

International vs. Intra-national Convergence in Europe – an Assessment of Causes and Evidence

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ABSTRACT: The article aims to explain the different patterns of economic development in Europe based on an assessment of regional and national performance with regard to innovation, entrepreneurship and difference in the industrial structure. The central hypothesis of the paper is that large intra-regional disparities do not necessarily lead to lower economic growth on the national level than smaller disparities do. On the contrary, the polarization of economic activities can lead to excess growth in some cases, and contribute to a process of convergence between nations.

To address the mechanisms behind this process, the long run patterns of convergence and disparities in regional economic performance with regard to GDP and the distribution of employment are analyzed on the regional and the national level for selected European countries.

The paper focuses on the apparent contradiction between increasing intra-national disparities on the regional level in most industrialized countries and the overall tendency toward convergence on the national level in Europe and tries to provide some tentative explanations based on empirical as well as theoretical considerations.

JEL classification: R11, R12, R58.

Key words: Convergence and disparities, innovation, entrepreneurship industrial structure, economic growth and employment.

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Convergencia internacional vs convergencia intra-nacional en Europa. Una estimación de las causas y evidencia

RESUMEN: El artículo apunta a explicar los diversos patrones del desarrollo económico en Europa basados en una estimación del desempeño regional y nacional con respecto a la innovación, al espíritu emprendedor y a las diferencias en la estructura industrial. La hipótesis central es que grandes disparidades intrarregionales no generan necesariamente menos desarrollo económico a nivel nacional, que lo que generan las disparidades de menor magnitud. Al contrario, la polarización de actividades económicas puede llevar a generar exceso de crecimiento en algunos casos, y contribuir a un proceso de convergencia entre las naciones. Para tratar los mecanismos detrás de este proceso, se analizan los patrones duraderos de la convergencia y las disparidades en el desempeño económico regional con respecto al PIB y a la distribución del empleo a nivel regional y nacional para un grupo de países europeos seleccionados. El trabajo se centra en la contradicción aparente entre el aumento de disparidades intra-nacionales a nivel regional en la mayoría de los países industrializados y en la tendencia hacia la convergencia en el nivel nacional en Europa e intenta proporcionar algunas explicaciones tentativas basadas en consideraciones teóricas como empíricas.

Clasificación JEL: R11, R12, R58.

Palabras clave: Convergencia y disparidades, innovación, estructura industrial del emprendimiento, crecimiento económico y empleo.

1. Introduction

Regional disparities have always been an important issue in economic policy, regardless whether they are large or small, or the countries are rich or poor. Also —in a global perspective— small differences in economic conditions can become a serious topic in public policy. The article aims to shed light on this issue in a European perspective, and to explain the different patterns of economic development in Europe based on an assessment of regional and national economic performance. Furthermore, the importance of innovation and entrepreneurship based on Danish evidence is investigated.

The central hypothesis of the paper is that large intra-regional disparities do not necessarily lead to lower economic growth on the national level than smaller disparities do. On the contrary the polarization of economic activities can lead to excess growth in some cases, and contribute to a process of convergence between nations. In this perspective the regional dimension of the Lisbon strategy becomes and central aspect of a policy aiming economic convergence not only between the EU member states, but also within countries and between regions of different countries.

The article is organized in three parts. Section 2 introduces the concepts of convergence and disparities based on a review of selected relevant literature. Furthermore, the section includes an overview of recent trends in regional convergence and dispa-

rities in a European context. Section 3 provides a deeper analysis of regional convergence in Denmark and a presentation of innovation and entrepreneurship as drivers of economic growth in a Danish context, and compares the results in a Nordic perspective. The final section of the article summarizes the main results of the study and sketches some further perspectives and implications.

2. Regional Convergence in Europe

The overall pattern in Europe shows that regional convergence has increased as long as the level of analysis is the difference between countries. As soon as the perspective turns on interregional disparities within countries, the result is often the opposite. Therefore, economic disparities and measures aiming to facilitate economic convergence are central on the national as well as the European agenda¹. This section will after a brief discussion of the concept of convergence and disparities provide an assessment of recent trends for regional economic development.

2.1. Theoretical Considerations and Empirical Results

During the past two decades, an extensive literature has emerged on the issue of economic convergence among nations and within nations. 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. These may on the other hand experience a relative decrease in growth. This type of convergence process is also called β -convergence, and was introduced by Barro and Sala-i-Martin (1991) who used the method to examine convergence between states in the United States. This convergence models can as shown by among others Abreu, de Groot and Florax (2005) be derived from the neo-classical model of economic growth by Solow (1956).

Another indicator of convergence has been developed by Quah (1993), and is labeled σ -convergence. This type examines the variation around the mean for a cross-section of nations or regions. If the variation decreases convergence is said to be present. The two concepts of convergence are strongly related, and it has been shown that β -convergence is a necessary, however not sufficient condition for σ -convergence to be present.

Although, initially applied on US data, the majority of studies on convergence has been applied on European data in order to examine regional impacts of economic integration. Regional economic convergence or cohesion is a fundamental goal of the EU regional policy, and the policy is considered successful if disparities i.e. measured by the GDP *per capita* between regions decreases. The emergence of regional statistics of good quality has facilitated the investigation and evaluation of the policy pursued by the EU.

¹ A Danish example is the regional growth report (Ministry of Economics and Business 2006) or the Cohesion policy 2007-13 (European Union, 2007).

Eckey and Türck (2008) offer a survey of the empirical results on both types of convergence. In addition, they consider the emergence of clusters as a result of the differences in growth across nations and regions within sectors. The majority of studies reported find a slow process towards convergence regardless of the method used. However, if the number of EU-countries is increased beyond the EU-15 the picture vanishes. The strongest results are found for the original six members of EU.

Despite of different theoretical backgrounds, empirical specifications and data sets many studies find a rate of convergence equal to 2 percent. Abreu, de Groot and Florax (2005) use a meta-analysis and surveys approximately 600 estimates taken from a random sample published studies. They find that it is misleading to speak of a natural convergence rate. As will become evident later in this article the process of convergence takes place more frequently in large countries than in small countries. Felsenstein and Portnov (2005) develop an empirical test to examine this problem. They conclude that this picture may not be the standard. However, in the small countries they observe a number of competing forces such as social cohesion availability of natural resources, population composition, openness to trade etc. The combination or intensity of these factors may lead to convergence as well as divergence.

Differences in the growth rates may lead to the formation of clusters. Corrado, Martin and Weeks (2005) use an econometric approach to test for regional convergence clusters across Europe. Their results suggest that the process of regional convergence across the European Union is complex and varying in time. At sector level, they consider agriculture, manufacturing, market service and non-market service. All sectors reveal quite large numbers of regional convergence clusters suggesting that there is no single European Union wide convergence process, but rather different paths. Interestingly they find little evidence that regional convergence has been strongly influenced by the provision of the European Union Structural and Cohesion Funds.

In a Scandinavian context Bentzen and Smith (2003) consider the presence of β -convergence. Using statistics at the municipality level ranging from 1970 to 2000 they find empirical evidence that regional incomes are converging towards the leading city or region in the respective countries, where the leader is defined as the region with the highest income level throughout the period. Finally, Neubauer et. al. (2007) provides an extensive empirical analysis of recent economic development of the regions in the Nordic hemisphere.

2.2. Political Aspects of Cohesion and Disparities

The issue of cohesion in regional economic associations like the EU is a decisive issue for further integration in particular after the latest enlargements. In the more advanced forms of economic integration the issue of re-distributive instruments becomes crucial Molle (1999, p. 146ff).

Regional cohesion can be defined in many ways, and the results of investigations of cohesion depend on a wide range of factors both political and social. In the statistical analysis the chosen indicators as well as the size of the regions are important for the results obtained. As mentioned in the previous paragraph cohesion and disparities

are central concepts in regional policy as well as in the literature on economic integration. In particular economic integration beyond the level of customs unions is often considered to have crucial impacts on regional disparities and as a consequence on regional cohesion — economical as well as societal. The process of economic integration itself has crucial importance for the inter- and intra-regional development:

- «(1) it must take account of intra-union factor movements;
- (2) it must address the implications of integration or harmonization of instruments of national economic policy other than commercial ones;
- (3) it must address the evolution of integration by reference to criteria that go beyond that of efficiency in resource allocation.» (Robson 1987, p. 3).

In particular the first two aspects are important, since the patterns of intra-union factor movement is of major importance for a union as regards coherence and regional (in)equity with regard to economic growth and in particular migration. Out-migration will leave the remote parts of the union as depressed low-growth areas. The saliency of this problem — also in a context of relative affluent resource inflow — can be studied in parts of the eastern Germany. Heavy inflow of capital and infrastructure investments can probably solve the efficiency problem of particular industries, but the German experience after the reunification makes evident that also very huge capital-inflows and transfer payments are not able to solve the inequity problems within a reasonable time². Economic coherence is still an unsolved goal despite of the fact that East-German business and industries are integrated in the national and international system of production.

In a study of the long-term development of regional disparities between European regions by Molle and Boeckhout (1995) the concept of coherence tentatively was delimited 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” (Molle & Boeckhout, 1995, p. 106).

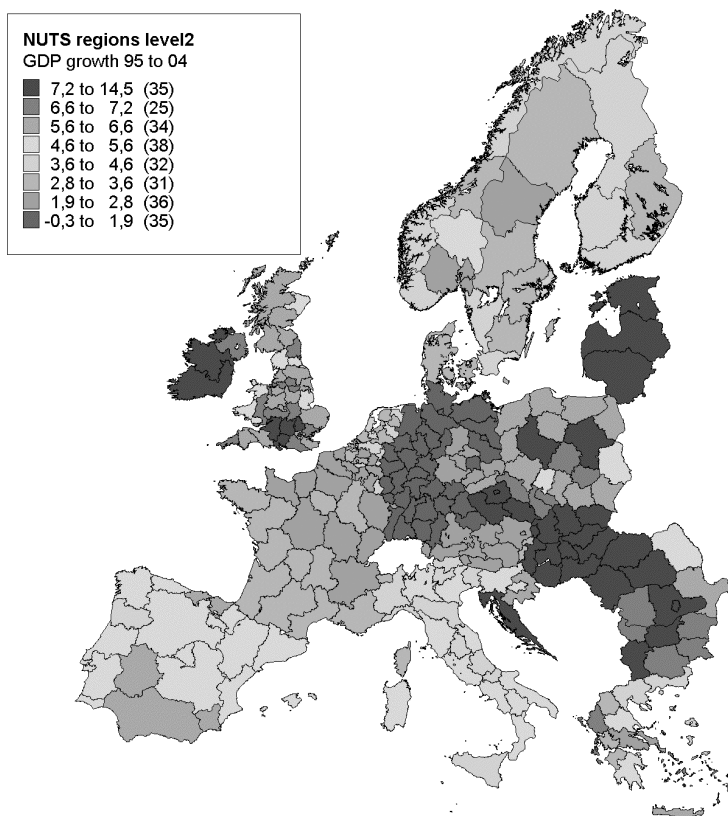
This delimitation of cohesion will be used as a starting point in the discussion of disparities and equity in the EU. In this regard the notion of ‘socially and politically tolerable’ is of considerable importance as mentioned, since the perceived (small) disparities within a country politically often becomes more important than the large international disparities. Experiences with re-distributional policy in countries with very small regional disparities like Denmark have shown that not the absolute level of differences but the relative position matters. In the case of Denmark the consequence is a revival of regional policy, now within the framework of the new enlarged regions.

² For a recent study of the issues, see Lentz (ed.) (2007).

2.3. Empirical Trends of Convergence in Europe

In a European context, the regional growth strategies have to contribute to fulfillment of the Lisbon targets to create the world's³ most competitive economic region. At the same time, the EU faces a complex challenge with decreasing economic divergence between member states and increasing disparities within many countries⁴. The maps in Figure 1 and 2 summarizes two aspects of the regional divergence in Europe for the period 1994 to 2005⁵. Figure 1 displays the state of nature with regard to the average annual growth rate differences among the European nations whereas Figure 2 focuses on the level of GDP *per capita* in €. All statistics are at the NUTS 2 classification of European regions with exception of Denmark where we use data at the NUTS 3 classification, see also Section 3 below.

Figure 1. Annual Growth in GDP *per capita* 1994 to 2005

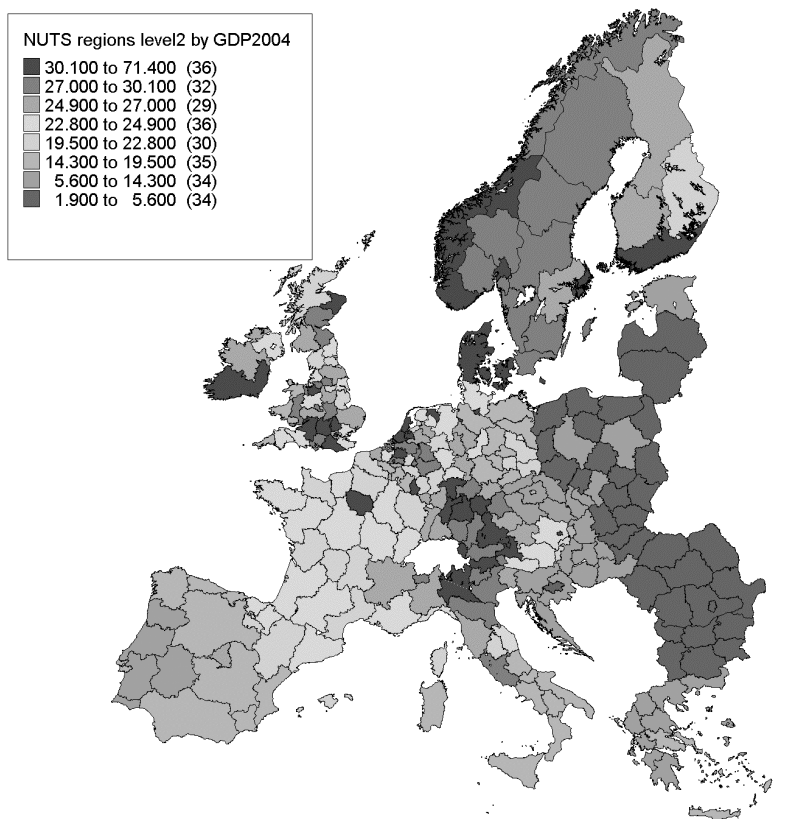


³ For a brief presentation in a geographical context, see Cornett and Sørensen (2006) and ESPON (2006).

⁴ For a discussion of the principal aspects of this trend, from both empirical and theoretical perspectives see Cuadrado-Roura & Parellada ed. (2002).

⁵ The authors would like to thank Postdoc, Geoinformatics, Niels Christian Nielsen at the Department of Business Communication and Information Science and Centre for Tourism, Innovation and Culture (TIC) at the University of Southern Denmark for excellently drawing the maps by use of his GIS-programs.

Figure 2. GDP per capita in € 2004



Source to Figure 1 and 2: Eurostat, Danmarks Statistik and Norges Statistik.

The comparison of the two graphs reveals that regions with a high level of GDP *per capita* in general have experienced low growth. This is especially true for Germany, France and the Nordic countries. On the other hand countries with a low *per capita* level have experienced high rates of growth. Besides from the Eastern European nations this has also been true for Ireland, part of the United Kingdom and southern Spain. In sum the two maps indicate that β -convergence should be present.

The Lisbon targets⁶ are not necessarily always in harmony with a policy aiming at a country's regional disparity reduction. Much 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

⁶ 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, see also Cornett & Sorensen 2007.

seen in Western Europe, including the Nordic countries and Denmark. Among the consequences is an increasing polarization of the commuting pattern in many areas leading to a process of regional enlargement⁷. The Figures actually states another striking feature. Many of the nations considered not have substantial regional income differences. This is especially true for the small nations. Large differences are mainly observed in large countries like Germany, France and United Kingdom⁸. Nations with some differences are Belgium, Greece, the Netherlands and Norway. For all these countries however, the income distribution within the nation is not symmetric. Italy is the Western European nation with the most symmetric distribution of income by region. Typically, the income level is high in the major city areas and low in the rural or peripheral areas. Notice that all these nations are located the Western part of Europe.

For several former East European countries, especially Poland and Czech Republic, a significant asymmetric distribution is also observed. In a growth theory perspective, these two nations are under a catch-up process towards the Western European economies.

In a European perspective, regional differences between countries have diminished during the last decades. This pattern can also be found in the new member countries during the process of economic catch-up. At the same time intra national disparities have been increasing in most countries, in Western Europe as well as in the new member states.

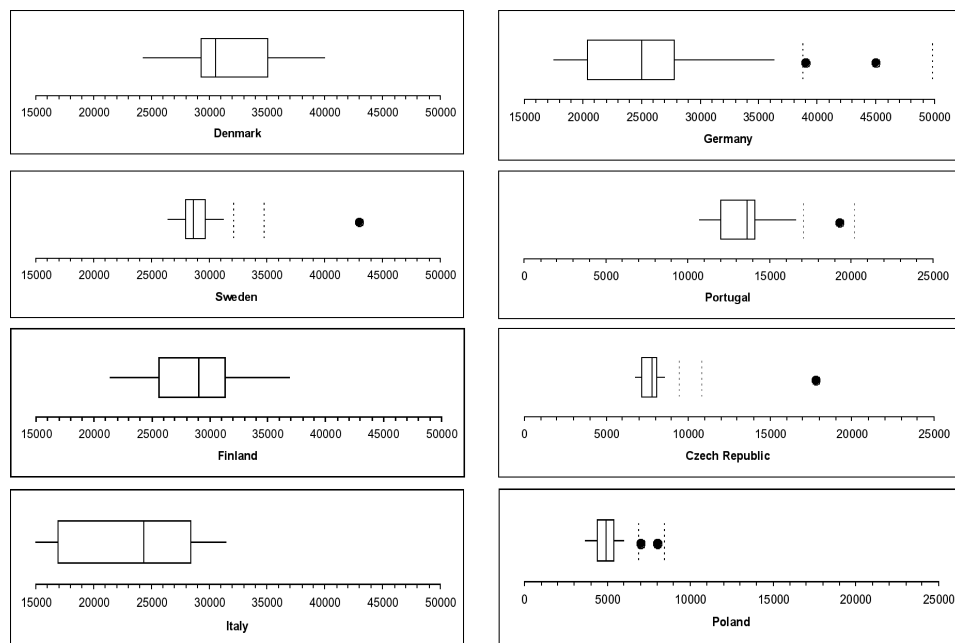
Figure 3 examines the issue of disparity by using simple box-plots for 2004 based on data Denmark and 7 other EU countries⁹.

It is observed that nations like Finland and Italy are examples of countries without extreme outliers, and a quite symmetric distribution of incomes. This may come as a surprise. In Finland, there are many rural areas, and Italy is famous for her controversy between the northern industrialized regions versus the southern rural regions. A similar symmetric pattern is, however, not observed for another Scandinavian country namely Sweden. Here the metropolitan region of Stockholm has a level of income far above the median. With regard to Germany, it is evident that the regions of Hamburg and Munich are far above the median. The range between the poorest regions in the former Eastern Germany and the richer areas in the former Western Germany is consequently quite significant. Comparing Germany and Italy it is observed that the level of income in the former Eastern Germany is only slightly above the level of income on Sicily. The level of income in for example Rome and Milan is then

⁷ For an assessment of the impacts on the regional labour markets in the Nordic countries see Neubauer *et al.*, 2007 pp.15ff. and 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.

⁸ In all three cases size of intra-national divergence can be partly explained by statistical reasons due to the geographical demarcation of the regions, with huge in-commuting from suburbs to the metropolitan area.

⁹ Due to the conversion of the Danish data from DKK to Euro, the result is for statistical reasons not comparable with the Danish data reported below in Figure 7. Here Denmark turns from convergence to divergence. Based on DKK and analysed for Denmark alone we will see increased divergence.

Figure 3. Box-Plots of Regional Disparities GDP 2004 (2000 prices), € per capita

Note: The Box plot is set up as follows: The median is marked as a vertical line across the box. The hinges of the box are the upper and the lower quartiles (the rightmost and leftmost sides of the box). The interquartile range (IQR) is the distance from the upper quartile to the lower quartile. The vertical dotted lines mark the inner and outer lower and upper fence respectively. The upper inner fence is a point at a distance of $1.5(IQR)$ above the upper quartile. The upper outer fence is a point at a distance of $3.0(IQR)$ above the upper quartile and vice versa with regard to the lower inner and outer fence respectively. If an observation is located between the inner and outer fence then it is considered as a suspected outlier. If an observation is located outside the outer fence then it is considered as an outlier.

Source: Own estimations based on data from Eurostat (2007) and Danmarks Statistik (2007).

far below the level of income in the most wealthy areas of Germany. Finally, in Figure 3 the three lower box-plots in the right panel reveal the distribution by region for Portugal, the Czech Republic and Poland. Notice, the change in the scale on the horizontal axis. The two latter countries are former plan economies, whereas Portugal joined the EU at the same time as Spain. Common for all countries is a lower level of GDP *per capita* than for example the Scandinavian countries. However, the distribution by region for Portugal reveals a pattern very similar to the one observed for Sweden. For both the Czech Republic and Poland, the difference between the rich and the poor regions is considerable.

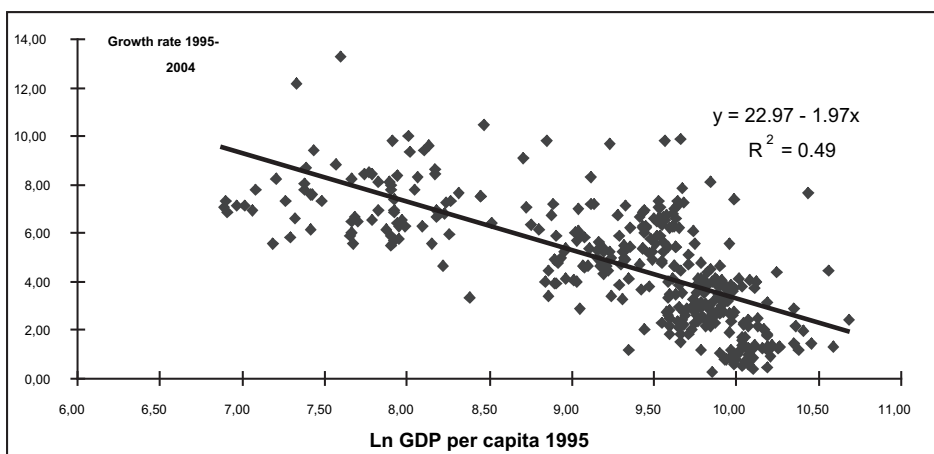
Based on the findings reported in Figure 1, 2 and 3 we can examine the influence of convergence in a European aggregated perspective by use of β -convergence and σ -convergence. As noticed in Section 2.1 an estimator of β -convergence can be developed from the neo-classical growth model. After a Taylor expansion around the natu-

ral level of GDP *per capita* growth and some mathematical manipulation, see for example Abreu, de Groot and Florax (2005), a model to be estimated by linear regression can be stated as:

$$y_{t+n} = \beta_0 + \beta_1 \ln GDP_t$$

Here y is the annual growth rate from 1995 to 2005. On the right side the GDP level has been transferred into logs in order to compress the range of the dataset. If β -convergence is present then β_1 should be significantly negative and giving a direct measure of the rate of convergence. Figure 3 revealed that the growth in economic centers is higher than in the rural districts. If this is the case β_1 should be significantly positive and we observe *divergence*. Finally, the coefficient of β_1 can be not significant. In this case, we observe a pattern of inclusiveness.

Figure 4 . β -convergence in European Regions



Using data from the Eurostat we can estimate this relation for the period from 1995 to 2004 for our statistics at NUTS 2 classification. Including the aggregates, we end up with a dataset containing 369 observations. The result is shown graphically in Figure 4 and the first row of Table 1. In addition, the table provides the partial rates of β -convergence for 18 members of EU and Norway where it is possible to calculate this measure of convergence. We used simple OLS for all estimations. For many of the considered nations the number of regions and consequently observations is very limited. For these countries the results should be taken with care¹⁰.

¹⁰ We have only recorded the R^2 and the overall standard error as diagnostics. This is not the optimal. The very limited number of observations has in many cases prevented us from testing for spatial autocorrelation. Some textbooks on statistics advocates using the Durbin-Watson in order to test for autocorrelation. This is debatable for several reasons. First, the H_0 is poorly defined, and second, the test is only applicable for first order autocorrelation. Instead, for example a LR-test for higher order correlation should be used.

For all regions the constant term as well as the β -coefficient giving the rate of convergence is both highly significant. The rate of convergence is equal to -1.97 , and very close to the “natural rate of 2 percent”. As indicated by the p-value the coefficient is strongly significant. In general, the result of the box-plots is confirmed, but no unequivocal pattern is found. EU-growth by regions is not at all uniform! For the small high-income economies, convergence is observed for only Austria and the non-member Norway. For the majority of small EU-countries a pattern of status quo or inclusiveness is found. For Sweden and Finland we find, a surprising pattern of divergence.

Table 1. β -Convergence and Divergence in 19 EU-countries and Norway 1995 to 2004

		Constant, β_0			β_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.

Convergence is observed for the large EU-economies of Germany, France and Italy. For Spain the coefficient is close to being significant. In general, the rate of convergence is at a lower level than for the total of EU. For the United Kingdom we find divergence. Here the regions of London and Birmingham have experienced a higher growth performance. Turning to the six new EU-members from the Eastern Europe included in our analysis a picture of internal divergence appears for all nations except for Slovenia where the pattern is inclusive. The rate of divergence is smallest for Poland and largest for Romania. Compared to for example Finland and Sweden the rate of convergence is significantly higher.

Table 2 examines the issue using σ -convergence measuring the evolution of the variation by year. The design of the table is similar to Table 1 in order to facilitate comparison. As observed in Figure 2 the level of income is much lower in Eastern EU than in the Western EU. In order to conquer with this issue we use the coefficient of variation (CV) defined as the standard deviation divided by the mean. If CV decreases, it means that convergence will take place.

Table 2. Estimates of σ -convergence in 19 EU-countries

CV		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
EU total	C	54,1	52,3	50,3	49,9	50,0	50,3	48,9	48,3	47,7	47,7
<i>Small EU members:</i>											
Denmark	D	14,2	14,7	15,0	14,4	16,1	17,0	16,9	17,9	17,3	18,7
Sweden	D	12,4	14,1	15,9	16,6	17,6	17,6	16,9	17,2	16,3	16,7
Finland	D	16,8	18,5	17,8	20,3	22,2	19,1	22,2	20,6	19,2	18,0
Netherlands	D	14,0	15,9	15,7	15,6	15,9	16,1	15,6	15,8	15,4	15,5
Belgium	I	36,0	36,4	35,7	35,4	36,1	36,2	36,4	36,6	35,8	35,6
Austria	C	20,4	20,6	19,8	19,6	19,3	18,9	19,0	19,0	18,5	17,8
Greece	D	17,5	18,3	16,9	16,1	15,0	19,5	19,7	20,3	20,6	21,0
Portugal	I	19,2	18,9	20,0	20,6	18,0	19,4	18,4	19,8	19,1	19,1
<i>Large EU members:</i>											
Germany	I	24,1	23,6	23,7	24,0	24,0	24,2	24,6	24,0	23,4	23,1
France	C	21,3	21,7	21,1	20,6	20,6	21,6	20,6	20,4	20,7	20,6
Italy	C	26,5	26,6	25,6	25,9	25,2	25,4	24,8	24,4	24,7	25,0
Spain	I	20,2	19,7	20,1	20,1	20,2	21,9	21,1	20,4	19,7	19,3
UK	D	25,0	25,4	26,7	27,8	28,2	29,8	28,8	29,5	29,5	29,4
<i>New EU members:</i>											
Poland	D	14,5	16,4	17,5	18,5	20,6	20,1	21,2	20,8	21,0	20,5
Czech republic	D	26,5	26,5	29,3	33,4	35,7	37,3	39,9	40,9	40,9	40,5
Hungary	D	23,6	25,4	27,2	27,5	29,9	31,8	31,8	34,5	33,4	32,6
Bulgaria	D	17,8	17,6	16,9	15,5	19,1	16,0	18,8	22,0	22,4	24,5
Slovenia	C	59,9	56,3	55,2	56,4	60,7	56,7	56,3	56,2	54,0	52,2
Romania	D	20,5	20,8	33,8	34,9	34,1	30,0	30,6

Note: CV is the coefficient of variation measures as $CV = \hat{U}/\text{mean}$, C = convergence, D = divergence and I = inclusive.

Source: Own calculations based on statistics from Eurostat and Danmark Statistik .

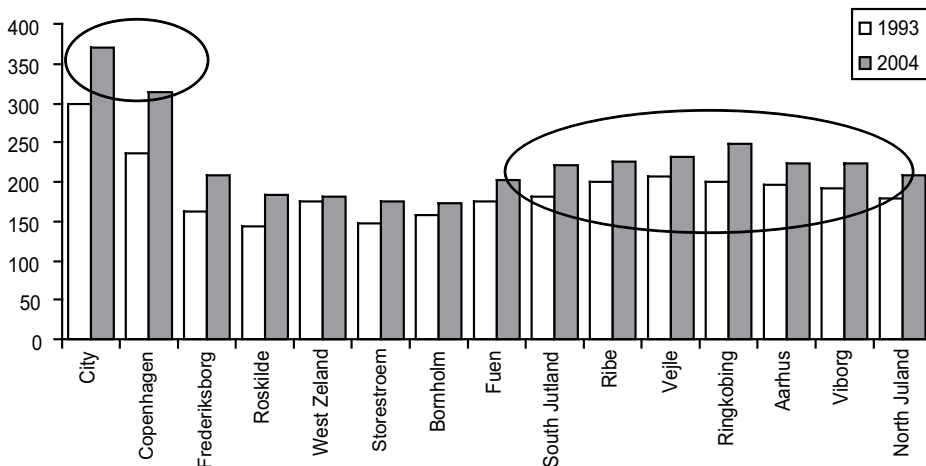
Furthermore, by using the coefficient of variation we also solve a problem frequently present in analyses of convergence over time, namely the presence of a non-stationary or trend in the considered statistics. For example, if a positive trend is present it is likely that the mean as well as the standard deviation will increase. Then, if we measure on the standard deviation, we will only observe divergence although this may not be the case.

In general, Table 2 confirms the findings from Table 1. However, there is a bias towards divergence or inclusiveness, i.e. the cases for Denmark, the Netherlands, Greece and Germany. The issue of divergence is further investigated in section 3.2 in a Nordic context.

3. Regional Growth and Disparities in a Danish and Nordic context¹¹

The purpose of the previous section was to provide an overview of regional convergence and disparities in a broader European perspective. Here the aim is to compare with recent trends in Denmark, which usually not is done in comparative NUTS 2 level studies, due to the lack of NUTS 2 regions in Denmark¹², and to discuss the findings in a Nordic perspective. In 2007, a new regional structure was implemented in Denmark reducing the administrative units from 14 counties and the two independent municipalities in inner Copenhagen to 5 regions at the NUTS 3 classification. Initially, we consider the regional evolution in the light of the former regional structure.

Figure 5. GDP per capita in Danish counties 1993 and 2004 (2000 prices in 1,000 DKK)



Source: Danmarks Statistik (2006).

¹¹ This section is an extended and updated version of Section 2 in Cornett and Sørensen (2006).

¹² A map of the regions in Denmark at the NUTS 3 classification can be found in Appendix.

Figure 5 illuminates the interregional development in Denmark since the early 1990s with regard to GDP *per capita* based on the Danish counties (NUTS 3). The counties to the left are located around the metropolitan area, and are located in the eastern parts of Denmark, whereas the countries to the right are located in the western parts of Denmark.

The figure visualizes the fact that economic growth within most of the western countries has been dispersing in the period before the new regions were formed. In many cases this has led to increased regional disparities within the former counties and the tendency will obviously be reinforced within the new regions, see below. This is well in accordance with the European trends presented in the previous section.

Obviously the figure can not tell the whole truth about the ongoing process of regional development. A first inspection of the data at least reveals three groups of counties, the metropolitan area of Copenhagen with the highest GDP *per capita*, a group around the national average covering the peninsula of Jutland and the remaining part of Denmark, the islands outside Metropolitan Copenhagen. Jutland as the 'industrial heartland' of Denmark, took advantage of export demand as well as the relative good standing of the Danish economy since the mid 1990s. In the longer run, a considerable part of the Jutland will face new problems due to decline of the labour force and probably also caused by loss of industrial employment through outsourcing etc. Regarding the low growth area of the islands outside Copenhagen, the enlargement of the Copenhagen labour market to cover all of Zealand has a negative impact on GDP *per capita*, but not on income *per capita* available in residential areas. Therefore, the real regional disparities are overestimated here. Generally, the enlargement of commuting areas in Denmark (Ministry of the Environment, 2006, pp. 30-35) indicates a centralization of economic activities in the country¹³.

3.1. Regional Growth and Disparities in Denmark

As noticed above a new regional structure has been introduced in Denmark at the beginning of 2007. The former approximately 270 municipalities have been reduced to 98, and the 14 counties as well as the two independent municipalities of Frederiksberg and Copenhagen have been incorporated in five new regions. From a regional development point of view it is of particular interest that regional business development policy and planning is the responsibility of the new regions. Nevertheless, health service is the dominant task, and attracts major attention. Table 3 provides an overview of growth patterns in the new Danish regions based on 2005 data, whereas Figure 6 and 7 combine some regional growth indicators during the period 1993 to 2005. As observed from Table 3 the Metropolitan region experienced a *per capita* income level 22 percent higher than the average for Denmark, which is relative limited compared to what can be seen in other parts of Europe. Since 2000, growth rates have been much higher in the Metropolitan region than in the remaining Danish regions.

¹³ Specific target regions for a regional growth strategy aiming to improve the situation of the most affected areas were already designated in 2003 (Ministry of Economics and Business, 2003).

The reverse was the case in the 1980s and the early 1990s. The region, most similar to the Metropolitan areas with regard to growth pattern is the region of Central Jutland, including Aarhus, Denmark's second largest city.

Table 3. Economic Performance by Danish Regions 2005

	<i>Metropolitan</i>	<i>Zealand</i>	<i>South Denmark</i>	<i>Central Jutland</i>	<i>North Jutland</i>
<i>Economics:</i>					
GDP total, DKK mill.	570.353	166.554	295.664	315.565	141.146
GDP <i>per capita</i> , DKK 1,000	349,4	206,0	249,9	259,6	244,6
GDP <i>per capita</i> index Denmark = 100	122	72	87	244,6	85
GDP share of Denmark total %	36,8	10,7	19,1	20,3	13,1
<i>Growth:</i>					
GDP growth rate 2005 %	1,5	1,2	0,9	1,6	1,1
GPD growth rate 2000-2005 % average	4,6	1,8	2,0	3,0	2,4

Note: Based on the old municipality statistics. Current prices. 7.45 DKK is equal to 1 € in 2005.

Source: Danmarks Statistik, Regional Accounts, 2007.

Figure 6 examines the evolution of real GDP *per capita* in real prices during the period 1993 to 2005. Data have been converted at municipality level from the old regional structure to the new structure. In general, this period has been characterized as one of the longest periods in Danish economy with continuous growth. Only the period from 2002 to 2003 had very moderate recession.

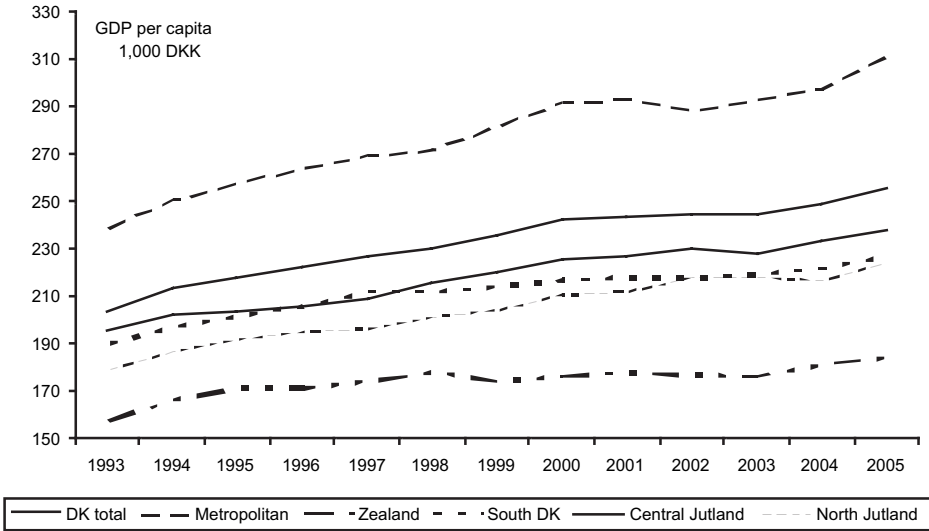
However, growth has not been equally distributed among the regions. The growth rates in the Metropolitan Copenhagen, Central Jutland and to some extent the Northern Jutland Region have been higher than in the remaining parts of Denmark. Stagnation has especially hit Region Zealand and from 1998 to 2003 also the Region of Southern Denmark. It should be stressed that large divergence exists within each region¹⁴.

Figure 7 examines the issue of convergence by using simple box-plots for 1995 and 2005, respectively. The hypothesis of decreasing internal convergence is supported. In the lower panel presenting results from 2005 it is evident that a lower outlier (Zealand) as well as a higher outlier (Metropolitan area) are present, whereas in 1995 only a higher outlier (Metropolitan area) was present.

Figure 8 presents an overview of the development of employment. The left vertical axis of the bar chart gives the index values of the change in employment relative to 1997. The right axis refers to the bar in the figure and gives the absolute number of employment by country. The chart confirms the picture sketched in Figure 5 of reinforced disparities. Besides the Metropolitan area, only the most central parts of Jutland the counties of Vejle and Aarhus show figures above the national average. In

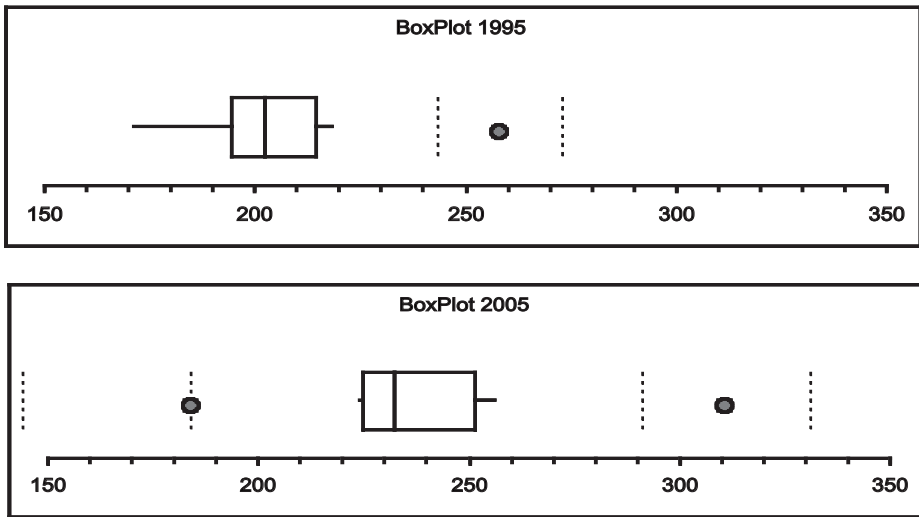
¹⁴ See also Figure 5 in this section, summarizing the development in GDP *per capita* since 1993 based on the old county division.

Figure 6. GDP by *capita* by Regions in Demark 1993 to 2005



Note: 2000 price level.
 Source: Danmarks Statistik, Regional Accounts, 2007.

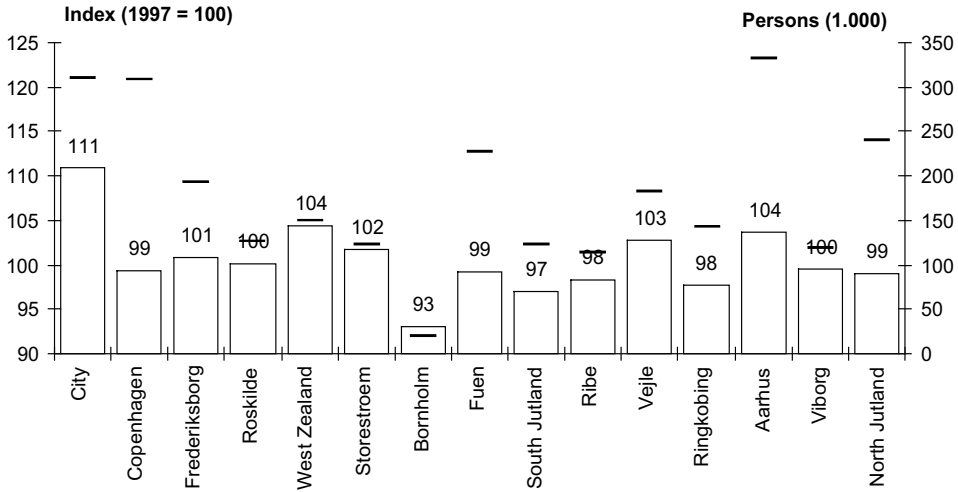
Figure 7. Box-Plots of Regional Disparities GDP in Denmark



Note: See Figure 3 for an explanation of the Box-plot.
 Source: Danmarks Statistik, Regional Accounts, 2007.

sum, the information in Figure 5 and 8 confirms the picture of Denmark with two growth centers; the Metropolitan area of Copenhagen and of the Eastern part of Jutland formed by the former counties of Vejle and Aarhus.

Figure 8. Development of employment in Western Denmark since 1993.



Note: The left vertical axis of the bar chart gives the index values of the change in employment relative to 1997. The right axis refers to the bar in the figure and gives the absolute number of employment by country.

Source: Danmarks Statistik (2006).

To sketch some further light on the process the final part of this section examines the interregional potentials of the most important business related growth driver’s innovation and entrepreneurship¹⁵.

It is well known that endowment in human resources (higher level of education), and the more innovative and entrepreneurial orientation with the dominance of services and in particular *Information and Communication Technology (ICT)* is concentrated in the centre regions. Also the other growth drivers are stronger in the Center areas leaving the periphery in a less favorable position. Overall the Central and Southern part of Jutland, according to the new regional division, is in an intermediate position¹⁶, see Table 4.

¹⁵ For a full examination, see Cornett and Sørensen (2007). In a European context, see the European Innovation Scoreboard 2006, Innometrics (2006). Denmark as a whole is here ranked 21 among 203 regions. With regard to entrepreneurship an international comparison can be found in Schøtt (2006).

¹⁶ For further examination, in particular also of the other growth drivers and the intra-regional disparities see Cornett & Sørensen (2007).

Table 4. Business related growth drivers in a regional perspective: Entrepreneurship and Innovation

Denmark	Metropolitan area	Zeeland	Southern Denmark	Central Jutland	Northern Jutland
<i>Innovative entrepreneurship volume relative to population (mean innovativeness 2002-2006)</i>					
1,2	1,4	1,0	1,1	1,2	0,9
<i>Innovative entrepreneurship share among entrepreneurs (2002-2006)</i>					
22	24	20	23	22	17

Source: Schøtt (2007).

To some extent this pattern also applies to the last driver, *innovation*, in particular in the advanced service sector, but probably to a lower degree in manufacturing. With regard to resource input for innovation and R&D, regional disparities in Denmark are significant. According to an analysis from The Ministry of Science (2004) the resources regionally spent on R&D were heavily biased toward the Copenhagen metropolitan area. In 2001, 62% of private R&D spending was in the Metropolitan area and only 10% in Southern Denmark¹⁷. The equivalent figures for public sector R&D were 62% and 10% in 2002 (Ministry of Science, 2004, p. 5f).

3.2. A Nordic Perspective on Disparities.

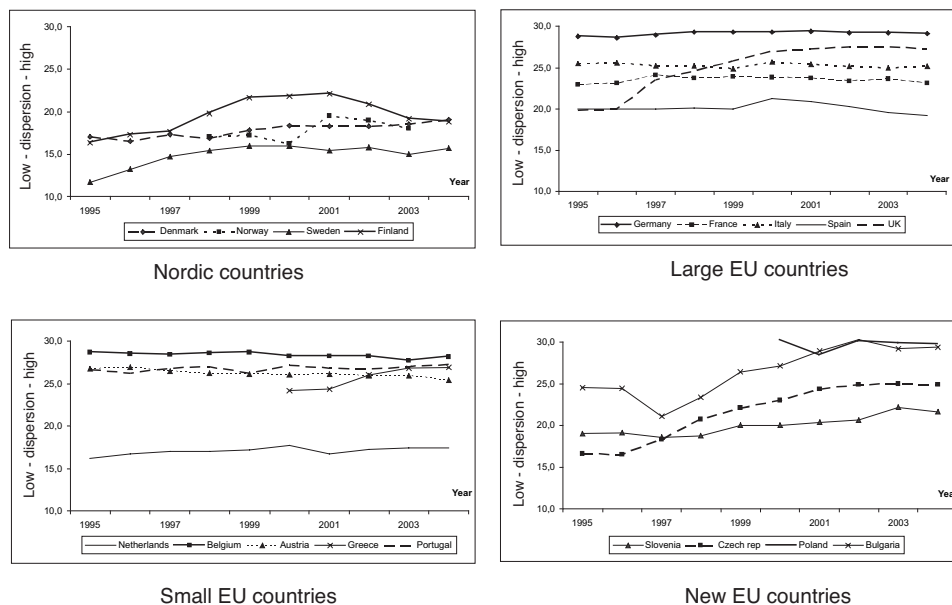
The Danish evidence of economic growth without a similar employment growth has been observed in many European countries during the last years. Even in low growth countries economic growth often exceeds the employment growth, or even takes place with shrinking employment due to productivity increase and changing production systems, i.e. outsourcing or off shoring, see Neubauer *et al.* (2007). How this has influenced in dispersion is considered in Figure 9 built up of four panels giving the figures on dispersion for the Nordic nations, the large EU nations, the small EU nations, and several newly EU member countries. Notice that the scales has been set in order to facilitate comparison.

In general, the Nordic countries and the Netherlands has lower dispersion than other nations. This is properly due to the welfare model and the tax system. The large EU members and the small “old” members of the EU have a level of disparity at a quite high level. In the new EU member countries the dispersion is increasing. This confirms the picture put forward in Section 2.

Overall, the Nordic data indicates that the trend toward growing inter regional disparities can not be found in all countries in a European context regardless the different regional equalization policies conducted.

¹⁷ Actually, the figure is slightly overestimated due to the fact that the statistics still belongs to the old regional classification. The Northern part of the former Vejle County now belongs to the region of central Jutland, see also Appendix. The same is the case for the metropolitan region, since the former Roskilde County now belongs to the Region of Zeeland.

Figure 9. Dispersion of Regional GDP/capita in Europe 1995-2004



Note: Dispersion is measured as the standard deviation of GDP *per capita* values normalized to the country mean. Country mean excludes GDP generated by offshore industries and other extra-territorial activity.

Source: Eurostat (2007) and for Norway Neubauer *et al.* (2007) p. 13.

4. Summary and perspectives

Overall, the initial research question whether large intra-regional disparities lead to lower economic growth on the national level than smaller disparities do cannot be answered unequivocal. Although regional convergence in the European Union is an issue that has received increased attention during the past decades, the picture today is still diversified. Very roughly, the countries can be divided into three groups with regard to regional convergence: large countries, small countries and new eastern EU member countries.

The analysis of regional divergence in Europe revealed a mixed picture. 3 out of 5 five large West European countries showed a tendency toward convergence. Only the UK has become more divergent in the decade from 1995 to 2004, whereas we found status quo for Spain. For the smaller West European economies the pattern was even more scattered. Only for Austria we found convergence. Most countries had a fairly stable regional pattern. Divergence was found in Sweden and Finland, both characterized by low population density and depopulation problems in the Northern regions. Except for Slovenia all analyzed Eastern EU-members are characterized by a pattern of divergence.

Metropolitan areas and other center regions in Europe are following a pattern of growth, rural and peripheral regions are lagging behind. This pattern is fairly stable throughout Europe, and contributes to the fact that divergence is reduced between nations.

This indicates probably a tendency in the future, dividing Europe in two levels, namely the high-growth city regions, and the low-growth rural regions. An open question is whether this will lead to increased divergence between countries in the long run, if the metropolitan areas in the smaller economies cannot keep up with the growth performance in the European center metropolitan areas, i.e. London, Paris, Milan or the major German agglomerations.

Viewed in a European context, Denmark is a nation without regional disparities. However, over the past 15 years a tendency quite similar to the pattern found in Finland and Sweden is observed, namely a higher growth rate in the Metropolitan Copenhagen. This tendency is at the moment not significant in an international perspective.

Regardless a relative small spread of disparities in Denmark, growth performance has been relative good compared to most Western European countries, but more specific studies are required.

Overall in Europe there seems to be a tendency toward convergence between countries and to some extent regions, regardless the fact that we still find huge and increasing disparities within countries. This is also the case in Denmark, at least for an analysis based on the old regional division. Internally in Denmark the main challenge is the very biased factor endowment with regard to the central growth drivers, human resources, entrepreneurship, innovative capabilities and information and communication technology.

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Appendix 1: Regions in Denmark

Before 2007 (Counties):



1. Copenhagen
2. Frederiksborg
3. Roskilde
4. West Zealand
5. Storebroem
6. Bornholm
7. Fuen
8. South Jutland
9. Ribe
10. Vejle
11. Ringkoebing
12. Aarhus
13. Viborg
14. North Jutland

In the inner Copenhagen “City” is the two municipalities Frederiksborg and Copenhagen city.

From 2007 (Regions):

- | | |
|------------------|--|
| 1. Metropolitan | Counties 1, 2, 3 and “City”. |
| 2. Zealand | Counties 4, 5 and 6. |
| 3. South | Counties 7, 8, 9 and south of county 10. |
| 4. Mid Jutland | North of county 10, 11, 12 and south of county 13. |
| 5. North Jutland | North of county 13 and 14. |