

Cornett, Andreas P.; Soerensen, Nils Karl

**Conference Paper**

## Development, growth and decline in Europe: New patterns of economic convergence and divergence?

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## **53<sup>th</sup> Congress of the European Regional Science Association**

*Andreas P. Cornett\* & Nils Karl Sørensen\**

*University of Southern Denmark*

E-mail: [Cornett@sam.sdu.dk](mailto:Cornett@sam.sdu.dk)

E-mail: [NKS@sam.sdu.dk](mailto:NKS@sam.sdu.dk)

### **Development, growth and decline in Europe: New patterns of economic convergence and divergence?**

#### **Abstract:**

The influence of general economic and fiscal policy is in recent years more significant than ever. Tight budgets sets limits on public spending in general and on regional development in particular, both with regard to programs specifically targeted on regional issue, but often also indirect due to changes in the geographical distribution of public spending (i.e. local purchasing of goods and services) or the location of institutions etc. Furthermore the focus on (global) competitiveness, innovation ‘smart growth’ in the Lisbon and Euro 2020 strategy seems to have a build in effect toward economic activities usually located in center or metropolitan areas.

Based on an analysis of the dominant policy measures used in EU structural and R&D policy the aim of the current paper is to assess, to what extent they have supported regional convergence, not only between but also within countries. The conceptual point of departure is new economic growth theory and the measures derived from these concepts. An attempt is made to analyze regional difference in the relevant factor endowments and to measure the impacts on regional convergence in a European (country wise) and urban-rural perspective.

The first part of the paper discusses the overall development with regard to Structural funds and the distribution of grants with focus on the developments and perspectives until 2020. The second part considers the impact on the process of convergence of the current decline in the overall economic trends in Europe in a regional context. In addition, in influence of innovation on the development in a European perspective in analyzed along with increasing concentration of the population in urban areas. Finally, the paper addresses the perspectives of the pursued policy in different regions.

*Keywords: Recession – regional economic growth - convergence & divergence – EU structural policy – innovation*

*Economic lit classification: R11, R12, R58*

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\* Alstion 2, DK-6400 Sønderborg, Denmark. Phone +45 6550 1211 or 1229

## 1. Introduction

The influence of general economic and fiscal policy on regional development is in recent years more significant than ever, not only in the South European countries facing a severe debt crisis, but also in other parts of Europe, irrespective whether they belong to the Euro area or not. Tight budgets sets limits on public spending in general and on regional development in particular, both with regard to programs specifically targeted on regional issue, but often also indirect due to changes in the geographical distribution of public spending (i.e. local purchasing of goods and services) or the location of public sector institutions etc. Furthermore the focus on (global) competitiveness, innovation ‘smart growth’ in the Lisbon and Euro 2020 strategy seems to have a build in effect toward economic activities usually located in center or metropolitan areas. This will the explicit inclusion of the smart growth policy in the ongoing programming of the new regional and structural fund period most likely not change.

Based on an analysis of the dominant policy measures used in EU structural and R&D policy the current paper aims at to assess, to what extent these initiative have supported regional convergence, not only between but also within countries. The conceptual point of departure is new economic growth theory and the policy measures derived from these concepts. An attempt is made to analyze regional difference in the relevant factor endowments with special attention on innovation<sup>1</sup>, and to discuss the impacts on regional convergence in a European (country wise) and urban-rural perspective.

The next section of the paper provides a brief outline of the conceptual framework and the theoretical foundation. The last part of this section provides a brief introduction to the empirical evidence of the topic. Part three discusses the overall change with regard to Structural Funds and the distribution of grants with focus on the development and perspectives until 2020. Section four considers the impact on the process of convergence of the current decline in the overall economic trends in Europe in a regional context. In addition, in influence of innovation on the development in a European perspective in analyzed along with increasing concentration of the population in urban areas. Finally section 5 addresses the perspectives of the pursued policy in different regions.

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<sup>1</sup> An assessment of the patterns and development of entrepreneurship in the course of the financial and European debt crisis can be found in Cornett (2013)

## **2 The context.**

Convergence and divergence in economic development have been crucial issues in the European Union since the early years of European integration. Structural change in business and industry, initiated through external shocks or by the process of integration itself has been the most important driver of regional alterations in Europe. Nowadays changes in the international system of production and the ability of countries and regions to adapt to these processes are of particular importance. In this context innovation and entrepreneurship are among the key factors of economic growth and competitiveness. Current strategies of policy (European as well as national and regional) are often derived from the concepts based on new economic growth theory. This section of the paper provides a brief introduction to the empirical and theoretical aspects of the issue. The explorative nature of this paper calls for a combined theoretical and empirical foundation of the analysis. Theoretical and conceptual the point of departure is threefold:

- new economic growth theory with focus on the transition from traditional linear to non-linear models of growth.
- spatial aspects of economic growth and competitiveness, with special attention on the importance of national and regional innovation systems as well as changes in location processes.
- this points to last conceptual anchor of the project, the concepts of convergence and divergence.

The second foundation of the paper is the empirical distribution of economic activity and the patterns of economic performance and convergence within the European Union.

### **2.1 New economic growth theory, regional innovation and the process of convergence and divergence**

The reason d'être of regional development efforts is closely linked to the fact that some regions perform worse compared to others, and that this leads to a (comparative) derogation of the quality of living, and will create unequal conditions within a country or Europe as a whole. These complex processes vary over time, and are dependent on external as well as internal factors. This section will

sketch some light on theoretical based explanation, before section 2.2. turns into a brief empirical assessment.

### **2.1.1 Non-linear growth<sup>1</sup>**

Traditional economic growth models have their focus on capital and labor as growth drivers. This type of growth has contributed significant to the reduction of international disparities within the EU area for several decades until the beginning of the 21th century. Since the end of the 1990's the pattern has changed, in particular in the mature industrial societies in North Western Europe. More refined concepts of growth and new growth models are operating with a wider range of growth drivers nowadays, and will have increased importance in future, in particular in a global perspective. Central factors like human capital, knowledge and innovation and even intangible factors like entrepreneurial spirit (Audresch 2006) are in the center of economic development policy. It has been recognized that some of the mechanisms behind economic growth are endogenous in a certain economic system rather than independent of previous performance (see Romer 1994). Innovation and the capacity to innovate are central factors for economic growth and regional development in this new context. The set-up of the regional and national system of innovation becomes crucial for the functioning of a modern business environment. Innovation has to be seen as both independent variable (i.e. a growth driver) and as a dependent variable with regard to policies aiming at stimulating innovative behavior in the firm or educational sector. In this perspective, the role of knowledge and innovation is at least twofold. In the short run, innovation and knowledge creation becomes necessary instruments in the process of regional adaptation to industrial change as a response to changes in the competitive environment. In a longer perspective, innovation and knowledge are preconditions for a successful restructuring of the economic base, nationally as well as regionally and locally. As a consequence, attention has been on the role of innovation policy in economic policy in general (i.e. OECD 2001), or Lisbon Strategy or Euro 2020 and on regional development in particular (see Acs & Varga 2002) and section 3 below.

Contrary to traditional growth theory in this non-linear approach to economic growth<sup>2</sup>, the knowledge sector, innovation and entrepreneurship has become one of the crucial growth-drivers, and has attracted much attention a public policy perspective. Figure 1 below modifies the more common framework (see Cornett & Ingstrup 2010) with special attention on the nature of the

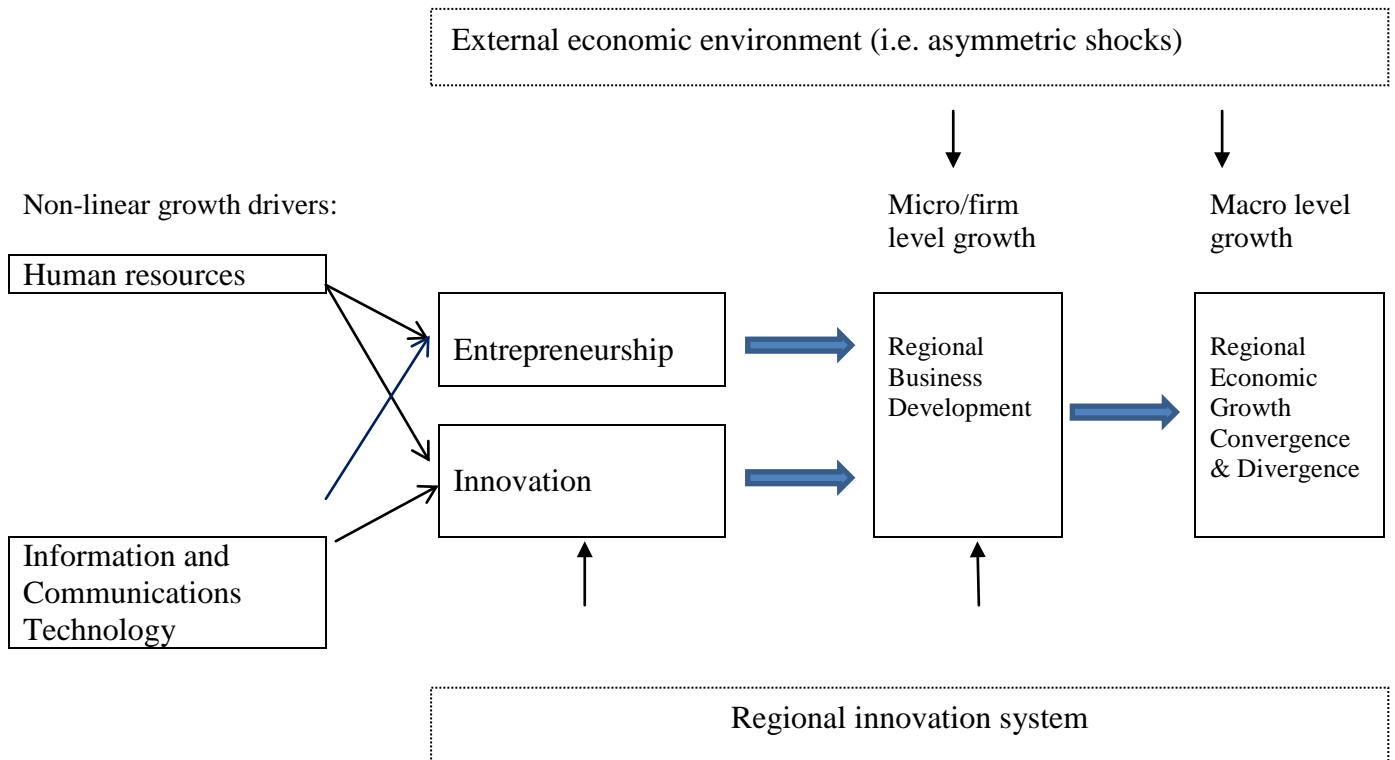
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<sup>1</sup> This section is based on Cornett (2013) forthcoming in Brown et al. (2013), Resources and Competitive Advantage in Clusters.

<sup>2</sup> For an assessment of traditional vs. new growth theory with special attention on to what extent growth factors are endogenous, see Solow 1994.

mechanisms and the micro and macro aspects of growth, and the regional setting (i.e. the regional innovation system). In the current context the main focus is on the linkage between growth drivers and how they influence economic growth and development, direct as well as indirect, see figure 1 below. In particular the importance of innovation capabilities for regional growth and balance is assessed in a period of severe economic challenges regional, national as well as international.

**Figure 1:** From growth driver to regional economic growth



**Source:** adapted from Cornett (2013 forthcoming)

### 2.1.2 The innovation system

The second conceptual anchor in this paper has to be found in the literature dealing with the geographical and institutional aspects of innovation systems. National and regional innovation systems are well-established in the literature of innovation, usually addressed under the headings 'National System of Innovation' or 'Regional System of Innovation'. Essential features of the systems are the *geographical delimitation* and *the actors*, the *linkages* and the *relations or interactions* in the respective system of innovation, the institutional setting. In a dynamic regional development context the institutional aspects of the economic environment are of particular importance for the possibilities of the economic agents and actors to influence the growth drivers determining the potentials of the regional economic performance. Further infrastructure and

accessibility are important parts of the economic framework in which the above sketched growth model is operating. For a brief introduction of the principal aspects, see Arne Isaksen (2003) or Cooke (2001) where the concepts of Regional Innovation Systems are elaborated further and related to the national system of innovation and the concepts of clustering and the knowledge economy. A comprehensive discussion of the national innovation systems can be found in Lundvall (1992).

In an assessment of the institutional and organizational aspects of the regional system of innovation Cooke et al (1997: 489-90) concludes: “the best configuration of a Regional Innovation System can be evaluated from a dual perspective: (a) From a regionalization approach, relating the region to its competence (jurisdiction) capacity, valuing its degree of autonomy to develop policies and manage the different elements that make up the regional system. As well as financing capacity for strategic investments in infrastructure absolutely necessary for the development of innovation processes. (b) From a regionalism approach, related to the region’s cultural base which is a certain level of systemic potential”. In many regards the RIS becomes a special case of the NIS which is defined by certain characteristic usually defined or specific to a country.

### **2.1.3 Convergence and divergence**

The process of economic convergence and divergence determinates the degree of homogeneity and coherence with regard to the economic aspects of the societies. In a study of the long-term development of regional disparities between European regions by Molle & Boeckhout (1995: 106) delimited the concept of coherence tentatively as:

“The concept of cohesion is a rather vague one. It is probably best explained as the degree to which disparities (imbalances) in economic welfare between countries or regions within the European Union are socially and politically tolerable. In practice, indicators like income per capita are used to measure disparity. We assume that an increase in disparity is detrimental for cohesion and vice versa”

Regional economic cohesion is to a large extent created through a process of convergence. If divergence dominate, inter regional cohesion will usual disappear or be reduced. In the current paper convergence will be measured as  $\beta$ -convergence<sup>1</sup>. Convergence implies that in the long run a unique pattern of steady state growth will be reached. Consequently, poorer regions will experience a higher rate of growth in GDP per capita than more wealthy regions. The existence of a unique pattern of growth  $g$  will be true if two key restrictions are imposed on the production function, namely diminishing returns to scale with respect to reproducible factors (capital), and constant and

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<sup>1</sup> The concept used in this article is based on Abreu, De Groot and Florax (2005), for a brief technical outline adapted to the theme of this paper see Appendix 1.

exogenous rate of labor augmenting technological progress. These assumptions will also secure a constant savings fraction of income.

In an economy characterized by nonlinear growth these assumptions have to be modified, but technical the measure still can provide insight in the result of the economic and societal development, see section 4 below.

## **2.2 Regional convergence and disparities<sup>1</sup>**

Structural change of the economy usually leads to an alteration of the regional balance within and between countries (Cornett & Sørensen 2008). The European Union and many other mature industrial countries, as well as the new fast growing economies, have faced the challenge of increasing regional disparities within the country, se Figure 2 below for the trends within the EU area.

During the last decade's growth in the metropolitan and center regions has in most countries been significant higher than in other regions, even in former industrial strongholds. One explanation is the previous mentioned change in the industrial structure toward knowledge and innovation intensive industries. In a European Union context the growth strategies since 2000 have to contribute to fulfillment of the Lisbon targets to create the world's most competitive economic region. The process to reach this goal turned out to some extent to be in contradiction to the intra-regional EU objective to promote regional conversion, not only between countries as a whole, but also within countries and between EU-regions.

Due to the fact that the half time evaluation of the implementation was rather disappointing the Lisbon Strategy was re-launched in 2005 named the 'Renewed Lisbon Strategy', stressing the innovation and conservation of the environment. Central objectives are (Mancha-Navarro & Garrido-Yserte 2008, p.57):

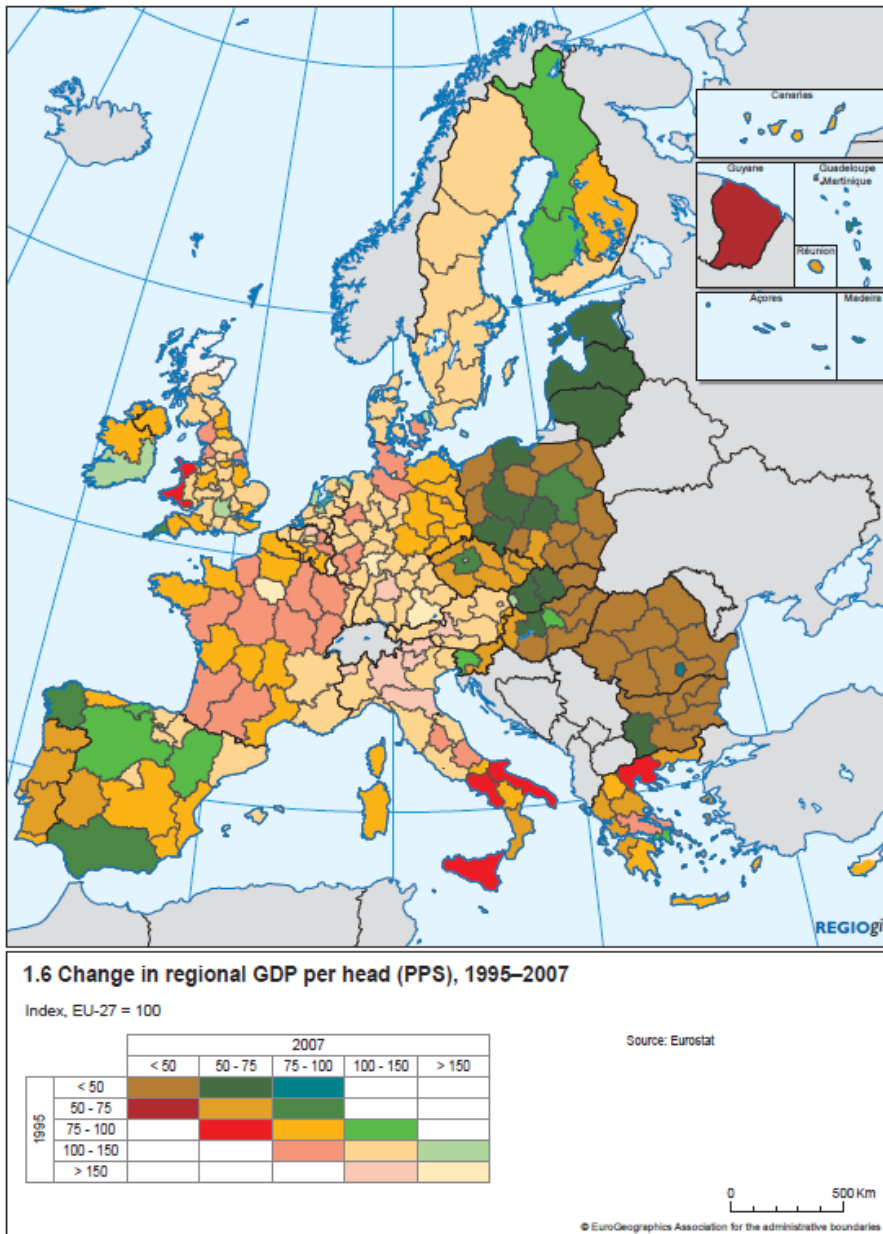
- Improvement policies related to Information Society and Research and Development.
- Acceleration of the structural reform process with regard to innovation and competitiveness.
- Social modernization through investment in human capital and combating social exclusion.
- Facilitating economic and social progress together with environmental protection.

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<sup>1</sup> This section is a revised and update version based on Cornett & Sørensen 2012b.



**Figure 2** Change in regional GDP per capita (PPS) 1995-2007



Source: European Union 2010, p.15.

These aims have to be implemented in a situation where the EU faces a complex economic situation with decreasing economic divergence between member states and increasing disparities within

many countries<sup>1</sup> and now also a significant decrease of economic growth with fundamental risks for economic wealth and progress in particular in some of the new East European member states.

In this perspective, the Lisbon targets<sup>2</sup> - also in the revised Renewed Lisbon Strategy - were not necessarily always in harmony with a policy aiming at a country's regional disparity reduction. Economic catch-up, in particular in new member states, has taken place in metropolitan areas with increasing internal disparities as a consequence. In the last 5-10 years, similar tendencies have been seen in Western Europe. Among the consequences is an increasing polarization of the commuting pattern in many areas leading to a process of regional enlargement<sup>3</sup>.

According to the Lisbon Strategy and the revised from 2010 entitled '*Europe 2020 – Strategy for smart, sustainable and inclusive growth*' (European Commission 2010a), innovation and entrepreneurship are central component in the policy to improve European global competitiveness. As the previous analysis has proved, overall economic growth and regional conversion are not always compatible. In particular, economic growth based on innovation, knowledge and often entrepreneurship tend to be biased toward economic core regions or the metropolitan areas.

One way to solve some of the adverse implications of this trend could be to allocate the Structural Fund resources aiming to improve the economic structure of economically disfavored regions toward these areas to facilitate not only an income catch-up but also an overall improvement of the economic base with regard to knowledge, innovation and human resources, see section 5 below for a short assessment. Based on the data presented in section 3 the record seems to be rather mixed, from the 2000-2006 to the 2007-2013 program period expenditures (planned expenditures) have become more concentrated geographically, but not to the advantage of the regions with the weakest factor endowment related to the new economic growth drivers.

In the spring 2010, the EU-commission formally re-launched the Lisbon Strategy under the heading 'The Europe 2020 Strategy' formulating a vision for 'Europe's social market economy' a well-known expression from the economic history of Germany after the second world. In the next 10 years, focus should be on three related and mutually reinforcing areas of priority (European Commission 2010b):

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<sup>1</sup> For a discussion of the principal aspects of this trend from both empirical and theoretical perspectives, see Cuadrado-Roura & Parellada ed. (2002).

<sup>2</sup> Of particular interest is the so-called EU Lisbon Strategy to create the most competitive economy in Europe by 2010 and the Barcelona targets to spend 3 % of GDP on R&D in the EU.

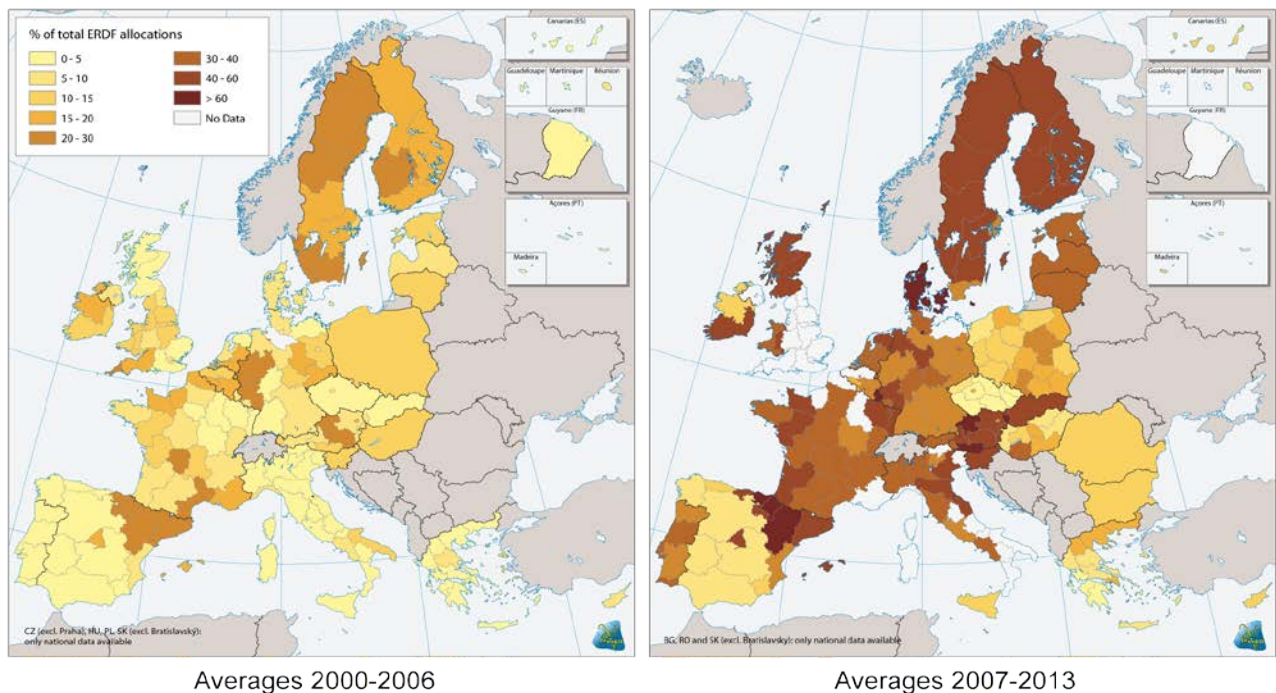
<sup>3</sup> See Johansson (2005) for a discussion of the concept and impacts of regional enlargement, based on a study of cities and regions in the Baltic Sea Region.

- Smart growth, developing an economy based on knowledge and innovation;
- Sustainable growth, promoting a low-carbon, resource-efficient and competitive economy;
- Inclusive growth, fostering a high-employment economy delivering social and territorial cohesion.

In particular the first target can have adverse effects on the intraregional balance, i.e. convergence, since urban and metropolitan area usually are better suited to take advantage of programs in this area, see figure 3 for expenditure in this field in the previous two program periods:

**Figure 3** Growth driver relevant expenditures of Structural Funds

Expenditure for R&D, innovation and information society at regional level



**Source:** European Commission 2007

Overall the targets in the Euro 2020 strategy to a large degree are similar to the Lisbon Strategy and progress towards these objectives will be measured against five representative EU-level targets. The member States have to translate the indicators into national targets reflecting their respective point of departure (European Commission 2010a&b):

- 75% of the population aged 20-64 should be employed

- 3% of the EU's GDP should be invested in R&D
- The "20/20/20" climate/energy targets should be met
- The share of early school leavers should be under 10% and at least 40% of the younger generation should have a degree or diploma
- 20 million less people should be at risk of poverty

The overall aims of the Lisbon Strategy seems only to be slightly modified, but the goal setting seems to be more realistic compared to the vision of the EU to become the most competitive regions of the world in the original strategy from 2000. The next issue to address is how these targets will become operational in the new Structural fund period from 2014 to 2020.

### 3. Instruments and objectives

The history of the regional policy of the EU since 1975 can be characterized as a history of extension in scope and financial resources, geographical extension due to the enlargement of the EU, and mainly of incremental changes in the principles of programming<sup>1</sup>. Nevertheless the current structural policy has very little in common with the first initiatives launched in the aftermath of the first plans to establish an economic and monetary union in the early 1970's.

**Table 1** EU structural Funds 2000-2013: Overview of objectives and instruments

<b>Cohesion policy 2000-2006</b>		<b>Cohesion policy 2007-2013</b>	
Objectives, Community initiatives, Funds	Financial Instruments	Objectives	Financial Instruments
Obj. 1: Lagging regions  Cohesion Fund	ERDF,ESF,FIFG EAGGF-Guarantee & Guidance	Convergence	ERDF ESF Cohesion Fund
Obj. 2:Economic and social conversion zones	ERDF ESF	Regional competitiveness and employment	ERDF ESF
Obj. 3:Training systems and employment policies	ESF		
Interreg III URBAN* EQUAL*	ERDF ERDF ESF	European Territorial cooperation	ERDF
Leader+	EAGGF-Guidance		
Rural development and restructuring of fishing sector beyond Obj. 1	EAGGF-Guarantee FIFG		
<b>4 Objectives</b> <b>4 Community initiatives</b> <b>Cohesion Fund</b>	<b>6 Instruments</b>	<b>3 Objectives</b>	<b>3 Instruments</b>

**Note:** \* 2007-13 part of convergence and regional competitiveness and employment objective

**Source:** European Union 2007.

The most important reform was the merge of all structural funds in the late 1980's forming a comprehensive structural policy. This approach is still dominating, and the basic principle with reference to the above mentioned EURO 2020 program seems to prevail also after 2014. The programming framework for the last two periods is summarized in Table 1. The geographical coverage of the structural policy is the whole of the EU, but still with clear funding priorities in favor of the economic weak parts of the EU, see Figure 4a & b.

<sup>1</sup> For an assessment of the spatial dimension and historical outline see Cornett & Othengrafen (2010)

The structural Fund instruments aim to contribute to the three below mentioned objectives(European Union 2007):

The *convergence objective* aims to speed up the convergence of the least-developed member states and regions by improving conditions for economic growth and employment. i.e. by investment in physical and human capital. This objective is the priority of the Funds.

The *regional competitiveness and employment objective* aims to strengthen the competitiveness and attractiveness as well as employment outside the areas supported according to the first objective.

The *European territorial cooperation objective* aims at strengthening and encouraging cross border and transnational cooperation

Economically the first objective is by far the most important. In the period 2007-2013, cohesion policy will receive 35.7% of the total EU budget, approximately 347.4 billion Euros in current prices. Objective 1, Convergence will receive the lion share 81.5 %. of the resources, the ‘Regional Competiveness and Employment’ objectives share is 16.0 % and 2.5 % of the budget is reserved for ‘European Territorial Cooperation’ (Inforegio 2010).

October 2011 European Commission launched a number of important changes of the cohesion policy and structural policy to adapt to the target of the Euro 2020 policy summarized above. Among the initiative are first of all (European Union 2011: 1f)

- concentrating on the Europe 2020 Strategy’s priorities of smart, sustainable and inclusive growth;
- rewarding performance;
- supporting integrated programming;
- focusing on results – monitoring progress towards agreed objectives;
- reinforcing territorial cohesion; and
- simplifying delivery.

The new architecture of the regional and structural policy operates with goals rather than objectives applied on three types of regions, see map in figure 4b and table 2 below..

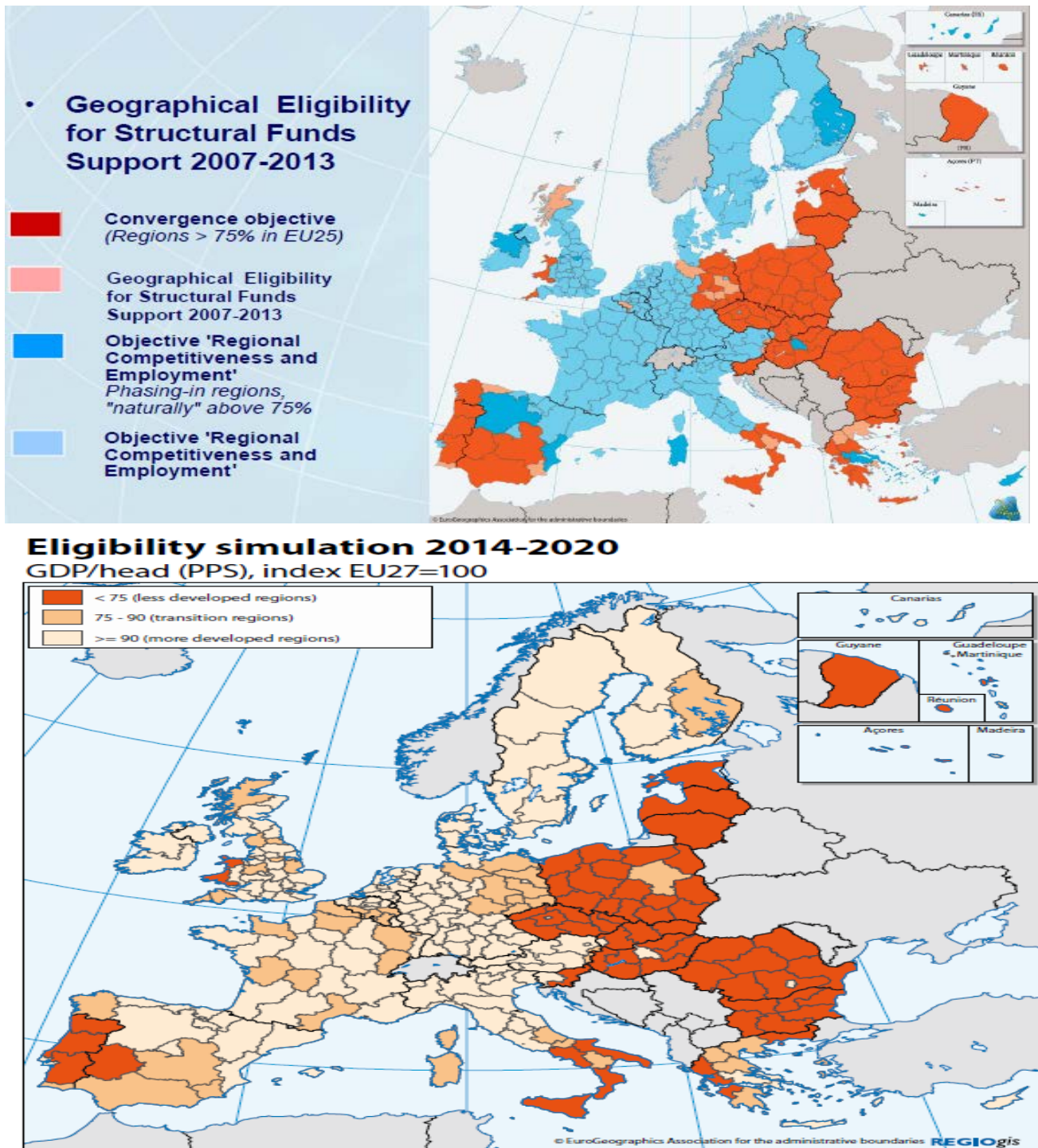
**Table 2** EU structural Funds 2007-2020: Overview of objectives and instruments

Program period 2007 - 2013		Program period 2014 - 2020		
Objectives	Funds	Goals	Category of regions	Funds
Convergence	ERDF & ESF	Investment in growth and jobs	Less developed regions	ERDF & ESF
Convergence phasing out			Transitions regions	
Regional competitiveness and employment phasing in				
	Cohesion Fund			Cohesion Fund
Regional competitiveness and employment	ERDF & ESF		More developed regions	ERDF & ESF
European Territorial Cooperation	ERDF	European Territorial Cooperation		ERDF

**Source:** European Union 2011:14

*Less developed regions* are still NUTS 2 regions with GDP per capita less than 75 % of the average GDP of the EU. Transition regions are NUTS 2 regions between 90 % & and 75 % of the average GDP per capita of EU-27, with a differentiated treatment of regions eligible under the Convergence objective in the period 2007-13. More developed regions are regions above 90%, also with differentiated treatment of regions eligible under the Convergence objective in the period 2007-13 (European Union 2011:15).

**Figure 4a &b:** Eligible for Structural Fund Regions 2007-13 & 2014-2020 (simulation)



**Source:** European Commission 2007 & European Union 2011:16

Rendering to the budget forecast from 2011, and before the agreement for the next 7 years period in June 2013<sup>1</sup>, the budget was distributed as follows: Less developed regions: 43,2 %, Transition

<sup>1</sup> June 27, compromise approved by the European Parliament not yet approved by the member states Press point/Brussels 27 June 2013.



regions: 10.4 % and more developed regions: 13,6 %. The remaining budget was allocated to specific, often regional not specified purposes, i.e. cohesion fund 68,7 billion (approx.18,3 %) Cooperation 3,1 %, Connecting Europe facility (infrastructure) 10,6 %. The total budget framework was set to 336 bill. Euro for the 7 year period.

According to an analysis of the pattern of regional research and innovation potentials and regional EU funding in RIS (2012) there are remarkable differences between European region across countries and between different types of regions. This calls for further discussion and analysis with regard to the topic addressed in this paper. Obviously most of the regions belonging to the group of leading innovators are located in the leading countries, but there are exemptions, i.e. Lisbon in Portugal Athens or Prague. Less surprising is that East and Southeast England are leaders regardless the fact that not belongs to the innovation leaders. This indicates that innovation often contributes to the regional divergence.

The crucial issue here is whether we can identify a process of self-reinforcement since the absorption capacity of subsidies due to the sectorial characteristics of the regions are higher.

#### 4. Innovation, growth performance and convergence

The aim of this section is to provide a first assessment of the impact of innovation- potential as well as performance - on regional convergence and divergence. According to Innometrics (2011) sigma-convergence<sup>1</sup>, the spread of innovation performance across the EU members has decreased over time, indicating a process of convergence, but during the economic crisis with a decreasing speed. Also between countries convergence was present in the period 2007-11 with regard to innovation performance in the EU at large.

**Table 3:**  $\beta$ -Convergence and Divergence in 19 EU-countries, & innovative performance on

	1995-2004	2007-2010	Innovation performance 2009/10
EU Total	C	D	<i>Followers</i>
<b><i>Small EU-members:</i></b>			
Denmark	I	C	<i>Leaders</i>
Sweden	D	I	<i>Leaders</i>
Finland	D	I	<i>Leaders</i>
Netherlands	I	C	<i>Followers</i>
Belgium	I	I	<i>Followers</i>
Austria	C	I	<i>Followers</i>
Greece	I	I	<i>Moderate Innovators</i>
Portugal	I	I	<i>Moderate Innovators</i>
<b><i>Large EU-members:</i></b>			
Germany	C	I	<i>Leaders</i>
France	C	I	<i>Followers</i>
Italy	C	I	<i>Moderate Innovators</i>
Spain	I	I	<i>Moderate Innovators</i>
UK	D	C	<i>Followers</i>
<b><i>New EU-members:</i></b>			
Poland	D	C	<i>Moderate Innovators</i>
Czech rep.	D	I	<i>Moderate Innovators</i>
Hungary	D	I	<i>Moderate Innovators</i>
Bulgaria	D	I	<i>Modest Innovators</i>
Slovenia	I	I	<i>Moderate Innovators</i>
Romania	D	C	<i>Modest Innovators</i>

**Note:** C: Convergence, D: Divergence, I: Inclusive

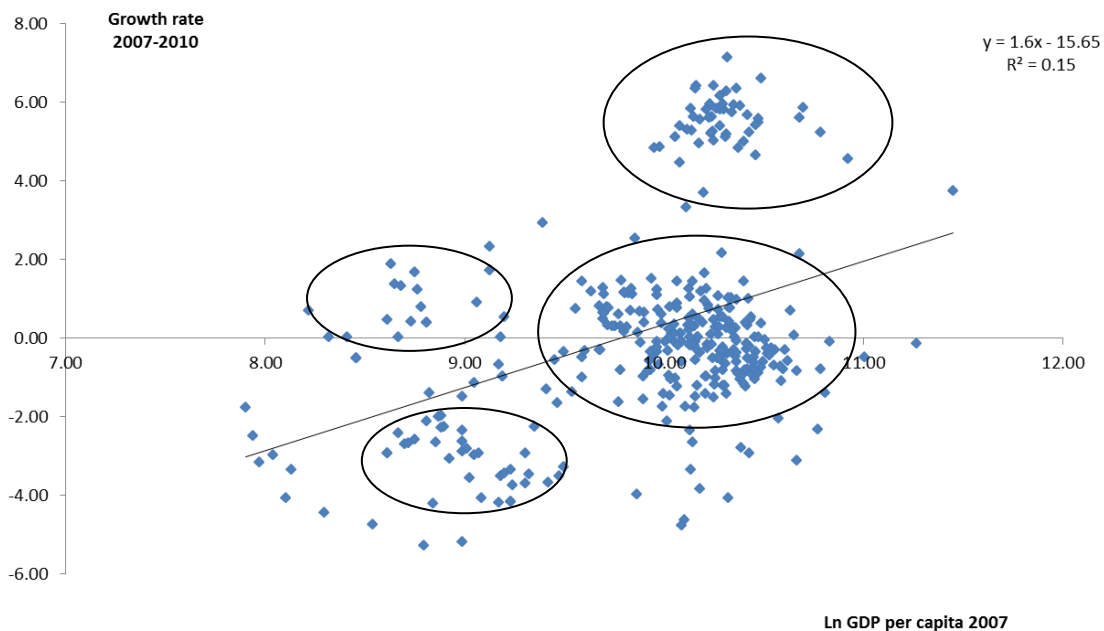
**Source:** See Appendix 2 and Innometrics (2011:8)

<sup>1</sup> Sigma convergence is measured by the ration between the standard deviation and the average performance of the countries, whereas beta-convergence is a measure for convergence between countries, i.e. when a less innovative country grows faster than a more innovative country, i.e. when a 'follower' in table 4 below catches up on an innovation leader in terms of GDP per cap. Beta convergence can be measured by the partial correlation between growth in innovation performance over time and the initial level. A negative sign indicates beta-convergence. (see Innometrics 2011:11)

The analysis presented in table 3 for selected EU member states indicate a rather modest impact on economic convergence, with divergences as the main result for the EU at large. In the aftermath of the financial crisis the influence of innovative performance on economic growth and convergence seems to be overshadowed by the general economic trends, but further investigations are needed. The four countries where convergence was identified belong to each of the innovation groups, and within most countries significant trends could not be identified. On the European level divergences was present, and the trend was reversed after 2007. Measured on NUTS 2 level the trend of GDP/cap moved in most countries in the same direction, regardless the fact that a polarization on the urban rural dimension has been visible in many countries indication a trend toward divergence if a tighter spatial division is used (see Cornett & Sørensen 2012a).

The next step of the analysis is to identify specific clusters or groups of regions according to innovative characteristic, economic growth and convergence. The first step can be found in figure 5 below (to be completed!).

**Figure 5:**  $\beta$ -convergence 2007-2010 for European regions (NUTS II, EU-27 & Croatia)

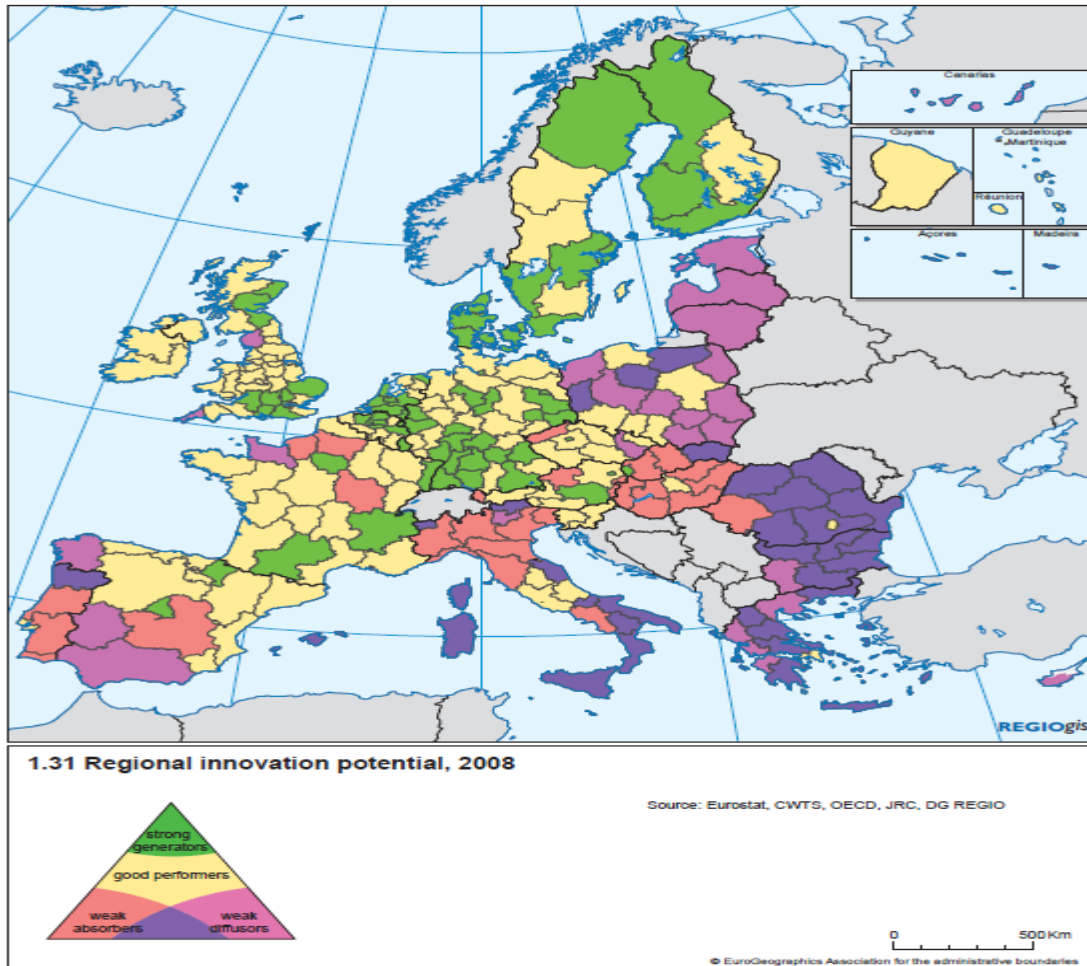


**Source:** see Appendix 2

A slightly different classification of the regional Europe with regard to innovative potentials was used in the 'Fifth Report on Economic social and Territorial Cohesion (European Union 2010), see figure 6 below. This map is of special importance with regard to future possibilities to use

innovation as a mean to catch up, i.e. to secure that Europe returns to the pre 2007 path of development.

**Figure 6** Regional Innovation Potentials 2008



**Note:** *Strong generators* are characterized by the ability to produce new technology at the global frontier, with strong dependency on R&D and human capital accumulation. *Goodperformers* is a intermediate classification for regions performing at a lower level than the first group and not necessarily at the frontier of innovation, the largest single category. *Weak absorbers* constitutes a group of regions catching up on the first (and second group) by a process of technology absorption. In a development perspective this requires an increase of the skill level of the workforce and an overall development of human capital. *Weak diffusers* can typically be found in the new member states, educational levels are often relative high but the main bottlenecks have to be found in the lack of infrastructure and the nature of the business environment, still lacking behind due to the still not fully *completed* process of economic transition. The last types of regions are regions characterized by a *combination of weak diffusers and low absorption capability*.

**Source:** European Union 2010: 54-55.

## 5. Concluding remarks

The theme of this paper ‘*Development, growth and decline in Europe: New patterns of economic convergence and divergence?*’ addresses the implications of the focus on macroeconomic issues in the aftermath of the financial crisis and the ongoing European debt and growth crisis on the regional balance of the EU. Employment and low growth are almost an all European phenomenon, with the exemption of few Northwest European countries, facing moderate employment problems, but still historic low growth rates.<sup>1</sup> Inter-European disparities have increased in the course of the economic downturn of Southern Europe. The intra –national divergence patterns have been relative stable, in most countries we still have a tendency toward an increased urban-rural divide.

This can partly be explained by the new economic growth concepts, focusing on innovation, high-growth and innovative entrepreneurship and the development of human resources. The industries based on these factors are usually located in larger urban areas or the capital regions. EU programs targeting these growth drivers will in the long run contribute to deepen the urban rural divide. So far the statement still needs to be confirmed. Recent data presented in this study only provides weak indications due to the limited data available for the years after the European debt crisis.

**Table 4:** EU Funding and innovations performance:

	Regional Innovation Performance Group 2006/2010:			
	Leader	Follower	Moderate	Modest
Framework Program: Leading absorber	21/22	17/15	0/2	1/0
Structural Fund: Leading users	0/0	2/2	0/1	13/12
Full absorbers/users	6/6	7/10	9/7	7/6
Low absorbers/users	27/39	65/66	40/34	56/49

**Source:** European Commission 2012: 35

With regard to the perspectives of the findings in a European regional development perspective the central issue is to what extent regional and the sectoral policies (i.e. the R&D and innovation policies) will contribute to increase or decrease inter-national as well as intra-national convergence. The Euro 2020 strategy to increase the global competitiveness and improve the internal balance at the same time will only succeed if the built in contradiction between global competitiveness and

<sup>1</sup> For an assessment of the regional implications of the economic crisis with special attention on the North-.South divide in the euro-area see Cornett (2013).

internal imbalance can be solved. Recent figures from the latest Regional innovation survey indicates that at least some of the lagging region have improved their ability to absorb funding also from the framework programs for R&D, see table 4.

The information provided in table 4 indicates that the framework programs mainly are targeted toward the strong regions with regard to innovation, which proves the relevance of the research question addressed in this paper, that the R&D policy has a tendency to reinforce divergences and mainly is targeted toward the improvement of the external competitiveness of the EU area. On the other hand most leading users of the structural funds are in the group of the weak innovators, whereas the intermediate group in both fields is distributed relative equally. From a policy point of view the most problematic result is that the pattern seems to be relative stable over time, and in particular that the low absorber/user group is the largest counting for approx. 50 % of all regions in 2010.

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## Appendix 1: Deviation of the relation for examination of $\beta$ -convergence

In this appendix, we derive the relation used to examine for the presence of  $\beta$ -convergence. This deviation is based on Abreu, De Groot and Florax (2005).

Convergence implies that in the long run a unique pattern of steady state growth will be reached. Consequently, poorer regions will experience a higher rate of growth in GDP per capita than more wealthy regions. The existence of a unique pattern of growth  $g$ , will be true if two key restrictions are imposed on the production function, namely diminishing returns to scale with respect to reproducible factors (capital), and constant and exogenous rate of labor augmenting technological progress. These assumptions will also secure a constant savings fraction of income.

The unique balanced growth equilibrium  $g$  in the neoclassical growth model can be stated as<sup>1</sup>

$$\frac{\dot{y}}{y} = \frac{\dot{k}}{k} = \frac{\dot{A}}{A} = g$$

where a “dot” indicating growth,  $y = Y/L$ , output per labor unit,  $k = K/L$ , capital, and  $A$  is labor augmenting technology.

If convergence is present, the growth rate of regions should approach towards this growth pattern. Denoting  $\tilde{y} = Y/AL$  and  $\tilde{k} = K/AL$  as output and capital per efficiency unit of labor respectively, a Taylor expansion in  $\log \tilde{k}$  around the steady state  $\tilde{k}^*$  results in the differential equation

$$\frac{\dot{\tilde{k}}}{\tilde{k}} = \lambda(\log \tilde{k}^* - \log \tilde{k})$$

$$\log \tilde{y}(t) = (1 - e^{-\lambda t}) \log \tilde{y}^* + e^{-\lambda t} \log \tilde{y}(0)$$

where  $t$  is the time operator at  $n$  periods from 0. In order to make this equation empirical testable note that the available data are defined in terms of per capita income, or  $y = \tilde{y}A$ . Substitution into the equation above and subsequent rearranging gives

$$\log y(t) - \log y(0) = (1 - e^{-\lambda t}) \ln A(0) + gt - (1 - e^{-\lambda t}) \ln y(0) + (1 - e^{-\lambda t}) \ln \tilde{y}^* + (1 - e^{-\lambda t}) \ln \tilde{y}^*$$

The neoclassical model is concerned with convergence *within* an economy rather than *across* economies. However, in the majority of contributions on convergence a cross-sectional

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<sup>1</sup> This condition is derived by use of a Cobb-Douglas production of the form  $Y = K^\alpha (LA)^\alpha$  with  $0 < \alpha < 1$ , where  $Y$  is output,  $K$  is capital,  $L$  is labor and  $A$  is labor augmenting technological progress.

version of the model has been adapted. Assuming that the initial level and the growth rate of technology are constant across countries and  $x$  represents a vector containing the determinants of the steady state the equation just outlined can be written as

$$\log y(t) - \log y(0) = \beta_0 + \beta_1 \ln y(0) + x' \gamma$$

or

$$\Delta \log y_t = \beta_0 + \beta_1 \ln y_0$$

where the final version is an operational version to be estimated by use of OLS. Here  $\Delta \log y_t$  is the growth rate from period 0 to t,  $\beta_0$  is a constant, and  $\beta_1$  is an estimate of the speed of convergence. If  $\beta_1$  is significantly negative then convergence is present. If  $\beta_1$  is positively significant, divergence is present.

Observe that in order to estimate the model in its most simple version several strong assumptions have to be imposed. Assuming that  $x' \gamma$  does not influence on the model implies that the model by itself finds the steady state and that the treatment of technology is assumed exogenous to the model. Abreu, De Groot and Florax (2005) review the different attempts that have been undertaken in various contributions to cope with these issues.

Another criticism to the approach of  $\beta$ -convergence is that only two points in time are needed in order to estimate the model. Therefore, it is truly a cross-section approach. A related, but slightly different approach of convergence is to consider the variation around the mean of  $\tilde{y}$  measured by the standard deviation of  $\sigma_{\tilde{y}}$ . If  $\sigma_{\tilde{y}}$  decreases in time, then convergence will be present as stated by Quah (1993). This type of convergence is called  $\sigma$ -convergence. In the paper we do not bring calculations on  $\sigma$ -convergence. Cornett and Sørensen (2008) reports calculations of  $\sigma$ -convergence for the period ranging from 1995 to 2005, and by use of this type of convergence similar results are obtained. It is evident that the concepts of  $\beta$ - and  $\sigma$ -convergence are strongly related, and it has been shown that  $\beta$ -convergence is a necessary, however not sufficient, condition for  $\sigma$ -convergence to be present, i.e. a reduction in the dispersion of per capita income over time.

## Appendix 2:

**Table A2-1:**  $\beta$ -Convergence and Divergence in 19 EU-countries and Norway 1995 to 2004

		Constant, $\beta_0$			$\beta_1$ -coefficient			$R^2$	Standard Error	Obs.
		Coef.	Std.dv.	P-value	Coef.	Std.dv.	P-value			
EU Total	C	22.97	0.97	0.00	-1.97	0.10	0.00	0.49	1.73	369
<i>Small EU members:</i>										
Denmark	I	-12.65	33.17	0.72	1.38	3.25	0.69	0.04	0.97	6
Sweden	D	-22.93	12.52	0.11	2.65	1.26	0.07	0.39	0.40	9
Norway	C	29.71	12.86	0.07	-2.63	1.29	0.10	0.45	0.69	7
Finland	D	-5.07	3.85	0.24	0.91	0.34	0.07	0.52	0.16	7
Netherlands	I	-5.46	5.75	0.36	0.93	0.58	0.13	0.15	0.31	16
Belgium	I	1.27	5.00	0.80	0.14	0.51	0.79	0.01	0.51	14
Austria	C	17.31	3.06	0.00	-1.50	0.31	0.00	0.68	0.21	13
Greece	I	26.83	24.00	0.28	-2.42	2.67	0.38	0.05	1.69	17
Portugal	I	14.93	17.71	0.84	-1.09	1.96	0.60	0.04	0.98	9
<i>Large EU members:</i>										
Germany	C	14.68	3.43	0.00	-1.34	3.87	0.00	0.23	0.59	51
France	C	9.63	3.93	0.00	-0.70	0.40	0.09	0.09	0.50	34
Italy	C	11.04	3.14	0.00	-0.69	0.33	0.05	0.15	0.47	27
Spain	I	10.43	3.02	0.00	-0.54	0.32	0.11	0.11	0.31	24
UK	D	-3.22	4.54	0.48	1.02	0.47	0.04	0.09	0.65	49
<i>New EU members:</i>										
Poland	D	-13.04	8.56	0.14	2.48	1.09	0.03	0.20	0.74	23
Czech rep.	D	-26.30	10.78	0.04	4.07	1.30	0.02	0.58	0.78	9
Hungary	D	-20.16	8.42	0.04	3.64	1.05	0.01	0.60	0.66	10
Bulgaria	D	-16.89	4.83	0.01	3.46	0.69	0.00	0.78	0.32	9
Slovenia	I	18.86	8.20	0.08	-1.34	1.00	0.25	0.31	1.22	6
Romania	D	-33.92	10.62	0.01	5.59	1.43	0.00	0.58	0.88	13

**Note:** C = convergence, D = divergence and I = inclusive. If the P-value is less than 0.10 weak significance is observed (10 % level), if the P-value is less than 0.05 significance is observed (5 % level), and if the P-value is less than 0.01 strong significance is observed (1 % level). For Romania, data are from 1998–2004. For Norway data are available for 2004 only, and the data set constructed is based on Neubauer et. al. (2007), who reports regional GDP growth rates for the period 1998–2002.

**Source:** calculations based on statistics from Eurostat, Danmarks Statistik.

**Table A2-2:  $\beta$ -Convergence and Divergence in 19 EU-countries 2007 to 2010**

		Constant, $\beta_0$			$\beta_1$ -coefficient			$R^2$	Standard Error	Obs.
		Coef.	Std.dv.	P-value	Coef.	Std.dv.	P-value			
EU Total	D	-15.65	1.98	0.00	1.60	0.20	0.00	0.15	2.37	366
<b>Small EU members:</b>										
Denmark	C	24.23	9.30	0.05	-2.35	0.80	0.05	0.64	0.32	6
Sweden	I	-16.96	36.57	0.66	1.57	3.49	0.67	0.02	1.44	9
Finland	I	-15.57	46.25	0.75	1.49	4.45	0.75	0.02	1.83	7
Netherlands	C	44.40	15.27	0.01	-4.31	1.47	0.01	0.36	0.84	17
Belgium	I	-6.89	9.91	0.50	0.57	0.96	0.57	0.03	0.98	14
Austria	I	-5.44	4.58	0.26	0.44	0.44	0.34	0.08	0.26	13
Greece	I	12.85	10.28	0.26	-1.24	1.05	0.23	0.09	0.71	17
Portugal	I	-8.51	12.86	0.53	0.81	1.33	0.54	0.06	0.71	9
<b>Large EU members:</b>										
Germany	I	-7.66	7.89	0.34	0.67	0.77	0.39	0.02	1.11	51
France	I	-8.70	5.80	0.14	0.85	0.57	0.15	0.06	0.66	34
Italy	I	2.58	4.55	0.57	-0.20	0.45	0.66	0.01	0.60	27
Spain	I	0.46	7.26	0.95	0.02	0.72	0.98	0.00	0.61	23
UK	C	14.17	5.01	0.01	-0.86	0.49	0.08	0.06	0.82	49
<b>New EU members:</b>										
Poland	C	8.67	4.24	0.05	-1.28	0.48	0.01	0.26	0.47	23
Czech rep.	I	-1.26	6.45	0.85	-1.44	0.69	0.74	0.02	0.61	9
Hungary	I	3.60	6.98	0.62	-0.30	0.39	0.71	0.02	0.72	10
Bulgaria	C	24.25	5.01	0.00	-3.40	0.61	0.00	0.82	0.52	9
Slovenia	I	-1.90	6.20	0.77	-0.24	0.67	0.71	0.04	0.65	6
Romania	C	13.45	7.53	0.09	-1.54	0.87	0.09	0.22	0.97	13

**Note:** C = convergence, D = divergence and I = inclusive. If the P-value is less than 0.10 weak significance is observed (10 % level), if the P-value is less than 0.05 significance is observed (5 % level), and if the P-value is less than 0.01 strong significance is observed (1 % level). Croatia included in the total.

**Source:** calculations based on statistics from Eurostat.