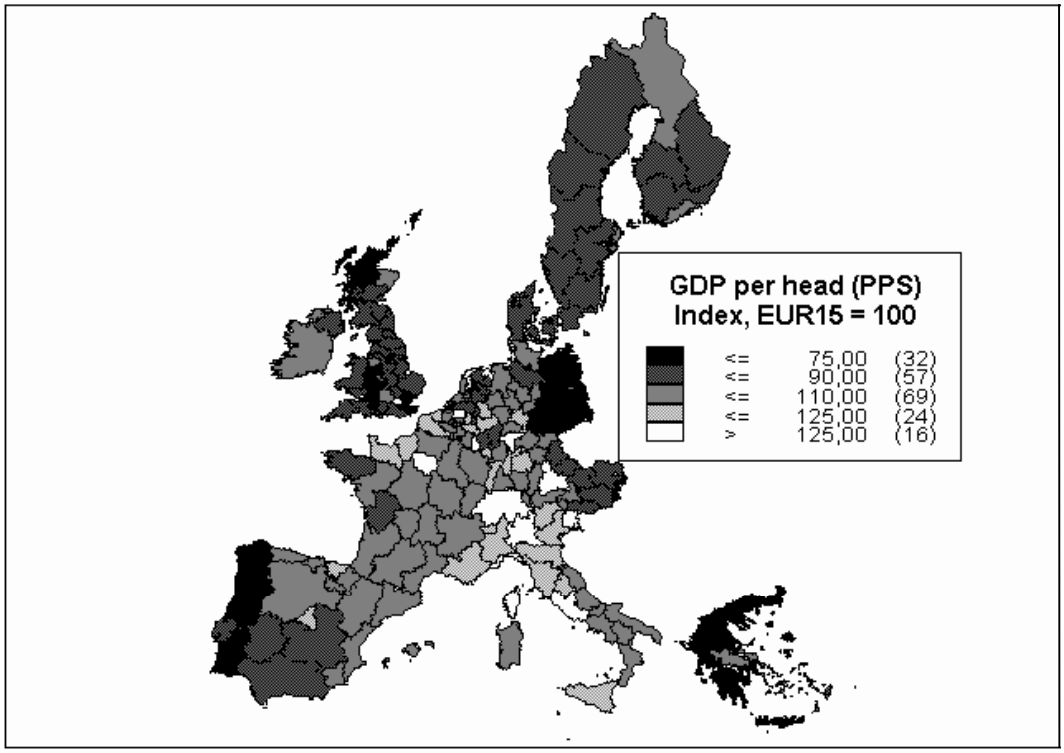
In Greece, the poorest Member State in the region, there has traditionally been little regional disparity. This is changing as Athens concentrates growth in the service and manufacturing sector and as the rest of the country is in the process of restructuring. Athens is also favoured because of its better access to the rest of the EU. While most Greek regions experienced growth over the 1986-96 period, three of them actually had a decline in GDP per head. These were Ipeiros (47.4% to 43.8%), Poloponnisos (60.7% to 58.3%) and Sterea Ellada which started from the relatively high base of 73.5% of the EU average in 1986 and declined to 65.5% in 1996.

Ireland has recorded the highest growth in the EU over the nineties, rising from 60.8% of the EU average in 1986 to 96.5% in 1996 and has now exceeded the EU average. The main problem encountered in Ireland is that the growth is concentrated in the East of the country and there remain large regional disparities. There are also some fears that the extent of linkages in the local economy created by one of the main sources of growth, namely inward investment and multinationals, may not be enough to sustain growth. On the other hand there has been a corresponding decrease in unemployment and a rise in participation rates. Allied with the rapid development of the service sector there still appears to be potential for future growth.

The inclusion of the new German Lander had the effect of lowering the average GDP per head in the Union, which in turn increased the relative level of other countries. In 1991 the Lander GDP per head was about one third of the EU average. By 1994 it had increased to about two thirds but since then there has been a slow down in its rate of catching up. The initial increase was probably largely due to specific policies adopted by the unified Germany to aid the new Länder.

In general, urban areas and areas with high concentrations of service and manufacturing activity display a high GDP per head. In contrast, rural areas, which are heavily dependent on agriculture, have a lower GDP per head. Even in poorer regions which are catching up with the EU average there is a danger that if supply side improvements and diversification does not take place growth will not be sustainable.

Map 3.1.2.4. GDP/cap. 1995-97



Unemployment Rate (output)

High unemployment remains a problem in the European Union. In 1998 unemployment was almost 10% representing 16.5 million people. High levels of long-term unemployment are associated with high levels of unemployment and have the additional negative social affects of marginalisation and social exclusion. By 1997 just over 49% of the unemployment in the EU had been out of work for more than one year (5.2% of the work force).

Unemployment rates are greatest in Spain and stretch out to the French Mediterranean regions. South Italy and the islands of Sardinia and Corsica are included in unemployment blackspots in the Mediterranean. In Northern Europe the worst unemployment is to be found in parts of Finland, eastern Germany and the declining industrial regions. Between 1987 and 1997 the overall unemployment rate in the Union remained similar (around 10%) but varied widely between the regions. Ireland, the UK and the Netherlands reduced their unemployment by as much as 4.5 percentage points whereas Sweden, Finland and south Italy increased theirs. In the case of Sweden unemployment rates escalated from 2.5% in 1987 to 10.4% in 1997, largely due to the recession in the early nineties.

Long-term unemployment is worst in the Northern regions of Spain, South and Central Italy, Greece, Northern Ireland and some regions undergoing restructuring in Belgium, Netherlands and parts of Germany and France. As long-term unemployment is about 50% of all unemployment in the EU, this would suggest that structural unemployment is a

major cause of concern, particularly in view of the fact that it is more persistent than short-term unemployment and involves more than just increased output or investment to solve.

Regions that display high rates of GDP per head do not necessarily have similar high rates of employment. In particular, urban areas often have higher than average unemployment. Urban areas are classified as having more than 500 inhabitants per square kilometre, by which definition 49% of the EU population is included. Rural areas are classified as having less than 100 inhabitants per square kilometre and include 24% of the EU population. Between these two are intermediate areas with 500-100 inhabitants per square kilometre and these areas incorporate just over one quarter of the population. Unemployment in rural areas averages 11.3%, which is almost as high as urban areas (11.7%). In intermediate areas unemployment is lower than in either of the other two areas at 9.1%. Unemployment of women is worst in rural areas at 13.8%, and is particularly serious in the Mediterranean regions. Long-term unemployment is highest in urban regions e.g. Merseyside, but can also be seen in agricultural regions that are restructuring e.g. Greece.

Portugal, which has less than 75% of the EU average GDP per head for the majority of its regions had relatively low unemployment rates. In Alentejo, the worst affected region, unemployment was still below the EU average for rural regions at 10% in 1997. In contrast, some regions in North France (Nord-Pas-de-Calais) and SE England which had high GDP per capita also displayed high unemployment rates. Greater London had 140% of the EU average GDP per head in 1996 but while its unemployment rate was below EU average (9.7% in 1997) the level of long-term unemployment was very high at 44.5%. Youth unemployment was also high at 16.6%. In this situation there is a strong likelihood of social exclusion and marginalisation.

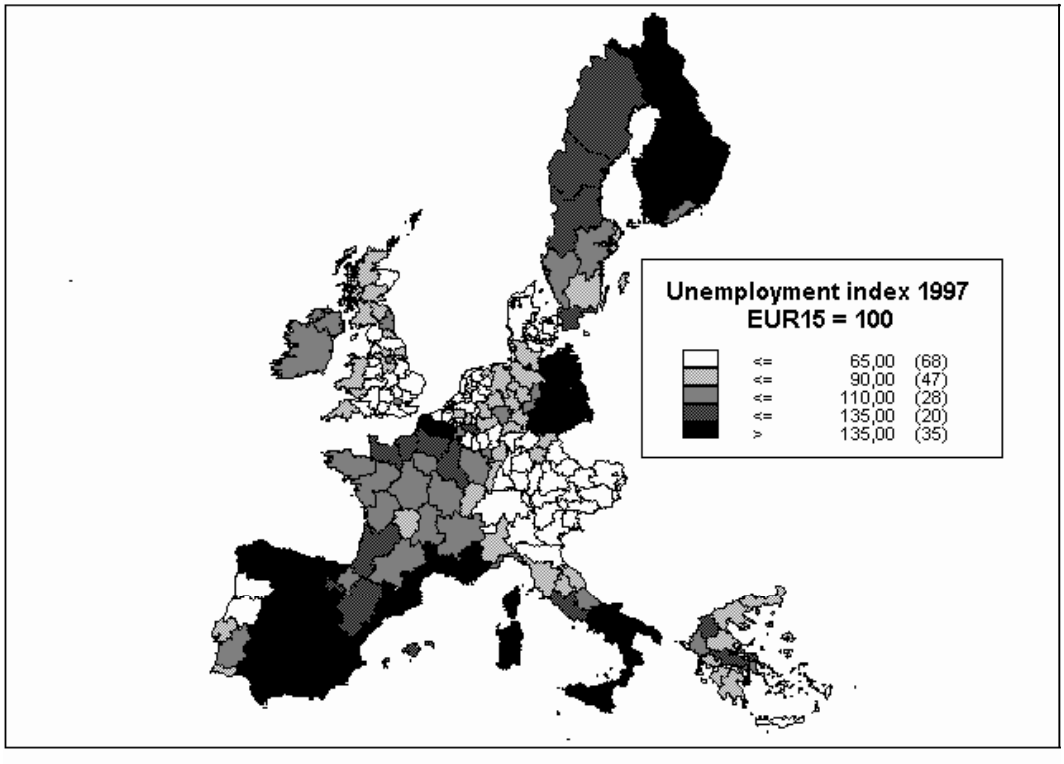
Unemployment among women is higher than that for men in most of the EU (12.5% as against 9.5% in 1997). Women form over 40% of the EU labour force but they account for almost half of the unemployed and over half of the long-term unemployed. Women are also likely to work part time and to be concentrated in the service sector. There are marked regional differences in female unemployment. In the Nordic countries female unemployment rates are similar to those of men, as they are in the UK. On the other hand, in Spain, Italy and Greece less than half of women participate in the labour market. When women do participate there is high unemployment and little opportunity for part time work.

Regional disparities remain a problem particularly where they are accompanied by and in part the cause of social exclusion. Whereas unemployment in the 25 worst affected regions averaged 28%, the least affected regions had unemployment rates of less than 5%. Structural problems are a major factor in long-term unemployment. A result of this is high unemployment scattered throughout some of the core regions. This is particularly evident in old industrial regions in Northern Europe such as Hainault in Belgium. However, poorer rural regions are also affected especially where there is still a high reliance on agriculture and a lack of diversification. In these cases unemployment itself is not always

high but the percentage of long-term unemployed and youth and female unemployment is high. While the level of unemployment in Greece is still relatively low there has been an increase in the growth rate of unemployment as it is in the early stages of restructuring its economy. On the other hand, Ireland, which has also experienced a decline in agricultural employment, has not experienced unemployment. Growth in other sectors, specifically manufacturing and services, has ensured that unemployment has decreased from 18% in 1987 to 10% in 1997.

The unemployment situation in each region and Member State is different and while it is possible to create broad typologies the unemployment rate in any given region will depend on the combination of factors in play at a particular time.

Map 3.1.2.5. Unemployment rate 1997



TYPOLOGY

Using a matrix taken from the classification of urban, intermediate and rural regions it is possible to create a preliminary typology of regions based on their economic strengths using the five classic indicators outlined above. Densely populated areas are defined as groups of contiguous municipalities, each with a population density of more than 500 inhabitants per square km and a total population for the area of more than 50,000.

Intermediate areas are defined as groups of municipalities, each with a population density of more than 100 inhabitants per square km, but not belonging to a densely populated area. The area's total population must be at least 50,000 or the area must be adjacent to a densely populated one. (A municipality or a contiguous group of municipalities with an area of less than 100 square km, not reaching the required density but fully contained in a

dense or intermediate area, is considered to be part of that area. If contained by a mixture of dense and intermediate areas, it is considered intermediate.
All the remaining areas are classified as sparsely populated.
Densely populated areas are referred to as urban and sparsely populated ones as rural.
Taking a small number of samples for each type of region figure 1 shows a broad typology.

Figure 3.1.2.1. Preliminary typology of economic strengths using the classic indicators

	High	Medium	Low
Urban	Wien, Hamburg, Ile de France, London	Limburg, Merseyside	Madrid, Attiki
Intermediate	Groningen, Uusimaa Stockholm, Lombardia, Piemonte	Hainault, Abruzzo Braunschweig	Dessau, Campania
Rural	Ahvenanmaa/Aland, Salzburg, Smaland Med Orna	Umbria,Aquitaine	Alentejo, Dytiki Makedonia, Mecklenburg-Vorpommern, Extremadura, Molise Galicia

In the highly developed urban regions those areas in the core come out most strongly. These regions have high GDP per employee, a relatively small share of employment in the agricultural sector and a high share of R&D employment as a percentage of total employment. On the output side they have a much higher than average GDP per head and low to average unemployment levels. Analysis at NUTS II level can hide enclaves of social deprivation in these regions where unemployment is very high and where long-term unemployment in particular is persistent.
At the other end of the scale there are poorly developed rural regions. These regions tend to be located in the south of Europe and in other peripheral regions. They have very low GDP per head and low productivity levels. In general the unemployment levels are high and the rate of unemployment seldom shows signs of declining and in some cases are increasing. These regions retain a high reliance on agriculture and have a very low percentage of the population working in R&D. The new German Lander tend to have low productivity but an above average rate of employment, with the largest share of employment in agriculture.
Regions such as Hainaut in Belgium lie between these two extremes. In many cases they are old industrial regions which are undergoing restructuring. GDP per head and output typically approach the EU average and may even be just above it but unemployment rates are above average and levels of long-term unemployment and youth unemployment are persistently high. The share of employment in R&D is also typically lower than in highly developed economic regions.

3.1.3 Conclusion

Within any region there are complex numbers of factors in action that will determine its overall economic strength. In particular it is possible that certain negative aspects of 'strong' regions will be lost in a typology and similarly, positive aspects of 'weaker' regions will also be overlooked. This is especially the case in the indicator for unemployment. Weaker economic regions will often display low unemployment rates, a situation aspired to by all regions, but it is not combined with high productivity or wealth. On the other hand, wealthy regions may also have relatively low (or occasionally high) unemployment rates but long-term unemployment can be a persistent problem. As an example, Madrid had increased its GDP/head by 1996 to just above the EU average but its unemployment rate had increased over the ten-year period 1987-97 from 16.3% to 18.4%. Furthermore, the long-term unemployment rate was 57.5% and youth unemployment was also high.

In general, the classic indicators show that a divergence remains between the lagging regions and strong regions. Nonetheless, there has been some convergence since the single market. In Objective 1 regions GDP per head has increased towards the Union average in almost every case. At the same time, the unemployment rate in these countries has tended to rise. This may be a short-term effect of structural readjustment, particularly as policy is focused towards increasing GDP rather than specific employment aims. It seems that the most immediate problems for the lagging regions are the unfavourable structure of their economy and their lack of innovation.

3.2. From globalisation to territorial rootedness (Luxembourg)

3.2.1. Concept/theory behind

The following overview aims to identify some of the processes associated with economic liberalisation. These processes give rise to various indicators of economic strength and the resulting trends that contribute to growth and innovation in some areas and peripheralisation in others.

One of the most significant trends of modern economics is that of *globalisation*. Malecki (1998:191) defines globalisation as the widening and deepening of the operations of firms to produce and sell goods and services in more markets. Brainard (1993) expands on this theme by suggesting that globalisation signifies functional integration of internationally dispersed activities. The nationality of a product becomes difficult to ascertain because it is the outcome of a complex set of links in a production chain across several countries.

Globalisation, therefore, has a significant impact on the economies of space. Knox and Agnew (1998:18) have pointed out that the shift in production and markets to a worldwide scenario has led, globally, to NICS (S. Korea, Hong Kong, Taiwan, Mexico, Brazil) but also to the polarisation of income and wealth. The United Nations Development Programme found that the differential between the wealthiest 20% of the world's countries and the poorest 20% increased from a factor of 30 in 1960 to a factor of 60 on 1990

(UNDP 1993). High technology has been the enabling factor allowing firms to locate and function on a global scale. Sachar and Oberg (1990) have identified three distinct spatial impacts of enabling technologies. The first is in core countries where high technology creates new jobs particularly in business and financial services but reduces the need for employment in manufacturing. It also creates new products, facilitates new production and distribution processes and new forms of corporate organisation. They identify the second spatial impact in semi-peripheral countries, where high technology brings an increase in manufacturing employment, increases in productivity and an overall improvement in competitiveness. The third spatial impact identified is in peripheral countries. Here there has been a relative decline in productivity and international competitiveness. New technologies are often too expensive to acquire and even when deployed their main effect is to displace jobs in labour-intensive sectors. This leads to an increase in the informal urban economy and a resultant pressure on the public sector to increase government sponsored jobs. In Ireland, Foley and Griffith (1992) have found that branch plants of TNCs exhibit 'good' manufacturing features, such as exports, high-technology sectors and high levels of worker skills, in contrast to local firms, which tend to be small, low technology and do minimal exporting.

The trend towards globalisation has ensured the consolidation of the core of the world system revolving around the triad of North America, East Asia and Western Europe. Malecki has identified (1998:273) the 'international rules of the game' to encompass not only product trade, but also trade in services, the creation and diffusion of technology, foreign direct investment (FDI) and strategic corporate alliances, all of which are becoming key determinants of international competitiveness. Contemporary firms seek good quality markets, skills and infrastructure. They need to be flexible in their methods of production, in their methods of work and in their inter-firm relationships. In general, flexible plants are likely to be affiliated with headquarters and R&D functions. Where this is the case closure and unemployment is less likely. The availability of skilled technical workers is a key determinant in the location of FDI.

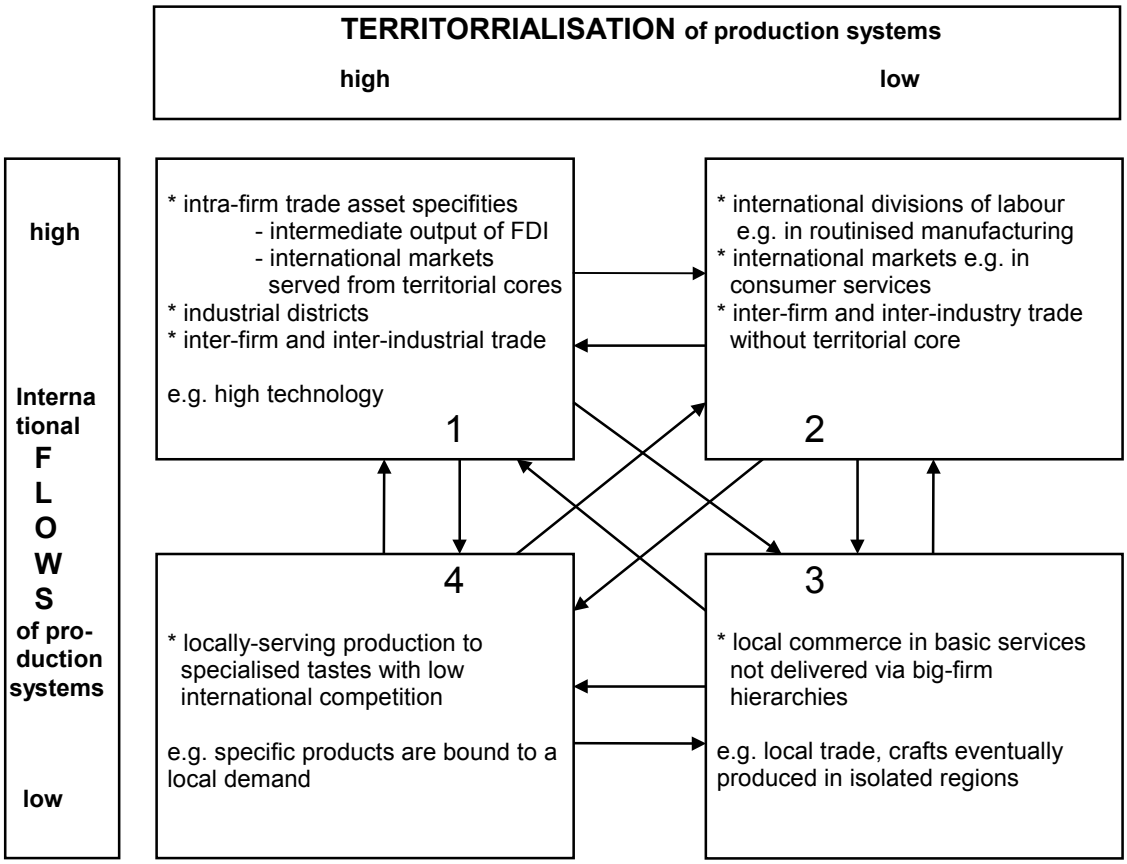
Depending on the type of FDI, regional development may be enhanced or stifled. Sweeney suggests (1985:97) that areas dominated by large firms tend to have low entrepreneurial activity because these firms have internalised their informational resources and networks. Branch plants tend to have their networks with the geographically distant parent company. Miller and Cote (1987) believe that the development of local linkages is the fundamental distinction between regions where development can be seen to have taken place and where it has not. Rural and non-metropolitan regions can compete provided that they encompass inter-firm interaction, specialisation and availability of finance and labour. The rate of new firm foundation is considered by Malecki to be an important indicator of a thriving economy. Others such as Storey (1993:78) argue that new firm foundation is not the most appropriate policy goal, rather the ability for businesses to grow and prosper may be more important. Storey

argues that the more significant long-term challenge to government is to generate competitiveness and increasing globalisation among small manufacturing enterprises.
Globalisation is also strongly connected with the openness of markets. This question has been discussed in the context of developing countries (Falvey/Gemmell 1999, Dollar 1992). Measures for openness are usually related to the differences in price levels and impediments for trade. There are also models employed that estimate the optimal trade for a country and calculate deviation from that value. The wide range of measures reasons in the observation that openness ranking is not strongly correlated (Falvey/Gemmell 1999:103). These approaches cannot be employed for regional analysis as exchange rates are fixed and trade impediments occur only on a very limited level. So the question arises as to how development can be measured at a regional level.

The EU aimed at raising the efficiency of economic activities by the introduction of the common market. The same is true for the activities of the World Trade Organisation, which sought the liberalisation of trade on a global scale. Liberalisation and increasing market efficiency encompasses the effect that regions that are equipped with competitive industries gain in the production sector whereas positive consumer effects occur everywhere. The economic strength of a region is likely to depend on the maintenance of a competitive position in the increasing globalisation of production and trade.
Having said that there is a question as to whether globalisation in general threatens the wealth of certain regions and/or nations. Trade theory reveals that trade raises wealth on both sides of the trading partners even when only comparative advantages exist. Export means to profit as a producer and import as a consumer. Locations all over the world display relative advantages for the production of goods and services. World trade is not a zero-sum game in that respect, (Krugman 1994) but there are differences in countries that give an indication about the quality and the persistence of comparative advantages. Storper (1995) set out a framework for the identification of these qualities - labelled as a research agenda rather than as a result.
He distinguished two dimensions in identifying different types of globalisation of economic activities. His starting point was the idea of two extreme states of economies described by the two dimensions (see Figure 3.2.1.1). *The territorialisation of production systems* describes the degree to which the production and consumption of goods and services are linked with regional specific resources and conditions that are singular to a certain region and not easy to reproduce in another region. The second dimension represents the *international flows of production systems* in terms of trade and also the flow of factors for production.
The pure flow substitution economy (case 2) is characterised by a very low territorial rootedness of production together with strong trade flows. The easy substitution of locations for production is possible. Locations are strongly competitive due to the high standardisation of products and technologies and locational factors. Multiple economies of scale are necessary. Strong intra regional interdependencies and specificities describe

the *pure territorial economy of interdependencies and specificities (case 4)*. Substitution of factors and trade partners is more or less impossible, demand and supply are inelastic and depend on scare resources only regionally and specifically available. In addition, case 1 represents the situation where the degree of territorialisation of economic activities is high, due to specific locational factors which are hard to substitute such as a complex social division of labour, specific local resources. Finally, case 3 considers a system of low territorialisation and low international flows not provided for by big firm hierarchies because of low economies of scale and potential high transportation costs.

Figure 3.2.1.1. Territorialisation and internationalisation of production systems



Source: Storper 1995, 280 with own adaptations

As long as competition in a globalised market takes place on comparative advantages that are rooted in the specific conditions in one place (case 1 and 4) there is not much danger that the population would feel threatened to be marginalised by strong competition. This definitely does no apply to case 2, where it starts to look coincidental that production takes place in one location rather than another.

This approach allows for the interpretation of moves actually taking place (Storper 1995: 281f). The bigger moves seem to take place towards case 2; from 3 to 2 by the incorporation of formerly locally produced goods into the national (post-war) and then into the European production system; from 4 to 2 where an internationalisation of middle class

tastes and therefore the structure of demand changes; from 1 to 2, what Storper calls "... the movement from 'internalisation' of production to its true 'globalisation' ..." (emphases also in the original) where "... the substitution of locations increases; and territorially-specific assets decrease dramatically in their importance to competitive production".[15]

Other moves are also visible in particular towards case 1 such as from case 4 where an internationalisation of territorially rooted production takes place (e.g. marketing of products all over the world) or case 3 to case 1, where standard but locally produced goods obtain territorial attributes. This can also happen to products with a high degree of standardisation and internationalisation by attaching territorially specific attributes to products (a move visible with the middle class: having participated with the standardisation of world consumption the search began for originality, the outstanding and incomparable) and/or using territorially rooted assets.[16]

The approach tries to address the question of globalisation by the identification of firm-related specificities in a region rather then looking at meso- or macroeconomic regional indicators. There the relation to the concept of competitiveness has to be considered which is described below in section 4. Links are also obvious with the question of modernisation looking at the endowment of regions with IT infrastructure and enterprises in the IT sector. But in total the concept of territorial rootedness stands on its own by concentrating on the question of how intricately linked the production is to the location where it is taking place. One may also interpret this as an element of competitiveness that adds an additional dimension to the whole concept.

3.2.2. Instead of conclusions: Resulting indicators, methodology and data restrictions

The outlined concept seems to broadly consider the fears of many political leaders and citizens although it does not provide a clear indication of economically strong regions and others. It depends largely on the type of region as to which kind of can be implemented (for example in a remote peripheral area local circulars of production and consumption have more potential for development than raising the export activities).

The question arises as to how to operationalise the two dimensions of "**territorialisation**" and "**international flows of production systems**" for further research. This has not been done yet. The dimension of the latter seems easier to start with:

The **International flows of production systems** comprise the following categories:

- Trade flows - sectoral composition of trade; ownership of traded commodities (foreign vs indigenous); destinations of exports, diversification of trade destinations over time; ratio of exports to imports; exports as percentage of total output by sector.

[15] Dunning 1992 cit. in Storper 1995, 282

[16] Storper (1995) refines his system with regard to where and which kind of trade takes place such as intra-firm trade or in an oligopoly (hierarchy) or within free markets are voluntarily built networks which may cement imbalances.

- Role of FDI - share of total investment in manufacturing and traded services; share of total employment and total output by region. Measure trend from early 1980s to late 1990s.
- Location of company headquarters - number of regional companies in Fortune 1000 list (or equivalent); location of headquarters of top 200 companies.
- IT indicators - ISDN lines, telephones, fax lines per 1000 population.

The second dimension of "**territorialisation**" is much harder to frame by indicators. It appears that some of the same indicators could be applied:

- territorialisation is apparent when mass standard products are produced which do not necessarily need to be produced in that particular region.
- The persistence (foundation and closure) of enterprise in non-IT branches (the IT branch also seems to flow constantly but should be interpreted as an innovative activity).
- The share of enterprises which located their headquarter in a particular region.
- Enterprise size in non-IT branches.
- Productivity/value added.
- Share of investments in relation to the output. Share of FDI of all investments.
- Regionally available natural resources.

The general methodology has been directed towards a kind of cross-tabling of the two dimensions but prior to this the correlation between the outlined indicators needs to be tested and a factor analysis could be helpful in identifying the main components of the approach. The combination of both dimensions could be achieved by using cluster analysis in order to "cut" typologies in an appropriate way.

The brief overview reveals that easily accessible databases do not provide enough data to produce worthwhile results. As table 3.2.2.1 clearly indicates the availability of data is a long way from being adequate. Therefore, the concept ought to be earmarked for further research and reference can only be made to other sources that tried to describe single indicators of the concept.

For example, the Sixth periodic report tried to address the question of FDI in the context of the investigation of competitiveness of the EU regions (European Commission 1999: 155) but also only on the national level. There it was pointed out that the cohesion countries benefited considerable from FDI but at different scales. "Relative to population, apart from Belgium/Luxembourg, the largest inflows were into Ireland, followed by Spain and Portugal, while inflows to Greece were substantially lower. The UK, which also had a level of GDP below the Union average, though by much less, was a recipient as well, while Finland, Germany and the Netherlands were the largest net exporters of capital", (European Commission 1999: 119). This short citation just points out the complexity of the problem. It is, indeed, an outflow of capital that marks strong regions, but it is also a strength to attract investments as an inflow of capital. The result is possibly a trade off between capital income and employment, but the capital income can similarly produce employment. Also, additional demands by new employment can initiate further

multiplicator effects. So the quality of investment into certain sectors is essential to assess the effects of the whole investment. Therefore, one has to address the wider picture but this was not possible within the given framework.

Table 3.2.2.1. Indicators on globalisation/territorialisation

	Territorial rootedness Indicator	Description	Data base/source
	"international flows of production systems"		
1.	Trade flows	sectoral composition of trade; ownership of traded commodities (foreign vs. indigenous); destinations of exports , diversification of trade destinations over time; exports/imports; exports/total output by sector	Eurostat regio: flow of goods
2.	Role of FDI	share of total investment in manufacturing and traded services; total employment and total output/region. Measure trend from early 1980s to late 1990s.	n.a. in Eurostat
3.	Location of Company Headquarters	number of regional companies in Fortune 1000 list (or equivalent); location of headquarters of top 200 companies	n.a. in Eurostat
4.	IT indicators	ISDN lines, telephones, fax lines per 1000 population	n.a. in Eurostat
	"territorialisation"		
1.	Persistence of enterprise in non-IT branches	Persistence of enterprise in non-IT branches	n.a. in Eurostat
2.	Share of enterprises with headquarter in particular region	Share of enterprises with headquarter in particular region	n.a. in Eurostat
3.	Enterprise size in non-IT branches	Enterprise size in non-IT branches	n.a. in Eurostat
4.	Productivity/value added	Productivity/value added	Eurostat
5.	Investment/Output - FDI/Investment	Investment/Output - FDI/Investment	n.a. in Eurostat
6.	Regional available natural resources	Regional available natural resources	n.a. in Eurostat

3.3. Modernisation and diversification (Ireland)

3.3.1. Concepts/theory behind

The theory behind using indicators of modernisation and diversification is one which seeks to assess the level of structural development of a region and the degree of diversification which it exhibits based on the region's inputs and outputs. To a large degree modernisation can be seen as a precursor to a region's ability to be competitive in the global environment. The spatial dimension inherent to economic development has been examined in a number of studies. In this study typologies and maps will be constructed from the indicators using factor analysis. It will then be possible to identify areas that range from low inputs/outputs to high inputs/outputs and regions for which a

factor has no particular significance. The identification of a region's level within the modernisation process will help with future policy direction over the long term.

Many studies have attempted to analyse the economic performance of regions, for example, Pompili (1994) constructed a taxonomy that highlighted the structural differences among EC Objective 1 Regions and evaluated the performance of these regions against other Community regions. Using indicators based on employment structure at industry macro-level, human capital endowment, entrepreneurship in manufacturing, access, peripherality and network infrastructure, and localised regional diseconomies, he found that structural variables come out as the determinants of development stages. In another study by Cambridge Econometrics (1998) for the EU Commission, the factors of growth in Europe over the 1980s were examined and indicators of competitiveness were arrived at. Some of their criteria are equally relevant to the concept of modernisation and diversification reflecting the inevitable overlap between the concepts.

The approach taken in this study has been to identify the indicators that are best considered as inputs and outputs to the modernisation process (see table 3.3.2.1), while at the same time being constrained by the availability of comparable data across the regions. Such indicators will include variables such as the labour supply, infrastructure, and the level of educational attainment of the population. On the output side the indicators used include the value added by sector, GDP per capita and the number of patent applications. This approach complements Malecki's (1998) view that economic development includes two related processes - structural change and productivity improvement. Similarly Flammang (1979:50) has described economic development as a 'process of structural change, implying something different if not something more'.

Structural change incorporates the large-scale sectoral shifts from agriculture to manufacturing to services and new niches. As a result the service sector, high technology and tourism are seen as potential foundations for regional economies. The service sector is a broad one, including financial services, advanced producer services (APS) and lower skilled work such as cleaning and security. The rise in APS is linked to the twin processes of externalisation by firms and technological change. Its activities include consulting and the provision of specialised guidance and advice to businesses which may not have the resources, time or expertise to provide these services in-house. Moulaert and Tödtling (1995) compared the inter-country evolution of APS employment in Europe. They used OECD labour force statistics (1992) which reaggregated APS with financial and insurance services.

Between 1970 and 1992 the share of APS and financial and insurance services in total employment in 10 EU countries almost doubled. While it is still a comparatively small proportion of all employment its importance lies in the effects on other firms and economic activities. APS plays an active role in innovation and firm formation, technical improvement, market expansion and competitiveness. The increased flexibility of firms

has led to a greater externalisation of functions through the use of consultants, specialists and sub-contractors.

The growth of R&D in private sector investment, in particular, is an indicator of the importance attached to product diversity. Development involves niche changing as well as niche filling. R&D contributes to product improvement, better processing methods, greater flexibility of production, improvements in product quality and service, lower costs and methods enabling a quicker response to changes in market demand. In the core countries most R&D is carried out by the private sector rather than the public sector. Even within the core countries there are 'islands of innovation' which tend to be relatively small and predominantly urban e.g. Greater London, Rotterdam/Amsterdam, Frankfurt, Turin. Less developed countries and regions are hampered in their R&D potential by the lack of innovativeness and openness to new ideas necessary for funding through venture capital. Public policy may support the provision of science and digital parks as a means of encouraging new firms through good infrastructure and networking potential. There is some debate as to their value where they have been artificially created as opposed to spontaneously developed. In the less well off regions it is sometimes possible to identify areas where there is a policy for high government spending on R&D in an effort to boost the region's economic base. However, this is often accompanied by low R&D expenditure by the private sector (e.g. Nisia Aigaiou, Kriti). When a regional technological infrastructure is developed its strength is largely dependent on competent governments and firms working together and supporting one another for the benefit of the region. Research has found that interaction does not necessarily take place even where there is geographic proximity. It is likely that a synergy is needed involving the presence of social structures of sociability and trust as well as an industrial structure conducive to firm interaction e.g. highly linked industries making flexibly changing products.

Paralleling the increase in R&D is the increase in demand for skilled workers. Regional offices, corporate headquarters and R&D facilities look to locate to areas where air and highway transportation facilities are good and where there is an availability of executive or professional talent (as opposed to labour). It has been argued that a region's ability to attract and retain educated people is as important as its ability to attract firms. There is an increased emphasis on the need for national economies to ensure that they have an abundance of technically skilled workers in order to increase the attractiveness of a region to FDI beyond branch plant location.

In general, economies in the larger regions are more diverse and produce a larger proportion of local needs than the smaller regions. It is important for all regions to have a broad range of sectors if they are to avoid economic fluctuations and uncertainties. The type of industries in a region is important to its economy. Amin and Thrift (1993) have found that diversity and adaptability in a region, derived from external links, are vital to ensuring new ideas, people and opportunities. Industrial diversity is also related to higher rates of new firm formation. High technology tends to be an innovative sector and because it employs highly educated skilled workers it has positive multiplier effects. As a

source of innovation it encourages entrepreneurialism and the establishment of new firms and industries. Although not directly employing large numbers of people it has the potential to create jobs. This can be seen in the growth of the leisure and health service industries that are meeting the demands of relatively high income earners with structured working hours.

As part of the process of modernisation, diversification within the economy is vital if regions are to thrive and develop. However, regions are often diversifying in different directions, largely dependent on whether they are in the core or the periphery of the world economy. Those in the core are most likely to have high technology industries and services as well as tourism and therefore they have a wide base and a greater resistance to economic fluctuations. Areas in the periphery and the semi-periphery will be more susceptible to economic uncertainties, particularly if they base most of their economic development on the tourist trade and associated services, much of which is highly dependent on the larger global economy.

3.3.2. Resulting indicators and data availability

In this study a relatively small number of key indicators have been used to provide a methodology for considering both the inputs and outputs in a region. The indicators for the inputs are based on the sectoral structure of the regions, education, R&D and infrastructure. Ideally it should have been possible to use very specific indicators for the sectoral structure such as the number employed in Advanced Producer Services or tourism revenue per capita. This would have helped to develop the typology. However, because of the limitations of the database on a regional level, some compromises have had to be made. The broader sectoral indicators used were the employment in agriculture and in services as a percentage of the total employment. As an indicator for advanced education it would have been useful to measure the number of PhDs per thousand inhabitants possibly alongside the number of students in higher level education. The latter would have had the advantage of indicating future human endowment and potential while the former would have indicated the existing number of very highly skilled workers. Instead, because it provided better comparable data and was still useful, the variable employed was the percentage of all 25-59 year olds who had achieved a higher educational (i.e. third level) qualification.

Two main indicators measure the inputs from R&D. The percentage of the active population employed in R&D in the business enterprise sector is used to capture the level of R&D in the private sector. The importance attached to product diversity is further measured by the expenditure on R&D by both government and private sectors as a percentage of total expenditure. The number of kilometres of motorway and rail (total) per square kilometre is used to measure the level of physical infrastructure.

The outputs indicate the performance of the region in terms of modernising by measuring a number of factors. These include the sectoral productivity using the indicators of GVA at

factor cost for market services as a % of the total and GVA at factor cost for agriculture as a % of the total. It should be noted that this study is primarily concerned with those regions at the extreme ends of the modernisation and diversification process.

Table 3.3.2.1.: Indicators of modernisation and diversification

Indicators	
Inputs	**Outputs**
Existing sectoral structure • Employment in agriculture as a % of total (agemp) 1997 • Employment in services as a % of total (servemp) 1997	**Sectoral productivity** • GVA at factor cost for agriculture as a % of total (gvaagfc) 1994 • GVA at factor cost for market services as a % of total (gvamsfc) 1994
Education • Percentage of all 25-59 year olds with higher educational (third level) attainment. (highed) 1997	**Employment** • Long-term unemployment as a % of the working population (unemp) 1997 • % of the female working population in relation to the total female population (empfem) 1997 • % of the working population in relation to the total population. (emptot). 1997
Research and Development (R&D) • % of active population employed in R&D in business enterprise sector (rdemp) 1995[a] • expenditure by government on R&D as a % of total (rdgov) 1995[b] • expenditure by private sector on R&D as a % of total (rdpriv) 1995[b]	**Research and Development** • Number of patents per 100,000 inhabitants (pattot) 1997
Infrastructure • Persons per kilometre of motorway (road) 1996 • Persons per kilometre of railway lines (rail) 1996	**Standard of living** • Number of cars per 1000 inhabitants (cars) 1994 **GDP** • Measured in power purchasing standard (PPS) per capita/head (ppscap) 1997

[a] Austria – R&D employment figures are for 1993, active population is 1995
[b] for Spain, France, Italy, Netherlands data is from 1994. For Denmark, Greece, Germany and Austria data is from 1993.

This is reflected in the inputs and outputs which deal with what are considered as the poles of modernisation/diversification, that is, a high level of R&D and market services on the one hand, and on the other a high reliance on a single sector, typically agriculture (see table 3.3.2.2). As a result, in this study those regions with a strong base in the manufacturing and non-market services sector will not always emerge as highly as their GDP suggests they should. Such regions include regions of North Italy and the South East of England among others.

The output indicator of employment has a number of purposes. High long-term unemployment is most commonly associated with urban regions where there can be social polarisation within the region itself. Measuring GDP per capita would not, by itself, be able to pick this up. High long-term unemployment is also indicative of structural problems and may be experienced in regions undergoing the early stages of sectoral change. Female unemployment is most prevalent in the sparsely populated (rural) regions but similar figures can be found in some urban regions. High female employment is associated with a modernised and diversified economy particularly where service

employment features strongly. Employment as a percentage of the labour force and female employment are both strongest in the intermediate regions i.e. between the densely and sparsely populated regions.

In this study the output in R&D is measured using the number of patents granted per 100,000 inhabitants. The alternative, patent *applications* per 1 million inhabitants was preferable in that it would have given an indication of the level of innovation and R&D activity in a region whether the patent was granted or not. However, the former indicator was used because data was available for a greater number of regions. For both of the patent measurements there is a shortcoming in that the patent is assigned to the inventor's place of residence and particularly in the case of large companies this may vary from the actual place of invention.

GDP per capita is an acknowledged indicator of a regions economic wealth. One of its weaknesses lies in its inability to identify enclaves of social deprivation within regions of high GDP unless analysis is carried out at, for instance, a NUTS 5 level where data considerations make it very difficult. Further considerations, which need to be taken into account, have already been discussed in the section on classical indicators particularly with regard to productivity and employment, and the lack of inclusive environmental accounting.

Another indicator of the standard of living is the number of private cars per 1000 inhabitants. This indicator is used as an output measure of consumption in the expectation that a good infrastructural base combined with high GDP would encourage a greater number of cars per inhabitant.

Further indicators that would have been useful but which were not available because of data difficulties include a measurement of models of governance which would give some indication of the level of centrality of government and also the linkages between government and private investment. As a further measure of innovation the rate of new firm formation would have been useful in assessing the level of innovative culture and activity in a region.

For some of the indicators data was available for 1997 but such recent data did not exist for all of the indicators (see table 3.3.2.1). This problem was more evident for the NUTS II and III regions than for the higher level regions. With the more complex indicators there was sometimes the disadvantage of having to combine datasets from different years in an effort to utilise the most comprehensive information available from the Regio database.

3.3.3. Methodology and interpretation

Based on the concepts for modernisation and diversification a broad typology has been set out in table 3.3.3.1. below.

Table 3.3.3.1.: General typology of the factors of modernisation and diversification

Factors of modernisation	Factors of diversifi-cation	High	Low
Sectoral shifts		Advanced technologies and producer/financial services. Evidence of quaternary service growth.	Single sector economic base. Dependence on low technological sector, manual work.
Education		High percentage of graduates in the labour force. Availability of technical education institutions	Little further education in the labour force. Poor educational infrastructure. High percentage of early school leavers.
Infrastructure		Science/digital parks. Inter-firm networks. Advanced telecommunications networks. Technopoles. Good road/rail and air networks.	Poor IT infrastructure and networking facilities. Underdeveloped transport networks.
Models of Governance		Mixture of bottom-up and top-down approaches through partnerships with business and regional institutions. Increased authority vested in local and regional government.	Dominance of central government through a top-down approach. Little regional/local autonomy.
Innovative Systems		Availability of venture capital. Indigenous private sector investment in R&D complementary to State/Institutional support. Evidence of firms co-operating with higher educational institutions. Active role by entrepreneurs.	Very little, if any, venture capital investment. Low private sector investment in R&D. Lack of linkages between firms and educational institutions. Dearth of entrepreneural activity.
Adaptability		Diversification within and between economic sectors. Rural diversification New tourism products. High rate of new firm foundation.	Reliance on a single industry/branch plant. Agriculture as the main or only economic base. Low rate of new firm foundation.

Typologies of the individual factor values based on data for the NUTS1 regions includes a spatial classification that follows the Eurostat classification of areas as follows:

- Densely populated areas are defined as groups of contiguous municipalities, each with a population density of more than 500 inhabitants per square km and a total population for the area of more than 50,000.

- Intermediate areas are defined as groups of municipalities, each with a population density of more than 100 inhabitants per square km, but not belonging to a densely populated area. The area's total population must be at least 50,000 or the area must be adjacent to a densely populated one. (A municipality or a contiguous group of municipalities with an area of less than 100 square km, not reaching the required density but fully contained in a dense or intermediate area, is considered to be part of that area. If contained by a mixture of dense and intermediate areas, it is considered intermediate.

- All the remaining areas are classified as sparsely populated.
- Densely populated areas are referred to as urban and sparsely populated ones as rural.

The data used in this analysis was extracted from the Eurostat Regio database, June 1999. As already noted the most recent data available for the indicators varied from year to year and between Member States. The resultant data for the sixteen indicators was compiled manually and transferred to SPSS for factor analysis.

Analysis was initially carried out at NUTS II level but given the gaps in the dataset for certain regions and indicators the outcome was not satisfactory. As a result it was decided to reduce the data to NUTS I level where, with the exception of the new German Länder, no missing values had to be inserted. The analysis was conducted using principal component analysis with orthogonal varimax rotation. Using eigenvalues over 1 it was possible to extract five factors which represented 83% of the total variance (table 3.3.3.2). The factor scores were then examined manually and typologies were built for the individual factor values based on the above spatial classification. The factors were also mapped thematically based on the regional values for each factor.

Table 3.3.3.2.: Total variance explained

	Initial Eigenvalues			*Rotation Sums of Squared Loadings*		
Component	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	6.270	**39.186**	39.186	3.613	**22.579**	22.579
2	3.171	**19.818**	59.004	2.904	**18.152**	40.731
3	1.522	**9.513**	68.517	2.694	**16.839**	57.570
4	1.191	**7.442**	75.959	2.537	**15.856**	73.426
5	1.140	**7.126**	83.085	1.545	**9.658**	83.085
6	0.825	5.154	88.234			
7	0.463	2.892	91.130			
8	0.330	2.061	93.192			
9	0.268	1.673	94.864			
10	0.217	1.358	96.222			
11	0.180	1.118	97.340			
12	0.162	1.010	98.350			
13	0.143	0.892	99.242			
14	0.075	0.470	99.712			
15	0.029	0.180	99.891			
16	0.017	0.110	100			

Extraction Method: Principal Component Analysis.

As a further step, the regions were clustered based on the factor analysis values. A number of clusters were examined using different methods and cluster numbers. In terms of providing a relatively even distribution of the regions and interpreting the results, the Ward method of clustering using eight clusters was selected as the most useful. A dendrograph of the regions based on their factor values further helped to clarify the relationship between the regions.

Factor analysis

Using factor analysis five themes were identified from the indicators on modernisation (table 3.3.3.3). These are examined in the following paragraphs.

Table 3.3.3.3.: Rotated component matrix

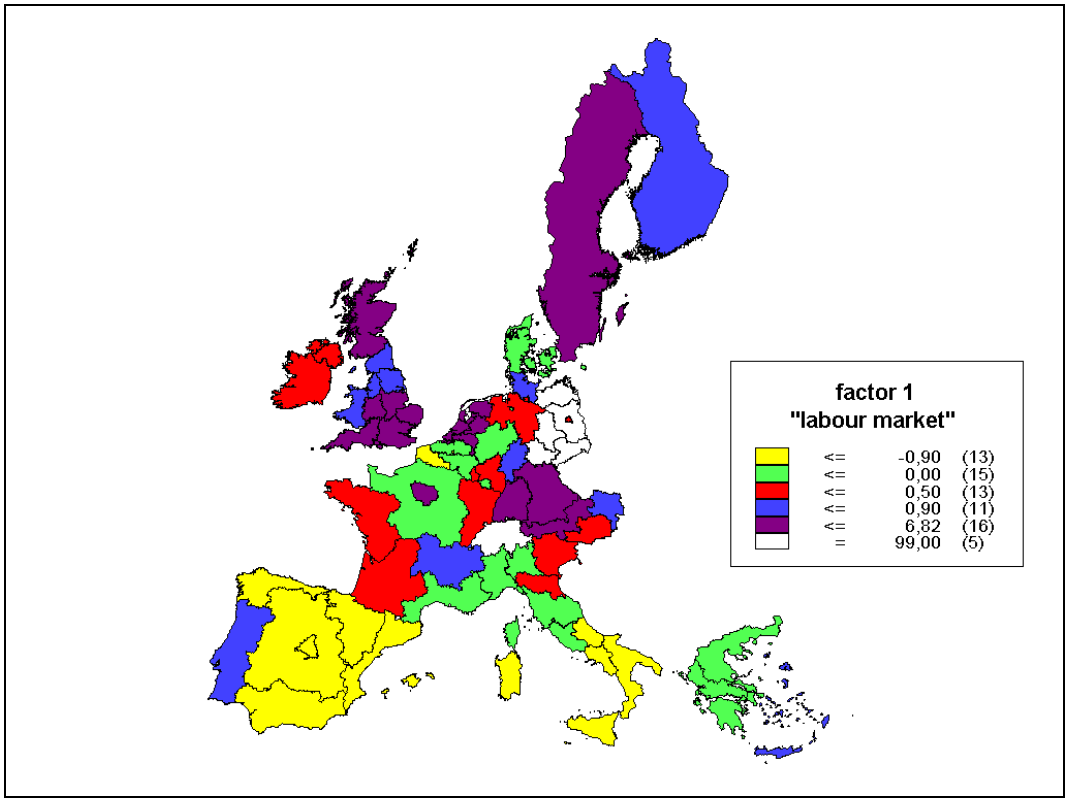
Indicators	Component				
	1	2	3	4	5
Inputs	Labour market	Sectoral Structure	Physical Infra-structure	Inno-vation	Living Stand-ard
employment in agriculture as a % of total employment (agemp)		**-0.629**		-0.504	-0.412
employment in market services as as a % of total employment (servemp)		**0.901**			
higher educational attainment of 25-59 year olds (highed)	0.378	**0.608**			-0.385
% of active population employed in business enterprise sector (rdemp)	0.493		0.499	0.464	
expenditure by gov. on R&D as a percentage of total expenditure (rdgov)				**-0.920**	
expenditure by private sector on R&D as a % of total expenditure (rdpriv)	0.431			**0.757**	
km motorway per sq. km (road)			**0.799**		
km rail per sq. km (rail)			**0.820**		
Outputs					
patents per 100,000 inhabs.(pattot)	0.480		0.412	0.446	
GDP measured in PPS per capita (ppscap)	0.358		**0.758**		0.353
GVA at factor cost for market services as % of total value added (gvamsfc)		**0.785**	0.372		
GVA at factor cost for agriculture as % of total value added (gvaagfc)		**-0.623**		-0.466	-0.487
long-term unemployment as % of the working pop (unemp)	**-0.914**				
% of female working population in relation to total female pop (empfem)	**0.907**				
% of the working pop in relation in relation to the total population (emptot)	**0.944**				
Cars per 1000 inhabitants (cars)					**0.892**

Only correlations with values > +/- 3.0 are inserted. Correlations > +/- 6.0 are in bold. Eigenvalues > 1.

Factor 1 - labour market adjustment under modernisation

This first factor accounted for 22.5% per cent of the rotated total variance (table 3.3.3.2).Table 3.3.3.3 demonstrates the significance of the labour market variables for this factor. They are represented as the output indicators of long-term unemployment, female employment relative to the total female population and working population in relation to the total population. Where long-term unemployment is low the latter two indicators are high. There is some correlation with high GDP and the number of patents granted but these indicators are more significant in other factors. On the input side both the expenditure by the business enterprise sector and the percentage of the active population employed in R&D correlates positively with the employment indicators.

Map 3.3.3.1.: Factor 1 - labour market adjustment under modernisation



The mapping of the factor scores for employment illustrates the poor labour market conditions in most of Spain and Southern Italy. In contrast, Portugal (treated here as one region) and many regions of Greece emerge as having good employment statistics in spite of the poor inputs for education, GDP per capita and the number of patents granted. This confirms the weak relationship in some regions, already identified in the classic indicators, between employment and GDP/employee (productivity). The Greek regions are interesting in that there is diversity in their distribution. Athens, with a higher GDP and better sectoral mix than its surrounding regions, scores the lowest and Nisia Aigaiou, Kriti the highest. This contrasts strongly with factor 2 (sectoral structure) and is an indication that Greece is still in the early stages of development and can expect widening intra-regional disparities in the short to medium term in both its employment rates and in sectoral structure.

This factor also identifies certain Objective 2 status regions that continue to have problems with unemployment due to an over reliance on declining industries. For instance, in Germany the regions of Saarland and Bremen do not score well in this factor, emphasising the importance of attaining better employment rates if modernisation is to be facilitated. This will involve the targeting of an improved skills base among the young and active population. In contrast, Hessen and Schleswig-Holstein have emerged as having positive employment figures suggesting that policy needs to focus more on other factors of modernisaton within these areas. In France, Nord-Pas-de-Calais and the Mediterranean regions show high unemployment levels while the scores for the Paris

Basin suggest that employment is not the most significant factor in the process of modernisation within that region.

Table 3.3.3.4.: Spatial classification of factor 1, labour market

Density	Extreme high + ve	High	Not significant	Low	Extreme Low - ve
Urban	South East	Hamburg, Hessen, Ile de France	Berlin, Nordrhein-Westfalen, Rheinland, North West (uk)	Brussels, Bremen, Athens, Madrid	
Intermediate	Baden-Württemberg Bayern	Schleswig-Holstein, Luxembourg, Netherlands, Ostösterreich, Portugal, Stockholm, Yorkshire, West Midlands	Vlaams Gewest Niedersachsen Est (fr), Lombardy, Nord Est (it), Emilia-Romagna, North (UK), Wales, N. Ireland	Region-Wallonne Saarland, Mediterranean, Nord Ovest (it), Centro (it), Lazio, Abruzzo-, Molise, Este (es) Nord-Pas-de-Calais	Campania Sud (it) Sicily
Rural	Ostra – Mellansverige Mellersta-Norrland	Ahvenanmaa-Aland, Nisia Aigaioiu, Kriti, Centre-Est (fr), Westosterreich, Manner-Suomi, Sydsverige, Norra Mellans-Verige, Scotland	Voreia Ellada Kentriki Ellada Paris Basin Ouest (fr) Sud-Ouest (fr) Ireland Sudosterreich	Noreste (es)	Noroeste (es) Centro (es) Sur (es) Sardinia

This factor illustrates the fact that labour market data alone cannot be used as a measure of economic performance within a region. There are some regions that have a high level of employment but very low or moderate GDP per capita and a poor structural base. Equally there are regions, the most striking of which is Region Bruxelles, where GDP per capita is very high but where the employment figures are poor particularly in comparison to other urban regions outside Objective 2 status.

Factor 2 – Sectoral structure

This factor is represents 18% of the total variance in the dataset. There is a high correlation between the inputs of employment in market services[17] and educational attainment and outputs measured by gross value added in market services. These are negatively correlated to employment in agriculture and the output of gross value added in agriculture.

A very strong pattern emerges with capital cities and regions displaying high scores. The only non-capital region to show such high levels of employment and gross value added in market services is the Mediterranean region of France. This reflects the high density of SMEs located in this region. Unlike in the northern member states these are not generally

[17] Market Services are as defined in Nace-Clio, branch R6 (B68) "Recovery, repair, trade, lodging, and catering services. Transport and communication services. Services of credit and insurance institutions. Other market services".

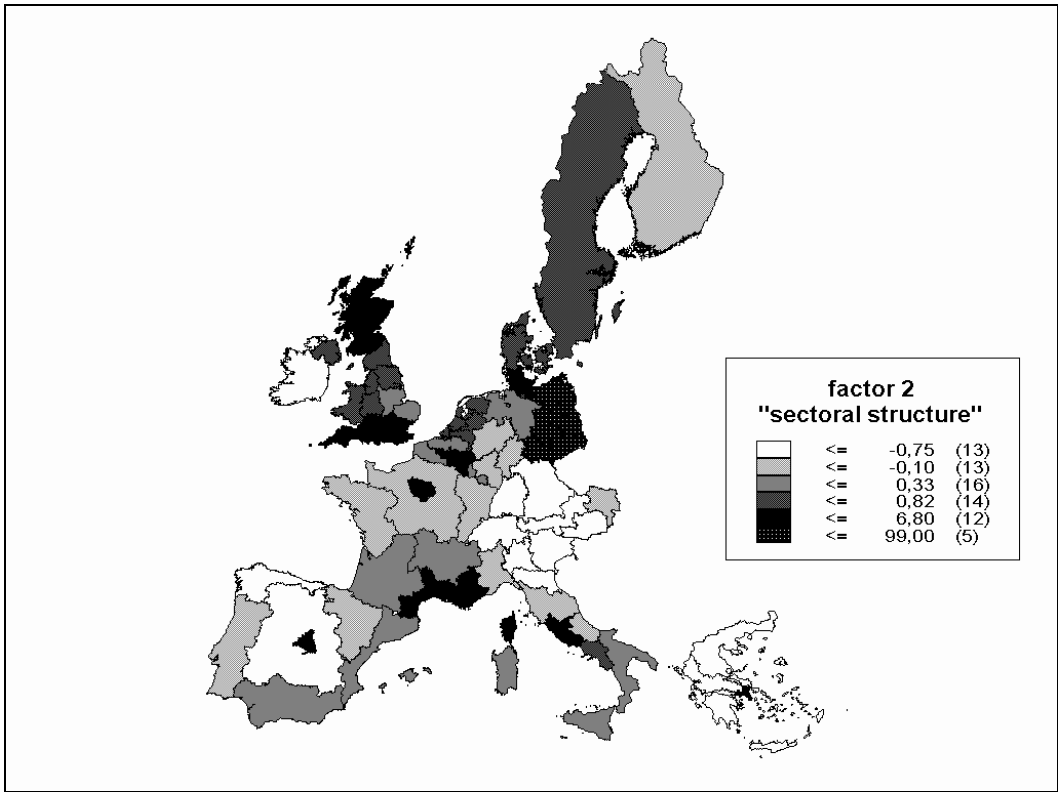
concentrated in the more dynamic sectors of the economy and tend to be small family businesses with few employees. As a result the potential for job creation and growth is limited and this is borne out by the poor employment profile of the Mediterranean region outlined in factor 1. The main difference between it and other regions of Southern Europe with a high density of SMEs, is the very high number of people employed in services and the relatively fewer inhabitants employed in agriculture. The Mediterranean has also got a higher educational attainment than, for instance, the regions of Southern Italy, and the rural regions of Greece and Portugal.

Table 3.3.3.5.: Factor 2 – Spatial classification of sectoral structure correlated with educational attainment

Density	Extreme high +ve values	High values	Not significant	Low values	Extreme low -ve values
Urban	Brussels Berlin Athens Madrid Ile de France South East (uk)	Hamburg South East		Bremen Nordrhein-Westfalen Rheinland-Pfalz Hessen	
Intermediate	Stockholm Lazio Mediterranean	Region Walloon Denmark Schleswig-Holstein Yorkshire South West (uk) Northern Ireland	Vlaams Gewest Campania Sud (it) Sicily Luxembourg Netherlands North (uk) East Midlands East Anglia West Midlands North West Wales	Baden-Würrtemberg Bayern Niedersachsen Saarland Este (es) Nord-Pas-de-Calais, Est (fr) Nord Ovest (it) Centro (it) Abruzzo-Molise Ostosterreich Portugal	Lombardy Nord Est (it) Emilia Romagna
Rural		Ovre Norrland	Sur (es) Sud-Ouest (fr) Sardinia Ostra Mellansverige Sydsverige Mellersta Norrland	Noroeste (es) Noreste (es) Centro (es) Ouest (fr) Centre-Est (fr) Ireland Norra Mellansverige Manner Suomi Ahvenanmaa/Aland	Voreia Ellada Kentriki Ellada Nisia Aigaiou, Kriti Sudosterreich Westosterreich

In contrast the regions of Northern Italy including Lombardia and the North East have emerged as weak in the market services sector and also in the percentage of 25-59 year olds with third level education. In this latter indicator they have some of the lowest attainment levels in the EU, with only the other regions of Italy and two regions of Austria displaying less education at third level. However, GDP per capita for Lombardia, the North East of Italy, and Emilia Romagna is above the EU average reflecting the strong manufacturing and industrial tradition of these regions which is not picked up in this factor.

Map 3.3.3.2.: Factor 2 - Sectoral structure



Within the core of Northern Europe there is a number of declining industrial regions that are continuing to experience structural problems. In particular, there are a number of urban and intermediate regions in Germany and France. This factor has illustrated not only a general core-periphery dichotomy in sectoral structure based largely on urban-rural disparities but also an urban divide within the core region.

Factor 3 – Infrastructure and GDP

This factor accounts for almost 17% of the total variance. On the input side it examines the physical infrastructure measured by the length of motorway and rail. High levels of infrastructure are strongly correlated with high levels of GDP (see appendix 4).

A strong urban/intermediate-rural/intermediate divide is evident. Core urban regions of Northern Europe are grouped in the high values with no rural regions represented on the left-hand side of the classification in table 3.3.3.6. In contrast, the rural regions are highly represented within the lower levels reflecting their low level of physical infrastructure and, in most cases, a lower than average GDP.

This factor has presented some results that do not, at first glance, appear to fit the expected pattern for measurements of infrastructure. For instance, the scores of some of the Greek regions are considered insignificant and are not dissimilar to those for the South East of England and the Netherlands. However, when the other factors of modernisation are taken into account the results are not so unexpected. Sectoral structure and innovation are far more significant determinants of modernisation for these

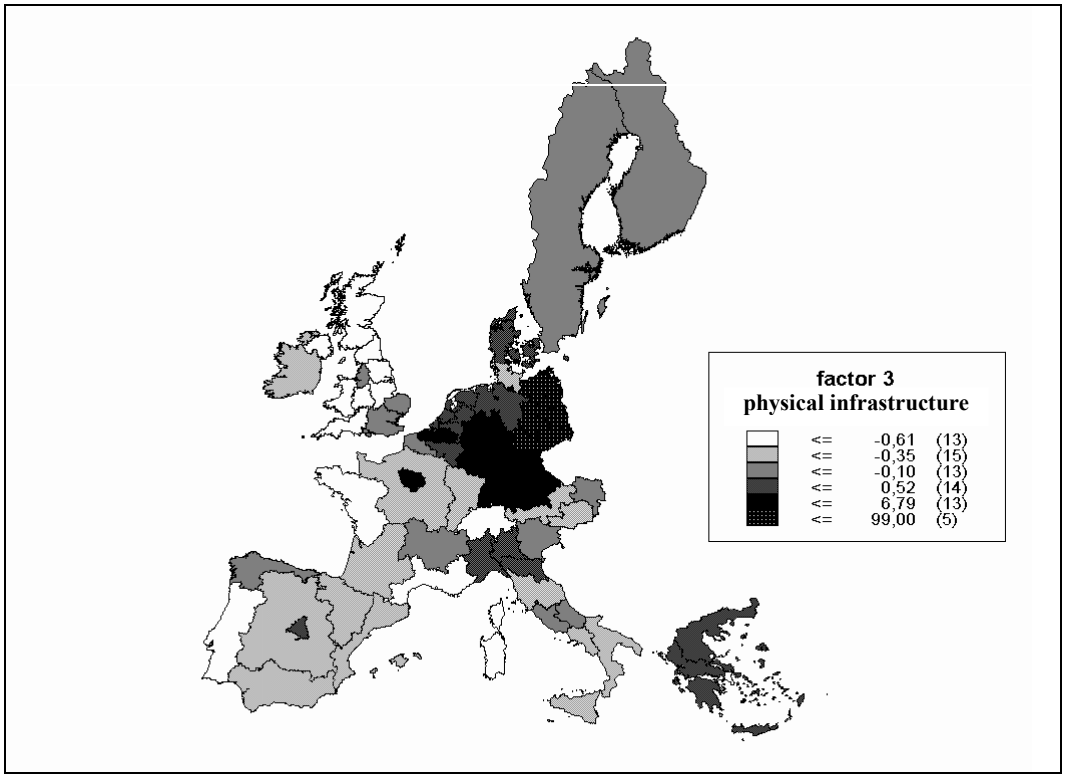
peripheral Greek regions than physical infrastructure. On the other hand, Athens has a broader sectoral base but its poor physical infrastructure, low level of innovation and negative employment figures suggest that there are several problems associated with modernisation.

Table 3.3.3.6.: Factor 3 – Physical infrastructure

Density	Extreme high +ve values	High values	Not Significant	Low values	Extreme low -ve values
Urban	Brussels Bremen Hamburg	Berlin, Hessen Ile de France Nordrhein-Westfalen Rheinland-Pfalz	Lazio South East Madrid	Athens	
Intermediate		Baden-Wurtemberg Saarland Luxembourg Vlaams Gewest Bayern Nord Ovest (it) Stockholm	Region Wallone Schleswig-Holstein, Nord-Pas-de-Calais, Niedersachsen Est (fr), Lombardy, Nord Est (it), Centro (it) Abruzzo-Molise, Emilia Romagna, Netherlands, Ostosterreich, Denmark, East Anglia, North West (uk)	Este (es) West Midlands South West (uk) Yorkshire East Midlands Mediterranean Sud (it) Sicily (it) Campania Portugal	North (uk) Wales Northern Ireland
Rural			Sudosterreich Westosterreich Ahvenanmaa/Aland Kentriki Ellada Nisia Aigaiou, Kriti Voreia Ellada Centre-Est (fr)	Noreste (es) Noroeste (es) Centro (es) Sur (es) Paris Basin Sud Ouest (fr) Ouest (fr) Norra, Mellansverige, Ostra, Mellansverige, Manner-Soumi Sydsverige, Ireland, Sardinia	Mellersta Norrland Ovre Norrland Scotland

To some extent this factor demonstrates the difficulties, from a policy viewpoint, in treating any single factor of modernisation in isolation. Physical infrastructure is strongly correlated with GDP and is also positively correlated with gross value added in the market services sector. It would be difficult to perceive any region, which is weak in infrastructural endowment, attracting the inward investment necessary for diversification. While the factors are useful in distinguishing areas within the process of modernisation where regions are particularly weak or strong, they cannot be treated individually as the basis for a narrowly focused orientation of policy.

Map 3.3.3.3.: Factor 3 - Physical infrastructure



Map 3.3.3.3 illustrates the broad centre-periphery divide that exists for this factor. In particular, regions along the Atlantic Arc, the Baltic regions and most of the Mediterranean regions have been identified as needing improvements to their physical infrastructure as a means of encouraging other factors of modernisation.

Factor 4 – Innovation

The performance of efforts to diversify the product base of regions is reflected in the fourth factor of innovation, which accounts for 15.8% of the total variance. It deals primarily with the inputs and outputs associated with investment in R&D. More specifically it is concerned with the indicators of low government investment in R&D and high business sector investment. This is further correlated on the input side to employment in the R&D sector and on the output side to patent grants (see appendix 4). A pattern emerges of regions with a high level of government expenditure on R&D displaying a narrow sectoral base with a high level of employment in agriculture. There are exceptions to this in some urban and intermediate regions.

This is not unexpected as, to a large degree, this factor is related to national government policies on R&D expenditure. The regions that are identified in the lower end of the factor scores are mostly peripheral and have Objective 1 or 6 status e.g. large areas of Spain, Portugal, Greece, S. Italy, and Finland. Their high level of government expenditure is associated with specific strategic policies. These are designed to increase the capacity of the regions to take advantage of scientific and technological developments necessary to improve their structural base. They are often assisted in this through the Structural Funds

which seek to promote regional capabilities by funding measures aimed at maximising human resources and increasing the rate of innovation and technology up-take by firms.

Table 3.3.3.7.: Spatial classification of factor 4, Innovation

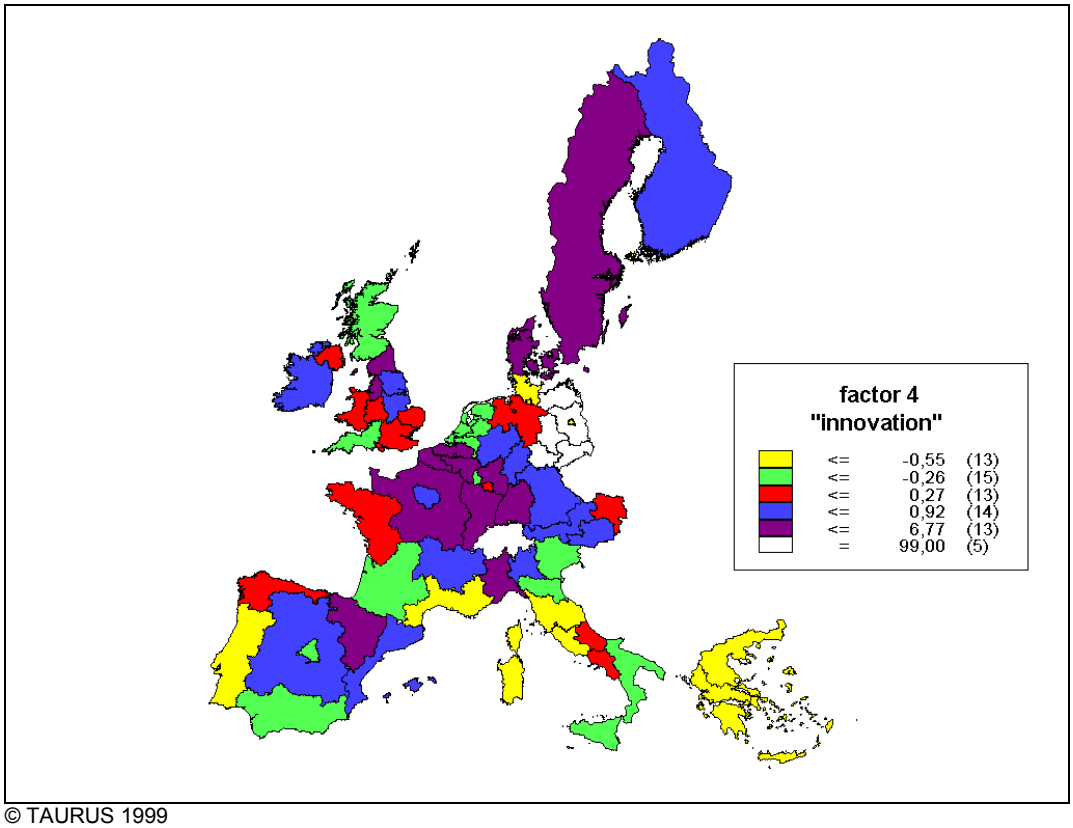
Density	Extreme High +ve values	High values	Not significant values	Low values	Extreme low -ve values
Urban		Hessen Rheinland-Pfalz North West (uk)	South East (uk) Bremen Nordrhein-Westfalen Ile de France	Brussels Berlin Hamburg Athens Madrid	Lazio
Intermediate	Stockholm Baden-Wurtemberg	Vlaams Gewest Region Wallonne Denmark Bayern Nord-Pas-de-Calais Est (fr) Nord Ovest (it) Lombardy North (uk) East Midlands Este (es)	Yorkshire East Anglia West Midlands Niedersachsen Northern Ireland Wales Abruzzo-Molise Campania Ostosterreich Luxembourg, Netherlands, Sicily	South West (uk) Schleswig-Holstein Saarland Westosterreich Mediterranean Nord-Est (it) Emilia Romagna Centro (it) Sud (it)	Portugal
Rural	Noreste (es)	Paris Basin Centre-est (fr) Ostra-Mellansverige Sydsverige Ireland	Noroeste (es) Centro (es) Ouest (fr) Sudosterreich Manner-Suomi Nora-Mellansverige Mellersta-Norrland Ovre Norrland	Scotland Voreia Ellada Kentriki Ellada Sur (es) Sud-Ouest (fr) Sardinia Westosterreich South West (uk)	Nisia Aigaiou, Kriti,Ahvenanmaa/Aland

Alongside the more peripheral capital regions in the low scores are the core urban regions of Berlin, Brussels and Hamburg. In Berlin government expenditure on R&D is almost as high as private expenditure and this must be interpreted in the context of its recent political history. In contrast, while Hamburg has high government expenditure on R&D, it has over twice as much expenditure attributable to the private sector. Brussels shows an unusual mix within the urban core. It has a profile of government spending which is not high relative to other core regions but unlike the other regions government spending is not complemented by high private investment in R&D. With the exception of the German Länder the only surrounding Member State regions with lower private expenditure are Berlin, Saarland and Schleswig-Holstein (Objective 2 regions). Athens has a very high government expenditure on R&D (31.3% of the total) which is only just exceeded by private spending (32.6% of total). Madrid has similar government expenditure but higher private expenditure on R&D at 52% of the total. The region of Lazio, which includes Rome, is unique among urban regions at NUTS I level in having higher government expenditure on R&D (52.2%) than private expenditure (30%).

Differentiation in government expenditure on R&D can be broadly explained by two diverse policies. On the one hand, policy designed to aid peripheral regions through large

transfers of public funds and, on the other hand, a situation where government expenditure on R&D is based on hard research in strong regions with good infrastructure and a solid economic base.

Map 3.3.3.4.: Factor 4 - Innovation



The Noreste region of Spain displayed a very high score in this factor emphasising the importance attached to R&D in the modernisation of this region. The region is associated with a high level of industry and includes the NUTS II regions of Pais Vasco, Navarro, Rioja and Aragon. Pais Vasco, in particular, has been the target of a number of framework programmes, through its Objective 2 status, that have sought to strengthen the innovative capacity of institutions and businesses in this region. Further research is required to establish why this region appears to have performed better than others under similar circumstances. The Este region of Spain has also performed well in this factor in contrast to the preceding three factors where it is to be found in the lower end of the distribution of the values alongside the Noreste region. Ireland, which did not score well in physical infrastructure or sectoral structure measured by employment in market services, has also scored well in this factor. In the case of Ireland the treatment of it as one region hides the intra-regional differentiation that exists for all factors, most specifically between the Eastern region and the rest of the country.

Factor 5 – Living standards (car ownership)

This fifth factor has identified regions where the level of car ownership is high. The indicator was used as a guide to living standards but obviously it could be argued that very

high living standards would negate the need for cars especially when considering environmental concerns. There was a small positive correlation with GDP and car ownership and a small negative correlation with the inputs and outputs of agriculture and also with higher educational attainment.

Table 3.3.3.8 reveals an interesting spatial pattern that appears to be highly influenced by national attitudes towards car ownership and culture. For instance, with the exception of Luxembourg, all of the regions that have scored extremely high are intermediate regions in Italy. However, given this strong car culture, a north-south divide in Italy is evident between the high and extremely high values. As a result no Italian regions are represented in the lower end of the distribution of the factor scores. This is the only factor in which, for instance, Sicily and Sardinia appear in the high scoring regions.

A further trend is evident in the high value scores where, with the exception of Italy, the urban and intermediate regions are all in Germany. Furthermore, they are generally in old industrial regions parts of which come under Objective 2 status and which have a GDP just at or above the EU average. Only Hessen and Baden-Wurttemberg have much higher than average GDP.

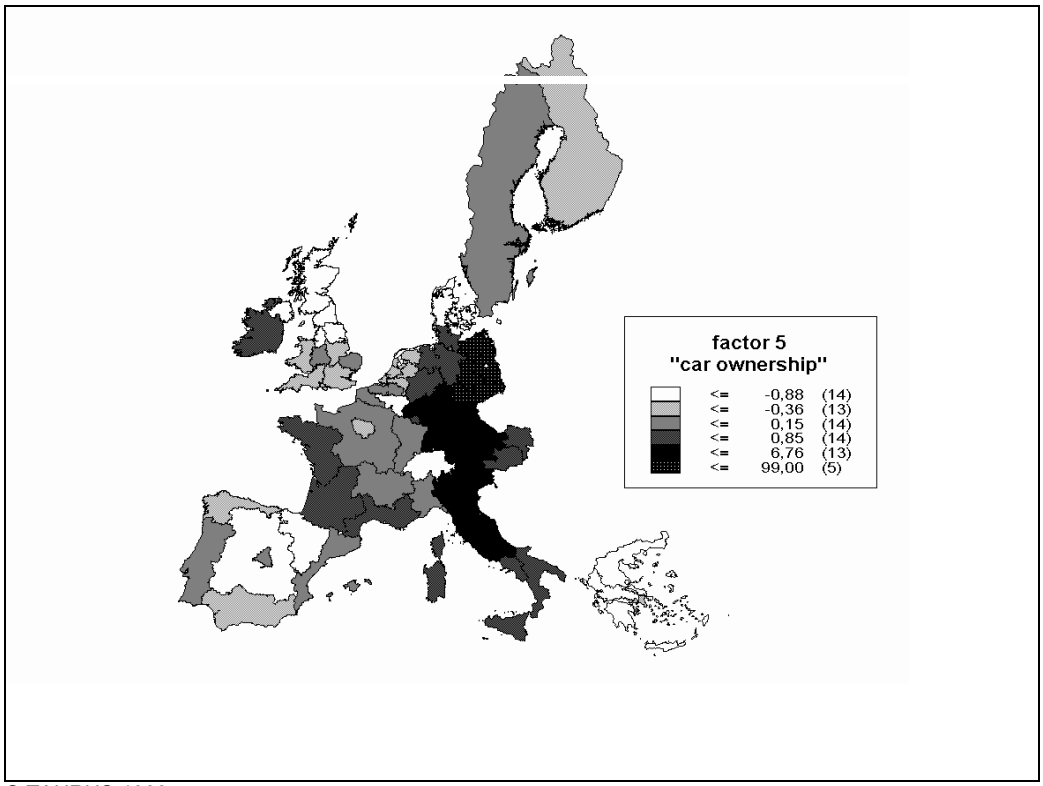
The lower value scores also reveal some interesting trends. The rural regions are highly represented by Greece and Spain reflecting their poorer performance in most of the other factors. On the other hand, the urban regions represented are, with the exception of Athens, all capitals of the North European core (Brussels, Berlin, Stockholm, South East (uk) and Ile de France). This suggests that at a certain stage of an urban region's development and/or density, car ownership decreases. This may be in part due to the disincentives of increased congestion on the roads but also to a more readily available and efficient public transport system. It is also interesting to note that, with the exception of the East German Lander, these capital regions rank in the first five for higher educational attainment (if the Lander were included in the ranking the capitals would all be within the top ten NUTS I regions). It is not for this study theme to assess whether this is due to a natural pull of educated people to urban areas or whether it can be argued that highly educated people are, for whatever reasons, more environmentally aware.

The measure of living standards by car ownership should therefore, be applied very cautiously. It appears to have more relevance to the factors of modernisation in the rural regions (with the exception of Italy) where higher car ownership is associated for the most part with higher GDP and higher educational attainment than in those regions where the inhabitants own fewer cars.

Table 3.3.3.8.: Factor 5 - living standards measured by car ownership

Density	Extreme high +ve values	High values	Not significant values	Low values	Extreme low -ve values
Urban		Hessen Nordrhein-Westfalen Rheinland-Pfalz	Bremen Hamburg Madrid North West	Athens South East (uk) Brussels Ile de France	Berlin Stockholm
Intermediate	Lombardy Nord Est (it) Emilia Romagna Centro (it) Lazio Luxembourg	Saarland Baden-Würrtemberg Bayern Neidersachsen Schleswig-Holstein Abruzzo-Molise Sicily	Vlaams Gewest Nord-Pas-de-Calais, Est (fr), Mediterranean Nord Ovest (it) Campania Sud (it), Portugal Netherlands North (uk), Yorkshire East Midlands East Anglia South West West Midlands North West,Wales	Northern Ireland Region Wallonne Denmark	
Rural		Ireland,Sardinia Sudosterreich Westosterreich Ahvenanmaa/aland Norra Mellansverige Mellersta Norrland Ovre Norrland	Ouest (fr) Sud-Ouest (fr) Centre-Est (fr) Paris Basin, Ostra Mellansverige Sydsverige	Scotland Noroeste (es) Noreste (es) Centro (es) Sur (es) Manner Suomi	Voreia Ellada Kentrike Ellada Nisia Aigaioiu, Kriti

Map 3.3.3.5.: Factor 5 - living standards measured by car ownership

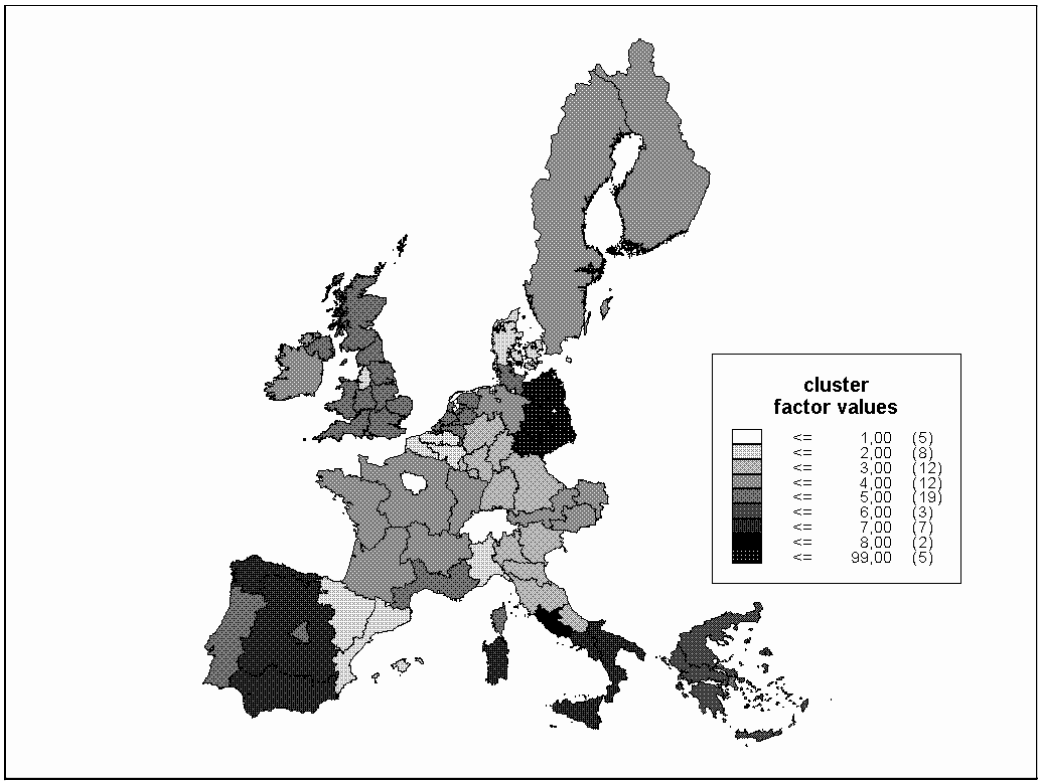


Cluster Analysis

Using the Ward method eight regional clusters were identified as being the most useful for this analysis. Using seven clusters had the effect of grouping clusters two and four together making one very dominant cluster. Lazio and Ahvenanmaa/Aland were consistently clustered when examining results of up to ten clusters. Similarly, the Greek rural regions were always clustered as a discrete group.

In general strong national patterns emerged from the clustering. These patterns can be at least partly accounted for by the spatial impacts of national policies but they have been further emphasised by the analysis at NUTS I level which treated, for instance, all of Sweden and the continent of Portugal as one region. However, within these broader patterns national disparities were also evident (map 3.3.3.6).

Map 3.3.3.6.: Cluster analysis on modernisation and diversification



Core urban/capital regions, comprising Brussels, Berlin, Bremen, Hamburg and Ile de France, formed an elite cluster in the Northern Member States. These regions displayed a positive sectoral structure with very high infrastructural endowment. Using the variables in this study their levels of innovation were not high, however, output indicators of innovation such as patents do not take account of technology transfer which may be just as important. The employment figures were mixed for these regions with Ile de France showing positive employment while Brussels had relatively high unemployment. All of these regions displayed a low level of car ownership, which may reflect good public transport infrastructure and/or congestion acting as a deterrent to car ownership.

Within the Southern Member States the capitals of Madrid, Athens and Lisbon (Portugal treated as one region) were clustered alongside the Mediterranean, the UK regions (with the exception of the North West), Schleswig-Holstein and the Netherlands. Their innovative performance is poor with the exceptions of the Northern and East Midland regions of England. Geographically, a dual pattern emerges between regions in the Northern Member States, particularly the UK, and the capital regions of the Southern Member States. Portugal, because it is treated as one region, is displaying positive labour market performance and a negative sectoral structure. However, on a NUTS II level Lisbon has a similar percentage of employment in the market service sector as either Athens or Madrid (i.e. just over 70% of total employment) but unlike the other Southern regions the Portuguese capital does not suffer from high unemployment rates. The Northern Member States all have positive labour market rates and this reflects the different biases within the sectoral structure that has been discussed above in the paragraph on factor 2 'sectoral structure'. A further factor influencing the level of modernisation within these regions was their infrastructural endowment. The level of infrastructure differs between the regions but, for the purposes of modernisation within this cluster, relative to the other inputs it plays a significant role. The dendrograph (see appendix 1) further explains the relationship at a sub-cluster level between the regions based on the five factor scores.

Within Italy a North-South divide is evident with the northern and some central regions grouped alongside largely urban German regions and Luxembourg. With the exception of Luxembourg, these regions do not have a strong market service sector but they share a strong manufacturing base. On the input side the German regions and Luxembourg display a positive physical infrastructure and this is complemented in the outputs by high car ownership. Car ownership is also high in Italy but the Italian regions do not have the strength of physical infrastructure displayed by the other regions in this cluster. Car ownership in Italy appears to be independent of the variables of modernisation and more dependent on cultural attitudes. As such it cannot be taken as an indication of living standards.

Within Spain an East-West divide is apparent between the North East and Eastern regions and the rest of Spain with the exception of Madrid. These Eastern regions are clustered with the North West of Italy, North West of England and Denmark and the southern regions of Belgium and Nord-Pas-de-Calais (cluster 2). They are associated with high levels of innovation measured by high private investment in R&D but low government expenditure on R&D. The remaining regions of Spain, except Madrid, are clustered with the southern regions of Italy (cluster 7). They are all either rural or intermediate areas and suffer from extremely high unemployment. Most of them also have a weak sectoral structure although both Campania and Sicily display a higher level of market services. All of these regions show a poor infrastructural base. The Centro region of Spain is the only area with a positive value for innovation in spite of negative values for all of the other four factors.

Cluster 4 is comprised of northern regions that are for the most part rural and performing relatively well. They are represented by large parts of France, all of Austria, Sweden (one region), Manner-Suomi in Finland and Ireland. Their clustering is based on a mixture of inputs and outputs. In general the labour market statistics are positive (with the exception of Südösterreich and the Paris Basin) but the sectoral structure is inclined towards a narrow base with low input and output from market services. The level of infrastructure is generally poor or not significant in terms of their modernisation performance. In spite of this the regions of Ireland, Sweden, Manner-Suomi and Westösterreich, in particular, display high values for innovation.

The clustering of Lazio and Ahvenanmaa/Aland is unusual in that it is the only cluster that displays no spatial proximity. However, these two regions are different because they have a much higher input of government expenditure than private expenditure on R&D. With the exceptions of the German Länder regions of Mecklenburg-Vorpommern and Brandenburg, the only other regions to have higher government expenditure on R&D were Portugal, Sardinia and Nisia Aigaiou, Kriti. However, unlike the latter, Lazio and Ahvenanmaa/Aland both have a higher than average GDP per capita. Lazio, which includes the Italian capital of Rome, has a good sectoral base but poor employment statistics while Ahvenanmaa/Aland shows a strong reliance on agriculture but nevertheless has low rates of unemployment.

The Greek regions have shown some of the least favourable conditions for modernisation within the EU (cluster 6). They are highly dependent on agriculture, show low levels of innovation and a low level of GDP per capita. Allied to this are a poor physical infrastructure and a generally low level of educational attainment. Unemployment is generally low or average although long-term unemployment and female and youth unemployment are high in some regions. Furthermore there appears to have been a general increase in unemployment rates between 1987 and 1997. The widening disparities between Athens and the other Greek regions would suggest that Greece is still in the early stages of development.

3.3.4. Conclusion

The analysis has emphasised the economic divide between urban and rural regions, which still exists within the EU. It has pointed to sectoral structure as one of the most important elements in assessing the modernisation of a regional economy. At the same time it has shown where similar outcomes occur between the regions, notably in terms of employment and unemployment type. Long-term unemployment crosses the rural-urban/core-periphery divide but is more prevalent in dense urban regions and in specific rural/intermediate regions that are undergoing economic restructuring.

The Scandinavian countries are generally an exception in that they have strong rural regions with relatively high GDP per head and a very high percentage share of employment in research and development. Stockholm emerges as a very strong region with high service employment, very high level of educational achievement and R&D

employment. The Finnish region of Ahvenanmaa/Aland is more of an anomaly. It is located on the extreme edge of the European periphery. It has a very low educational attainment and a high government expenditure on R&D. This is combined with very little employment in R&D and with the exception of the Greek regions it has the highest employment in agriculture in the EU. Possibly because of its advanced welfare system it has a GDP well above the EU average.

GDP per head remains highest in the urban regions. There are a significant number of regions that lie between the two extremes and this is a positive feature. It suggests that some of the more peripheral regions are making strong efforts to converge towards the core regions. In order that the regions can catch up and ensure sustained growth it is important that both diversification and supply side improvements occur.

The Greek regions, with the exception of Athens, stand out as one of the least modernised/diversified areas with a very high percentage of employment remaining in agriculture. These regions also offer a very low base of educational attainment, which combined with the strong reliance on agriculture, does not augur well for future diversification. On the other hand, the growth in unemployment (see 'classic indicators) in some of the regions which have traditionally experienced high employment, may indicate the early stages of structural change. This will create the potential, at least in the short-medium term, for greater marginalisation of local communities if they do not have the capacity to adapt to wider economic forces.

A number of regions displayed a high level of innovation even where other inputs suggested that they were not economically strong. This has resulted in some more peripheral and rural regions, where infrastructure is not very good and where the sectoral base does not have a strong market service sector performing better than expected. Such regions include Ireland and West Austria. Other regions that tend to have high levels of innovation are the old industrial regions centred on the northern core of Europe and including the North West of England and the North and North East of Spain. Many of these regions have traditionally suffered from high long-term unemployment rates in particular but, with the exception of Nord Ovest (It) and Nord-Pas-de-Calais the unemployment rate in these regions is showing signs of a decrease.

Examining the broad spatial pattern the analysis has confirmed a North-South divide and a general core-periphery differentiation. There is also a very strong national pattern within which intra-regional disparities exist. If any one factor of modernisation were capable of overcoming economic backwardness it would seem to be innovation. However, the attainment of a critical mass on all the indicators is vital if regions are to reach their full potential. This is evident from both the correlations in the component matrix (table 3.3.3.3) and in the correlation matrix for the indicators (see appendix 2-4).

3.4. Competitiveness (Luxembourg)

3.4.1. Concept/theory behind

Regional competitiveness appears to be the most comprehensive concept with which to measure the economic strength of spatial units. Competitiveness aims at measuring the potential and actual performance of the spatial units in globalised markets. In this respect, competitiveness considers most of the other concepts already described. One possible approach would be to create a new model on competitiveness using the different approaches, however, a range of concepts on competitiveness already exists. Therefore, it seems to be a better approach to use these models initially and then to try and develop links by comparing the results of the different approaches.

A variety of literature exists on the national dimension of competitiveness in the wake of the globalisation debate (Durand 1992, Hirst/Thompson 1996, Fischer 1998; critical: Krugman 1994, Rodric 1997). These national approaches are only partly useful for the regional level as the national dimension of competitiveness is much more related to macro indicators such as currency rates, interests, saving ratio, national regulations. But competitiveness is also related to the micro level incorporating the innovation capacity of firms, enterprise strategies and culture which are considered in the approaches outlined previously. Regional competitiveness has to be allocated at an intermediate or meso level (Thierstein 1996) and, therefore, needs to be approached in a different way. Regional competitiveness was broadly discussed in the wake of the finalisation of the single market. The most prominent approach has been the "blue banana" by the French DATAR/RECLUS (Brunet et. al. 1989) apart from other studies e.g. the BFLR (Irmen/Sinz 1989) and British researchers (e.g. Keeble 1989).

Any methodology and indicator system should lead to a kind of typology which allows for the classification of spatial units in a transparent and comprehensible manner which will facilitate policy makers in decision making. As an example, Irmen/Sinz (1989) developed a typology for competitiveness in the wake of the Common market studies which had to deal with the restricted availability of data at that time. In order to measure the competitiveness of the European regions two main sets of indicators were developed: the *Level of Development* (determined by the indicators GDP per capita (PPP), industrial income per capita (PPP), share of gross value added (factor costs) in export oriented branches) and the *Development Dynamics* (determined by the indicators growth of GDP per capita (PPP) in %, development of employment in %). Proceeding from this differentiation nine types of regions were identified as the following figure shows (see table 3.4.1.1).

Table 3.4.1.1.: Example, typology in regional competitiveness

Level of Development / Dynamics Of development	above average	average	Below average
Above average	prosperous metropols and highly specialised regions	booming rural areas	Booming regions in the periphery
Average	economic centres with lesser growth	regions in between prosperous and problem regions	Peripheral regions with weak development
Below average	Old-industrialised regions	regions with structural problems	peripheral regions without development impulses

Source: own compilation on the base of Irmen/Sinz 1989

Most competitive are regions that score high on both the level and the dynamics of development. Regions with different profiles face different problems in terms of competitiveness such as a high level of development but a lacking dynamism or a low level together with strong dynamics. This approach was interesting in terms of describing the situation of regions but it did not explain much on the reasons for competitiveness. Another approach was chosen by the Commission in the 6th Periodic report (European Commission 1999: 35ff) starting from a definition of the OECD (1996) where competitiveness is defined "… by the ability to produce goods and services which meet the test of international markets, while at the same time maintaining high and sustainable levels of income" or more generally "the ability of companies, industries, regions to generate, while being exposed to international competition, relatively high income and employment levels" (European Commission 1999: 32). The links between the competitiveness issue and globalisation (section 3.2.) is obvious, keeping in mind that there is a different quality in the kind of local/regional rootedness of economic development (see section 3.2.). On that basis a simple model of the relationship between regional GDP/capita and the most significant features contributing to this was constructed. The main factors cited in the literature which explain variations in the regional GDP were included in order to find adequate indicators. Four indicators explained almost two-third of the variations in GDP per head i.e. 65% of the variations between the region's GDP were associated with differences in the following factors:

- the structure of economic activity – indicated by high concentration of employment in market services and/or manufacturing;
- the extent of innovation activity – indicated by a high number of patent applications;
- regional accessibility – indicated by a new index of DG16 on the base of good accessibility in respect of transport infrastructure;
- the skill of the work force – indicated by a high proportion of relative highly qualified workers aged between 25-59.

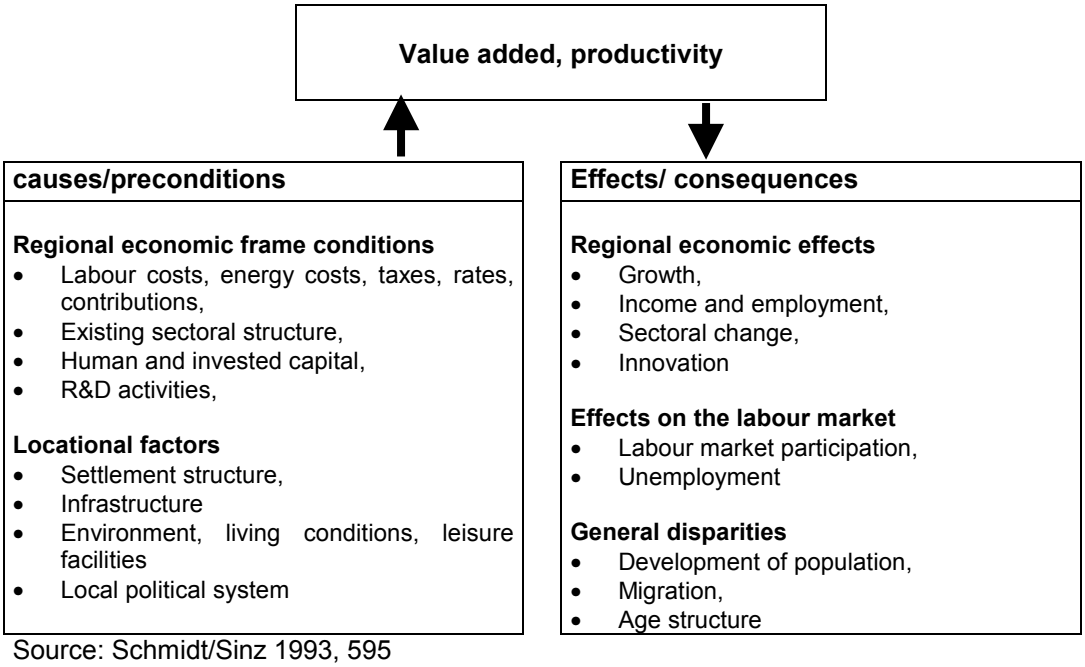
Without repeating the results of the study – they are developed in the interpretation of the results of this study - one may conclude that the lines between the causal factors cannot be drawn in a direct manner; the factors may not have the same effect in isolation, other

factors not included in the analyses might influence the measured factors (in particular institutional factors) (European Commission 1999). The existence of the factors does not tell anything about the ways in which to address their consequences from a political point of view, in particular, because the regional development path involves simultaneous changes in a wide range of factors.

One of the main criticisms of this approach concerns the definition of the effects or the success of competitiveness that results mainly in the level of GDP/capita. There is no doubt of the importance of this variable but from our point of view an approach ought to be chosen which covers a broader range of success variables than the ones outlined in the previous approaches. A second consideration that has to be taken into account for the selection of the approach outlined below were the constraints in data availability. In addition, using an approach which was already applied to the main features some seven years ago has allowed some careful comparisons of these results with previous results.

The BFLR, (now BBR) tried to develop a comprehensive model which sought to integrate various approaches (Schmidt/Sinz 1993). Their approach is used as the basis for the further elaboration of the competitiveness concept as it considers not only the causal variables and preconditions but also the effects and consequences of competitiveness in a broader approach (see figure 3.4.1.1.). The regional value added or productivity stands in the middle as being determined by the input preconditions /causal side. However, productivity also represents the output indicating regional economic performance and effects.

Figure 3.4.1.1.: The causes-effects approach of regional competitiveness



Source: Schmidt/Sinz 1993, 595

A broad range of theory taken from the literature and previous studies supports the hypothesis of the kind of interaction outlined. The restrictions imposed by the data availability are still considerable but the methodology allows for the production of results

that fit within the framework of the studies cited. Otherwise, it has to be kept in mind that a task of this study is to define the approaches for further in-depth analysis.

3.4.2. Resulting indicators and data availability

Data is available in many cases from the Eurostat Regio database and has been amended by the data of the Bundesamt für Bauwesen und Raumordnung (BBR) in Germany. The idea of the following list of indicators was to come as close as possible to the concept outlined above, taking into account the availability of indicators. Table 3.4.2.1 puts forward big gaps for more specific data but the main areas of the indicators are covered.

Table 3.4.2.1.: Indicators for regional competitiveness

Indicator	*Indicator by Schmidt/Sinz*	*Indicator in this study*	*Data source for this study*
1. Productivity, value added	Productivity average GDP per employee in past 3 years	Productivity: average GDP (Mio. ECU) per employee, 1993-95 (EU15=100)	Eurostat - Regio Data base
2. Causes/ preconditions			
2.a) Regional economic frame conditions			
Labour costs, energy costs, taxes, rates, contributions	Labour costs in manufacturing sector	Labour costs in manufacturing sector in 1996 (1)	Eurostat (latest data)
Existing sectoral structure	Share of employees in agricultural sector	Sectoral structure: Share of employees in agricultural sector in 1997	Eurostat - Regio Data base
Human and invested capital	Employment age (share of the 15-35 year old)	Employment age (share of the 15-35 year old in 1997)	Eurostat - Regio Data base
R&D activities	Innovation activities in the EU regions	R&D employees: Share of R&D employees in private companies to total R&D employment in 1995 R&D investment: Share of R&D investment (in all sectors) to GDP in 1993	Eurostat - Regio Data base Eurostat - Regio Data base
2.b) Locational factors			
Settlement structure			
Infrastructure	*Regional location*: Average road travel time to the next centre (22 selected centres) *Location in the EU context:* Average travel time using combined transport to all centres in minutes *Transport accessibility* Average speed as the crow flies to all centres using rail transport *Production related infrastructure* Production relevant infrastructure	Regional location (see Schmit/Sinz) Location in the EU context (see Schmit/Sinz) Transport accessibility (see Schmit/Sinz) Infrastructure endowment	BBR compilation BBR compilation BBR compilation Eurostat - Regio Data base

	Motorway length in km per square km area	Motorway length in km per square km area)	
Local political system	None		
3. Effects/ consequences			
3.a) Regional economic effects			
Growth	Average change of GDP in the past 5 years	Economic growth: average change of GDP (Mio. ECU) between 1995-97	Eurostat - Regio Data base
Income and employment	Average change of employment in the past 5 years	Employment trend: Average change of employment between 1995-97	Eurostat - Regio Data base
Sectoral change			*In addition:* Change of sectoral structure such as innovation branches Change in industrial sector
Innovation			*See concept on modernisation as an effect* Change of R&D activities (see above)
3.b) Effects on the labour market			
Labour market participation			*In addition:* Labour market participation rates
Unemployment	Unemployment rate last year change of the unemployment in past 5 year	Unemployment rate in 1997 Unemployment trend: change of the unemployment between 1991-97	Eurostat - Regio Data base *Strong relation to criteria social integration* Eurostat - Regio Data base
3.c) General disparities			
Development of population	Population change in the past 5 years	Population trend: Population change between 1990-96	Eurostat - Regio Data base
Migration	Cummulated balance of migration for the past 9 years per 1000 inhabitants	Migration : Cummulated balance of migration between 1990-95 per 1000 inhabitants	BBR compilation
Age structure	Share of the 60+ years old	Age structure: Share of the 60+ years old in 1996	Eurostat - Regio Data base

(1) labour costs for GB and Italy were generated by multiplying labour costs per hour in 1995 with the annual working hours in 1992

Source: Schmidt/Sinz 1993 with own additions

3.4.3. Methodology and interpretation

(1) **Descriptive statistics** were prepared in a first step (see table 3.4.3.1.) displaying the basic values for average, minimum, maximum and quartils. The values give a first impression on the indicators for competitiveness and were used to detect emerging trends within the data set.

Table 3.4.3.1.: Descriptive statistics on the data set

	mean	maximum,	location	minimum,	location	25. percentil	50. percentil	75. percentil
Productivity, value added								
Productivity	93,5	209,7	Bruxelles	31,8	Centro	73,0	92,8	109,3
Regional economic frame condition								
Labour costs	2650,1	4518,0	Hamburg	759,0	Norte	2120,0	2576,0	3311,0
Sectoral structure	6,2	40,1	Peloponnisos	0,1	Merseyside	2,2	3,9	7,6
Employment age	41,6	50,3	Campania	31,4	Ahvenanmaa/ Aaland	39,3	41,4	43,4
R&D Investment	1,5	3,9	Baden-Württemberg (Nuts1)	0,0	Dytiki Makedonia	0,7	1,5	2,0
R& employees	44,3	95,8	Picardie	0,3	Acores	24,7	42,8	60,4
Locational conditions								
Location (regional)	147,8	758,0	Notio Aigaio*	0,0	14 Zentren	49,7	101,0	172,4
Location (EU)	312,6	605,1	Higlands, Islands*	199,4	Darmstadt	258,0	293,9	345,1
Transport accessibility	69,0	85,7	Wien	46,4	Sardegna*	66,7	69,1	72,1
Infrastructure endowment	27,8	200,4	Flevoland	0,0	e.g. Sardenga; Highlands, Corse, Thessalia,	8,3	20,7	34,7
Effects on regional economic								
Economic growth	11,5	53,3	Thüringen	-18,0	Sardenga	-0,3	16,5	21,6
Employment trend	0,7	14,1	Ceuta Y Melilla	-17,2	Corse	-1,6	0,6	3,3
Effects on labour market								
Unemployment rate	10,0	32,0	Adalucia	2,5	Luxembourg	5,8	8,5	12,2
Unemployment trend	2,5	12,8	Dessau	-5,7	Northern Ireland	0,1	2,7	4,4
General disparities								
Population trend	2,7	22,5	Flevoland	-16,3	Halle	0,9	2,8	4,6
Age structure	21,2	30,2	Liguria	12,3	Flevoland	19,4	21,1	22,8
Migration	31,4	230,1	Oberbayern	-145,4	Ile de France	2,1	20,0	56,4
The regions Ceute Y Melilla, Acors und Madeira were counted with the same values because of missing data								

(2) The **correlation analysis** of all indicators (see table 3.4.3.2) started with the correlation coefficients of the productivity with the causal variables. The correlation coefficients display the expected values and with the exception of the working age all correlations are highly significant. A comparison with the study of Schmid/Sinz 1993 reveals that the association of causal variables and productivity has lessened slightly, in particular, in the case of the indicators concerning accessibility and location. This is obviously good news in the sense that productivity is not necessarily bound to these indicators due to the influence of information technologies. An exception is the increased association of labour costs which is correlated more highly with productivity than in 1993.

Table 3.4.3.2.: Correlation of the causal side of indicators

	Productivity / value added	**Regional economic frame conditions**					**Locational conditions**			
	Productivity	Labour costs	Sectoral structure	Employ-ment age	R&D investment	R&D employees	Location (regional)	Location (EU)	Transport acces-sibility	Infra-structure endow-ment
Productivity / value added										
Productivity	1,000**									
regional economic frame conditions										
Labour costs	**0,798****	1,000**								
Sectoral structure	**-0,457****	**-0,526****	1,000**							
Employment age	-0,012	-0,160*	-0,125	1,000**						
R&D investment	**0,379****	**0,564****	**-0,470****	-0,251**	1,000**					
R&D employees	**0,372****	**0,485****	**-0,363****	-0,262**	**0,432****	1,000**				
Locational conditions										
Location (regional)	**-0,313****	**-0,412****	**0,431****	0,093*	**-0,338****	**-0,467****	1,000**			
Location (EU)	**-0,566****	**-0,672****	**0,612****	0,084	**-0,505****	**-0,552****	**0,725****	1,000**		
Transport accessibility	0,196**	**0,366****	-0,171**	-0,179*	0,250**	0,211**	**-0,547****	**-0,417****	1,000**	
infrastructure endowment	**0,427****	**0,418****	**-0,413****	0,062	0,273**	0,221**	**-0,464****	**-0,578****	0,165*	1,000**

** / * Correlation is significant on the 0,01 / 0,05 – level (2-tailed) correlations with values >/< +/- 0.3 are printed bold, correlations >/< +/- 0.6 are boxed in.

The correlations between the indicators on the causal side and the effects side were examined in the next step (see table 3.4.3.4.) and created a mixed picture.

Table 3.4.3.3.: Correlation of the effect side of indicators

	effects on regional economy		**effects on labour market**		**general disparities**		
	Economic growth	Employment trend	Unemployment rate	Unemployment trend	Population trend	Age structure	Produc-tivity
Effects on regional economy							
Economic growth	1,000**						0,088
Employment trend	-0,054	1,000**					-0.104
Effects on labour market							
Unemployment rate	-0,194**	-0,014	1,000**				-0,052
Unemployment trend	0,050	**-0,393****	**0,561****	1,000**			0,164*
General disparities							
Population trend	0,061	0,067	-0,401**	-0,221**	1,000**		0,216**
Age structure	-0,243**	-0,259**	0,004	0,152*	**-0,325****	1,000**	-0,082
Migration	0,099	-0,097	-0,299**	0,014	**0,554****	0,092	**0.358****

** / * Correlation is significant on the 0,01 / 0,05 – level (2-tailed) correlations with values >/< +/- 0.3 are printed bold, correlations >/< +/- 0.6 are boxed in.

On the one hand 46% and 61 % of the correlation coefficient deviate significantly from zero on the 1 % and 5 %-level (Schmid/Sinz 1993: 33 % and 43 %). On the other hand, the correlation coefficient values do not score highly and stay in the range of below 0.3 (Schmidt/Sinz 1993 had also values >0.6) . Correlations are obviously on the effect side but the data suggests deviating patterns, among the different indicators some are positively and some are negatively interrelated.

Table 3.4.3.4.: Correlation matrix causes and effects

	Effects						
	Effects on regional economy		Effects on labour market		General disparities		
Causes / preconditions	Economic growth	Employment trend	Rate of unemployment	Unemployment trend	Population trend	Age structure	Migration
Productivity/ value added							
Productivity	0,09	-0,10	-0,05	0,16*	**0,22***	-0,08	**0,36****
Regional economic frame conditions							
Labour costs	**0,22****	**-0,27****	-0,14*	0,22**	**0,29****	-0,11	**0,43****
Sectoral structure	0,00	0,07	0,03	0,06	0,06	**0,26****	-0,10
Employment age	**-0,30****	**0,32****	**0,27****	-0,24**	0,02	**-0,46****	**-0,25****
R&D investment	0,09	**-0,19****	**-0,26****	0,10	**0,21****	-0,18*	**0,32****
R&D employees	**0,21****	-0,14*	**-0,32****	-0,06	**0,22****	-0,05	**0,26****
Locational conditions							
Location (regional)	-0,16*	0,11	0,30**	0,08	-0,06	0,06	-0,16*
Location (EU)	**-0,26****	0,18*	**0,35****	0,04	-0,15*	0,13	**-0,29****
Transport accessibility	0,00	**-0,36****	-0,10	0,22**	-0,01	0,09	0,17*
infrastructure endowment	0,19**	0,10	**-0,19****	-0,15*	**0,23****	**-0,24****	0,18*

**/* Correlation is significant on the 0,01 / 0,05 - level (2-tailed) on the 0,01 level in bold letters and </> -/+ 0,30 boxed in

An in depth analysis of the single effect indicators reveals many significant and relatively high correlations of effect variables such as growth, unemployment rate, migration and population development with causal variables. The correlation values of the former three have risen with migration for all of the indicators, whereas the correlation of the development of population has weakened in comparison to the 1993 study. Some significant changes of the signs that are worth noting show changed associations between the variables:

- Economic growth and working age: from 0.43 to –0.31;
- Unemployment and productivity: from –0.25 to 0.16;
- Development of unemployment and accessibility: from -0.18 to 0.22;
- Migration and location : from 0.13 to –0.29

The careful interpretation of these shifts points to a better economic development together with worse developments on the labour markets for those central regions with good accessibility, a relatively old working population and high productivity i.e. mainly the “blue banana” regions. The other correlation coefficients for the indicators of development of unemployment support the conjecture that increasing unemployment is also true for better developed regions. The stronger associations between migration and the causal variables point at more directed migration towards regions with better potentials in the defined

scope of causal indicators i.e. economically stronger regions in the centre of the EU and the regional centres of the periphery.

(3) **Creation of combined indicators – manual compilation of indices and factor analysis**

Further analysis demanded a reduction of the exisiting indicators (17) towards a smaller number by two ways.

a) **Manually by building combined indices** of the causal variables and the effect indicators

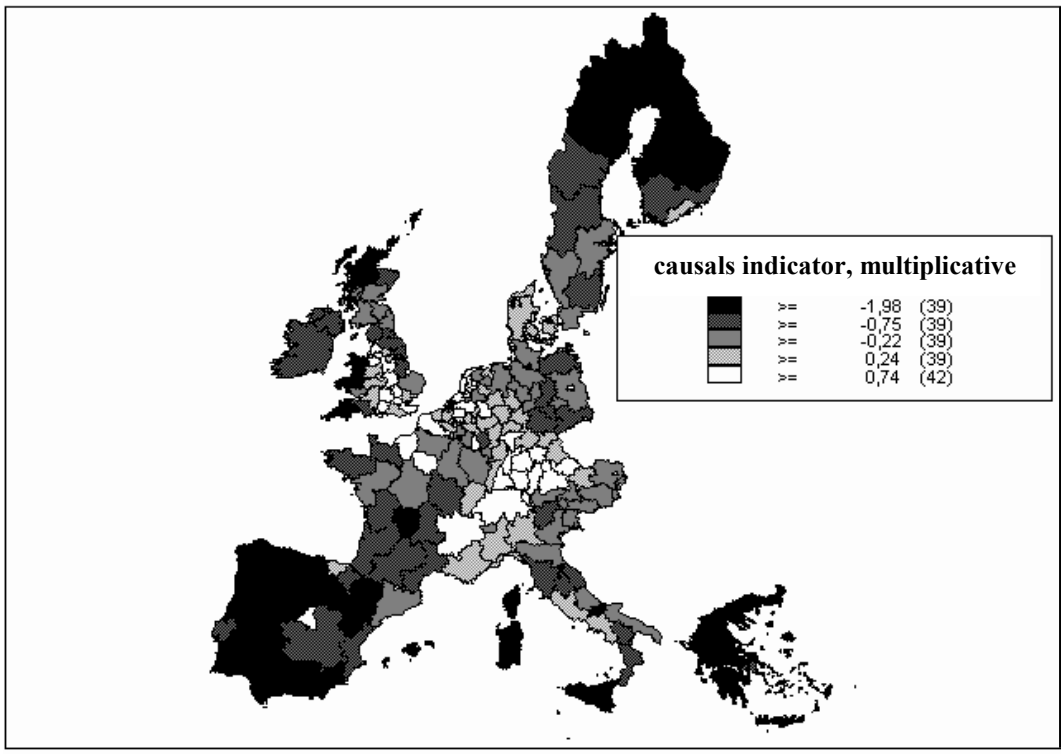
As a first step indicators were standardised in order to avoid scale-related effects. “Negative” defined variables such as the average travel time or the unemployment rate were transformed by a multiplication with –1, so that positive values represented positive facts. An index was compiled by an additive and multiplicative combination of the transformed and standardised values for both the causal and the effect indicators.

The additive compilation allowed complete substitution of the values of the indicators within the resulting indices. The multiplicative compilation method only allowed a limited substitutionality which led in real terms to the following results:- stronger deviations of regions for one indicator, in terms of a weakness, influenced the index towards the negative and – vice versa – strengths pushed the index upwards thus allowing for better compensation (limited substitution – instead of full substitution). The problem of negative values with the multiplication procedure was overcome by adding 10 to all values, which shifted all indicator values into the positive range and allowed the multiplication process to proceed without changing signs. Finally the indices for the causal and the effect side had to be standardised because of different numbers of causal and effect indicators.

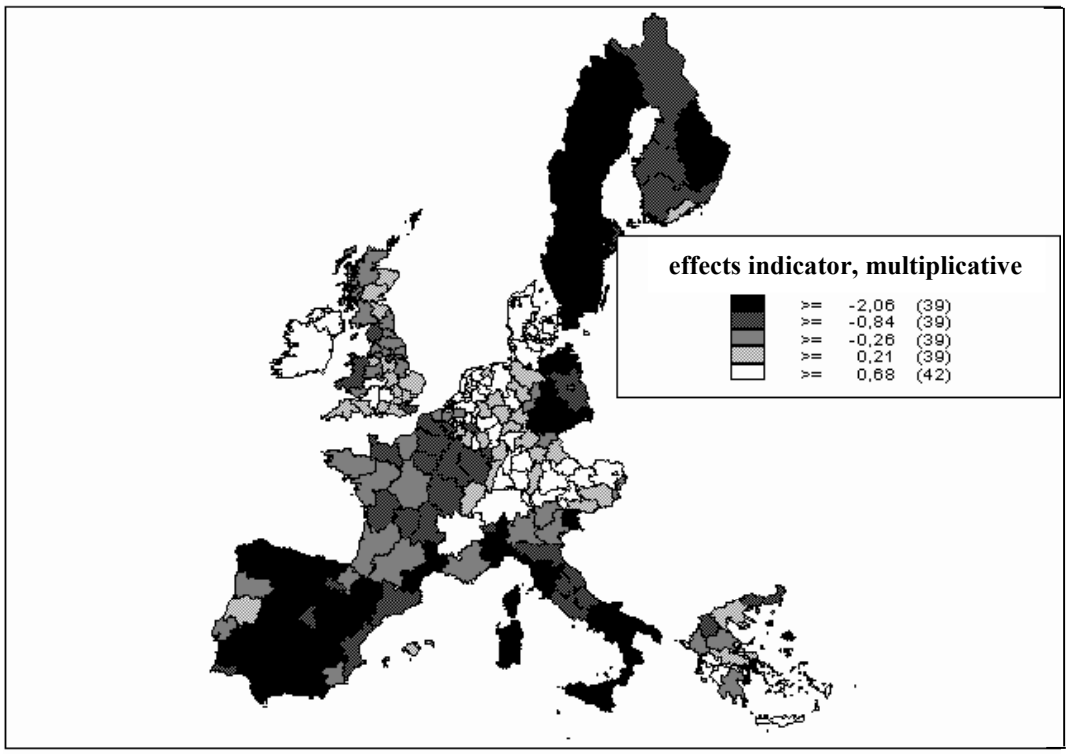
The comparison of both methods led to the conclusion that there were hardly any differences in the distributions of the values when building classes. Nevertheless, the multiplicative method is better able to take account of the reality by assuming limited substitutionality of the locational factors. Therefore, further analysis was built on the multiplicative method.

Maps 3.4.3.1. and 3.4.3.2. show how the regions of the EU are classified on the causal and the effect side using the multiplicative method. It is interesting to note that the causal side follows more or less completely the EU-wide centre-periphery pattern and the centre periphery pattern on a regional scale, in particular, on the outer ring of the EU with only minor exceptions. This does not apply to the effect side suggesting that the peripheral regions are better developed than one would expect from the causal side and vice versa. Therefore, it would be interesting to take a closer look at the regions which differ in both directions i.e. develop worse than expected and also develop better than expected from the causal side. The effects are much more diverse for both the EU-wide and the regional centre-periphery pattern. The maps, therefore, confirm findings already expected from table 3.4.3.2., 3.4.3.3. and 3.4.3.4. where the relation between the single causal factors and the single effect factors have not been strong.

Map 3.4.3.1.: Manually compiled causal index of competitiveness for the EU regions (multiplicative compilation)

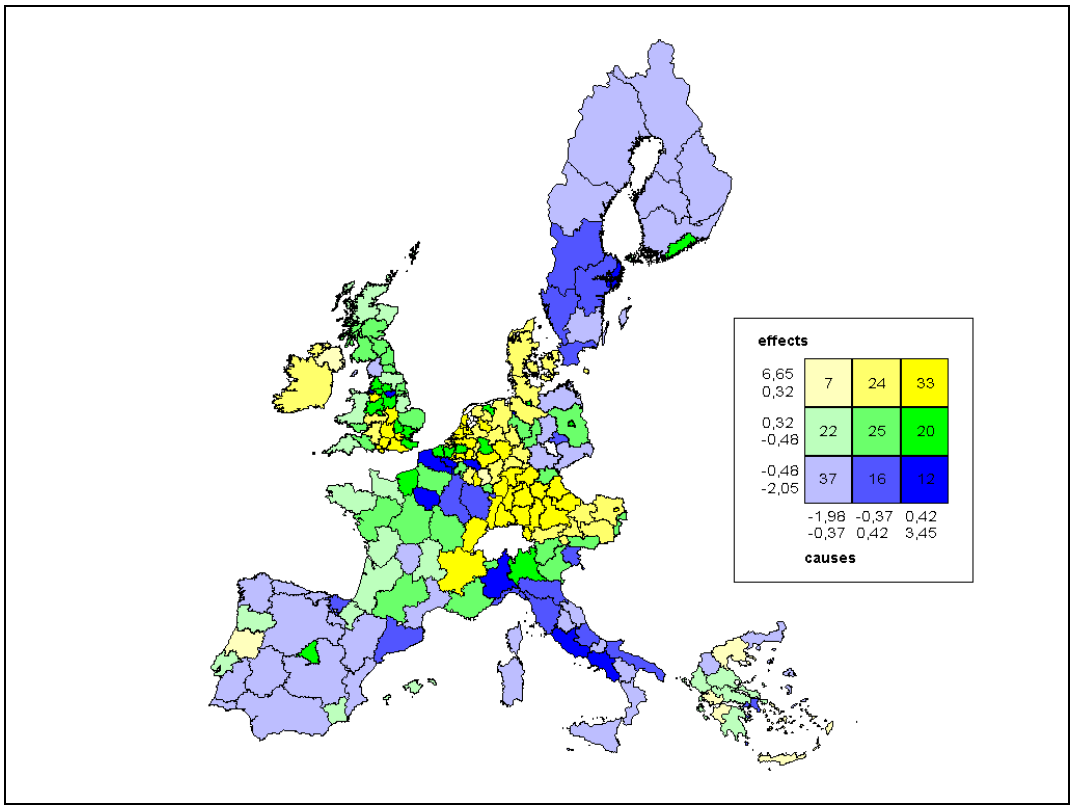


Map 3.4.3.2.: Manual effects index of the EU regions (multiplicative compilation)



To visualise the differences between the causal and effect dimensions they have been cross-tabled in a rough form using a 3 by 3 matrix approach (see map 3.4.3.3.). It is not surprising that the capital regions of the outer ring of the EU show stronger development trends but there also seems to be a national pattern overshadowing the whole structure. The Italian regions and South of Sweden in total are performing worse than expected whereas the Irish regions and the UK regions are nearly all performing better than the average. This also applies for most of Denmark, Austria and Northern Germany and the Centre of France apart from the Ile de France. So it is necessary to observe the national pattern alongside the other methods before drawing conclusions.

Map 3.4.3.3.: Manual cross table of causal and effect indices (multiplicative compilation)



b) A statistical way by employing **factor analysis** and creating clusters of regions.

Apart from the manual creation of indices a factor analysis was used to detect the complex indicators hidden behind the causal and effect variables. The multivariate procedure of factor analysis allowed a reduction in the number of variables by using extraction methods and orthogonal and other rotation procedures (as there were no significant differences the orthogonal procedure was chosen for further analysis due to its better compatibility with the proceeding cluster analysis). As the other procedures also led to invalid communality estimates >1, the principal component method in combination with varimax rotation was finally chosen. The investigation of a range of factors (2-5) lead to the selection of 5 factors with Eigenvalues >1 which explain 70 % of the variance of the whole sample. In comparison to the other models with 2-4 factors the solution of 5 factors

was also most convincing in terms of possible interpretations (see table 3.4.3.5). The orthogonal rotation has to be critically assessed because of the high correlation between the indicators but this method was also a necessary precondition for the following cluster analysis.

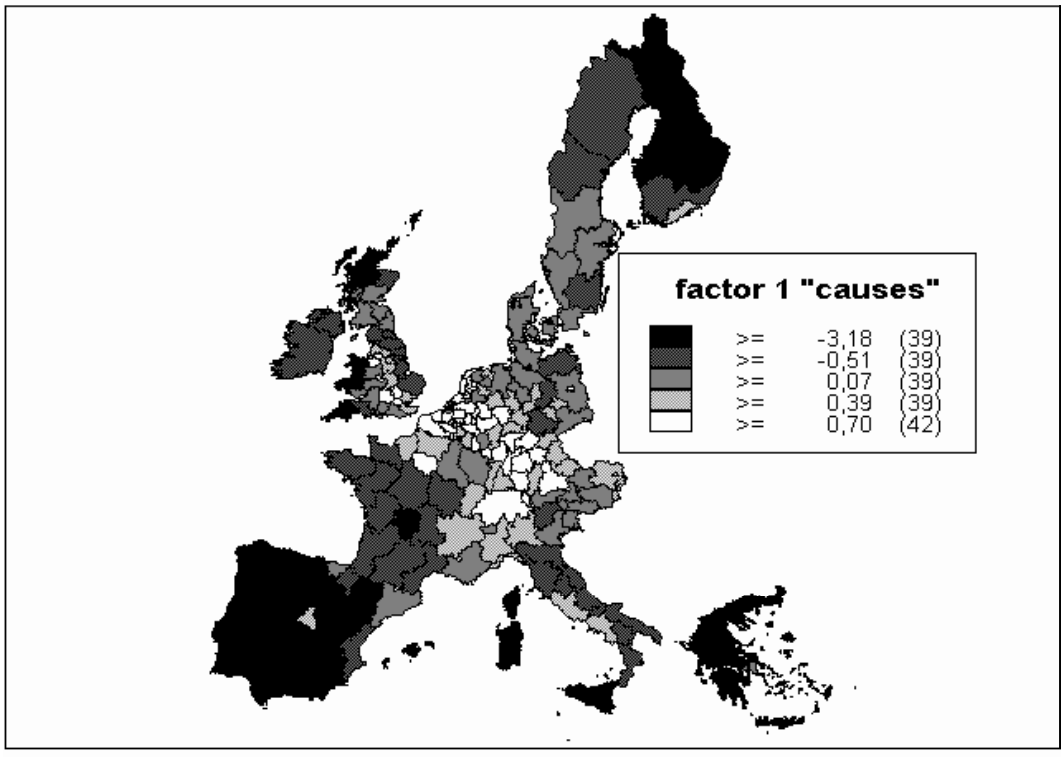
Table 3.4.3.5.: Results of the main component method with five factors and orthogonal varimax rotation

Indicators	factors and correlations "broad description"				
	factor 1 "causes"	factor 2 "employment	factor 3 "population"	factor 4 "labour market"	factor 5 "growth"
Location (EU)	**-,890**				
Location (regional)	**-,788**				
Sectoral structure	**-,775**				
Labour costs	**,725**		,461		
Productivity	**,633**		,432	,317	
Infrastructure endowment	**,633**				
R&D investment	,572		,341		
R&D employees	,561				
Transport accessibility	,525	-,475			
Age structure		**-,766**			
Employment age		**,733**			-,488
Employment trend		**,613**		-,324	
Population trend			**,821**		
Migration			**,809**		
Unemployment trend		-,330		**,844**	
Unemployment rate			-,329	**,788**	
Economic growth					**,931**
All factors with eigenvalues > 1, share of total variance explained by these factors: 69,7% extraction: main component analysis; rotation: varimax. Only correlations with values >/< +/- 0,3 are displayed, correlations >/< +/- 0,6 are printed bold					

It is important to note that from the wider perspective there are not too many differences between the different methods of analysing competitiveness with the data set, but this perspective needs to be refined when examining single regions. This is best demonstrated by the finding of the factor analysis that there is a high correlation between the indicators which have been defined as preconditions or causes for competitiveness but the relation between the preconditions and success is not as clear (see table 3.4.3.3.). Preconditions were highly correlated with the first factor of the factor analysis and the complex indicator built from multiplying the standardised values of the precondition. This means that the preconditions listed are leaning in the same direction and none can be entirely excluded. Given these findings it may be concluded that all of the mentioned preconditions have to be present somehow and that substitution is only possible to a limited extent. The Sixth Periodic report extracted four main factors that, with the exception of the last one, are represented in this study (European Commission 1999: 35ff). These are: the structure of economic activity; innovative activity; regional accessibility; skills of the workforce as driving factors for the wealth of a region based on the equation of: $\frac{\text{GDP}}{\text{capita}} = \frac{GDP}{employment} x \frac{employment}{totalpopulation}$

Let us start with the hypothesis of strong association between the causal variables (table 3.4.3.5.; map 3.4.3.4.). It is interesting to see that the spatial pattern follows nearly a perfect periphery-centre pattern. Productivity is also strongly related with this factor but GDP/capita is not which confirms that high productivity is not necessarily indicative of wealth. It is obvious that the development of employment is not associated with productivity.

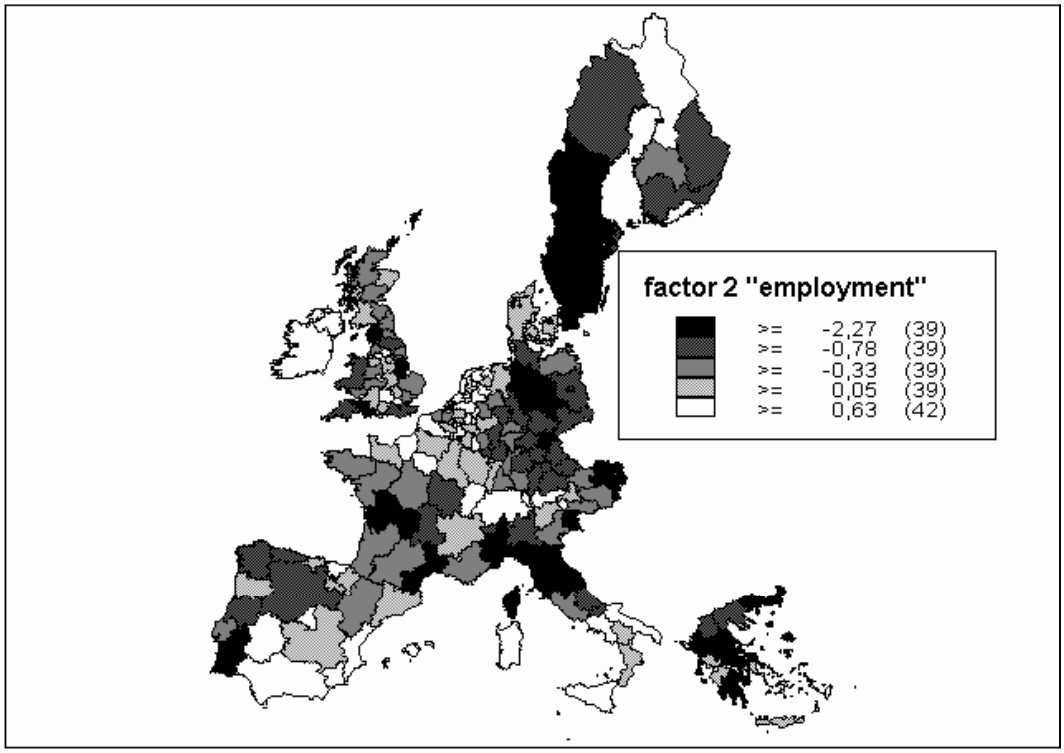
Map 3.4.3.4.: On the factor 1 - causal effects



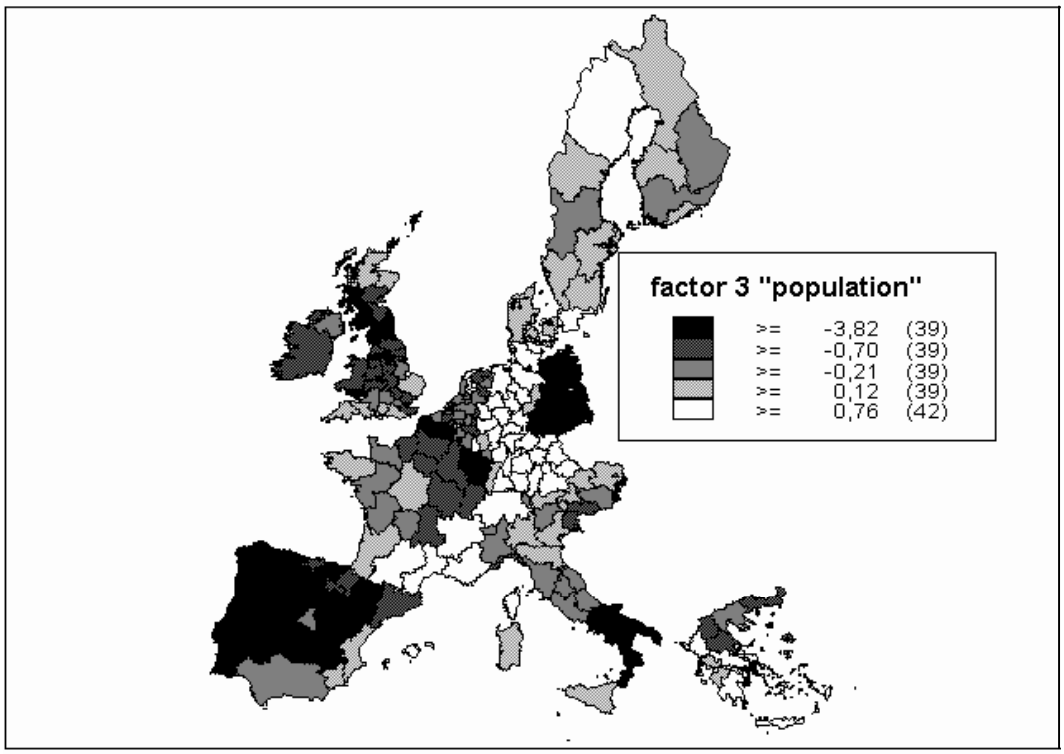
Addressing factor two (map factor 2) which is highly associated with changes in employment, the relation with productivity is quite weak. Instead, the age structure in terms of the share of elderly is adversely correlated whereas the share of young people in working age is positively related. The regional picture reveals a mosaic throughout the EU showing better values for South Spain and Italy, all Ireland the Northern parts of Finland and also a brighter stretch in North-East France and the Benelux. There is the hypothesis that this effect combines the fact of increasing employment dynamics starting from a level with a certain age structure.

Factor 3 represents the changes of the population – highly correlated with population development and migration. It is important to note that the changes of the population are most strongly correlated with the factors describing the causal variables of competitiveness in the data set. This could be interpreted to mean that the causal variables attract people and that the level of unemployment also plays a stronger role than the dynamics of unemployment.

Map 3.4.3.5.: On the factor 2 - employment

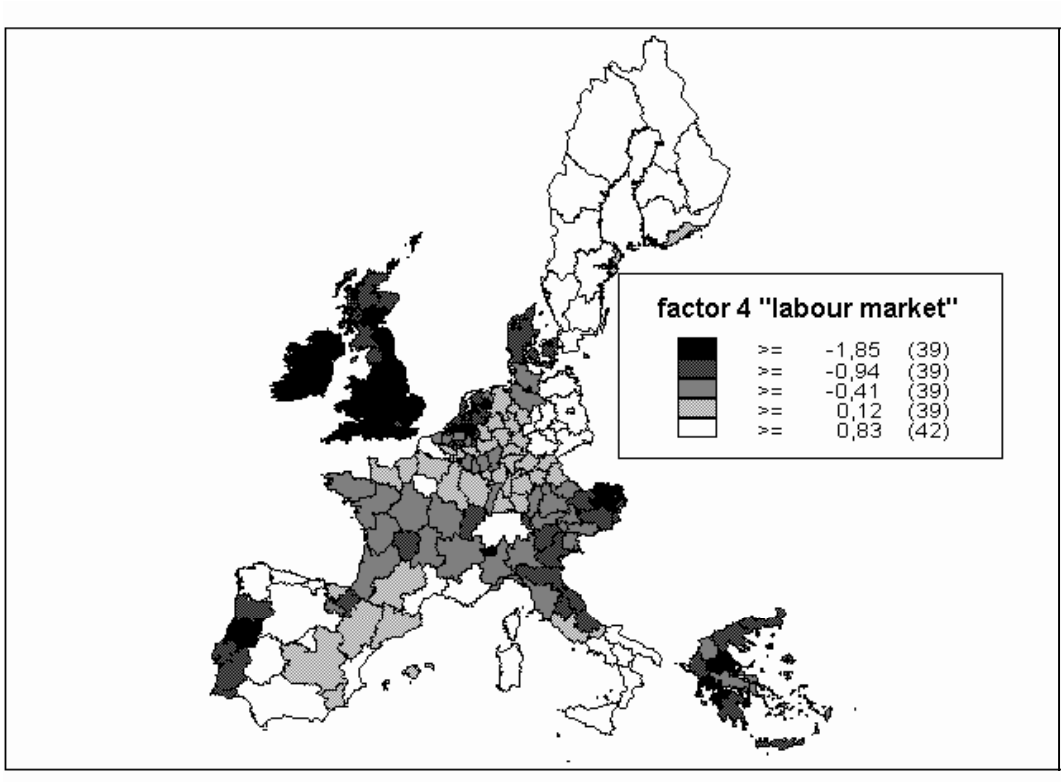


Map 3.4.3.6.: On the factor 3-population



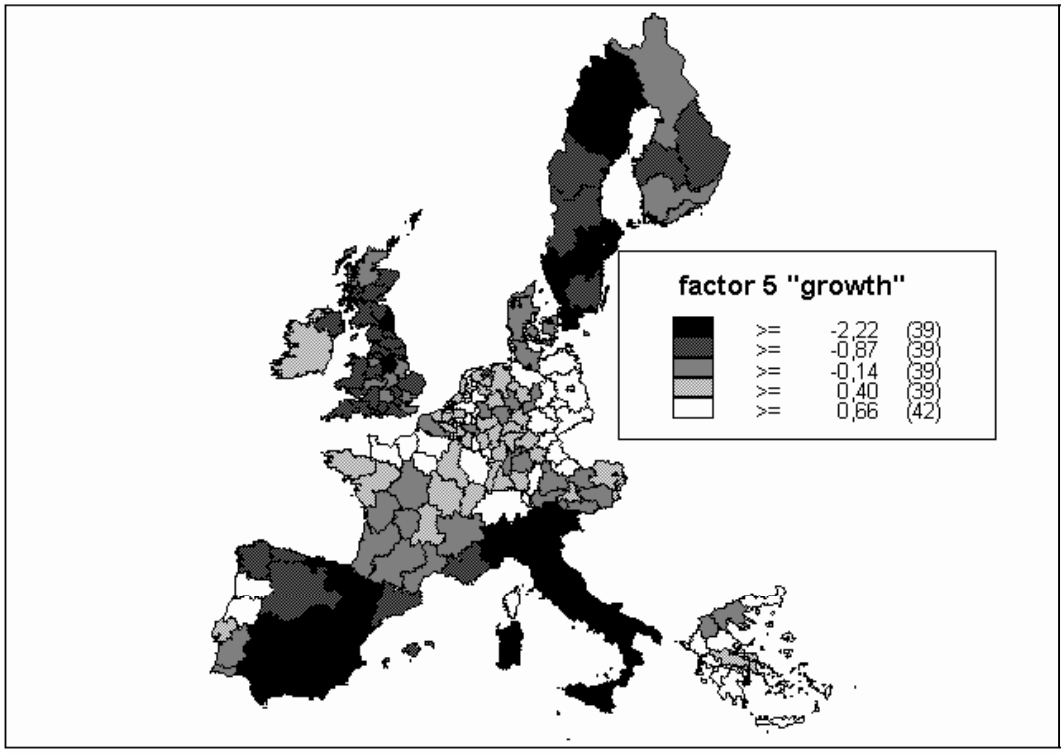
Factor 4 could be described as the labour market factor in which there is a high association between the level and the dynamics of the labour market. Some national patterns are emerging which emphasise the continuing importance of the national employment policies which lead to increasing total employment (see factor two). The most dynamic countries under this factor are Ireland, UK, the Netherlands and Denmark. These regions may also be responsible for the links with the development of productivity. In contrast the positive development in Portugal, Austria, Greece, Northern East Italy and Central France must be related to other factors as they do not score highly in factor 1 and 2. It is not possible to qualify this labour market development further on the basis of the data available in this study. However, it is possible to conclude that positive development in these latter regions is put at risk by change because it is not sustained by other hard factors and its relationship to increasing productivity is weak.

Map 3.4.3.7.: On the factor 4-labour



Finally, the last factor is dominated by the growth rates and the map clearly indicates a national pattern which is not surprising given that the growth rate only covers a time span of 3 years. National tendencies are obvious in virtually all of the countries apart from Germany which displays a strong East-West divide. As the factor is also related to the share of young workers (but only with -0.44) the characteristics of those regions is supported by this pattern. The growth rate itself has to consider the base effect for the growth of structurally weak regions in comparison to regions which already have high GDP levels.

Map 3.4.3.8.: on the factor 5-growth



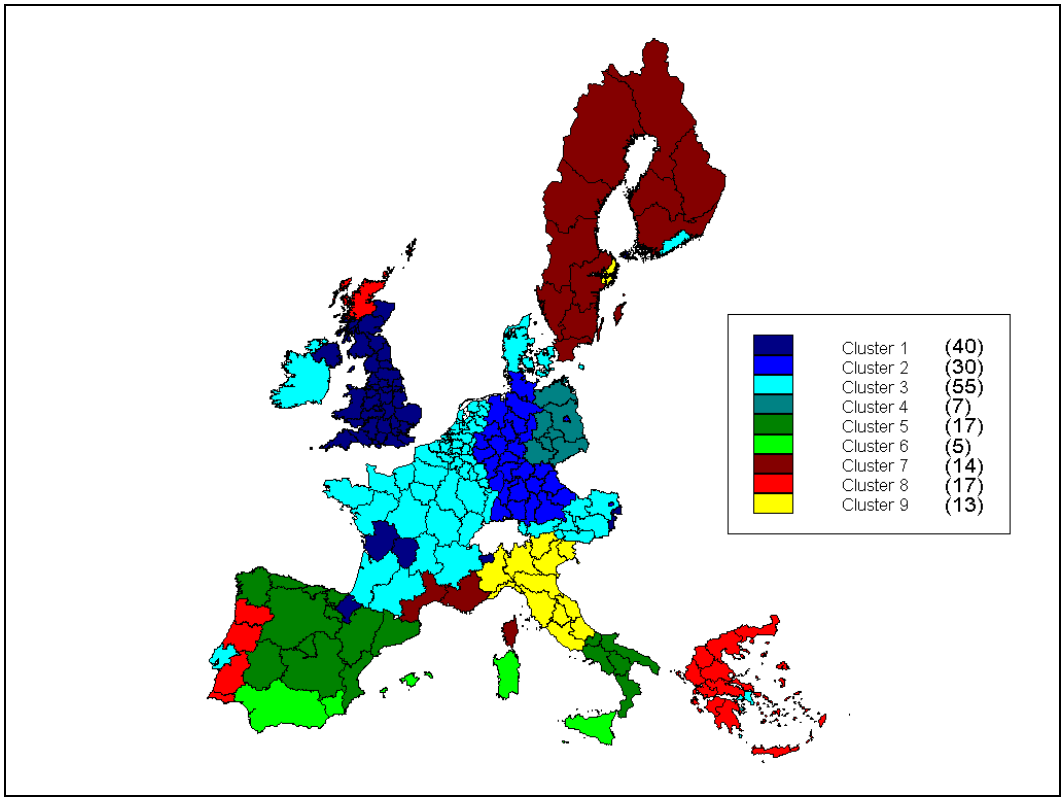
(4) The creation of indices by the methods outlined was followed by a **cluster analysis** which classified the regions on the basis of the factor values of the 5-factor results and the manual indices. It has to be borne in mind that the precondition of statistically independent variables is not true for the manually compiled indices. The significant deviation of correlation coefficients for both additive (0.24) and multiplicative (0.36) indices clearly revealed this problem. Therefore, the cluster analysis of the manually compiled regions has not been considered further.

The dissimilarity coefficients of the factor analysis data suggest clustering at least seven groups to reach a sufficient homogeneity within the clusters but we decided to consider nine groups to allow for a more refined analysis. Different procedures were applied but the Ward method compiled the most convincing results. The procedure created, in contrast to the other methods, relatively evenly populated clusters. Other methods tended to build a few big clusters leaving others almost unoccupied. The nine Ward clusters each contains between 3.5% and 29 % of the regions (clustering on the basis of factor values) whereas the Single-Linkage-procedure (as an extreme case) computed one cluster encompassing 92% of the regions followed by three clusters with one.

The **discriminant analysis** was carried out to test and correct the results of the cluster analysis. Less than 11 % of the cases had to be regrouped which was taken as further proof that the clustering by the factor values had a high discriminatory power. The result of that procedure is reproduced in map 3.4.3.9. The regional pattern was built on the basis of 9 clusters, the reduction to 7 clusters would have led to the unification of cluster 5 and 7

(i.e. remote Swedish and Finnish regions would have joined North/Central Spain and Southern Italy) and cluster 1 and 9 would have been grouped together (i.e. North/Central Italy together with the UK)

Map 3.4.3.9.: Clusters of regions on the base of the factor analysis-five factors



Map 3.4.3.9. solves the problem of the unclear relations between the causal and the effect side which have been detected in the correlation cross-table and in the factor analysis which created one causal factor and four effect factors. The key to that difference seems to be that national characteristics dominate in clustering the regions factors. This would also support the hypothesis that there is a kind of choice on how well potentials can be used and that this choice is made on the national level. Apart from the national strategies, the clustering identifies only very strong differences on the national level such as the West-East divide in Germany, the North-South divide in Italy and centre-periphery pattern in the countries of the outer circle of the EU.

(5) The **comparisons of the mean values** of the indices and factor values of all clusters were used to describe the clusters generated by the cluster and discriminant analysis. (see table 3.4.3.6.) The clusters illustrated on map 3.4.3.9. need to be elaborated upon. As the factor values and their mean values are difficult to understand, the mean values for the clusters of the manual multiplicative method were also calculated. Table 3.4.3.6. shows that the second cluster (mainly Germany) the third cluster (mainly Denmark, France, Austria, and Ireland) and the first cluster (mainly

Table 3.4.3.6.: Comparison of mean values of the 9 cluster classification on the base of factor values (case of 5 factors) and their resulting mean values of the clusters of using the manual multiplicative method

		Factor values					values for factor clusters using the results of multiplicative method and the ranking				Clusters compiled on the base of manual multiplicative method (no map available)		
classification		1. Factor	2. Factor	3. Factor	4. Factor	5. Factor	rank	causal	rank	effect	classification	causes	effects
1	mean	,197	-,096	-,435	-1,127	-,460	(3)	,280	(3)	,117	1	-,325	-,026
	standard deviation	,537	,697	,571	,345	,402		,921		,482		,290	,272
	N	40	40	40	40	40		40		40		37	37
2	mean	,806	-,397	1,326	,344	,443	(1)	,832	(1)	,649	2	,174	,887
	standard deviation	,419	,295	,552	,328	,236		,755		,543		,247	,401
	N	30	30	30	30	30		30		30		29	29
3	mean	,477	,530	-,088	-,180	,559	(2)	,376	(2)	,541	3	2,126	-,224
	standard deviation	,488	,771	,656	,643	,321		,678		1,157		,579	,583
	N	55	55	55	55	55		55		55		12	12
4	mean	,202	-,890	-2,262	1,735	2,644	(5)	-,364	(9)	-1,312	4	1,068	1,386
	standard deviation	,229	,489	,934	,485	,263	(	,242		,539		,325	,362
	N	7	7	7	7	7		7		7		16	16
5	mean	-,387	,322	-,961	1,036	-1,291	(7)	-,545	(8)	-1,199	5	,768	,236
	standard deviation	,553	,604	,594	,585	,529		,668		,442		,259	,346
	N	17	17	17	17	17		17		17		30	30
6	mean	-1,496	2,468	,552	1,395	-1,085	(8)	-1,329	(5)	-,204	6	,070	-1,052
	standard deviation	,720	1,173	,481	,760	,613		,476		,940		,345	,427
	N	7	7	7	7	7		7		7		25	25
7	mean	-,201	-,845	,588	1,528	-,436	(6)	-,535	(7)	-1,105	7	-,941	-1,093
	standard deviation	,467	,784	,403	,467	,529		,492		,418		,351	,385
	N	14	14	14	14	14		14		14		35	35
8	mean	-2,252	-,406	,106	-,633	,773	(9)	-1,648	(4)	,079	8	-1,728	,387
	standard deviation	,700	1,248	1,080	,485	,412		,337		,619		,286	,437
	N	19	19	19	19	19		19		19		17	17
9	mean	,226	-,798	,037	-,328	-1,785	(4)	,237	(6)	-,687	9	1,944	6,655
	standard deviation	,430	,578	,336	,476	,312		,715		,444		,	,
	N	13	13	13	13	13		13		13		1	1
total	mean	,000	,000	,000	,000	,000		,000		,000	total	,000	,000
	standard deviation	1,000	1,000	1,000	1,000	1,000		1,000		1,000		1,000	1,000
	N	202	202	202	202	202		202		202		202	202

UK) have the same high mean values for both the causal and the effect side of all variables. East Germany is a unique case and while it has advantages in accessibility it still has several structural problems. Cluster 8 (Portugal without Lisbon, Greece without Athens) combines the lowest levels on the causal side but a "midfield" performance whereas the situation in cluster 6 (South Spain, Sicily and Sardinia) is not as bad on the causal side but worse on the effect side. Cluster 5 (Central/Northern Spain and Southern Italy) performs on a lower level than one would expect from the causal side. The analysis gives a varied picture on the regional situation on the EU's territory.

(6) Finally the study could be extended in the field of distinguishing different types of settlement structure in order to expand on that very important field of spatial planning. The distinction of different types of regions was taken from Schmidt-Seiwert (1997) who classified 6 types of regions (see table 3.4.3.7.)

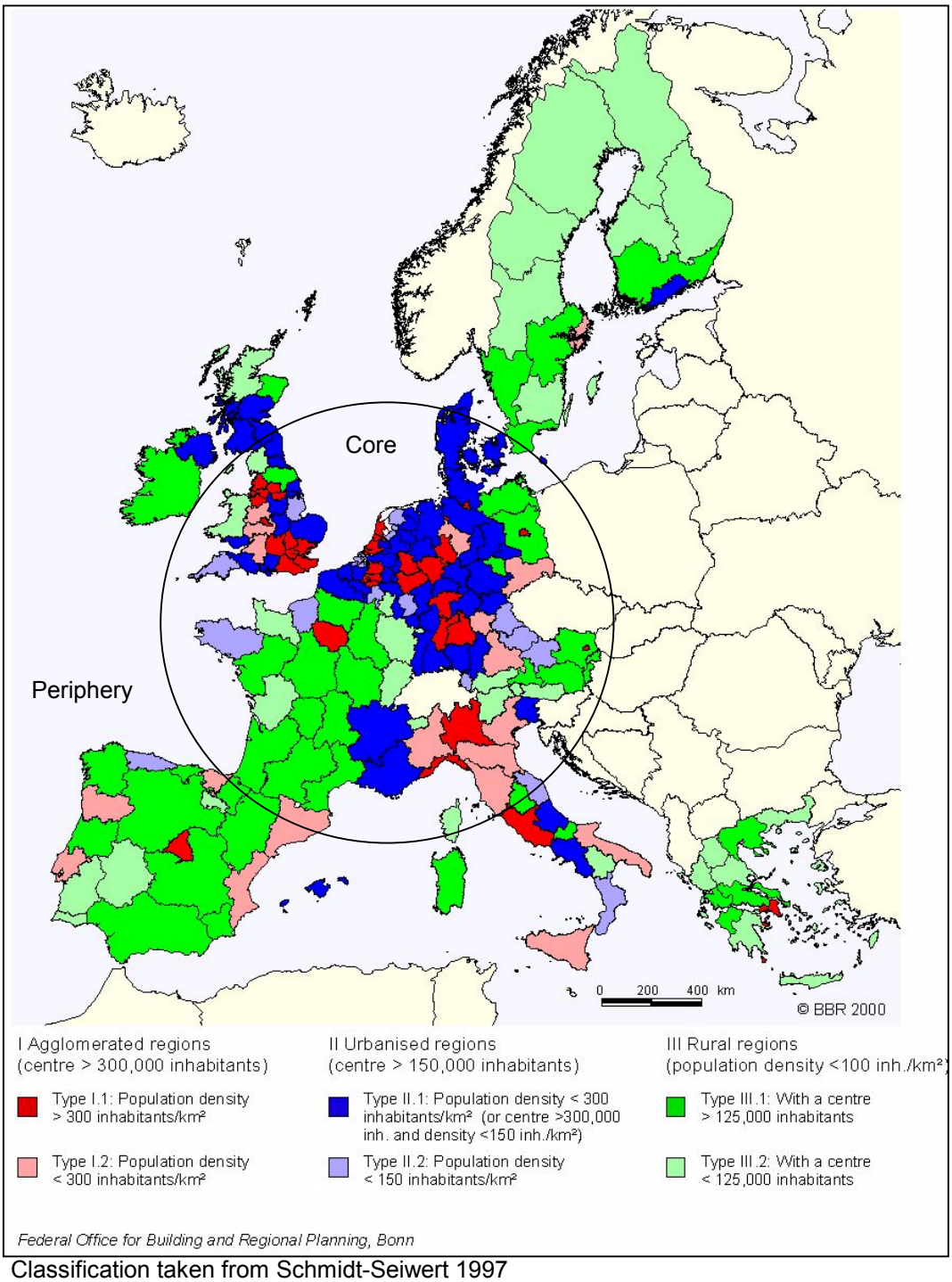
Table 3.4.3.7.: Classification of the EU-regions by settlement structure and numbers of regions in total, in the core and in the periphery

Type	description	Total	Core	Periphery
Type I 1	Agglomerated regions (centre > 300.000 inhabitants) Population density > 300 inhabitatnts/km^2	36	34	2
Type I 2:	Agglomerated regions (centre > 300.000 inhabitants) : Population density < 300 inhabitants/km^2	19	11	9
Type II 1	Urbanised regions (centre > 150.000 inhabitants) Population density < 300 inhabitants/ km^2 or centre > 300.000 inh. and density < 150 inh./km^2	53	47	8
Type II 2	Urbanised regions (centre > 150.000 inhabitants) Population density < 150 inhabitants/km^2	16	14	3
Type III 1	Rural regions (population density < 100 inh./km^2 With a centre > 125.000 inhabitants	39	20	19
Type III 2	Rural regions (population density < 100 inh./km^2) With a centre < 125.000 inhabitants	35	12	23

Source: Schmidt-Seiwert 1997 for the classification of the settlement structure

It is clear that this distinction of different types of region is constructed from a central European perspective. The perception of a big centre and a middle sized town varies between countries i.e. Sweden or Portugal. Even here important seems to be a distinction of the EU core and the periphery which was achieved by an intuitive procedure. Existing borders of EU Member States were used except for the Italian and the UK case. The core compromises Germany, Belgium, Netherlands, Luxembourg, France, England/Wales, North Italy, Denmark, Austria whereas the periphery includes all other countries and regions of the outer ring. (See discussion below). It would be worth trying to introduce country dummies and different population densities and city sizes. The proposed classification leads to a map (see map 3.4.3.10) which creates a helpful tool, although it might engender some criticism.

Map. 3.4.3.10.: The settlement structure of the EU's territory - distinction of core and periphery



Classification taken from Schmidt-Seiwert 1997

For types see table 3.4.3.7.

As a first step into the analysis the mean value of the causal indicators have been listed in table 3.4.3.8. and visualised in figure 3.4.3.1. The table shows an interesting pattern. Very densely populated agglomerations (type I 1) have the best potential followed by urbanised regions with higher population density or bigger centre (type II 1). Following the

agglomerations with lower density and then come the lower category of urban regions (type II 2) and rural regions. Looking at the effect side of performance it is obvious that both types of urbanised regions perform relatively better than the agglomerations given the latters advantages on the causal side. This seems to be a surprising result that needs further investigation.

Previous results have already suggested (see text to map 3.4.3.3.) that agglomerations in the core of the EU could play a different role than those in the periphery. In the core the agglomerations tend to perform worse in relation to the expectations implied by the causal variables. It would be interesting to investigate this finding further on a regional scale and examine how this pattern is influenced by location on the EU level. Therefore, analysis was carried out for the two groups of regions, the core and the periphery. The selection of regions for both of these types was achieved by an intuitive procedure (see map 3.4.3.10.) using existing borders of EU Member States except for the two cases of UK and Italy where the countries were split into two (in the Italian case the South/Sardinia and Central/North and in the UK case Scotland/Northern Ireland and England/Wales).

Table 3.4.3.8.: Mean values for different types of the settlement structure

settlement structure		Causal Index	Effect Index
I Agglomerated regions (centre > 300.000 inhabitants)	mean	1,16	0,23
Type I 1: Population density > 300 inhabitatnts/km^2	N	36	36
	standard deviation	0,82	0,77
I Agglomerated regions (centre > 300.000 inhabitants)	mean	0,05	-0,22
Type I 2: Population density < 300 inhabitants/km^2	N	20	20
	standard deviation	0,88	0,89
II Urbanised regions (centre > 150.000 inhabitants)	mean	0,24	0,36
Type II 1:Population density < 300 inhabitants/ km^2 or centre	N	55	55
> 300.000 inh. and density < 150 inh./km^2	standard deviation	0,67	0,84
II Urbanised regions (centre > 150.000 inhabitants	mean	-0,10	0,54
Type II 2: Population density < 150 inhabitants/km^2	N	17	17
	standard deviation	0,94	1,80
III Rural regions (population density < 100 inh./km^2)	mean	-0,54	-0,40
Type III 1: With a centre > 125.000 inhabitants	N	39	39
	standard deviation	0,61	0,87
III Rural regions (population density < 100 inh./km^2)	mean	-0,94	-0,48
Type III 2: With a centre < 125.000 inhabitants	N	35	35
	standard deviation	0,70	0,71
Total	mean	0,00	0,00
	N	202	202
	standard deviation	1,00	1,00

The evaluation of the causal and effects variable by core and periphery (see figure 3.4.3.1.a,b. and c. See for data appendix 5-7 and table 3.4.3.7) reveals some interesting patterns which are worth noting. Within the EU core investigated most of rural regions of both types of centres (>125.000 inhab. and < 125.000 inhab.) are found in France and Austria. Within the core it is most surprising that the urbanised regions with lower population density (type II 2) perform best in the relation between cause and effect.

Figure 3.4.3.1.a: Causal and effects indicator by settlement for all EU regions

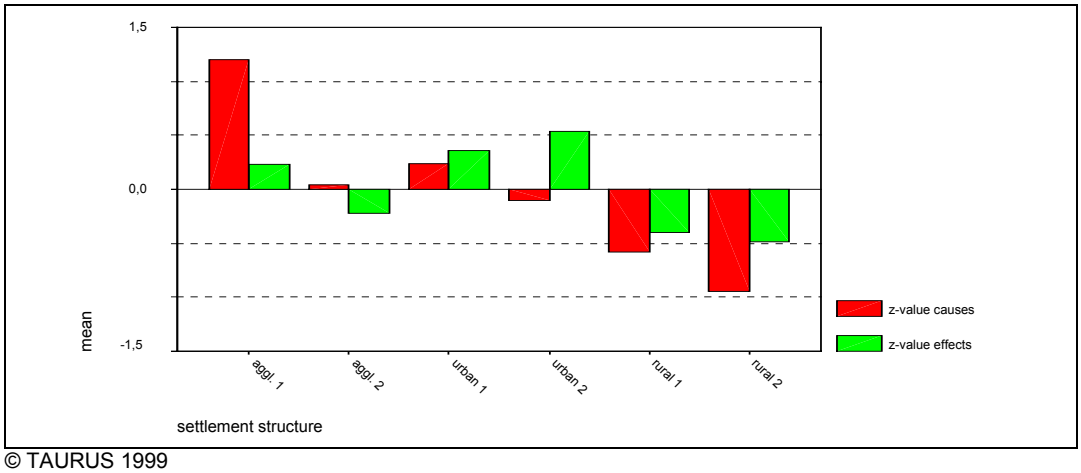


Figure 3.4.3.1.b: Causal and effects indicator by settlement structure for the core EU regions (Core: A, B, D, DK, F, L, I without South of Rome and Sardinia, NL, UK without Northern Ireland/Scotland)

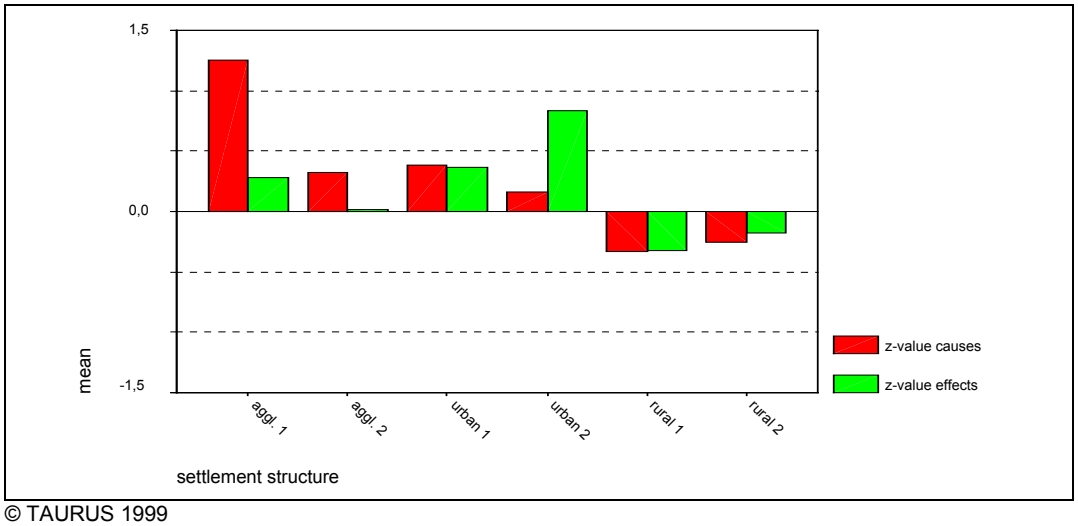
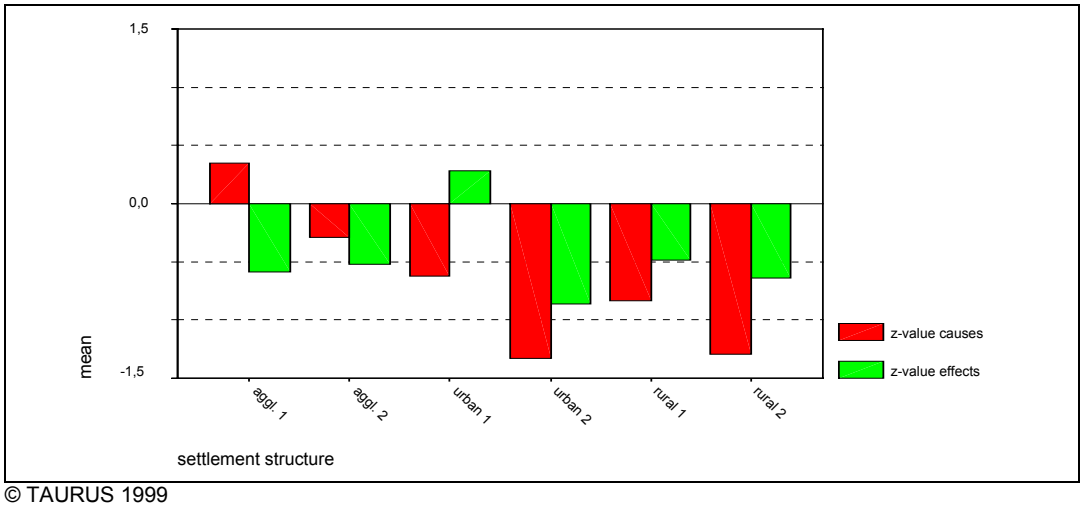


Figure 3.4.3.1.c: Causal and effects indicator by settlement structure for the peripheral EU regions (Periphery: E, P, Gr, Irl, I South/Sardinia, S, SF, Northern Ireland/Scotland)



Taking into account that these regions usually link the hinterland to the agglomerations and urbanised regions which are mostly found in the EU's core, the result is not as surprising as these regions also profit from the causal effects of agglomerations and urbanised regions. This underlines two consequences - relations between different types of neighbouring regions exist and the hypothesis of national clusters. In general, the relationship between the causal and effects variable are less obvious than for the periphery.

In the periphery the settlement structure of the agglomerations with lower density and the two rural region types are dominant. This has an effect on the interpretation of the low number of urbanised regions with higher population density or bigger centre (type II 1) that performed best in the periphery. In total the urbanised regions do not play a major role in the periphery. Furthermore, in peripheral regions the rural regions performed better than the agglomerations in relation to the causal effects. It is also worth noting that the rural areas perform relatively better in terms of the causal - effect relations than the core regions.

3.4.4. Conclusions

The study on competition distinguishes the causal factors and effects of competitiveness taken from theory and previous studies and investigates how these factors are interrelated and found in the regional web. Causal factors which were considered in the study were productivity, labour cost, sectoral structure, share of young employed, share of R&D employment and expenditure, the location in the regional and the European context, accessibility and infrastructural endowment. Effect factors were growth of GDP per capita, employment trend, rate of unemployment, the development of unemployment, population trend, migration, share of +60.

The first finding is that all of the investigated causal factors are more highly correlated than the factors defined as effects of competitiveness. Causal factors follow a strong centre periphery pattern with the exception of the capital region. The effect factors also follow this trend of centre periphery but there are many exceptions especially towards a better economic performance in the periphery. The factor analysis with clustering revealed three interesting patterns. The strong interrelation of causal factors was confirmed. The effects are more diverse, it seems as though the positive effects of competitiveness express themselves in an “either/or” pattern i.e. either there is strong relation with developments on the labour market, or employment ratio, or population development, or growth per capita, or some combinations but relations between these factors tend to be weak. The patterns of causal and effect indices produced by the factor analysis were clustered with the result that a very strong national trend is still visible. One may conclude that national policies and regulations play a decisive role for the performance of regions. An intervening variable could be the deviating growth cycle of national economies, which sustain national patterns on the regional level.Recent experience suggests that the achievement of economic and social cohesion between the EU periphery and the central pentagon is possible,

sometimes very rapidly. However, it is not achieved as a result of any single process, several factors are essential. These include a transition from government to governance, the ability to establish and maintain competitiveness based on factors associated with comparative advantages, the timely provision and maintenance of infrastructure, the capacity to adapt and reposition in the context of a rapidly changing business environment, and long-term investment in human resource development and social capital.

4. CONCLUSIONS FOR POLICIES AND FURTHER RESEARCH (Luxembourg/Ireland)

Amalgamation of the parts of the study

A range of spatial patterns occur in the European territory which are influenced by some very specific developments in certain regions due to national and regional conditions and policies. In general (with many exceptions addressed below), all parts of the study confirm the EU wide core-periphery pattern in economic strength which underlies two further sub-patterns detected on the basis of the following working hypothesis: there are factors representing input in terms of the preconditions of economic strength and also factors of output in terms of the effects of economic strength. In relation to the preconditions, polycentric areas in the core perform better in economic terms than agglomerations (particularly those with lower density). In the periphery the lower density agglomerations play a more decisive role in economic development but this is partly a result of the fact that polycentricity in the form of urbanised areas is much less prevalent than in the core of the EU. This latter pattern owes more to the existing settlement structure and population density than to the particular strength of agglomerations.

Just how far the polycentric urbanised areas in the core benefit from agglomerations in terms of draining wages and employment into the surrounding areas with better living conditions is hard to prove on this statistical level.

The rural areas are not necessarily connected with low performance and bad starting conditions. Rural areas with a bigger centre (type III 1) regularly perform better particularly in regions where there are better preconditions in the sectoral structure and in innovation potential. These regions are largely concentrated in the northern part of the EU.

It also became obvious that there is a kind of mainstream relation between the preconditions and inputs for economic development and the effects and outcome. It is interesting to note that the outcome is less streamlined than the input in terms of the spatial coincidence of different indicators on both sides. The output, usually measured in GDP per capita, was defined in a broad way by considering productivity, participation rates and unemployment that allowed a trade off between these variables (although the relation was not exactly modelled). National patterns were revealed particularly on the effect side of economic strength when combining them with the input factors. This result led to the conclusion that policy and institutionally related factors play a determining role in regional economic strength.

Apart from these general results, diverging regions could be identified on both sides i.e. developing worse or better than the mainstream trend. This was related to a positive or negative combination of locational factors embedded in a specific national context. These findings suggest that it would be worthwhile moving beyond the macro-analytical level through the use of case studies. The Irish case for example reveals that it is more than simple factors that are within the reach of policy (such as the easy access to the country due to common language). This has to be combined with other appropriate policies and the

art is to find the right balance that can address bottlenecks and location specific potentials to the advantage of spatial development.

Recent experience suggests that the achievement of economic and social cohesion between the EU periphery and the central pentagon is possible, sometimes very rapidly. However, it is not achieved as a result of any single process. Several factors are essential, such as a transition from government to governance, ability to establish and maintain competitiveness based on factors associated with comparative advantages, the timely provision and maintenance of infrastructure, the capacity to adapt and reposition in the context of a rapidly changing business environment, and long-term investment in human resource development and social capital.

... on policies

What conclusions can be drawn for policies? The messages for policies are many. Regional and spatial policy should find the weakest part of the chain within the strongly related causal factors. Spatial development policy has to consider all factors and should not concentrate exclusively on single factors such as technology or hard infrastructure. A balanced development of the factors of potentials ought to be envisaged. This does not only apply to infrastructure but also to economic structure. Regional policies will always be overshadowed by national trends – with the exception of capital regions it is obviously hard for the regions to withstand national trends. Strong national trends not only point to different stages in terms of growth cycles and the overall development level but also to different institutional structures which can hamper or accelerate regional development in comparison to other EU regions. Intra-sectoral productivity differentials are a major source of the variation in per capita GDP levels. Convergence among regions will require a shift from low productivity sectors in rural areas and old industrial zones, but a co-ordinated approach of sectoral policies is needed. Similarly the achievement of policies by different governmental levels can only be attained through the use of a spatially co-ordinated approach.

Research on the modernisation indicators supports the view that single policies aimed, for instance, at increasing the expenditure on R&D in weaker regions, needs to be accompanied by a broader policy framework given the interrelationship between the different causes of modernisation and their effects. In rural peripheral regions, in particular, high agricultural employment correlated negatively with all of the other inputs to modernisation except government expenditure on R&D, indicating that this latter variable is not enough on its own to create a modernised economy. To some extent this has been recognised in the most recent programming period. Priorities were changed from an emphasis on the intervention of public sector supply of facilities to more emphasis on building R&D skills alongside the stimulation of demand and promotion of innovation through partnerships. Policies following this direction would help the development of a polycentric model of spatial development and encourage the spread of economic strength outside the capital regions.

The positive starting conditions in competitiveness seemed to be strongly overshadowed by national economic policy moves towards growth and through the institutional restrictions in each country. The results support the view that there is a choice in the way in which use is made of the economic potential for employment, growth and/or productivity.

Furthermore, the improvement in regional cohesion and development along a convergence trajectory is most likely to be mediated through the upper level of the urban system. In this respect, it seems that agglomerations play a stronger role in the periphery whereas a polycentric urbanised development dominates the core of Europe. Intra regional differences may deepen so that the strengthening of urban rural relations is required to counteract these developments. There is a need for support through physical infrastructure and soft support to facilitate stronger rural urban linkages (they need not be territorially constrained) and also more complex forms of inter-urban interactions. The links to cohesion and co-ordination issues stressed by the Commission are obvious.

In terms of direct links to the policy options of the ESDP the following are particularly important to target. The spatial integration of sectoral spatial policies. Better use of urban-rural relations in urbanised and rural areas. Information exchange on successful institutional arrangements in a broad range of policy fields. Furthermore, the policy options mentioned under the topic of improved accessibility by transport and of knowledge to support the diffusion of innovation are of increasing importance for balanced spatial development. The art of politics in this case lies in the ability to respond to local conditions in an appropriate way. To achieve this aim it would be useful to learn more about the micro-conditions in the successful and less successful regions identified in this study.

... on further research

The research on this theme has provided a spatial analysis of the economic performance of the regions of the EU. In investigating the level and dynamics of the regional economies it has sought to identify and give reasons for the spatial differentiation associated with economic strength indicators. While a broad core-periphery divide was evident throughout the research, certain regions were identified as out-performing others in spite of starting from the same baseline potential. Given these findings from a macro point of view, it would be interesting to conduct **case studies** on those regions focusing on a number of factors including;

- Institutional frameworks – investigating their structure, the level at which policy decisions are made for the region and who makes them.
- The role of urban-rural relations in determining the regions economic performance. To what extent do spillover effects influence the economic performance of regions and are urban-rural partnerships a successful mechanism to maximise any benefits?
- Examine whether regions that have performed less well than expected would benefit from a spatial planning policy that encourages the development of a polycentric model of development. Should this model be based on multiple linkages and nodal points,

bearing in mind that the regions that have performed most poorly are rural areas with a small centre? How feasible would it be to implement such a policy? Research could be linked to the role of urban areas, as distinct from agglomerations, in enhancing economic performance given that they emerged as the most successful regions for the indicators of competitiveness.

- The dimensions of core and periphery in the EU taking into account population densities ought to be further investigated. The roles of the system of balance payments between regions needs to be further highlighted in that context.
- To investigate further the question of territorial rootedness of production and service systems in the context of increasing globalisation and the enlargement of the EU.

It emerged from this study that more data, regularly updated, needs to be provided for the indicators of economic strength. This data should be widely available at a minimum of NUTS II level for all indicators and regions. As much of the information may already be available through research organisations within individual member states it could be useful to establish new working networks between Eurostat and data facilitators.

Such an arrangement would enhance further research into economic strength, in particular into the concept on territorial rootedness. Both a model and indicators were outlined for this concept but there was a dearth of available data on a range of indicators including: Role of FDI; Location of company HQ; IT indicators – ISDN lines, fax lines per 1000 inhabitants; Persistence of enterprise in non-IT branches; Share of enterprise with HQ in a particular region; Enterprise size in non-IT branches.

Further research ought to consider the questions of choice on the regional level concerning labour and/or wealth and/or growth and/or productivity. It would also be useful to investigate the role which urbanised areas are playing as these areas are performing better than agglomerations – this topic would also have considerable effects on the spatial development policy of the EU. The improvement in regional cohesion by using the different approaches of polycentric development or a more monocentric orientated growth pole in different spatial contexts and productivity levels needs to be examined. Possible inter-urban, rural-urban and inter-rural linkages and their contribution to a more balanced development by making use of the potentials and strengths of different types regions should be looked at using a collaborative approach. The institutional dimension is of special interest in that context.

Macro level EU wide regional analysis is limited by the availability of data and the constraints imposed by administrative boundaries used for NUTS classifications. Considerably more in-depth, micro level analyses of the dynamics of change are required but these need to be linked to an extended macro analysis.

Finally, future research on the economic strength of regions will be of greatest value if it continues to be complemented by research on the other themes in this study (i.e. social, cultural, land use and environmental issues). In this way a holistic interpretation of the processes which form regional identity will provide a broader framework for the evaluation of the spatial pattern of individual criteria.

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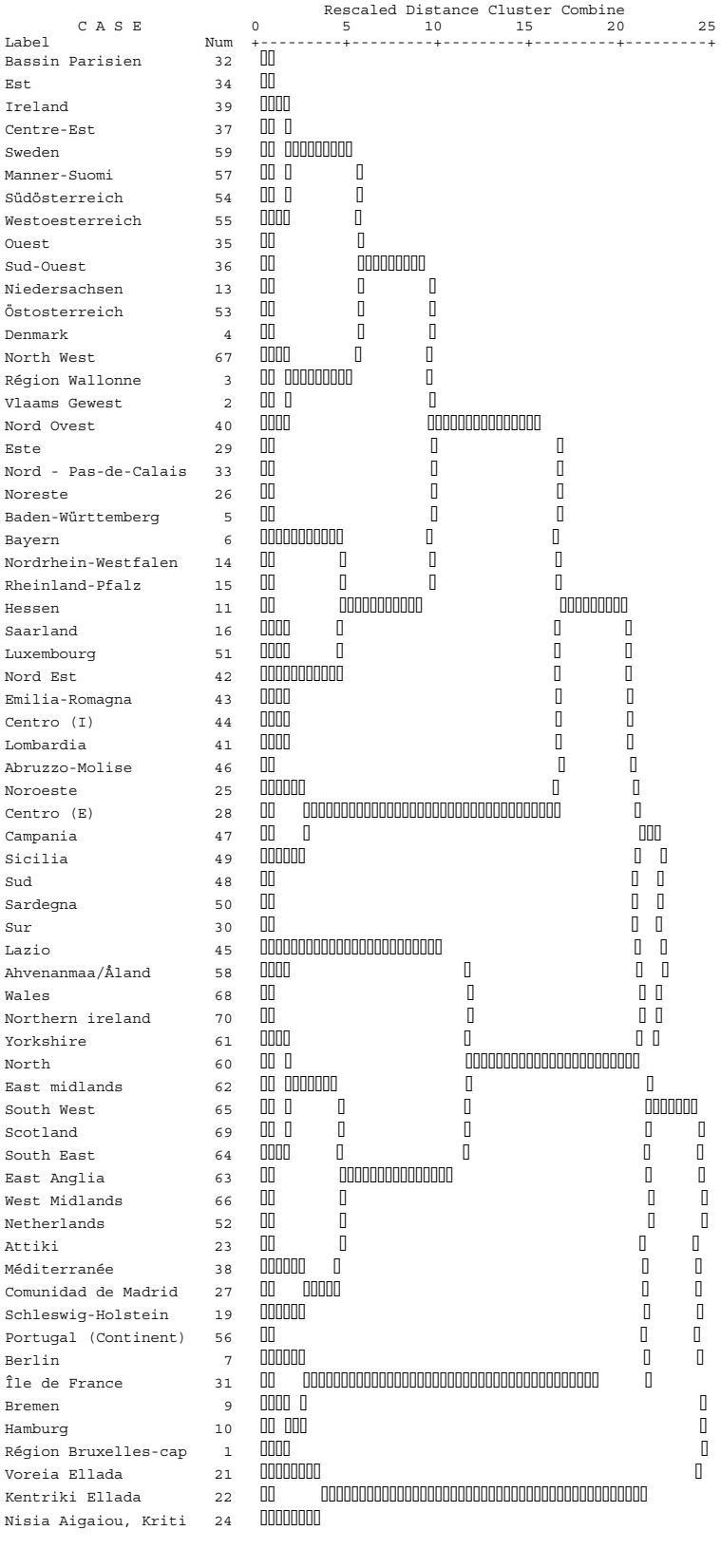
Appendix

Appendix 1: Dendrogram using ward method, hierarchical cluster analysis



Appendix 2: Correlation Matrix causes

	AGEMP	SERVEMP	higher ed attainment of 25-59 y olds (% total)	RDEMP	RDGOV	RDPRIV	km m/w per km2	rail
AGEMP	1.00							
SERVEMP	-0.655***	1.000						
higher ed. attainment of 25-59 y olds (% total)	-0.466***	0.586***	1.00					
RDEMP	-0.534***	0.408***	0.60***	1.000				
RDGOV	0.452***		-0.21*	-0.317***	1.000			
RDPRIV	-0.590***	0.197*	0.40***	0.660***	-0.612***	1.000		
km m/w per km2	-0.449***	0.390***	0.27**	0.366***			1.000	
rail length (km) per km2 (area)	-0.317***	0.430***	0.377***	0.312***			0.675***	1.000

Significance (1-tailed) at p = 0.05* significance at p = 0.01** significance at p = 0.005***

Appendix 3: Correlation matrix- effects

	PPS ('000) per capita	GVAMSFC	GVAAGFC	UNEMP	EMPFEM	EMPTOT	patents per 10,000 inhab.	cars per inhabitant
PPS ('000) per capita	1.000							
GVAMSFC	0.368***	1.000						
GVAAGFC	-0.498***	-0.492***	1.000					
UNEMP	-0.398***	0.285**		1.000				
EMPFEM	0.305***		-0.258*	-0.764***	1.000			
EMPTOT	0.312***	-0.196*	-0.181*	-0.833***	0.962***	1.000		
patents per 10,000 inhabs	0.501***		-0.376***	-0.392***	0.462***	0.413***	1.000	
cars per inhabitant	0.414***	0.185*	-0.501***				0.342***	1.000

Significance as above

Appendix 4: correlation matrix causes and effects

	AGEMP	SERVEMP	higher ed. attainment of 25-59 y olds (% total)	RDEMP	RDGOV	RDPRIV	km m/w per km2	rail
PPS ('000) per capita	-0.508***	0.422***	0.32***	0.618***		0.377***	0.574***	0.592***
GVAMSFC	-0.398***	0.746***	0.35***	0.241*	0.244*		0.459***	0.465***
GVAAGFC	0.939***	-0.608***	-0.39***	-0.470***	0.397***	-0.499***	-0.495***	-0.331***
UNEMP	0.205*		-0.22*	-0.371***		-0.423***		
EMPFEM	-0.428***	0.247*	0.47***	0.510***	-0.272*	0.539***		
EMPTOT	-0.347**		0.37***	0.460***	-0.178*	0.477***		
patents per 10,000 inhabs	-0.405***	0.251**	0.46***	0.804***	-0.332***	0.552***	0.219*	0.200*
cars per inhabitant	-0.450***	0.208*		0.196*		0.232**		

Significance as above

Appendix 5: Mean values for different types of the settlement structure (periphery)

Settlement structure		Causal Index	Effect Index
Agglomerated regions: Type I 1	mean	0,35	-0,59
	N	2	2
	standard deviation	0,91	0,45
Agglomerated regions: Type I 2	mean	-0,29	-0,52
	N	9	9
	standard deviation	1,13	0,7
Urbanised regions: Type II 1	mean	-0,62	0,28
	N	8	8
	standard deviation	1	0,88
Urbanised regions: Type II 2	mean	-1,33	-0,86
	N	3	3
	standard deviation	0,67	1,46
Rural regions: Type III 1	mean	-0,84	-0,49
	N	19	19
	standard deviation	0,56	1
Rural regions: Type III 2	mean	-1,3	-064
	N	23	23
	standard deviation	0,5	0,72
Total	mean	-0,89	-0,47
	N	64	64
	standard deviation	0,81	0,88

Appendix 6: Mean values for different types of the settlement structure (core)

settlement structure		Causal Index	Effect Index
Agglomerated regions: Type I 1	mean	1,25	0,28
	N	34	34
	standard deviation	0,77	0,76
Agglomerated regions: Type I 2	mean	0,32	-0,02
	N	11	11
	standard deviation	0,51	0,99
Urbanised regions: Type II 1	mean	0,39	0,37
	N	47	47
	standard deviation	0,47	0,84
Urbanised regions: Type II 2	mean	0,16	0,84
	N	14	14
	standard deviation	0,76	1,76
Rural regions: Type III 1	mean	-0,34	-0,33
	N	20	20
	standard deviation	0,31	0,76
Rural regions: Type III 2	mean	-0,26	-0,18
	N	12	12
	standard deviation	0,49	0,61
Total	mean	0,41	0,22
	N	138	138
	standard deviation	0,79	0,98

Appendix 7: Mean values for different types of the settlement structure (total)

settlement structure		Causal Index	Effect Index
Agglomerated regions: Type I 1	mean	1,2	0,23
	N	36	36
	standard deviation	0,79	0,77
Agglomerated regions: Type I 2	mean	0,05	-0,22
	N	20	20
	standard deviation	0,88	0,89
Urbanised regions: Type II 1	mean	0,24	0,36
	N	55	55
	standard deviation	0,67	0,84
Urbanised regions: Type II 2	mean	-0,10	0,54
	N	17	17
	standard deviation	0,94	1,80
Rural regions: Type III 1	mean	-0,58	-0,40
	N	39	39
	standard deviation	0,51	0,87
Rural regions: Type III 2	mean	-0,94	-0,48
	N	35	35
	standard deviation	0,70	0,71
Total	mean	0,0	0,0
	N	202	202
	standard deviation	1,00	1,00