Lack of regional convergence

by[1]

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Abstract

We start by laying out some stylized facts on regional growth in Europe from 1960 onwards (Section 2). On this basis we proceed in Section 3 to an econometric analysis on how these facts can be explained, allowing for a broad range of causal factors as well as the possibility that the dynamics differ across various types of regional 'clubs'. Section 4 broadens the analysis by taking into account the possible impact of changes in EU regional support in the last decade. Finally, in Section 5 we return to the questions of what all this has to say for regional convergence in Europe in the future, what the lessons for policy are and how the future research agenda in this area should look like.

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1 INTRODUCTION

Greater equality across Europe in productivity and income has been one of the central goals for the European Community since the early days of European economic integration. And for a long time this was achieved. As shown by several studies[1] differences in GDP per capita between European regions declined steadily from the early 1950s onwards. However, more recently this process seems to have slowed down considerably, and perhaps come to a complete halt (Fagerberg and Verspagen, 1996).

What are the reasons behind these developments? Economic analyses of differences in growth across countries or regions have been based on two competing perspectives. The first, based on the traditional neoclassical theory of economic growth (Solow, 1956), is based on the assumption that technology is a public good, available to anyone free of charge. This perspective puts the emphasis on capital accumulation as the main vehicle for reducing differences in productivity across countries or regions. Moreover, this is assumed to happen more or less automatically, as long as markets are allowed to work freely. The other, competing, perspective puts the main emphasis on innovation and diffusion of technology as the driving force behind differences in growth. This perspective is based on a totally different view on technology, emphasizing its public as well as private character, and the complementarity between technology and other factors that take part in the growth process. Technological know-how is described as a rather local affair, embedded in firms, organizations, networks and so on, dependent on specific assets of various types that are not easily forthcoming. This leads to the hypothesis that without the ability to develop such assets, countries or regions are likely to fall behind rather than catch up.

Previous research has shown that the predictions of the public good model do not fit regional growth very well (see, for instance, Sala-i-Martin, 1996) and that a more comprehensive framework, taking into account a wider range of factors, is necessary in order to accommodate the facts. This is what we wish to do in this chapter for the European case. We start in Section 2 by laying out some stylized facts on regional growth in Europe from 1960 onwards. On this basis we proceed in Section 3 to an econometric analysis on how these facts can be explained, allowing for a broad range of causal factors as well as the possibility that the dynamics differ across various types of regional 'clubs'. Section 4 broadens the analysis by taking into account the possible impact of changes in EU regional support in the last decade. Finally, in Section 5 we return to the questions of what all this has to say for regional convergence in Europe in the future, what the lessons for policy are and how the future research agenda in this area should look like.

2 REGIONAL CONVERGENCE IN EUROPE: THE STYLIZED FACTS

In this section we take a fresh look at regional disparities in GDP per capita in EU countries. We extend the data to the most recent ones available (1995) at the time of writing. For all countries except the most recent members of the EU (Austria, Finland and Sweden), EUROSTAT provides data on regional income data in purchasing power standards (PPS) values from 1980 to 1995. We link these data with earlier data as consistently as possible in order to study fairly long historical series on dispersion within and between EU countries. In addition we provide some evidence on regional dispersion of labour productivity.

Our data on regional per capita GDP levels cover the period 1960 to 1995. The data for 1960 are based on Molle (1980). The data for 1970 to 1980 are based on various issues of the yearbook of regional statistics from EUROSTAT. More recent data are from the REGIO database.[2] All data are measured in PPS (purchasing power standard). As a measure of dispersion, we use the standard deviation of the logarithm of regional GDP per capita.[3]

Table 1 presents the trends for two country groupings, EU9 and EU12. The difference between these two is that the latter also includes the three southern countries that joined the Community in the 1980s; Greece, Portugal and Spain. For each grouping we present two measures of dispersion, *regional* and *national* standard deviation. The former measures the dispersion across regions in Europe, irrespective of which country the region belongs to. The latter measures the dispersion between country aggregates (that is, means over regions).

Table 6.1 Dispersion of GDP per capita in EU regions and countries 1960–1995

	1960	1970	1980	1995
Regional standard deviation EU9	0.343	0.274	0.202	0.205
National standard deviation EU9	0.263	0.233	0.184	0.168
Regional standard deviation, GDP per worker, EU9	0.306	0.211	0.145	0.153
Regional standard deviation EU12			0.279	0.255
National standard deviation EU12	0.459	0.342	0.328	0.258
Share of total regional dispersion in EU9 due to:				
Between country dispersion in per cent	64	79	52	41
Within country dispersion in per cent	36	21	48	59

Note.
All figures based on PPS. The regional disaggregation is more detailed from 1980 and onwards and this biases the figures before 1980 for EU9 downwards. The productivity figures for EU9 do not include Denmark and Ireland and are based on the NUTS-I level for most countries, as employment data at the NUTS-II level were not available. The share of total dispersion is based on a standard decomposition of the total variance of log GDP per capita in between country and within country effects.

The table shows that a significant decrease in both regional and national dispersion took place in EU9 between 1960 and 1980. Hence, Europe appeared to be on a path towards convergence. After 1980, this trend continued at the national level (that is, between countries), although at a slower pace. The latter is not so surprising, given that the level of disparity was rather low already in 1980. What is more surprising, however, is that at the regional level, for which the level of disparity in 1980 was much higher, convergence ceased after 1980. These findings are in accordance with the figures presented by Molle and colleagues, using a different methodology (Molle, 1980; Molle and Cappellin, 1988).[4]

As can be seen from the table, the level of dispersion in GDP per employed person is lower than in GDP per capita. This implies that high-income regions are rich not only because they have high productivity but also because a larger share of their population is working. However, the change in the dispersion of GDP per employed over time is quite similar to that of GDP per capita. This implies that in the present context, the use of GDP per capita as a proxy for productivity is relatively unproblematic.

The larger group (EU12), including the southern entrants, deviates from the EU9 experience by showing both regional convergence and national convergence between 1980 and 1995. Furthermore, the reduction in national disparity (that is, between country aggregates) is much stronger than for EU9. This shows that on average the three new entrants grew faster than original members, that is, that a process of catch-up in productivity took place. However, also in this case, the trend towards convergence was much stronger at the national level than at the regional level.

We thus find a clear difference between trends at the national and regional levels, with much less convergence at the regional level.[5] This shows that although countries in the EU at large are still converging to each other, not all regions benefit from this process to the same extent. This is also indicated by the increasing (since 1970) share of total disparity that is accounted for by within-country disparity in EU9, rather than between country disparity (last lines in Table 6.1).

Figure 6.1, which reports data for regional dispersion within individual member countries, further illustrates this pattern.[6,7] For all EU9 countries there is either little change or a tendency towards increased regional dispersion (notably for the UK and to some extent Italy[8]). For the three new entrants there is a lot of variation over time, but there appears to have been some reduction in regional disparity in all three countries over the period as a whole. However, for Spain and Portugal this reduction is very small, and for Greece it took place prior to 1982, after which regional dispersion has been slowly increasing. Hence the conclusion seems to be that there has been very little convergence between regions within individual EU member countries since the early 1980s.

(Figure 6.1 about here)

The evidence brought forward in this section confirms that the process towards convergence in GDP per capita (or productivity) across European regions has indeed slowed down in recent years. However, this is not caused by diverging trends between EU countries. In fact, at the country level there is still some evidence of convergence. This applies in particular to the southern countries that entered the community in the early 1980s. Rather, this slow-down seems to be related to the lack of convergence – and in some cases increasing dispersion – between regions within most EU member countries.

3 EXPLAINING REGIONAL GROWTH

The finding that there is more convergence between countries than within them certainly begs new questions about the relationship between regional and nationwide growth. Clearly not all regions benefit from nationwide growth to the same extent. There are at least two central issues here. First, what are the factors that determine whether a region forges ahead or lags behind compared to the country average? Second, conditional on differences in country trends, are there important commonalties between regions in different countries that share certain basic characteristics? Is it, for instance, the case that, say, agricultural regions have much in common, independent of which country they belong to? These are issues that we would like to explore in the following.

Any explanation of growth differences needs theoretical underpinning. Our point of departure is the 'technology gap theory' of growth (Fagerberg, 1987).[9] As in other theoretical frameworks, it is assumed that innovation, diffusion and technology fuel growth. However, although technological activity gives rise to positive externalities, technology is not assumed to be a public good in the sense that it is equally available to everybody free of charge. On the contrary, it is argued that successful adoption of new technology is generally costly. Typically, it requires a host of complementary factors of the sort that Abramovitz (1994) classifies under the terms 'social capability' and 'technological congruence'. Hence, following this perspective regional growth may be seen as the outcome of three sets of factors:

- innovation activities in the region,
- the potential for exploiting technologies developed elsewhere (diffusion), and
- complementary factors affecting to what extent this potential is realized.

There are two major problems in applying this perspective. The first has to do with finding indicators of innovation and the potential for diffusion, the second with identifying and measuring the 'complementary factors'.[10] For innovation we use R&D intensity, defined as business enterprise R&D personnel as a percentage of total employment. We expect a positive impact of this variable. For diffusion potential we use, as customary in the literature, the initial level of GDP per capita in the region (log-form, 1980). The higher this level, the smaller the scope for imitating more advanced technologies developed elsewhere. Hence, the expected impact of this variable is negative. Regarding complementary factors, there are many candidates that can be defended theoretically, from variables related to various types of investments in humans (that is, education), infrastructure and physical capital to structural factors of various sorts. However, data are extremely scarce, especially among the former.

The 'complementary' variables that we were able to take into account include:

- physical infrastructure (kilometres of motorways per square kilometre),
- population density (the number of inhabitants per square kilometre),
- industrial structure (the shares of employment in agriculture and industry, respectively, in total employment),[11]

- long-term unemployment (that is, duration of more than one year, as a share of the total labour force) and
- growth rate of the population in the region.

Among these, we would expect the first two to have a positive impact on technology diffusion, since both a more developed infrastructure and a higher population density increase the profitability/reduce the cost of introducing new technology. Regarding industrial structure, it is one of the standard results in the existing empirical literature on regions that industrial structure matters. In particular, a high reliance on agriculture has been shown to be detrimental to regional growth (Fagerberg and Verspagen, 1996), among other things because of low technological opportunities, and slow growth of the market. On the share of 'industry' in total employment the expectations are less clear. Traditionally this sector – particularly manufacturing – has been regarded as an 'engine of growth' (Kaldor, 1967). However, technological progress in recent decades has been more geared towards services than industry and many traditional industries have been characterized by slow growth. Finally we include the level of unemployment as a possible complementary factor. We interpret this as a measure of the cohesion of the broader social and economic system in the region. The higher the share of the labour force that is excluded from work on a long-term basis, the less well this system works. Hence it is an indicator of institutional failure, and as such it might be expected to have a negative impact on growth.[12] For instance, it may hamper inflows of risk capital and qualified people, and encourage outflows, as empirical research in this area indeed suggests (Fagerberg, Caniëls and Verspagen, 1997). Long-term unemployment also leads to deprecation of skills and lack of learning by doing in parts of the workforce. In preliminary estimations we also included population growth, but it never had any significance, and was consequently dropped. All explanatory variables included in the regressions are for 1985, except unemployment, which due to data availability refers to 1987. The dependent variable, growth of GDP per capita, is the mean growth rate over the years 1980–94.

Table 6.2 presents the results. The basic model (first column) explains about 40 per cent of the total variance. When country dummies are added (third column), as is customary when pooling regional data for different countries, the explanatory power increases quite a bit. Furthermore, as shown in the bottom row of the third column, an F-test suggests that these dummies are jointly significant. However, by inspection it turns out that most of these dummies are of little numerical importance. The exceptions are Spain and Portugal, of which the former grows significantly faster, and the latter significantly slower, than the average.

The results support the basic hypothesis of our approach. Both innovation (R&D) and a large potential for diffusion contribute positively to regional growth when the impact of other, conditioning factors is taken into account. Among the latter, all but physical infrastructure receive some support. The evidence suggests that a high reliance on agriculture hampers growth, as does a high share of the workforce in industry. Hence, the regions that have been able to exploit the potential for diffusion to the fullest extent, are those that are specialized in services. This is consistent with the view that the effects of the ICT revolution have been more widespread in services than in other areas. For the two remaining conditioning variables, population density and unemployment, the results do to some extent depend on whether country dummies are included or not. Although the signs are as expected in both cases, the estimated coefficients are not significantly different from zero in the latter case. This is especially evident in the case of unemployment. The latter has to do with the fact that long-term unemployment is especially high in Spain. Since Spain is a fast-growing country despite these problems, the variable loses its explanatory power when country-specific effects are not included.

The second question we wish to address is the extent to which regions differ according to other criteria that may cut across country borders. Is it, for instance, the case that the dynamics of, say, regions with high unemployment differ from that of other regions in important respects? We test this using a method developed by Durlauf and Johnson (1992), and subsequently applied by two of us on European growth (Fagerberg and Verspagen, 1996). The method consists of sorting the observations in increasing (or decreasing) order of a control variable, splitting the sample at each observation *j* and run two separate regressions

for the first *j* observations and the last *n-j* observations (where *n* is the total number of observations). The final step is to pick the combination of control variable and *j* that yields the highest explanatory power.[13] As control variables we include all the explanatory variables in our model and, in addition, a variable reflecting the location of the region on a north–south axis (*longitude).*[14] The latter is introduced to test for the commonly held view (see, for instance, Neven and Goyette, 1995) that there is a clear division between the dynamics in the north and south of Europe.

Table 6.2 Basic results. One or several growth clubs?

Variables	Model (A)	t-stat.	Model (B)	t-stat.	Test for split (A) F(7,91)	Test for split (B) F(7,82)
Longitude					2.02	1.86
Constant	0.1954	(6.17)	0.2386	(4.88)		
GDP per capita	-0.0432	(5.43)	-0.0535	(4.25)	2.56(**)	1.95
Agriculture	-0.0375	(4.25)	-0.0398	(3.99)	3.49(*)	2.53(**)
Industry	-0.0358	(3.71)	-0.0386	(4.10)	2.77(**)	2.45(**)
Infrastructure	0.0001	(0.55)	0.0003	(0.84)	1.87	1.86
Unemployment	-0.0002	(1.05)	-0.0010	(3.54)	4.52(*)	2.15(**)
Population density	0.0006	(0.91)	0.0017	(1.96)	2.35(**)	1.62
R&D	0.0027	(1.54)	0.0038	(2.73)	3.47(*)	3.97(*)
Belgium			-0.0009	(0.36)		
Germany			-0.0003	(0.13)		
Greece			-0.0025	(0.67)		
Spain			0.0084	(4.01)		
France			-0.0012	(0.74)		
Italy			0.0025	(1.42)		
Netherlands			-0.0027	(0.82)		
Portugal			-0.0072	(1.98)		
UK			0.0003	(0.19)		
R2	0.40		0.55			
(R2)	(0.36)		(0.47)			
N	106		106			
Test for inclusion of dummies F(9. 98)			3.29 (*)			

Note.
Absolute, heteroscedasticity consistent t-statistics in brackets. One and two stars denote significance of F-test at the 1 and 5 per cent level, respectively. R2 in brackets adjusted for degrees of freedom.

The two last columns in Table 6.2 report F-tests for the significance of these splits, the first without – and the second with – country dummies included in the regression. The results are broadly the same, although – as could be expected – there is more evidence in favour of splits when country-specific effects are not allowed for. In both cases the results suggest that the splits based on geography (longitude) and infrastructure do not lead to a significant rise in the explanatory power of the model. Hence there is very little support in the data for a simple north–south dichotomy. Rather the results point to a more complex pattern. In both cases the most significant splits are those based on structural factors (agriculture and industry), unemployment and R&D. Among these the split based on unemployment is much less significant when country-specific factors are allowed, for reasons just discussed (the Spain-effect). In fact, the only split that is supported at the one per cent level of significance in both cases is the one based on R&D.

Table 6.3 gives some of the characteristics of the most significant regional groupings (variable means). It turns out that there are important similarities between the splits based on R&D, agriculture and industry. In all three cases, we get a split between a small, high-productivity group (20–30 regions) and a larger group with more average/low levels of productivity. The smaller group also has a different industrial structure, with a much more prominent role for services, and a very small agricultural sector. Moreover, these regions also have better infrastructure, higher population density, less unemployment and – above all – much higher investments in R&D. They also tend to be more 'northern', although this is not a defining characteristic in itself, as noted above.

Table 6.3 Characteristics of 'regional clubs'

	R&D		Agriculture		Industry		Unemployment	
Split	High	Low	High	Low	High	Low	High	Low
Number of regions	29	76	85	20	27	78	31	74
Productivity growth	0.014	0.016	0.015	0.017	0.013	0.017	0.018	0.015
Population growth	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Average longitude	49	43	43	50	47	44	42	46
GDP per capita	8322	5791	6152	7923	7526	6131	5502	6903
Agriculture	0.05	0.18	0.17	0.02	0.07	0.17	0.15	0.14
Industry	0.33	0.29	0.29	0.32	0.40	0.26	0.27	0.31
Services	0.61	0.53	0.53	0.66	0.53	0.56	0.57	0.55
Investment	0.17	0.23	0.23	0.13	0.20	0.21	0.22	0.20
Infrastructure	3.67	1.15	1.32	4.08	2.62	1.58	1.43	2.02
Unemployment	4.83	6.74	6.05	6.89	5.33	6.52	11.11	4.16
Population density	0.62	0.18	0.13	1.05	0.21	0.34	0.47	0.23
R&D	0.93	0.14	0.27	0.77	0.60	0.28	0.15	0.45
Country composition:								
Belgium	0.07	0.01	0.00	0.15	0.00	0.04	0.06	0.01
Germany	0.28	0.03	0.05	0.30	0.26	0.04	0.00	0.14
Greece	0.00	0.17	0.14	0.05	0.00	0.17	0.00	0.18
Spain	0.03	0.22	0.19	0.10	0.15	0.18	0.58	0.00
France	0.28	0.17	0.24	0.05	0.30	0.17	0.03	0.27
Italy	0.07	0.24	0.24	0.00	0.15	0.21	0.26	0.16
Netherlands	0.14	0.00	0.05	0.00	0.04	0.04	0.00	0.05
Portugal	0.00	0.07	0.06	0.00	0.04	0.05	0.00	0.07
UK	0.14	0.09	0.05	0.35	0.07	0.12	0.06	0.12

Table 6.4 reports the working of the model for these regional groupings. In most cases the difference in the estimated coefficient for the same variable across the two subsamples of the split is small and not significant. The main exception is for R&D, for which it is positive and significant for the smaller groups, but negative (and significant in two out of three cases) in the larger ones. Thus, while R&D may be an important factor behind differences in growth performance among advanced regions, and between advanced and less advanced regions, it does not seem to be a very efficient tool for regions below a certain threshold of development. This certainly begs new questions about the creation of technological capabilities in such

regions.[15] The other exception is for industry. Although the impact of specialization in industry is negative for all regional groupings, the estimated impact is much stronger in the larger groups. Hence the regions with low productivity, little R&D, a high share of total employment in agriculture and so on (in short, the less advanced regions) experience the largest negative growth impulse from industry.

Table 6.4 Explaining regional growth, 'regional clubs'

	High R&D	Low R&D	High agri-culture	Low agri-culture	High industry	Low industry	High unem-ploy-ment	Low unem-ploy-ment
N	29	76	85	20	27	78	31	74
GDP per capita level	-0.0446 (4.01)	-0.0403 (2.83)	-0.0409 (1.81)	-0.0522 (4.28)	-0.0489 (3.33)	-0.0384 (2.58)	-0.0521 (4.15)	-0.0379 (2.43)
Agriculture	-0.0596 (6.64)	-0.0439 (3.64)	-0.0333 (2.01)	-0.0479 (4.35)	-0.0500 (4.06)	-0.0542 (4.82)	-0.0331 (3.76)	-0.0444 (3.42)
Industry	-0.0272 (3.63) (*)	-0.0676 (4.70)	-0.0628 (2.61)	-0.0315 (3.51)	-0.0378 (4.28) (*)	-0.1200 (4.29)	-0.0290 (2.38)	-0.0404 (3.02)
Unemployment	-0.0010 (4.65)	0.0009 (2.34)	-0.0009 (1.42)	-0.0009 (3.52)	-0.0011 (3.78)	-0.0010 (2.93)	-0.0007 (2.94) (*)	-0.0059 (3.38)
Population density	0.0013 (2.50)	0.0017 (1.10)	0.0926 (2.11)	0.0016 (2.03)	-0.0010 (0.27)	-0.0023 (1.51)	0.0018 (1.93)	0.0120 (1.50)
Infrastructure	0.0001 (0.19)	0.0003 (0.85)	-0.0065 (1.94)	0.0001 (0.39)	0.0005 (0.96)	0.0015 (2.34)	0.0005 (1.47)	0.0000 (0.02)
R&D	0.0026 (1.98) (*)	-.1287 (4.69)	-0.0908 (3.34) (*)	0.0042 (3.25)	0.0041 (2.50) (*)	-0.0095 (1.45)	0.0028 (1.76)	0.0003 (0.09)
Country dummies	Yes		Yes		Yes		Yes	
R2(R2)[3]	0.66	(0.56)	0.63	(0.52)	0.63	(0.51)	0.62	(0.50)

Note.
Absolute, heteroscedasticity consistent t-statistics in brackets. One star denotes significance of Wald-test for difference in coefficients across the two subsamples at the 1 per cent level, respectively. R2 in brackets is adjusted for degrees of freedom.

The split based on unemployment is to some extent different from the three other splits (Table 6.3). Again, there is a small group and a larger one, but in this case the regions in the small group are high unemployment regions, of which more than one-half are Spanish. Among the remaining, the majority are Italian. On average these regions have low productivity, little R&D, bad infrastructure and a large agricultural sector, as is typical for many 'peripheral' regions. In this case, the only significant difference between the two groups relates to the impact of unemployment on growth, which happens to be much more manifest in the low unemployment regions. However, since this result seems to depend very much on observations from one country (Spain), it is difficult to draw strong conclusions on this basis. We return to this issue in the next section.

The findings in this section support the view that innovation and diffusion of technology are important factors behind regional growth. But innovative efforts in the form of

investments in R&D appear to be most efficient in advanced regions. In fact, in technologically less advanced regions, for example regions that do little R&D themselves, there is no evidence suggesting that regions that do more R&D than others fare any better in terms of growth. However, the results confirm that less advanced regions are faced with a considerable potential for growth through exploitation of more advanced technologies developed elsewhere. But the evidence suggests that this potential is seldom fully exploited because of counteracting factors such as, for instance, structural problems (a high reliance on agriculture and other traditional industries) and problems related to social and institutional failure (as reflected in the levels of long-term unemployment). In general, these counteracting factors appear to exist in combination, indicating that the disadvantages of 'backwardness' are complex and interrelated, and cannot be reduced to a single dimension such as, for instance, the location of a region on a north–south axis.

4 THE IMPACT OF EU REGIONAL SUPPORT

In recent years EU Structural Funds have been reformed and their funding has increased significantly. The purpose has been to make them more effective in reducing the gap between the more and less advanced regions and strengthening economic and social cohesion in the European Community.[16] Following the 1988 reform, the financial resources allocated to these funds have doubled in real terms. The extent to which these funds have contributed to regional convergence in the EU is not addressed directly in our analysis. One reason for not splitting our sample in two, and analysing growth during 1980–87 and 1988–94 separately, is that we believe these periods are too short for explaining long-term growth. In fact, most of the recent empirical growth literature has used longer time periods than we have. Thus to estimate the effects on long-term growth rates or income levels for that matter, of increased regional support, seems premature at this stage. One would run the danger of mixing a short-run Keynesian demand effect of higher transfers with the long-term supply effect.

It is worth noting, however, that the criteria used by the Structural Funds when allocating resources to different regions are to a large extent reflected in our analysis. The so-called Objective 1 regions are those which are characterized by low levels of GDP per capita, a large agricultural sector, a poorly developed infrastructure and high long-term unemployment. The Objective 2 regions are those affected by industrial decline. Objective 3 regions are those with long-term unemployment problems for people over 25 years, while Objective 4 is concerned with the integration of young people into working life. Funds for Objective 5 regions are partly related to agriculture and partly to rural development. Table 6.5 provides a breakdown of the Structural Funds by country and Objective.[17]

Table 6.5 Structural Funds by country and objective, 1989–1993.
(ECU mn)

Country	Obj. 1	Obj. 2	Obj. 3,4	Obj. 5	Total	Share of GDP
Belgium	-	214	344	182	740	0.1
Denmark	-	25	171	206	402	0.1
Germany	2955	581	1054	1425	6015	0.1
Greece	7528	-	-	-	7528	2.7
Spain	10171	1506	837	586	13100	0.7
France	957	1225	1442	2283	5907	0.1
Ireland	4460	-	-	-	4460	2.7
Italy	8504	387	903	959	10753	0.3
Luxembourg	-	12	11	32	55	0.2
Netherlands	-	165	405	155	725	0.1
Portugal	8450	-	-	-	8450	3.1
UK	793	2015	1502	506	4816	0.1
EUR12	43818	6130	6669	6334	62951	0.3

Source: EC (1996, Tables 24 and 25).

As can be seen from the table, support from the Structural Funds is small in most EU countries. On average it amounts to 0.3 per cent of GDP. There are only three countries for which such support really matters on a national scale: Greece, Ireland and Portugal. For these countries the total support from the funds amounts to roughly 3 per cent of annual GDP in each country per year. The regions that receive support in these countries all fall under Objective 1 (the poorest regions). Spain also receives an above average share (0.7 per cent), most of which also falls under Objective 1.

If regional support from the EU leads to significantly higher growth in the supported regions, our analysis may be biased, because we omitted an important factor affecting regional growth. There are two possible effects that such support might have on our analysis. First, in the countries for which such support is widespread, it may show up in nationwide growth, that is, in the estimated country- specific factors. However, by inspection it turns out that the two countries in our sample that have received such support on a substantial scale, Greece and Portugal, both receive a negative contribution from the country-specific factor. Hence, although a positive effect on the national level is a theoretical possibility, it is not something that appears to be reflected in our data.

The other possible effect implies that the estimates obtained on variables that are also Objective 1 criteria may be biased. For instance, our analysis suggests that poor regions may grow rapidly through imitation of more advanced technologies developed elsewhere. But the reality could be that these regions grow fast because they get regional support! If so, we would be likely to overestimate the contribution from the potential for catch-up. Or take agricultural regions, which are also supported. Failing to take into account the support to agricultural regions might lead us to underestimate the negative effect on growth of a large agricultural sector. However, the results obtained from splitting the sample (Tables 6.3–6.4) show that there is no significant difference between the estimates obtained for these two variables in the two subgroups of the split(s). Thus it appears that in these cases the hypothesis of a bias, although possible in theory, is not of great practical relevance. This may be different, though, for long-term unemployment (which is, as mentioned, also one of the Objective 1 criteria) in the split based on that variable. In this case we got a significantly smaller negative effect of unemployment among high unemployment regions, consistent with the assumption of a downward bias in the estimate. Hence, it is possible that by failing to take into account various types of support that prop up growth in high unemployment areas,[18] we have underestimated somewhat the negative impact that unemployment has on growth in these regions.

Another way to look at this issue would be to investigate what happened to regional dispersion within countries in the last decades. The assumption, then, would be that countries that have attracted a lot of regional support, should be more likely than others to converge internally. Most of the Objective 1 regions, that receive the lion's share of the support, are located in Greece, Ireland, Portugal, Spain and southern Italy. When we look at the regional dispersion within EU countries, cf. Figures 6.1 and 6.2, it becomes clear that neither within Greece nor Italy has increased regional support through the Structural Funds prevented regional dispersion from increasing. There is also no change in the trend after 1988 for these countries. For Portugal and Spain, on the other hand, there is some evidence of a long-term decline in dispersion. But for Spain there is no evidence of faster internal convergence after 1988, and for Portugal data problems make it difficult to make an assessment.[19] Thus, there is no strong support in the data for the idea that increased support from the Structural Funds had a great impact on dispersion.

5 CONCLUSIONS

The evidence presented in this chapter shows that the level of aggregation in the empirical analysis matters a lot for our interpretation of growth processes. If one looks at the country level there appears to be a tendency towards long-run convergence in productivity and income levels in the European Union. However, this tendency masks important differences between regions within the same country. In fact, for most countries, there is either little change in regional dispersion, or a tendency towards divergence. This appears to happen in spite of

increasing efforts at the EU level in the form of increased contributions to backward regions from the Structural Funds.

How is this to be explained? We looked at these developments from three closely related angles: *technology*, *structure* and *institutions*. The technological perspective is based on the distinction between innovation and diffusion of technology. Regions at the frontier may receive a growth stimulus from investments in innovation activities (R&D), while backward regions may benefit from the adoption of new technologies at a relatively low cost. The evidence considered in this chapter shows that both sources are important for growth. However, many backward regions have failed to take advantage of the potential for diffusion. Lack of data prevents us from exploring many potentially relevant aspects of this, but among the factors that we were able to take into account, the industrial structure of the region and its ability to fight long-term unemployment appear to be among the most important. The evidence shows that, conditional on other factors, the most successful regions are those specialized in services and high-tech industry, while agricultural regions and those specialized in traditional industries are at a disadvantage. This is consistent with the view that technological progress in recent decades, dominated by ICT technology, has been more beneficial to services than to most other sectors of the economy.

In previous work two of us showed that, conditional on other factors, regions that receive support from the Structural Funds do not grow faster than other regions (Fagerberg and Verspagen, 1996). Here, we have looked further into this issue and found that there is little evidence suggesting that support from the Structural Funds, including the increase in these funds in recent years, have had any significant effect on growth at the regional or national level. The findings in this chapter suggest that to achieve growth regional support schemes should give priority to policies that

- increase the ability of the regions to absorb new technologies,
- change the industrial structure (away from agriculture and traditional industries),
- and lead to a reduction in long-term unemployment.

Why existing policies have failed to produce significant growth effects is not dealt with in great detail here, and will be an important topic for further research in this area. One hypothesis might for example be that these policies are not designed in a way that encourages growth, that is, do not sufficiently take into account the points made above. Another possibility would be that any positive effect on growth that these policies might have are counteracted by other polices at the EU or national level, such as, for instance, the Common Agricultural Policy (CAP).

One factor that makes the design of regional policy difficult is that similar policies may have quite different consequences in different environments. This has to do with the fact that regions may differ not only by initial conditions, investments in R&D and physical capital and so on, but also in the dynamics, that is, in the impact that these variables have in the economy. To explore this issue we tested for possible differences in the impact of variables across regional subgroups defined by the three dimensions mentioned above (technological, structural and institutional). We also included a fourth dimension, based on a north–south (geographical) divide. The results showed that a simple north–south dichotomy explains very little. However, what seems to be a fairly robust finding is that there exists a high R&D, high productivity subgroup with its own dynamics. What distinguishes these high R&D regions from the rest is primarily that R&D matters a lot in the former, while it is of little importance (or contributes negatively) in the latter. Also the tendency towards deindustrialization (negative impact of specialisation in industry) is much weaker among high R&D regions than for the others, indicating that high R&D industry is less affected by these negative trends than industry at large. These findings may serve as a warning against R&D euphoria in backward regions that lack the necessary infrastructure. Clearly, creating technological capabilities in backward regions demands much more than R&D, and it is an important task for future research to explore the interaction between the various factors that take part in these processes.

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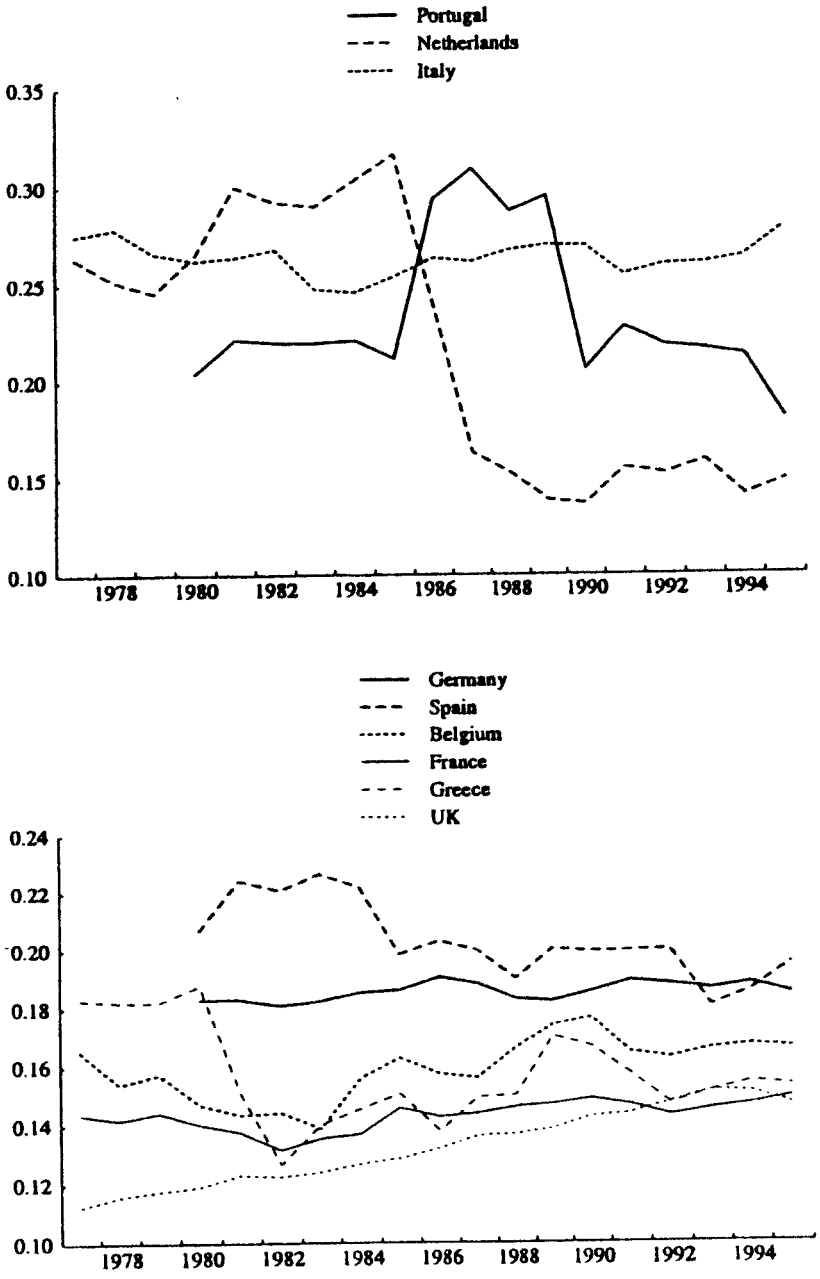
Figure 6.1 Dispersion in regional GDP within EU countries



NOTES

1. The performance of regions in the US, Japan and Europe is analysed in a series of papers by Barro and Sala-i-Martin (see, among others, Barro and Sala-i-Martin, 1991, 1992; Sala-i-Martin, 1996). For a more comprehensive treatment of the European case, see Neven and Goyotte (1995), Fagerberg and Verspagen (1996) and Fagerberg, Verspagen and Caniëls (1997).
2. Some missing observations in the REGIO database have been collected from other publications or are estimates by the authors.
3. To make this measure comparable over time we divided regional GDP per capita by the mean value in the aggregate we look at (that is, EU9, EU12 or the individual country).
4. Molle (1980), a now classic study in this area, relies on so-called Theil-indices of GDP per capita. The Theil-index weights the regional per capita incomes using a measure of the size of the regions as weights. This implies that dispersion may change only because of changes in relative size and not because of changes in the dispersion of per capita incomes *per se*. A measure such as the standard deviation of the log of relative GDP per capita, used here and by many others, gives all regions the same weight independence of size. See also Dignan (1996).
5. This result is also born out in the EC (1996, p. 19) for a somewhat shorter period.
6. Note that the figures for Portugal between 1985 and 1990 reflect adjustments (shifts) in the data for certain regions. The hat-shaped curve that these adjustments give rise to is clearly a statistical artefact. What is of interest is the long-run trend.
7. For The Netherlands, the changes in oil (and gas) prices have influenced the incomes of Groningen so that the dispersion dropped dramatically from 1985 to 1987.
8. Italy stands out with the largest within-country dispersion, reflecting Italy's well-known north–south divide. For the other eight countries the internal dispersion as measured by the standard deviation of log per capita GDP (in PPP relative to the average) of each country is now between 0.15 and 0.20 (1995). Hence, apart from Italy, there has been a convergence towards a common level of dispersion.
9. The hypothesis that technological catch-up requires substantial efforts and capabilities in the receiving country is discussed and tested in Fagerberg (1987,1988). Verspagen (1991) and Amable (1993) analyse the possibility that countries without the necessary assets may end up in a low-growth trap. For an overview of empirical work on catch-up and growth, including its theoretical underpinnings, see Fagerberg (1994).
10. All data for the variables described below are taken from the EUROSTAT REGIO database.
11. Industry as used here includes fuel and power, manufacturing and construction. The remaining part of total employment when agriculture and industry are deducted is services, which therefore cannot be included as a separate variable.
12. Reverse causation cannot be excluded, of course, but previous research shows that the distribution of unemployment is roughly constant through time. Hence the high unemployment regions at the beginning of the period also had high unemployment at the end, and *vice versa* (Fagerberg, Caniëls and Verspagen, 1997). This seems to point to persistent social, institutional and economic problems in these regions that depress growth.
13. In the paper by Durlauf and Johnson (1992), and the article by Fagerberg and Verspagen (1996), the samples of *j* and *n-j* observations are subsequently subjected to the same splitting procedure on and on, until the number of degrees of freedom becomes too small to allow a new split, thus building so-called regression trees. In this chapter, we limit ourselves to just one split.
14. The variable was defined as the most southbound longitude that crosses a region.
15. It is possible that our measure of technological capability, R&D employment, is biased towards large firms in high R&D industries and countries, and fails to reflect the efforts by small firms, firms engaged in imitation, and industries in which learning – rather than organized R&D – dominates technological progress. This is in area where further research seems not only fruitful but absolutely necessary. For an analysis of differences in modes of technological accumulation across industries, see Pavitt (1984, 1988).
16. For an analysis of regional policy in the EU, including its rationale and the need for reform, see Begg and Mayes (1993) and Begg (1997).
17. Note that funds disbursed to regions according to Objective 3 and 4 criteria are not regional specific in nature. But they may still have an allocation biased towards peripheral regions as high long- term unemployment and low rates of labour participation are quite typical features of such regions.
18. Note also that the high unemployment regions grow faster than any other subgroup included in Table 6.3.

19. As mentioned the figures for Portugal between 1985 and 1990 reflect adjustments (shifts) in the data for certain regions. The hat-shaped curve that these adjustments give lead to is clearly a statistical artifact.