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Unconditional Convergence in Currency Unions: An analysis of European regions from 1991 to 2009

Matthias Firgo[1] & Peter Huber[2,3]

Abstract

We analyze unconditional within-country convergence from 1991 to 2009 in 21 European countries. Unlike most previous studies we focus on the heterogeneity of convergence. We find that convergence processes in currency unions are extremely heterogenous, highly discontinuous and strongly concentrated: Only around half of the regions starting with below national average GDP per capita levels in 1991 experienced catching-up over the period analyzed and two thirds of the regions starting with above average GDP per capita converged towards the national average. The average duration of the longest spell of unbroken above average growth for poor converging regions lasted for five years, while the longest below average growth rate spell for these regions lasted for three years. About two thirds of the growth rate differential of the average catching-up region to the national average over the period can be attributed to the year with the strongest growth. In addition, human capital and innovation are the main predictors for the propensity of a region to catch-up. These stylized facts therefore question the focus of the traditional literature on average (beta-)convergence and suggest substantial non-linearities in regional convergence processes and imply that growth strategies based on increasing human capital investments and innovation capacities are the most likely to be successful in triggering convergence in monetary unions.

Key words: unconditional regional convergence, within-country development, extreme growth events, currency unions

JEL codes: O52, R11, R58

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1. Introduction

The recent financial and economic crisis has drawn renewed attention to the substantial national and regional disparities in the European Monetary Union (EMU). Quite a few analysts have emphasized the important policy challenges that are posed for the viability of the EMU by the failure of the Southern European periphery to converge in terms of GDP per capita and productivity. In particular it has been argued that the task of restructuring these peripheral countries currently facing severe macro-economic problems (e.g. Cyprus, Greece, Italy, Spain, Portugal), is complicated by their membership in EMU, which does not allow them to devalue their currency. The lack of this important policy instrument may lead to high social and political costs of national reform programs based on devaluation strategies over-stressing the importance of wage restraints in regaining competitiveness.

Despite the widespread acknowledgement of this additional complexity, empirically very little is kown about the process of and conditions for unconditional convergence in monetary unions. In this paper we argue that the only historical experiences of catching-up within currency unions available, are those of regions in countries. We therefore use the experience of 269 NUTS 2 regions in 21 European countries between 1991 and 2009 to analyze the process of and the determinants for unconditional convergence of regions to the country mean. As a consequence we depart from the standard literature focusing on measuring the average rate of conditional (beta-)convergence in a country (see Baumol (1986), Barro (1991), Barro and Sala-i-Martin (1991, 1992), Mankiw et al. (1992), for classical contributions and Magrini (2004), Abreu et al. (2005), Durlauf et al. (2005), Dobson et al. (2006) for recent surveys) in a number of ways. First, in contrast to this literature, we focus on unconditional convergence because the central debate with respect to convergence of the peripheral countries in EMU - as indeed with respect to most policy discussions (see Rodrik, 2013 for a forceful argument in this direction) – is one on unconditional convergence, since the viability of the monetary union is threatened by the level of regional disparities in the European Union and not by the incapability of countries or regions to converge to their (potentially very disparate) steady state growth paths. Second, by following a suggestion made by Faini (2003) and dividing our sample into various subgroups of regions based on their starting level of GDP and their subsequent growth experience, we highlight the heterogeneity of regional convergence/divergence processes rather than being interested in "average" rates of convergence across all regions. In this respect we are closer to the recent literature on growth events (e.g. Pritchett 2000, Hausmann et al. 2005) than to the standard beta convergence analysis. This literature seeks to understand the heterogeneity in growth processes across countries argues that the traditional convergence literature runs the risk of "averaging out the most interesting variation in the data" (Hausmann et al. 2005 p.304).

We find that unconditional convergence to the country mean in a currency union is far from automatic, as well as highly discontinuous and strongly concentrated on a rather limited number of time periods: Only around half of the regions starting with below national average GDP per capita levels in 1991 experienced a catch-up over the period 1991 to 2009 and only two thirds of the regions starting with above national average GDP per capita in 1991 converged towards the respective country average until 2009. Poor converging regions typically grew faster than their respective national average for less than two thirds of the period considered, with the typical duration of the longest unbroken spell of above average growth being five years and the longest below average growth rate spell typically lasting for three years. Furthermore, about two thirds of the growth differential to the national average growth of an average catching-up region can be attributed to the year with the strongest growth, and if the weakest year of growth is omitted the average catching-up region could have almost doubled its growth rate differential to the national average. Finally, an econometric analysis of the predictors discriminating between regions growing above and below the national average for initially poor and rich regions indicates that human capital endowments and innovative performance are the main predictors for above-average growth (i.e. unconditional within-country convergence) of poor regions, while for rich regions human capital endowments, the presence of a national capital and sector specialization are more important factors predicting above-average growth.

We argue that these stylized facts are of both positive as well as normative interest. From a positive perspective our evidence questions the focus of the traditional literature on average (beta-)convergence and lends support to theories that view regional growth and convergence as a discontinuous and non-linear process as is for instance the case in the literature on development traps and growth thresholds (Sachs 2005, Azariades and Drazen 1990) and non-linearities in regional development (Brezis and Krugman 1997, Brezis et al. 1993, van de Klundert and Smulders 2001) or literature that considers periods of above average growth as primarily caused by exogenuous shocks and thus rather as a consequence of good luck than of good governance (Easterly et al. 1993). In terms of policy, by contrast, these findings imply that immediate and automatic success for growth oriented policies in peripheral countries and regions is unlikely to occur in monetary unions but that among potential growth strategies based on increasing human capital investments and innovation capacities are mort likely to be successful in monetary unions.

2. Data and Stylized Facts

The heterogeneity of convergence and divergence processes

The data we use were collected from the EUROSTAT, OECD and Cambridge Econometrics databases for 269 NUTS 2 regions in 21 European countries (19 EU-27 countries plus Norway and Switzerland) excluding overseas regions of France and Portugal (due to a lack of data) for the period from the reunification of Germany in 1991 to 2009. We use data on real GDP per capita (based on year 2000 prices) from the Cambridge econometrics database as an indicator of regional development and exclude EU countries consisting of less than three NUTS 2 regions to avoid situations in which within-country divergence or convergence cannot be observed by definition or in which the convergence or divergence of one region fully determines the convergence or divergence of the other region in the country.[4]

{Table 1 Around here}

As a starting point for our discussion Table 1 shows the results of unconditional beta convergence regressions in GDP per capita, i.e. a panel regression of the growth rate of GDP per capita in region i between time period t and t+1 (g_{it}) on the level of output in period t (y_{it}), for each of the countries in our sample for the period of 1991-2009 and two sub-periods (1991-2000 and 2000-2009). While we find some evidence of unconditional within-country convergence (i.e. negative coefficients) for the majority of countries sampled, there is also compulsive evidence of substantial variation in coefficients: First, there is a wide variation in the level and significance of estimates across countries. For each period we find a number of countries with significant negative and significant positive coefficients. Thus, although unconditional convergence tendencies seem to have dominated, this tendency has been far from ubiquitous. Second, convergence rates and tendencies also differ markedly across time periods. While in the 2000-2009 time period more countries experienced unconditional within-country convergence than divergence, the opposite was the case in the 1991-2000 period. Furthermore, Germany and Finland are the only countries that exhibited significant convergence during both sub-periods. In all other countries significant convergence applies

[4] We refrain from filtering business cycle effects from our data. The reason is that within individual countries business cycle sychnronisation is usually high for data on an annual frequency (see: Montoya and de Haan (2008)). This implies that the risk of identifying effects from asymmetric regional cycles relative to the national average is relatively low and is likely to have a lower impact on results than the ambiguities necessarily induced by trend-cycle decompositions.

to only one of the two decades at most. In sum, these findings suggest a substantial heterogeneity of convergence and divergence experiences both over time and across space.

{Table 2: Around here}

To further analyze this heterogeneity we follow a suggestion by Faini (2003) and (for each country and time period) divide regions into four groups, depending on firstly, whether they had GDP per capita levels below or above the national average at the beginning of a period, and secondly, on whether their average growth rate was above or below the national average throughout the period. This gives us four types of regions (table 2):

- Regions with below average levels of GDP per capita at the beginning of the observation period that grew below average from 1991 to 2009. For these regions, by definition, the initially (negative) gap in GDP per capita to the national average increased. We therefore refer to these regions as poor diverging regions (type 1).
- Regions with below average levels of GDP per capita at the beginning of the observation period that in contrast to the first group grew above the national average. These are referred to as poor converging regions (type 2).
- Regions with above average levels of GDP per capita at the beginning of the observation period that grew below the national average over the observation period. In contrast to the first group (that also experienced below average growth) these regions reduced their (positive) GDP per capita gap to the national average. In consequence we label them rich converging regions (type 3).
- Regions with above average levels of GDP per capita at the beginning of the observation period that grew above the national average. These regions increased their (positive) GDP per capita gap and are thus rich diverging regions (type 4).

As can be seen from the map in the top panel of figure 1 which illustrates the geographical distribution of these four groups of regions for the period 1991-2009, there was also substantial heterogeneity in the convergence and divergence experiences of individual regions even in countries in which regions on average converged according to the results of table 1. Of the total of 269 regions analyzed, 152 started with below country average GDP levels in 1991 (i.e. belonged to the group of poor regions) and 117 belonged to the rich regions.[5] Out of the 152 poor regions in 1991 only 78 (slightly more than half) converged to the country mean until 2009, the rest diverged. Furthermore, almost in every country and time period analyzed, poor and rich converging regions co-existed with poor and rich diverging regions.

{Figure 1: Around here}

Convergence tendencies were slightly more pronounced in the upper part of the GDP per capita distribution. Of the 117 rich regions in 1991, 77 (or 66%) converged until 2009, while 40 (or 34%) diverged. In other words, a small part of the initially rich regions, accounting for about 15% of all 269 regions, were ploughing ahead during this time period, while a much larger share of one third of all regions was initially poor and fell behind even further.

Splitting the sample into two sub-periods (from 1991 to 2000 and 2000 to 2009) leads to similar results (see middle and bottom panels of figure 1): In the period from 1991 to 2000 around 41% and in the period from 2000 to 2009 about 50% of the initially poor regions converged, while 57% (in the 1991 to 2000 period) and 62% (in the 2000 to 2009

[5] The fact that there are more regions located to the left of the country average than to the right is interesting in its own right. It illustrates the skewness of the GDP per capita distribution documented in many other empirical descriptions of regional disparities in Europe (e.g. Juessen, 2009).

period), respectively, of the initially rich regions converged. Unconditional convergence is therefore not an automatic process taking place in all regions. Only just about half of the initially poor and about two-thirds of the initially rich regions converge over a 19 year period.

Further, convergence also has low persistence and is often temporal in nature only. Quite a lot of regions changed group membership between time periods. In each country there is at least one region that converged in one decade but diverged in the other. Also the transition matrix illustrating the probability for changing region types between the two subperiods highlights substantial mobility among the four groups of regions (table 3). Only, around 62% of the poor converging regions in the 1991 to 2000 period continued to grow above average in the later period (57% as poor plus 5% as rich regions) and around 61% of the rich converging regions in the 1991 to 2000 period continued grow below average in the subsequent period (39% as rich and 22% as poor regions).

{Table 3: Around here}

This low persistence of relative growth levels also applies to annual growth rates. In table 4 we firstly consider the average number of years for which the average region in each of the four types of regions grew with growth rates above the respective country's national average, and the number of years the average region in each group grew with below average growth rates for the whole time period (in the top panel) as well for the two sub-periods (in the bottom two panels). Secondly, we also report the average of the largest number of consecutive years a region grew with above and below average growth rates (i.e. the average duration of the longest above and below average growth spell), the average dispersion of the annual growth rates of a region (i.e. the within variation) measured by the coefficient of variation, and the average persistence (autocorrelation) of growth rates measured by the average regression coefficient of a region's growth rate on its lagged growth rate.

According to the results, in the 18 years of growth considered the average poor converging region grew faster than its respective national average for between 11 to 12 years (i.e. for slightly less than two thirds of the period) but also below the national average for 6 to 7 years (one third of the period). Similarly, the duration of the longest spell of unbroken above average growth for these regions was five years (i.e. ¼ of the period) while the longest spell of below average growth was three years (or around 1/6 of the period) on average. Thus – as evidenced by two sample t-tests for the equivalence of indicators between poor converging and diverging regions – poor converging regions grew above the national average for a significantly longer period (both when considering the total number of years of above average growth as well as when considering the longest spell) than poor diverging regions, but also in the former group of regions convergence was far from continuous and was often interrupted by (sometimes rather protracted) spells of below average growth.

Also the results for the autocorrelation coefficient of growth rates and the coefficient of variation of growth rates indicate large variability and low persistence of growth. In particular, the autocorrelation coefficient of growth rates is significantly higher in the average poor converging region than in the average poor diverging region and thus indicates more continuous growth paths for poor converging regions, but even for these regions the coefficient remains rather low (with 0.5). By contrast, the coefficient of variation of annual growth rates suggests that the standard deviation of growth rates exceeds its average (over the 18 year period analyzed) by a factor of three in all region types considered.

{Table 4: Around here}

{Table 5: Around here}

High average regional growth rates are also mosly due to the growth of only a few years, indicating a heavy concentration of regional growth rates. This is illustrated by the results in table 5 which shows the contribution of the year with the highest (lowest) growth rate to total GDP per capita growth over the two decades considered (top panel) and for the two sub-periods (bottom panels).[6] These results suggest that the average poor converging region grew by 2.1% per year over the time period considered, which was by 0.6 percentage points higher than the national average. Of this 2.1% average annual growth around 0.4 percentage points can be attributed to the year with the strongest growth rate, so that around 2/3 of the growth rate differential between poor converging regions and the national average is accounted for by the year with the highest annual growth rate. The contributions of the strongest year are also quite high for all other groups of regions, in which it contributed about 0.3 percentage points to the total annual average growth. However, this contribution is significantly lower than in poor converging regions only in diverging poor regions. Similarly, the year of weakest growth reduced average annual growth rates by -0.6 percentage points on average in the group of poor converging regions, so that without the worst year the growth differential to the national average would have been almost twice as high in this group of regions. Again these reductions are of a similar magnitude also in the other groups of regions and range between -0.4 to -0.5 percentage points.

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[6] For this purpose we recalculated the average annual growth rate over the period if the year with the highest (lowest) growth rate were replaced by the region's average growth rate: Given that the average growth rate of a region is the geometric mean of the annual growth rates this hypothetical growth rate for region i can be calculated as $\hat{g}_i^{hyp} = [\bar{g}_i/g_i^{max}]^{1/(t-1)}$ with $\bar{g}_i = (GDP_t/GDP_0)$, and with g_i^{max} being the maximum annual growth rate of the region in *t* periods. The contribution of the year with the strongest growth in percentage points ($Cont_i^{max}$) can be calculated by $Cont_i^{max} = 100(\bar{g}_i{}^{1/t} - gihyp$. The same calculations apply to the year with the weakest growth performance.

In addition the t-tests at the bottom of table 5 illustrate that for all four groups of regions and all periods, with the exception of poor converging regions for the 1991-2000 period, the absolute value of the impact of the weakest year of growth on the growth differential is significantly higher than the impact of the strongest year. This therefore implies an asymmetry of the growth process in which strong downward moves have a more important impact on long term regional growth than strong upward moves.

Developments of potential growth drivers

Our data also allow for an investigation of how the four groups of regions differ in the development of a number of economic indicators other than GDP per capita. In particular we are interested in the development of a number of variables frequently used as explanatory variables in the regional growth literature (see Durlauf et al. 2005 for a survey) and that can be influenced by policy such as the investment share (i.e total investment as share of regional GDP), unit labor costs (measured as total real labor compensation in % of real GDP) both of which were taken from the Cambridge Econometrics data base, as well as the share of population with tertiary education, the share of population with compulsory education[7], and the number of patents per million inhabitants, which were obtained from EUROSTAT and OECD sources. In addition we also include variables capturing the sector composition as well as structural change in a region, which is measured by the share of employment in agriculture, the employment share of industry, the employment share of the tradable (non-financial) service sector, the employment share of the financial service sector, and the turbulence index[8]. These variables again were taken from Cambridge Econometrics sources.

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[7] For education levels data is only available from 1999 on, so that we use the earliest available observation in both the descriptive and the econometric analysis below.

[8] This index is half of the sum of absolute changes in sector employment shares from period *t-1* to *t*. It ranges between zero and one, with zero (one) indicating no (maximum) structural change in employment.

Table 6 shows descriptive statistics for these variables both at the beginning (columns 2 to 5) and at the end (columns 8 to 12) of the observation period. Table 6a in the appendix reports the same statistics for the two sub-periods periods of 1991 to 2000 and 2000 to 2009. These tables also highlight the significance of two kinds of tests for differences in mean values. The asterisks in the first four columns indicate whether the average 1991 value of a variable for a particular group differs significantly from the average 2009 value, while the asterisks in columns five and six show the results of a t-test of the null hypothesis of equal values for poor converging and diverging regions (or rich converging and diverging regions, respectively) in the initial period.

{Table 6: Around here}

All variables in table 6 are measured relative to the country average. Thus, the descriptive statistics indicate that poor converging regions started from GDP per capita levels that were at 79.8% of the country mean on average in 1991, which was significantly lower than the value for poor diverging regions (90.3%). By 2009, however, this relationship had reversed. Poor converging regions on average had a GDP per capita of 88.6% of the national average – which was significantly (around 9 percentage points) higher than in 1991. Poor diverging regions, by contrast, had a GDP of 82.1% of the national average. This was significantly (around 8 percentage points) lower than in 1991. With respect to rich converging and diverging regions, by contrast, no significant differences in starting levels (which were at 119.6% and 119.7% of national GDP, respectively) existed in 1991, but by 2009 rich diverging regions had obtained a GDP per capita that was at 137.8% of the national mean on average (18 percentage points higher than in 1991), while rich converging regions had an average GDP of 109.1% (10 percentage points lower than in 1991).

These observations therefore suggest a) that between 1991 and 2009 primarily regions with very low GDP per capita relative to the national average caught-up to the national average, while regions in the lower-middle part of the distribution often fell behind, and b) that differences in growth between rich converging and diverging regions were much more pronounced than between poor converging and diverging regions, particularly with rich diverging regions forging ahead quite substantially. These stylized facts (with the potential exception of the very strong growth of rich diverging regions) are also robust across time periods (see table 6a in the appendix).

Poor converging regions also had significantly higher investment rates than poor diverging regions in 1991, as did rich diverging regions relative to rich converging regions. Regions with above country average growth therefore seem to experience phases of above average investments in the period preceding their growth phases. This is also corroborated when splitting the sample into the sub-periods. In both the 1991-2000 and the 2000-2009 period poor converging regions and rich diverging regions had significantly higher investment rates than poor diverging regions and rich converging regions, respectively. Significant differences further exist for unit labor costs. Here, however, poor converging regions – somewhat counter to expectations – had (weakly significantly) higher unit labor costs than poor diverging regions at the outset of the period analyzed and rich diverging regions also had higher unit labor costs than rich converging regions. Unit labor costs, however, increased significantly less rapidly in poor converging differences.

Additional significant differences exist with respect to patents and in agricultural employment shares. Patents were significantly higher and agricultural employment was significantly lower in rich diverging regions than in rich converging regions in 1991. The share of industrial employment was significantly lower both in poor converging and rich diverging regions than in poor diverging or rich converging regions. This may indicate that regions with a low share of industrial employment had a higher probability to grow faster than the national average due to the effects of economic and financial crisis on industry, since the significance of these differences is primarily driven by significant differences in the period 2000 to 2009 (see table 6a and 6b in the appendix). Finally, the evidence on education suggests that poor converging and rich diverging regions, (i.e. regions growing faster than average) had a significantly higher (lower) share of population with tertiary (primary) education than their slowly growing counterparts.

Table 6, however, also shows that apart from GDP per capita and, investment shares as well as potentially unit labor costs none of the potential growth determinants showed significant changes in their relative levels within the four groups of regions between 1991 and 2009. This therefore indicates that for the occurrence of unconditional convergence or divergence of a region within countries the (initial) levels in these potential growth factors seem to matter more than changes in these levels during the convergence/ divergence process.

3. Econometric Analysis

The results of the descriptive analysis – aside from implying substantial heterogeneity and volatility in convergence – suggest that unit labor costs, investments, education levels, and sector shares in the initial year may be predictors of above average growth performance of regions. In part these results, however, could be due to co-linearity of different indicators or could be influenced by developments in nearby regions that impact on the growth of a particular region through spatial spillovers. Thus, to analyze the capability of different variables to discriminate between successful and less successful regions we conduct two sets of cross-sectional probit regressions[9] in which we focus on poor regions (i.e. regions that had GDP per capita below the national average in the initial period) and on rich

[9] We give preference to using probit regressions rather than more conventional convergence regressions because these can better capture the substantial non-linearities in convergence behaviour implied by our descriptive results.

regions (i.e. regions which an above national average GDP level in the initial period) separately. In both of these regressions the dependent variable takes on a value of 0 if the region grew with a below the national average GDP per capita growth during the period observed and is equal to 1 if the region grew with a GDP per capita growth rate above the national average. In both regressions aside from including (the logs of) the initial period values of all variables shown in table 6, we also include variables that take account of the spatial structure of the economy and the fact that aside from developments in the region itself also developments in the vicinity of a region may impact on its growth prospects (see e.g. Ertur and Koch, 2007; LeSage and Fischer, 2008; Crespo-Cuaresma et al., 2012). These variables consist of an indicator variable which takes on a value of 1 if the region under consideration hosts the capital city of the country and 0 otherwise, a spatial lag[10] of the initial GDP per capita of neighboring regions of the same country (which is included to capture potential spillover effects from neighboring regions) and a full set of country fixed effects to focus on unconditional convergence within countries (currency unions) and to purge results from any country specific effects stemming from national institutions or policies.

The marginal effects of the probit analysis discriminating between poor converging and diverging regions are reported in table 7 and those of the analysis for rich converging and diverging regions in table 8.[11] The first five columns of these tables show estimates

[10] The spatial lag is based on a contiguity matrix W, with element $w_{ij}=1/n$ if region *i* borders on region *j* and is located in the same country, and $w_{ij}=0$ otherwise and with *n* being the number of same country neighbors of region *i*. A dummy variable taking the value of 1 for regions lacking neighbors of the same country (i.e. islands and Northern Ireland) is included in the regression to account for the missing spatially lagged GDP for such regions by definition.

[11] Analyzing poor regions, Bulgaria has to be dropped from the sample, because all three regions below the country mean level of GDP per capita were converging during the period observed. In the regression analysis for rich regions, Sweden and Slovakia only had one region above the mean during

including the variables suggested as being particularly likely to have an impact by our descriptive analysis, while the results reported in specifications 6 to 12 augment these basic models by controlling for location characteristics and spatial spillovers, as well as sector employment shares and the turbulence index as additional controls. Furthermore tables 7a and 8a in the appendix report the marginal effects for the same specifications for the two sub-periods. In these regressions data are pooled across periods and all explanatory variables are interacted with an indicator variable (*D*) that takes on the value zero for the period between 1991-2000 and one for the period 2000-2009 to check the robustness of our results with respect to the two sub-periods.[12]

Results for regions with GDP per capita below the average

Focusing on poor regions first (table 7), the results indicate a highly significant negative impact of the initial level of GDP per capita on the probability to grow above the country average:[13] This - consistent with the descriptive findings - indicates that poorer regions among those with low GDP per capita have a higher chance to converge. In addition, also higher initial investment shares in regional GDP increase the probability for poor regions to converge. This effect, however, is insignificant in all specifications for the full time period. If the two sub-periods are analyzed (table 7a), however, the effect is significant for the 1991 to 2000 sub-period and does not differ significantly from the 1991-2000 coefficient in the 2000-2009 sub-period. These findings suggest a higher potential for

the period observed and in Belgium, Germany, Finland and Portugal, all regions above the mean converged, so that these countries had to be excluded from these regressions .

[12] The comparison of the results for the 1991-2009 period and the individual sub-periods has to be treated with caution because group membership may differ between subperiods. Additionally, Switzerland has to be excluded when analyzing sub-periods because of a lack of pre 2000 data on education and a lack of variance in the dependent variable in the 2000-2009 period.

[13] The capitalcity variable had to be omitted from the estimates of this equation because the set of poor regions includes only one region hosting a national capital (Berlin).

investment to stimulate growth in the medium run (such as over one decade) than in the long-run (i.e. two decades).[14]

Higher unit labor costs reduce the probability for poor regions to converge with the coefficient being insignificant in the basic specifications (1) to (4) but becoming significant (albeit at a very low significance level) once we control for patenting activities. This result stems from two opposite effects in the two decades analyzed. While in the period from 1991 to 2000 poor regions with higher unit labor costs were also significantly more likely to grow above the country average than poor regions with low unit labour costs, the opposite applies to the 2000 to 2009 period. All in all, this result suggests only a rather inrobust impact of unit labor costs and investments in discriminating between poor converging and diverging regions.

Human capital, by contrast, is the uniformly most significant predictor of convergence for poor regions. The share of population with tertiary education is associated with a higher probability to grow above averge, while the share of the population with at most compulsory education significantly reduces this probability, irrespective of whether only one or both of these variables are controlled for and the significance also applies to both subperiods. An increase in the share of tertiary educated population by 1% increases the probability to converge for poor regions by 1 to 2 percentage points. The number of patents in a region per million inhabitants is the second most important positive predictor for the probability of a poor region to grow above average and is also significantly positive in all specifications. This finding, however, does not seem to be robust across time periods. While patents were a significantly positive predictor for above average growth of poor regions in the 1991 to 2000 period, their effect in the 2000 to 2009 period was significantly smaller

[14] Since we were concerned that the high volatility of investments may impact on results we also used the three-year and five-year average investment rates rather than single initial year investment rates as explanatory variablein additional regressions not reported. This, however, had no impact on the size and significance levels of the coeffccient on the investment rate.

leading to a net effect of around zero in the latter sub-period. Spillovers in GDP per capita as proxied by the spatially lagged initial GDP per capita of adjacent regions of the same country have the expected positive impact on the probability of convergence, but the coefficients remain insignificant in all specifications. Similar obsevations apply to variables measuring sector specialization. Among these only the turbulence index has a significant negative impact on the probability of poor regions to converge to the country average. All other things equal, poor regions with larger shifts in sector employment have a lower probability to converge.

{Table 7: Around here}

{Table 8: Around here }

Results for regions with GDP per capita above the national average

Focusing on rich regions the regression results (table 8) for the same set of specifications, indicate that also among rich regions those with lower GDP per capita at the outset had a higher probability of growing faster than the country average. The significance of this variable is, however, conditional on controlling for capital regions. As for poor regions, investment shares again have the expected positive sign. However, the variable remains insignificant in all specifications for the overall period. For the sub-periods it is significant for the 1991 to 2000 period, but unlike for poor regions, significantly smaller in the 2000 to 2009 period compared to the previous sub-period. Also – as for poor regions – the dominant factor predicting above average growth is the educational structure of the population measured by the share of population with tertiary education. The coefficient for this variable is positive and significant at the 1% level in all specifications. A higher population share with compulsory education again reduces the probability for high growth but – unlike for poor regions – the impact of this variable becomes insignificant if added to the share of tertiary educated.

For the other variables, the results indicate some differences in comparison to poor regions. The most important of these are that a higher number of patents per million inhabitants does not affect the probability of above-average growth for rich regions significantly[15], and that in addition to human capital, hosting the capital city of a country turns out to be the main predictor for rich regions to diverge. This is in line with the findings of Crespo-Cuaresma et al. (2011) and Crespo-Cuaresma and Feldkircher (2012), who conclude that the infrastructure associated with a region's status of hosting a national capital is one of the most important factors for high regional growth.[16] In addition, also unit labor costs are found to have a positive effect on the probability to grow above average for rich regions. However, the significance of this result is weak and disappears if tertiary education is included and the financial service sector share is excluded.

Finally, also for the set of rich regions, spillovers from neighboring regions with higher levels of GDP per capita only have an insignificant impact on the probability to grow more rapidly, although here too effects seem to differ across sub-periods, with the spatially lagged GDP exhorting a negative impact on the probability to grow above average in the 2000 to 2009 period following an insignificant positive one in the earlier period. A larger share of the industry sector in employment significantly increases the probability for above-

[15] One reason for this could be that in richer regions (in particular in large cities) service orientation is much higher than in the poor regions. This could lead to a bias of the coefficients on patents in rich regions on account of the low propensity of service enterprises to patent their innovations. This bias should, however, be of minor importance because, as shown in Table 6, the industry shares of rich regions are not smaller on average than those of poor regions.

[16] The high explanatory power of this variable as a predictor for above average growth is not only driven by the developments of the new EU member states. Also ten out of the fourteen capital regions of Western European countries that are found in the group of rich regions were diverging from their national average between 1991 and 2009.

average growth of rich regions, a higher share of financial services reduces it and results for the two sub-periods reveal opposing effects for the agricultural and the industry sector in each sub-period. In sum,therefore, the main differences in predicting above average growth for poor and rich regions are that the initial GDP level is a less important determinant for predicting above average growth in rich regions, while industry structure is more important.[17]

4. Conclusions

In this paper we analyze unconditional convergence in 21 European countries covering 269 NUTS 2 regions from 1991 to 2009. Focusing on the heterogeneity in within-country convergence allows us to uncover a number of stylized facts with respect to unconditional regional convergence within currency unions. In particular unconditional regional convergence within currency unions is a discontinuous process associated with repeated setbacks. We divide regions into four groups, depending on whether they had below or above national average GDP per capita levels at the beginning of our period of analysis, and on whether their average growth was above or below the national average throughout the period. Only just about half of the regions starting with a below average GDP per capita experience catching-up over a period of 18 years. Furthermore, only just about 60% of the regions that were poor but converged and only about half of those that were rich and converged in the first decade continued to do so in the second of the two decades. In addition, the average poor converging region grew faster than its respective national average for slightly less than two thirds of the period but also below the national average for around

[17] This finding is supported by t-tests of the null-hypothesis of equality of the coefficients of the estimates for poor and rich regions (see table A1). These tests suggest that among those variables that are significant either for poor or for rich regions significant differences in marginal effects between rich and poor region exist only for initial GDP per capita, the industry share and in some specifications the share of primary educated as well as unit labour costs.

one third of the period. The average duration of the longest spell of unbroken above average growth of these regions was five years on average, but the longest below average growth rate spell was three years.

Our results also show that catching-up often depends on the growth of only a few years and the process leading to a catch-up is thus highly concentrated in time. About two thirds of the growth differential of the poor converging regions to the national growth rate can be attributed to the year with the strongest growth, and if the weakest year of growth is omitted from the observations poor converging regions could have almost doubled their average growth rate differential to the national average. This indicates that the impact of years of extreme weak growth on long-run performance is even stronger than the impact of individual years of extremely high growth.

Finally, an econometric analysis of the predictors discriminating between regions growing above and below the national average for initially poor and rich regions indicates that human capital endowments and initial GDP per capita levels are the main robust predictors for above-average growth (i.e. unconditional convergence) of poor regions, while for rich regions human capital endowments and the presence of a capital city in the region are the most important factors predicting above average growth.

These stylized facts are of interest both for normative as well as a positive reasons. In particular our evidence questions the focus of the traditional literature on average (beta-) convergence and lends support to theories that view regional growth and convergence as a discontinuous and non-linear process. In terms of policy, by contrast, these findings imply that for policies to foster growth of poor regions in a monetary union, investments in education and R&D capacity is likely to have the highest impact. Furthermore these results also warn that immediate and automatic success for growth oriented policies is unlikely to occur in a currency and that in restructuring the European periphery substantial perseverance will be required from policy makers and residents both in the countries and regions concerned as well as in the “core” of the European Union.

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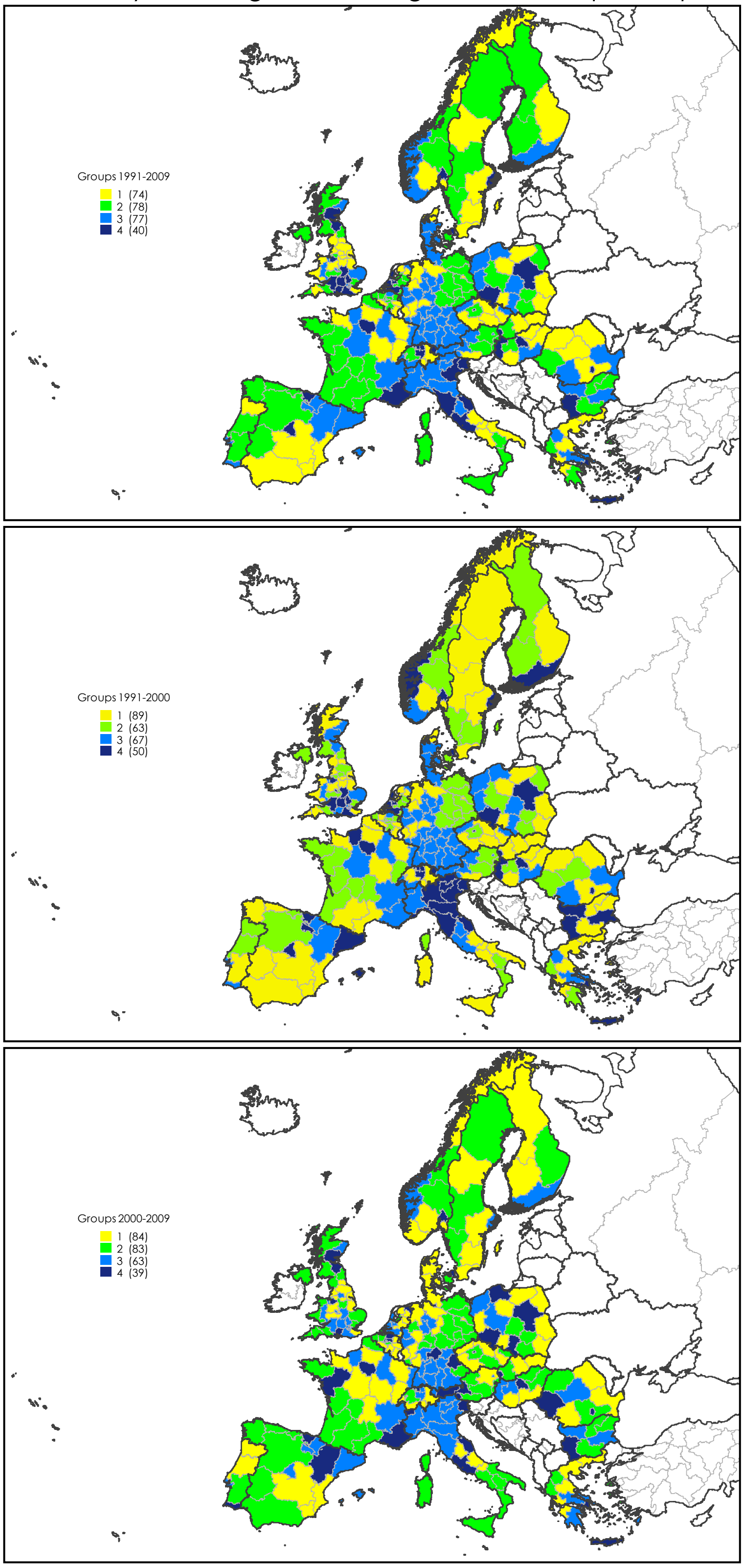
Figure 1 – Within-Country Convergence/Divergence in GDP per Capita



Source: Cambridge Econometrics. Legend: 1= poor diverging regions, 2=poor converging regions, 3=rich converging regions, 4=rich diverging regions. Numbers in brackets indicate the number of regions by type.

Table 1: Estimates of unconditional within-country beta-convergence for GDP per capita, (period 1991- 2000 and 2000-2009)

Country	1991 – 2009		1991 -2000		2000 - 2009	
Austria	-0.0166	***	-0.0020		-0.0239	***
Belgium	-0.0062	**	0.0021		-0.0050	*
Bulgaria	-0.1393	***	-0.1916	***	-0.0682	
Switzerland	0.0043		0.0238	***	-0.0109	
Czech Republic	0.0281	***	-0.0033		0.0047	
Germany	-0.1049	***	-0.1498	***	-0.0199	***
Denmark	-0.0306	**	-0.0045		-0.0128	
Spain	-0.0260	***	0.0224	***	-0.0338	***
Finland	-0.0250	**	-0.0311	***	-0.0502	***
France	-0.0201		0.0113	***	-0.0191	
Greece	-0.0116		-0.0484	**	-0.0053	
Hungary	0.0130		0.0783	***	-0.0135	
Italy	-0.0128	***	-0.0009		-0.0127	***
Netherlands	-0.0122	***	0.0310		-0.0269	***
Norway	-0.0035		0.0212	**	-0.0162	
Poland	0.0256	***	0.0500	***	0.0139	***
Portugal	-0.0266	**	-0.0114		-0.0034	
Romania	0.0326	*	-0.0529		0.0113	
Sweden	-0.0048		0.0354	***	-0.0549	*
Slovakia	0.0061		0.0212	***	0.0081	
UK	-0.0065		0.0168	***	-0.0136	
Conv.	15		10		17	
Sign. Conv.	10		4		8	
Div.	6		11		4	
Sign. Div.	3		9		1	

Source: Cambridge Econometrics. Table shows the coefficient (β) of regression of the growth rate of GDP per capita (g_{it}) over the time period in a region on it's starting period GDP per capita (y_{it}) (i.e. $g_{it} = \alpha + \beta g_{it} + \varepsilon_{it}$) . ***, (**), [*] denote significance of this coefficient at the 1%, (5%) and [10%] level, respectively; Estimations for Germany start in 1992, Conv.=number of converging countries (i.e. with a negative coefficient), Div.=number of diverging countries (i.e. with a positive coefficient), Sign. Conv.=number of significantly converging countries (i.e. with a statistically significant negative coefficient at the 10% level), Sign. Div.=number of significantly diverging countries (i.e. with a statistically significant positive coefficient at the 10% level).

Table 2: Region types considered

		GDP per capita initial level		
		Above average	Below average	
Growth performance	Above national average	Rich diverging	Poor converging	Fast growing
	Below national average	Rich converging	Poor diverging	Slow growing
		Rich	Poor	

Table 3: Transition matrix of group membership (1991-2000 vs. 2000-2009 period)

			2000-2009				
			Poor Regions		**Rich Regions**		**Total**
			Diverging	**Converging**	**Converging**	**Diverging**	
1991-2000	**Poor Regions**	**Diverging**	50 (56.18)	39 (43.82)	0 (0.00)	0 (0.00)	89 (100.00)
		Converging	19 (30.16)	36 (57.14)	5 (7.94)	3 (4.76)	63 (100.00)
	Rich Regions	**Converging**	15 (22.39)	8 (11.94)	26 (38.81)	18 (26.87)	67 (100.00)
		Diverging	0 (0.00)	0 (0.00)	32 (64.00)	18 (36.00)	50 (100.00)
	Total		84 (31.23)	83 (30.86)	63 (23.42)	39 (14.50)	269 (100.00)

Source: Cambridge Econometric: Table shows number of regions affiliated to a particular group in the two time periods, Numbers in brackets indicate the share in the row sum.

Table 4: Duration of growth phases, autocorrelation and coeffecient of variation of growth rates by groups of regions

Groups	Poor diverging	Poor converging	Rich Converging	Rich diverging	T-Tests			
					1 ≠ 2	3 ≠ 4	1 ≠ 3	2 ≠ 4
Time Period			**1991 – 2009**					
Years of								
Above average growth	6.865	11.577	7.091	11.850	***	***		
	(2.629)	*(2.680)*	*(2.666)*	*(2.338)*				
Below average growth	12.041	7.321	11.597	7.150	***	***		
	(2.598)	*(2.808)*	*(2.627)*	*(2.338)*				
Largest number of consecutive years with								
Above average growth	2.919	5.462	3.130	5.825	***	***		
	(1.515)	*(2.738)*	*(1.380)*	*(2.171)*				
Below average growth	5.716	2.910	5.701	3.225	***	***		
	(2.651)	*(1.513)*	*(2.782)*	*(1.493)*				
Coeff. of variation of	3.227	3.814	3.379	3.314				
annual growth rates [a]	*(1.213)*	*(3.214)*	*(2.786)*	*(2.413)*				
Autocorelation of	0.387	0.488	0.365	0.596	***	***		***
annual growth rates	*(0.229)*	*(0.214)*	*(0.242)*	*(0.214)*				
No of Regions	**74**	**78**	**77**	**40**				
Time Period			**1991 - 2000**					
Years of								
Above average growth	3.539	6.492	3.104	6.740	***	***		
	(1.913)	*(1.804)*	*(1.707)*	*(1.588)*				
Below average growth	6.382	3.381	6.537	3.260	***	***		
	(1.856)	*(1.913)*	*(1.682)*	*(1.588)*				
Largest number of consecutive years with								
Above average growth	2.202	4.302	2.060	4.720	***	***		
	(1.367)	*(2.312)*	*(1.113)*	*(2.241)*				
Below average growth	4.225	1.857	4.776	1.920	***	***		
	(2.173)	*(1.090)*	*(2.228)*	*(0.922)*				
Coeff. of variation of	3.646	3.268	2.861	3.822			*	
annual growth rates [a]	*(3.716)*	*(2.086)*	*(1.508)*	*(5.026)*				
Autocorelation of	0.331	0.601	0.395	0.704	***	***		
annual growth rates	*(0.297)*	*(0.215)*	*(0.255)*	*(0.468)*				
No of Regions	**89**	**63**	**67**	**50**				
Time Period			**2000 – 2009**					
Years of								
Above average growth	3.393	6.229	3.794	6.538	***	***		
	(1.568)	*(1.633)*	*(1.567)*	*(1.484)*				
Below average growth	6.607	3.771	6.206	3.462	***	***		
	(1.568)	*(1.633)*	*(1.567)*	*(1.484)*				
Largest number of consecutive years with								
Above average growth	2.774	4.952	4.254	5.231	***	**	***	
	(1.383)	*(2.682)*	*(2.307)*	*(2.146)*				
Below average growth	5.964	3.458	4.921	3.077	***	***	**	
	(3.087)	*(1.830)*	*(2.295)*	*(1.579)*				
Coeff. of variation of	3.037	3.363	3.334	3.244				
annual growth rates [a]	*(0.977)*	*(1.903)*	*(2.113)*	*(1.441)*				
Autocorelation of	0.364	0.483	0.286	0.498	***	***		
annual growth rates	*(0.298)*	*(0.232)*	*(0.272)*	*(0.211)*				
No of Regions	**84**	**83**	**63**	**39**				

Source: Cambridge econometrics. First four columns report means (and in brackets standard deviations) of the variables. Columns headed "T-Tests" report significance levels of a t-test for equivalence between region types based on equal or unequal variance depending on the results of Bartlett's (1937) test for equal variances of two subgroups. 1= poor diverging regions, 2=poor converging regions, 3=rich converging regions, 4=rich diverging regions. ***, (**), [*] indicates significance at the 1%, (5%), [10%] level. [a] Growth defined as Y(t) / Y(t-1) to avoid negative values.

Table 5: Growth performance and concentration of growth by group of region

	Poor diverging	Poor converging	Rich converging	Rich diverging	T-Tests $1 \neq 2$	$3 \neq 4$	$1 \neq 3$	$2 \neq 4$
Time Period		1991 – 2009						
# of regions	74	78	77	40				
annual growth (in %)	1.182	2.093	0.806	2.251	***	***	**	
	(0.824)	(1.199)	(1.147)	(1.600)				
annual difference to country mean (PP)	-0.583	0.618	-0.722	0.713	***	***		
	(0.456)	(0.783)	(0.719)	(0.962)				
		Strongest Year						
Contribution to average annual growth (PP)	0.289	0.418	0.296	0.334	***			
	(0.126)	(0.412)	(0.229)	(0.249)				
annual difference to country mean without strongest year (PP)	-0.871	0.200	-1.018	0.379	***	***		
	(0.497)	(0.645)	(0.888)	(0.805)				
		Weakest Year						
Contribution to average annual growth (PP)	-0.412	-0.577	-0.502	-0.517				
	(0.158)	(0.868)	(0.653)	(0.721)				
annual difference to country mean without weakest year (PP)	-0.171	1.195	-0.220	1.230	***	***		
	(0.457)	(1.199)	(0.619)	(1.380)				
T-Test: Impact of strongest year lower than of weakest year	-8.483***	-2.377***	-3.881***	-1.958**				
Time Period		1991 - 2000						
# of regions	89	63	67	50				
annual growth (in %)	0.972	3.336	1.108	2.457	***	***		**
	(2.025)	(1.732)	(1.423)	(2.709)				
annual difference to country mean (PP)	-0.829	1.167	-1.122	1.002	***	***	**	
	(0.725)	(1.517)	(0.972)	(1.321)				
		Strongest Year						
Contribution to average annual growth (PP)	0.591	0.638	0.454	0.641			*	
	(0.585)	(0.557)	(0.264)	(0.784)				
annual difference to country mean without strongest year (PP)	-1.421	0.529	-1.576	0.361	***	***		
	(1.034)	(1.037)	(1.120)	(1.274)				
		Weakest Year						
Contribution to average annual growth (PP)	-0.867	-0.519	-0.603	-0.972	**			
	(1.484)	(0.235)	(0.325)	(2.028)				
annual difference to country mean without weakest year (PP)	0.038	1.687	-0.519	1.973	***	***	***	
	(1.574)	(1.653)	(0.867)	(2.465)				
T-Test: Impact of strongest year lower than of weakest year	-2.720***	2.178	-4.572***	-1.697**				
Time Period		2000 – 2009						
# of regions	84	83	63	39				
annual growth (in %)	0.901	1.737	0.277	2.070	***	***	***	
	(1.287)	(1.826)	(1.084)	(2.271)				
annual difference to country mean (PP)	-0.429	0.566	-0.700	0.618	***	***		
	(0.365)	(0.542)	(1.333)	(0.715)				
		Strongest Year						
Contribution to average annual growth (PP)	0.526	0.612	0.588	0.623				
	(0.237)	(0.589)	(0.352)	(0.458)				
annual difference to country mean without strongest year (PP)	-0.955	-0.046	-1.288	-0.005	***	***		
	(0.490)	(0.505)	(1.629)	(0.582)				
		Weakest Year						
Contribution to average annual growth (PP)	-0.758	-0.857	-0.881	-0.784				
	(0.343)	(0.491)	(0.833)	(0.350)				
annual difference to country mean without weakest year (PP)	0.329	1.423	0.181	1.402	***	***		
	(0.455)	(0.805)	(0.695)	(0.990)				
T-Test: Impact of strongest year lower than of weakest year	-6.189***	-3.989***	-3.937***	-2.192**				

Source: Cambridge econometrics. First four columns report means (and in brackets standard deviations) of the variables. Columns headed T-tests report significance levels of a t-test for equivalence between region types based on equal or unequal variance depending on the results of Bartlett's (1937) test for equal variances of two subgroups. 1=poor diverging regions, 2=poor converging regions, 3=rich converging regions, 4=rich diverging regions. ***, (**), [*] indicates significance at the 1%, (5%), [10%] level.

Table 6: Developments of key economic indicators by group of regions (1991-2009)

	1991				**1991 – 2009** T-Tests '91 Levels		**2009**			
	Poor div.	Poor con.	Rich con.	Rich div.	**1 ≠ 2**	**3 ≠ 4**	Poor div.	Poor con.	Rich con.	Rich div.
# of regions	74	78	77	40			74	78	77	40
GDP per capita	0.903***	0.798***	1.196***	1.197**	***		0.821	0.886	1.091	1.378
	(0.079)	(0.155)	(0.204)	(0.284)			(0.093)	(0.106)	(0.215)	(0.427)
Investment rate	0.975	1.114**	0.899***	1.018	***	**	1.029	1.012	0.993	0.937
	(0.209)	(0.326)	(0.198)	(0.266)			(0.197)	(0.197)	(0.193	(0.210)
Unit labor costs	0.994**	1.015	0.982	1.017	*	**	1.014	1.005	0.981	0.999
	(0.072)	(0.087)	(0.086)	(0.084)			(0.053)	(0.084)	(0.068)	(0.061)
Tert. edu. share[2)]	0.889	0.984	0.974	1.293	***	***	0.911	0.973)	0.997	1.244
	(0.152)	(0.162)	(0.196)	(0.367)			(0.132)	(0.159	(0.173)	(0.315)
Prim. edu. share[2)]	1.054	0.970	1.045	0.860	***	***	1.066	0.954	1.055	0.851
	(0.114)	(0.204)	(0.161)	(0.192)			(0.123)	(0.254)	(0.194)	(0.166)
Patents[1)]	0.655	0.695	1.225	1.780		***	0.688	0.717	1.259	1.749
	(0.439)	(0.519)	(0.869)	(1.110)			(0.454)	(0.476)	(0.703)	(1.008)
Agriculture share	1.183	1.240	0.823	0.533		***	1.225	1.228	0.806	0.511
	(0.532)	(0.555)	(0.594)	(0.398)			(0.606)	(0.514)	(0.433)	(0.339)
Industry share	1.033	0.878	1.110	0.964	***	***	1.053	0.934	1.079	0.881
	(0.233)	(0.275)	(0.305)	(0.340)			(0.241)	(0.272)	(0.326)	(0.355)
Trade serv. share	0.947	0.962	1.029	1.118			0.970	0.973	1.015	1.079
	(0.116)	(0.162)	(0.180)	(0.256)			(0.110)	(0.123)	(0.147)	(0.148)
Fin. serv. share	0.843	0.860	1.042	1.484			0.851	0.880	1.048	1.419
	(0.196)	(0.202)	(0.318)	(0.633)			(0.161)	(0.179)	(0.274)	(0.464)
Turbulence	1.061	0.997	0.964	0.963			1.026	1.003	1.013	(0.945
	(0.895)	(0.372)	(0.370)	(0.357)			(0.204)	(0.144)	(0.135)	(0.245)

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports group averages (values in brackets are standard deviations), ***, (**), [*] next to 1991 values indicate significant difference to 2009 values at the 1%, (5%), [10%] level. Columns headed 1≠ 2, 3 ≠ 4 report significance levels of a t-test for equivalence of poor diverging and poor converging or rich converging and rich diverging regions respectively with ***, (**), [*] indicating significant differences at the 1%, (5%), [10%] level, respectively; 1=poor diverging regions, 2=poor converging regions, 3=rich converging regions, 4=rich diverging regions. Numbers in brackets below variable names indicate the number of regions per group included if data is not available for all regions for the first and the final period, 1) number of observation by region type: Poor div. = *65,* Poor con =*67,* Rich con.=*69,* Rich div.=*35,* 2) number of observation by region type: Poor div. = *71,* Poor con =*73,* Rich con.=*72,* Rich div.=*35;*

Table 7: Determinants for growth above average 1991-2009 (poor regions)

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	-2.306***	-2.669***	-3.292***	-3.182***	-3.129***	-3.509***	-3.574***	-3.484***	-3.473***	-3.537***	-3.734***
	(-4.66)	(-4.57)	(-4.52)	(-4.49)	(-4.91)	(-5.00)	(-4.98)	(-4.34)	(-4.97)	(-4.76)	(-4.69)
Investment rate	0.0331	0.263	0.141	0.237	0.230	0.311	0.318	0.309	0.312	0.307	0.357
	(0.14)	(1.04)	(0.56)	(0.92)	(0.88)	(1.09)	(1.12)	(1.09)	(1.10)	(1.06)	(1.19)
Unit labor costs	-0.0755	-0.645	-0.918	-0.967	-1.675*	-1.643*	-1.808**	-1.612	-1.742*	-1.661*	-1.534
	(-0.12)	(-0.91)	(-1.36)	(-1.32)	(-1.95)	(-1.81)	(-1.97)	(-1.62)	(-1.88)	(-1.87)	(-1.64)
Tert. edu. share		1.580***		0.909**	1.645***	2.079***	2.109***	2.071***	2.099***	2.066***	1.995***
		(4.18)		(2.13)	(3.97)	(4.72)	(4.70)	(4.54)	(4.73)	(4.57)	(4.60)
Prim. edu. share			-1.816***	-1.249***							
			(-4.03)	(-2.61)							
Patents					0.126*	0.194**	0.191**	0.195**	0.193**	0.194**	0.213**
					(1.76)	(2.32)	(2.28)	(2.34)	(2.30)	(2.33)	(2.36)
Spatial lag						0.640	0.614	0.650	0.669	0.642	0.857
						(1.30)	(1.27)	(1.37)	(1.36)	(1.30)	(1.64)
Agriculture share							-0.0370				
							(-0.34)				
Industry share								-0.0214			
								(-0.08)			
Trade serv. share									-0.217		
									(-0.51)		
Fin. serv. share										0.0386	
										(0.14)	
Turbulence											-0.346**
											(-1.97)
N	149	149	149	149	147	147	147	147	147	147	147
pseudo R^2	0.224	0.296	0.308	0.323	0.326	0.398	0.398	0.398	0.399	0.398	0.413
AIC	206.2	193.3	191.0	189.8	187.3	176.7	178.6	178.7	178.6	178.7	175.6

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports marginal effects of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects and a dummy for regions without neighbors are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates, based on hetrosketasticity robust errors.

Table 8: Determinants for growth above average 1991-2009 (rich regions)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	0.325	-0.739*	-0.301	-0.776*	-0.681	-1.762***	-1.821***	-1.920***	-2.435***	-1.814***	-2.014***	-1.786***
	(0.83)	(-1.69)	(-0.68)	(-1.76)	(-1.57)	(-3.01)	(-2.80)	(-3.15)	(-3.40)	(-2.76)	(-3.23)	(-2.76)
Investment rate	0.276	0.0706	0.179	0.0844	0.0382	0.295	0.246	0.359	0.297	0.251	0.331	0.341
	(1.07)	(0.25)	(0.62)	(0.30)	(0.13)	(0.79)	(0.63)	(0.76)	(0.71)	(0.66)	(0.81)	(0.86)
Unit labor costs	1.903***	1.045	1.300*	0.994	0.819	0.138	0.809	1.391	0.623	0.827	2.076*	0.885
	(2.77)	(1.21)	(1.68)	(1.14)	(1.00)	(0.17)	(0.92)	(1.35)	(0.67)	(0.91)	(1.93)	(0.98)
Tert. edu. share		1.615***		1.452***	1.526***	0.942**	1.464***	1.759***	2.206***	1.459***	2.576***	1.420***
		(4.28)		(3.07)	(3.69)	(2.02)	(2.87)	(3.24)	(3.51)	(2.90)	(3.61)	(2.93)
Prim. edu. share			-1.323***	-0.314								
			(-3.18)	(-0.73)								
Patents					0.165*	0.0790	0.101	0.0770	0.0848	0.100	0.166	0.104
					(1.82)	(0.79)	(0.94)	(0.69)	(0.70)	(0.94)	(1.03)	(0.98)
Capital						0.730***	0.710***	0.786***	0.827***	0.708***	0.836***	0.703***
						(8.02)	(6.70)	(9.04)	(10.75)	(5.91)	(10.70)	(6.15)
Spatial lag							0.798	1.303	1.494	0.787	1.838	0.674
							(0.62)	(1.22)	(1.30)	(0.60)	(1.62)	(0.52)
Agriculture share								0.198				
								(1.03)				
Industry share									0.860*			
									(1.78)			
Trade serv. share										0.0463		
										(0.07)		
Fin. serv. share											-1.401**	
											(-2.03)	
Turbulence												-0.125
												(-0.60)
N	85	85	85	85	85	85	85	85	85	85	85	85
pseudo R^2	0.184	0.361	0.285	0.364	0.383	0.446	0.493	0.506	0.535	0.493	0.534	0.495
AIC	131.3	112.7	121.5	114.4	112.1	106.8	105.3	105.8	102.3	107.3	102.5	107.1

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports marginal effectsof a probit regression on the probability of rich regions to grow with an above national average rate. Country fixed effects and a dummy for regions without neighbors are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates, based on hetrosketasticity robust errors.

Appendix

Table 6a: Developments of key economic indicators by group of regions (1991-2000)

	Poor div.	Poor con.	Rich con.	Rich div.	T-Tests 1991 Levels $1 \neq 2$	$3 \neq 4$	Poor div.	Poor con.	Rich con.	Rich div.
					1991 – 2000					
	1991						2000			
# of regions	89	63	67	50			89	63	67	50
GDP per capita	0.881***	0.804***	1.186**	1.209*	***		0.822	0.881	1.107	1.324
	(0.091)	(0.169)	(0.213)	(0.260)			(0.098)	(0.117)	(0.219)	(0.326)
Investment rate	0.989	1.127	0.898*	0.995	***	**	1.015	1.057	0.955	0.962
	(0.219)	(0.341)	(0.191)	(0.264)			(0.227)	(0.191)	(0.150)	(0.223)
Unit labor costs	0.988*	1.028*	0.982	1.009	***		1.006	1.004	0.992	0.994
	(0.077)	(0.080)	(0.089)	(0.083)			(0.054)	(0.057)	(0.066)	(0.060)
Tert. edu. share[2)]	0.668	0.721	1.224	1.631		**	0.638	0.735	1.191	1.850
	(0.442)	(0.518)	(0.845)	(1.065)			(0.346)	(0.480)	(0.640)	(1.126)
Prim. edu. share[2)]	0.906	0.991	0.995	1.203	***	***	0.897	0.982	0.992	1.231
	(0.119)	(0.215)	(0.186)	(0.175)			(0.147)	(0.171)	(0.206)	(0.358)
Patents[1)]	1.046	0.965	1.036	0.905	***	***	1.048	0.964	1.048	0.893
	(0.119)	(0.215)	(0.186)	(0.175)			(0.112)	(0.233)	(0.157)	(0.159)
Agriculture share	1.234	1.182	0.817	0.600		**	1.239	1.197	0.827	0.558
	(0.580)	(0.489)	(0.580)	(0.486)			(0.553)	(0.497)	(0.437)	(0.408)
Industry share	0.974	0.925	1.077	1.038			0.993	0.953	1.056	0.995
	(0.244)	(0.295)	(0.297)	(0.356)			(0.237)	(0.293)	(0.303)	(0.359)
Trade serv. Share	0.970	0.933	1.033	1.094			0.959	0.951	1.024	1.103
	(0.128)	(0.157)	(0.168)	(0.257)			(0.103)	(0.130)	(0.155)	(0.217)
Fin. serv. Share	0.847	0.857	1.051	1.384			0.825	0.875	1.062	1.385
	(0.199)	(0.200)	(0.318)	(0.616)			(0.168)	(0.171)	(0.320)	(0.574)
Turbulence	1.065	0.973	0.933	1.004			0.988	0.942	0.980	1.040
	(0.822)	(0.394)	(0.369)	(0.357)			(0.351)	(0.345)	(0.330)	(0.403)
					2000 – 2009					
	2000						2009			
# of regions	84	83	63	39			84	83	63	39
GDP per capita	0.876**	0.823***	1.210*	1.306	***		0.843	0.867	1.145	1.388
	(0.087)	(0.113)	(0.192)	(0.381)			(0.094)	(0.107)	(0.188)	(0.437)
Investment rate	0.997	1.059	0.929	0.997	*	*	1.019	1.016	0.950	1.006
	(0.165)	(0.246)	(0.165)	(0.207)			(0.176)	(0.211)	(0.199)	(0.212)
Unit labor costs	1.007	1.008	0.978	1.003		*	1.013	1.004	0.984	0.990
	(0.047)	(0.056)	(0.066)	(0.067)			(0.055)	(0.083)	(0.061)	(0.074)
Tert. edu. share[2)]	0.735	0.607	1.435	1.684	*		0.780	0.725	1.422	1.391
	(0.394)	(0.473)	(0.925)	(1.065)			(0.492)	(0.534)	(0.847)	(0.896)
Prim. edu. share[2)]	0.904	0.946	1.068	1.208		*	0.915	0.953	1.056	1.197
	(0.146)	(0.172)	(0.207)	(0.399)			(0.141)	(0.152)	(0.190)	(0.317)
Patents[1)]	1.045	0.999	0.994	0.919			1.071	0.981	0.992	0.895
	(0.117)	(0.220)	(0.145)	(0.203)			(0.150)	(0.254)	(0.158)	(0.223)
Agriculture share	1.202	1.213	0.690	0.613			1.206	1.226	0.687	0.581
	(0.539)	(0.514)	(0.424)	(0.406)			(0.592)	(0.498)	(0.410)	(0.381)
Industry share	1.065	0.918	1.067	0.926	***	**	1.052	0.947	1.057	0.908
	(0.248)	(0.260)	(0.322)	(0.346)			(0.246)	(0.269)	(0.348)	(0.365)
Trade serv. Share	0.948	0.964	1.018	1.158			0.972	0.967	1.016	1.105
	(0.116)	(0.105)	(0.155)	(0.224)			(0.125)	(0.102)	(0.132)	(0.171)
Fin. serv. Share	0.852	0.843	1.173	1.372			0.868	0.870	1.138	1.337
	(0.166)	(0.165)	(0.371)	(0.614)			(0.153)	(0.172)	(0.314)	(0.499)
Turbulence	0.965	1.021	0.996	1.035			1.020	0.998	0.995	0.970
	(0.355)	(0.329)	(0.351)	(0.446)			(0.190)	(0.137)	(0.181)	(0.216)

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports group averages (values in brackets are standard deviations), ***, (**), [*] next to first year values indicate significant difference to last year values at the 1%, (5%), [10%] level. Columns headed $1 \neq 2$, $3 \neq 4$ report significance levels of a t-test for equivalence of poor diverging and poor converging or rich converging and rich diverging regions respectively with ***, (**), [*] indicating significant differences at the 1%, (5%), [10%] level, respectively; 1) number of observation by region type: Poor div. = *65,* Poor con =*67,* Rich con.=*69,* Rich div.=*35,* 2) number of observation by region type: Poor div. = *71,* Poor con =*73,* Rich con.=*72,* Rich div.=*35;*.

Table 7a: Marginal Effects for Poor Regions with Decade interaction terms

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	-1.044**	-1.203**	-1.243**	-1.250**	-1.504***	-1.698***	-1.729***	-1.900***	-1.694***	-1.572***	-1.716***
	(-2.40)	(-2.52)	(-2.38)	(-2.46)	(-2.73)	(-2.90)	(-2.99)	(-2.95)	(-2.99)	(-2.61)	(-2.77)
D × *GDP per capita*	0.118	0.139	0.289	0.163	0.526	0.655	0.441	0.878	0.677	0.362	0.676
	(0.19)	(0.22)	(0.43)	(0.24)	(0.72)	(0.85)	(0.57)	(1.01)	(0.90)	(0.46)	(0.84)
Investment rate	0.428	0.544*	0.407	0.527*	0.544*	0.675**	0.693*	0.675*	0.635*	0.699**	0.713**
	(1.40)	(1.76)	(1.32)	(1.68)	(1.70)	(1.98)	(1.93)	(1.95)	(1.87)	(2.01)	(2.04)
D × *Investment rate*	0.224	0.0615	0.155	0.138	0.283	0.117	0.242	0.116	0.156	0.106	0.0770
	(0.55)	(0.15)	(0.37)	(0.32)	(0.65)	(0.26)	(0.51)	(0.25)	(0.35)	(0.23)	(0.17)
Unit labor costs	1.512**	1.193*	1.197*	1.146	1.786**	1.974**	1.865*	1.689*	1.511	2.043**	2.021**
	(2.34)	(1.69)	(1.74)	(1.61)	(2.03)	(2.07)	(1.88)	(1.70)	(1.55)	(2.19)	(2.10)
D × *Unit labor costs*	-1.988*	-1.932	-1.952*	-1.806	-3.185**	-3.188**	-3.938**	-2.877*	-2.822*	-3.447**	-3.245**
	(-1.76)	(-1.63)	(-1.65)	(-1.50)	(-2.33)	(-2.20)	(-2.51)	(-1.87)	(-1.91)	(-2.40)	(-2.23)
Tert. edu. share		0.980***		0.866*	0.872**	1.106***	1.107***	1.150***	1.195***	1.282***	1.063**
		(2.67)		(1.95)	(2.23)	(2.67)	(2.66)	(2.74)	(2.83)	(2.95)	(2.54)
D × *Tert. edu. share*		-0.508		-0.207	-0.361	-0.506	-0.530	-0.564	-0.558	-0.785	-0.464
		(-1.05)		(-0.33)	(-0.70)	(-0.93)	(-0.96)	(-1.00)	(-1.00)	(-1.39)	(-0.85)
Prim. edu. share			-0.682**	-0.189							
			(-2.03)	(-0.47)							
D × *Prim. edu. share*			0.460	0.416							
			(1.09)	(0.79)							
Patents					0.168**	0.253***	0.253***	0.246***	0.250***	0.257***	0.266***
					(2.25)	(3.07)	(3.04)	(2.93)	(3.06)	(3.13)	(3.11)
D × *Patents*					-0.267**	-0.360***	-0.365***	-0.352***	-0.360***	-0.371***	-0.373***
					(-2.52)	(-3.17)	(-3.19)	(-3.03)	(-3.17)	(-3.28)	(-3.22)
Spatial lag						0.126	0.114	0.0542	0.219	0.130	0.245
						(0.28)	(0.25)	(0.12)	(0.49)	(0.28)	(0.51)
D × *Spatial lag*						0.0631	0.0644	0.137	0.00967	0.0473	-0.0594
						(0.11)	(0.11)	(0.23)	(0.02)	(0.08)	(-0.10)
Agriculture share							-0.0283				
							(-0.26)				
D × *Agriculture share*							-0.108				
							(-0.74)				
Industry share								0.176			
								(0.70)			
D × *Industry share*								-0.196			
								(-0.56)			
Trade serv. share									-0.686		
									(-1.53)		
D × *Trade serv. Share*									0.363		
									(0.53)		
Fin. serv. share										-0.313	
										(-1.22)	
D × *Fin. serv. Share*										0.576	
										(1.45)	
Turbulence											-0.178
											(-1.12)
D × *Turbulence*											0.183
											(0.86)
N	300	297	297	297	292	292	292	292	292	292	292
pseudo R^2	0.159	0.186	0.174	0.188	0.221	0.243	0.247	0.244	0.248	0.247	0.245
AIC	432.6	422.2	427.2	425.7	406.1	405.5	407.6	409.1	407.4	407.6	408.5

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects and a dummy for islands are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

Table 8a: Marginal Effects for Rich Regions with Decade interaction terms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	0.164	-0.0348	0.115	-0.0411	0.0826	-0.202	-0.158	-0.208	-0.175	-0.131	-0.172	-0.193
	(0.66)	(-0.13)	(0.44)	(-0.16)	(0.31)	(-0.54)	(-0.43)	(-0.57)	(-0.49)	(-0.34)	(-0.47)	(-0.56)
D × *GDP per capita*	-0.000765	0.119	-0.0437	0.101	0.00401	0.270	0.0684	0.522	0.00643	-0.0653	0.181	0.113
	(-0.00)	(0.33)	(-0.12)	(0.28)	(0.01)	(0.57)	(0.14)	(1.06)	(0.01)	(-0.13)	(0.37)	(0.25)
Investment rate	0.423*	0.423**	0.417*	0.432**	0.426**	0.482**	0.487**	0.515**	0.485**	0.598***	0.497**	0.336
	(1.93)	(2.00)	(1.93)	(2.01)	(2.00)	(2.28)	(2.27)	(2.42)	(2.13)	(2.77)	(2.30)	(1.44)
D × *Investment rate*	-0.451	-0.454	-0.471	-0.483	-0.614*	-0.669*	-0.528	-1.006**	-0.615*	-0.539	-0.595*	-0.378
	(-1.33)	(-1.39)	(-1.40)	(-1.46)	(-1.81)	(-1.96)	(-1.52)	(-2.40)	(-1.79)	(-1.51)	(-1.65)	(-1.09)
Unit labor costs	0.835**	0.581	0.754*	0.588	0.629	0.454	0.921*	0.663	0.579	1.299**	0.812	0.870*
	(2.10)	(1.33)	(1.78)	(1.33)	(1.39)	(1.02)	(1.77)	(1.21)	(1.10)	(2.23)	(1.51)	(1.76)
D × *Unit labor costs*	-0.395	-0.265	-0.430	-0.288	-0.303	-0.160	-0.724	0.255	-0.0599	-0.831	-0.484	-0.641
	(-0.53)	(-0.34)	(-0.55)	(-0.36)	(-0.38)	(-0.19)	(-0.84)	(0.28)	(-0.07)	(-0.85)	(-0.55)	(-0.78)
Tert. edu. share		0.320*		0.460*	0.195	-0.0422	0.157	0.0561	0.219	0.145	0.0411	0.175
		(1.77)		(1.84)	(0.97)	(-0.17)	(0.59)	(0.20)	(0.79)	(0.52)	(0.12)	(0.69)
D × *Tert. edu. share*		-0.199		-0.432	-0.150	0.0701	-0.0852	-0.0109	-0.187	-0.0351	0.183	-0.113
		(-0.69)		(-1.19)	(-0.49)	(0.20)	(-0.22)	(-0.03)	(-0.48)	(-0.09)	(0.39)	(-0.30)
Prim. edu. share			-0.135	0.216								
			(-0.66)	(0.90)								
D × *Prim. edu. share*			-0.147	-0.467								
			(-0.37)	(-1.00)								
Patents					0.0537	0.0315	0.0386	0.0480	0.0303	0.0370	0.0309	0.0304
					(0.92)	(0.51)	(0.62)	(0.78)	(0.50)	(0.56)	(0.48)	(0.49)
D × *Patents*					-0.0420	-0.0199	0.0295	0.00949	0.0587	0.0152	0.0549	0.0361
					(-0.49)	(-0.22)	(0.33)	(0.10)	(0.66)	(0.17)	(0.59)	(0.42)
Capital						0.466	0.385	0.245	0.645**	0.210	0.288	0.449
						(1.20)	(1.05)	(0.68)	(2.29)	(0.55)	(0.75)	(1.25)
D × Capital						-0.185**	-0.173*	-0.0325	-0.209***	-0.137	-0.135	-0.176***
						(-2.31)	(-1.87)	(-0.11)	(-5.28)	(-0.82)	(-0.84)	(-2.64)
Spatial lag							0.450	0.241	0.683	0.173	0.298	0.396
							(0.73)	(0.41)	(1.22)	(0.25)	(0.46)	(0.69)
D × *Spatial lag*							-1.569**	-1.596**	-1.787***	-1.189	-1.502**	-1.555**
							(-2.20)	(-2.21)	(-2.74)	(-1.47)	(-1.99)	(-2.23)
Agriculture share								-0.0822				
								(-0.85)				
D × *Agriculture share*								0.297**				
								(2.19)				
Industry share									0.327*			
									(1.73)			
D × *Industry share*									-0.609***			
									(-2.66)			
Trade serv. share										0.568		
										(1.48)		
D × *Trade serv. Share*										0.254		
										(0.48)		
Fin. serv. share											0.179	
											(0.59)	
D × *Fin. serv. Share*											-0.461	
											(-1.17)	
Turbulence												0.182
												(1.19)
D × *Turbulence*												-0.253
												(-1.37)
N	197	197	197	197	193	193	193	193	193	193	193	193
pseudo R^2	0.240	0.252	0.244	0.255	0.262	0.273	0.327	0.356	0.353	0.351	0.333	0.333
AIC	273.0	273.8	275.9	277.0	269.0	270.1	264.3	260.8	261.7	262.2	266.8	266.7

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects and a dummy for islands are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

Appendices not for Publication:

Table A1: T-Tests for differences in mariginal effects between poor and rich regions

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita.	-6.708***	-4.630***	-7.922***	-5.806***	-5.572***	-3.296***	-3.096***	-2.041**	-3.268***	-2.894***	-3.983***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.042)	(0.001)	(0.004)	(0.000)
Investment rate	-2.083**	2.152**	-0.467	1.859*	2.594**	0.576	-0.331	0.101	0.528	-0.194	0.118
	(0.040)	(0.033)	(0.641)	(0.065)	(0.010)	(0.565)	(0.741)	(0.919)	(0.598)	(0.847)	(0.906)
Unit labor costs	-6.582***	-11.197***	-10.385***	-11.938***	-12.856***	-13.655***	-14.625***	-14.694***	-13.976***	-14.372***	-14.061***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tert. edu. share		-0.061		-1.444	0.230	1.234	0.669	-0.253	1.277	-0.938	1.162
		(0.952)		(0.151)	(0.818)	(0.219)	(0.504)	(0.801)	(0.203)	(0.349)	(0.247)
Prim. edu. share			-1.033	-4.101***							
			(0.303)	(0.000)							
Patents						0.429	0.563	0.531	0.432	0.126	0.491
						(0.668)	(0.574)	(0.596)	(0.666)	(0.900)	(0.624)
Spatial lag						5.969***	2.716***	5.752***	5.964***	5.988***	6.336***
						(0.000)	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)
Agriculture share							-1.319				
							(0.189)				
Industry share								-3.243***			
								(0.001)			
Trade serv. share									-5.159***		
									(0.000)		
Fin. serv. Share										3.343***	
										(0.001)	
Turbulence											-1.528
											(0.130)

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports statistics of two sample t-tests with unequal variances. P-values for the H0 (coefficient in table 7 is equal to coefficient in table 8) are in brackets. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Positive (negative) values indicate a higher (smaller) coefficient for rich than for poor regions.

Table A2: Coeffcient Estimates for Poor Regions

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	-5.784***	-6.691***	-8.260***	-7.977***	-7.845***	-8.800***	-8.961***	-8.736***	-8.709***	-8.869***	-9.360***
	(-4.65)	(-4.57)	(-4.51)	(-4.49)	(-4.91)	(-4.99)	(-4.98)	(-4.33)	(-4.97)	(-4.75)	(-4.68)
Investment rate	0.0829	0.658	0.353	0.594	0.575	0.780	0.796	0.776	0.784	0.770	0.896
	(0.14)	(1.04)	(0.56)	(0.92)	(0.88)	(1.09)	(1.12)	(1.09)	(1.10)	(1.06)	(1.19)
Unit labor costs	-0.189	-1.618	-2.304	-2.423	-4.199*	-4.120*	-4.534**	-4.043	-4.369*	-4.165*	-3.845
	(-0.12)	(-0.91)	(-1.36)	(-1.32)	(-1.95)	(-1.81)	(-1.97)	(-1.62)	(-1.88)	(-1.87)	(-1.64)
Tert. edu. share		3.961***		2.278**	4.123***	5.212***	5.287***	5.192***	5.263***	5.182***	5.000***
		(4.17)		(2.13)	(3.97)	(4.73)	(4.71)	(4.54)	(4.74)	(4.58)	(4.60)
Prim. edu. share			-4.558***	-3.131***							
			(-4.04)	(-2.61)							
Patents					0.317*	0.487**	0.478**	0.490**	0.484**	0.486**	0.534**
					(1.76)	(2.32)	(2.28)	(2.34)	(2.30)	(2.33)	(2.36)
Spatial lag						1.604	1.539	1.630	1.678	1.609	2.147
						(1.30)	(1.27)	(1.37)	(1.36)	(1.30)	(1.64)
Agriculture share							-0.0927				
							(-0.34)				
Industry share								-0.0538			
								(-0.08)			
Trade serv. share									-0.545		
									(-0.51)		
Fin. serv. share										0.0967	
										(0.14)	
Turbulence											-0.868**
											(-1.97)
Constant	57.02***	55.49***	93.62***	81.00***	63.50***	54.02***	56.08***	53.39***	53.86***	54.50***	55.63***
	(4.91)	(4.10)	(4.85)	(4.23)	(4.40)	(3.19)	(3.23)	(2.94)	(3.24)	(3.13)	(3.12)
N	149	149	149	149	147	147	147	147	147	147	147
pseudo R^2	0.224	0.296	0.308	0.323	0.326	0.398	0.398	0.398	0.399	0.398	0.413
AIC	206.2	193.3	191.0	189.8	187.3	176.7	178.6	178.7	178.6	178.7	175.6

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

Table A3: Coefficient Estimates for Rich Regions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	0.824	-1.908*	-0.763	-1.999*	-1.757	-4.472***	-4.675***	-4.897***	-6.313***	-4.657***	-5.260***	-4.600***
	(0.83)	(-1.70)	(-0.68)	(-1.76)	(-1.57)	(-3.05)	(-2.85)	(-3.18)	(-3.42)	(-2.82)	(-3.25)	(-2.82)
Investment rate	0.699	0.182	0.453	0.217	0.0987	0.747	0.633	0.915	0.769	0.644	0.866	0.878
	(1.07)	(0.25)	(0.62)	(0.30)	(0.13)	(0.79)	(0.63)	(0.75)	(0.71)	(0.66)	(0.80)	(0.86)
Unit labor costs	4.821***	2.699	3.295*	2.561	2.113	0.349	2.076	3.547	1.616	2.123	5.423*	2.279
	(2.77)	(1.21)	(1.69)	(1.14)	(1.00)	(0.17)	(0.92)	(1.34)	(0.66)	(0.91)	(1.88)	(0.99)
Tert. edu. share		4.169***		3.743***	3.938***	2.389**	3.759***	4.487***	5.720***	3.746***	6.728***	3.655***
		(4.25)		(3.07)	(3.67)	(2.02)	(2.90)	(3.20)	(3.45)	(2.92)	(3.43)	(2.94)
Prim. edu. share			-3.353***	-0.808								
			(-3.19)	(-0.73)								
Patents					0.426*	0.200	0.258	0.196	0.220	0.257	0.433	0.268
					(1.81)	(0.79)	(0.94)	(0.69)	(0.70)	(0.94)	(1.02)	(0.98)
Capital						2.837***	2.483***	3.508***	3.895***	2.461**	3.951***	2.395***
						(2.76)	(2.76)	(2.74)	(3.05)	(2.50)	(3.25)	(2.67)
Spatial lag							2.049	3.324	3.873	2.019	4.800	1.736
							(0.63)	(1.22)	(1.31)	(0.61)	(1.60)	(0.52)
Agriculture share								0.505				
								(1.03)				
Industry share									2.230*			
									(1.73)			
Trade serv. share										0.119		
										(0.07)		
Fin. serv. share											-3.658*	
											(-1.95)	
Turbulence												-0.323
												(-0.60)
Constant	-4.717	9.400	20.38	13.96	6.463	37.74***	16.75	5.035	2.468	16.56	-3.075	20.12
	(-0.47)	(0.93)	(1.62)	(1.26)	(0.64)	(2.61)	(0.56)	(0.18)	(0.08)	(0.56)	(-0.11)	(0.66)
N	85	85	85	85	85	85	85	85	85	85	85	85
pseudo R^2	0.184	0.361	0.285	0.364	0.383	0.446	0.493	0.506	0.535	0.493	0.534	0.495
AIC	131.3	112.7	121.5	114.4	112.1	106.8	105.3	105.8	102.3	107.3	102.5	107.1

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

Table A4: Coefficient Estimates for Poor Regions with Decade interaction terms

	(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	-2.636**	-3.031**	-3.132**	-3.151**	-3.798***	-4.294***	-4.370***	-4.799***	-4.277***	-3.972***	-4.343***
	(-2.40)	(-2.52)	(-2.38)	(-2.46)	(-2.73)	(-2.90)	(-2.99)	(-2.95)	(-2.98)	(-2.61)	(-2.76)
D × *GDP per capita*	0.297	0.351	0.727	0.410	1.328	1.655	1.116	2.219	1.710	0.916	1.711
	(0.19)	(0.22)	(0.43)	(0.24)	(0.72)	(0.85)	(0.57)	(1.01)	(0.90)	(0.46)	(0.84)
Investment rate	1.082	1.371*	1.025	1.329*	1.374*	1.705**	1.752*	1.705*	1.602*	1.767**	1.803**
	(1.40)	(1.76)	(1.32)	(1.68)	(1.71)	(1.98)	(1.93)	(1.96)	(1.87)	(2.02)	(2.04)
D × *Investment rate*	0.565	0.155	0.390	0.348	0.715	0.295	0.612	0.293	0.394	0.269	0.195
	(0.55)	(0.15)	(0.37)	(0.32)	(0.65)	(0.26)	(0.51)	(0.25)	(0.35)	(0.23)	(0.17)
Unit labor costs	3.818**	3.008*	3.015*	2.889	4.511**	4.990**	4.716*	4.266*	3.816	5.163**	5.115**
	(2.34)	(1.69)	(1.74)	(1.61)	(2.03)	(2.07)	(1.88)	(1.70)	(1.54)	(2.18)	(2.10)
D × *Unit labor costs*	-5.019*	-4.871	-4.917*	-4.552	-8.044**	-8.060**	-9.954**	-7.268*	-7.126*	-8.711**	-8.210**
	(-1.76)	(-1.63)	(-1.65)	(-1.51)	(-2.33)	(-2.20)	(-2.51)	(-1.87)	(-1.91)	(-2.40)	(-2.23)
Tert. edu. Share		2.471***		2.183*	2.203**	2.796***	2.798***	2.905***	3.018***	3.238***	2.689**
		(2.67)		(1.95)	(2.22)	(2.66)	(2.66)	(2.74)	(2.83)	(2.96)	(2.54)
D × *Tert. edu. Share*		-1.280		-0.522	-0.912	-1.279	-1.341	-1.425	-1.408	-1.984	-1.173
		(-1.05)		(-0.33)	(-0.70)	(-0.93)	(-0.96)	(-0.99)	(-1.00)	(-1.39)	(-0.85)
Prim. edu. Share			-1.718**	-0.477							
			(-2.03)	(-0.46)							
D × *Prim. edu. share*			1.159	1.049							
			(1.09)	(0.79)							
Patents					0.425**	0.641***	0.639***	0.623***	0.632***	0.649***	0.673***
					(2.25)	(3.05)	(3.03)	(2.92)	(3.05)	(3.12)	(3.10)
D × *Patents*					-0.675**	-0.911***	-0.924***	-0.890***	-0.910***	-0.937***	-0.943***
					(-2.52)	(-3.16)	(-3.18)	(-3.02)	(-3.16)	(-3.27)	(-3.21)
Spatial lag						0.319	0.288	0.137	0.553	0.328	0.621
						(0.28)	(0.25)	(0.12)	(0.49)	(0.28)	(0.51)
D × *Spatial lag*						0.159	0.163	0.345	0.0244	0.120	-0.150
						(0.11)	(0.11)	(0.23)	(0.02)	(0.08)	(-0.10)
Agriculture share							-0.0715				
							(-0.26)				
D × *Agriculture share*							-0.273				
							(-0.74)				
Industry share								0.445			
								(0.70)			
D × *Industry share*								-0.495			
								(-0.56)			
Trade serv. share									-1.733		
									(-1.53)		
D × *Trade serv. Share*									0.916		
									(0.53)		
Fin. serv. share										-0.791	
										(-1.22)	
D × *Fin. serv. Share*										1.455	
										(1.45)	
Turbulence											-0.451
											(-1.12)
D × *Turbulence*											0.464
											(0.87)
Constant	30.47***	27.84**	39.80***	31.02**	35.82***	36.14**	37.26**	40.78**	37.65***	33.39**	34.42**
	(3.09)	(2.49)	(3.09)	(2.27)	(2.74)	(2.42)	(2.47)	(2.57)	(2.70)	(2.26)	(2.24)
D × Constant	-4.663	-2.154	-12.26	-7.409	-11.49	-15.30	-9.648	-20.30	-16.23	-9.071	-13.60
	(-0.33)	(-0.14)	(-0.74)	(-0.43)	(-0.66)	(-0.76)	(-0.46)	(-0.95)	(-0.84)	(-0.45)	(-0.67)
N	300	297	297	297	292	292	292	292	292	292	292
pseudo R^2	0.159	0.186	0.174	0.188	0.221	0.243	0.247	0.244	0.248	0.247	0.245
AIC	432.6	422.2	427.2	425.7	406.1	405.5	407.6	409.1	407.4	407.6	408.5

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

Table A5: Coeffcient Estimates for Rich Regions with Decade interaction terms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDP per capita	0.624	-0.135	0.439	-0.161	0.319	-0.768	-0.610	-0.802	-0.702	-0.493	-0.658	-0.780
	(0.66)	(-0.13)	(0.44)	(-0.16)	(0.31)	(-0.54)	(-0.43)	(-0.58)	(-0.49)	(-0.34)	(-0.47)	(-0.57)
D × GDP per capita	-0.00291	0.463	-0.167	0.396	0.0155	1.026	0.264	2.012	0.0257	-0.246	0.694	0.457
	(-0.00)	(0.33)	(-0.12)	(0.28)	(0.01)	(0.57)	(0.14)	(1.07)	(0.01)	(-0.13)	(0.37)	(0.25)
Investment rate	1.610*	1.644**	1.593*	1.688**	1.646**	1.834**	1.878**	1.983**	1.942**	2.252***	1.907**	1.357
	(1.94)	(2.00)	(1.94)	(2.01)	(2.01)	(2.30)	(2.31)	(2.46)	(2.17)	(2.78)	(2.34)	(1.50)
D × Investment rate	-1.718	-1.766	-1.797	-1.886	-2.371*	-2.545**	-2.037	-3.877**	-2.462*	-2.029	-2.280*	-1.524
	(-1.35)	(-1.39)	(-1.41)	(-1.47)	(-1.83)	(-1.98)	(-1.53)	(-2.38)	(-1.82)	(-1.51)	(-1.66)	(-1.11)
Unit labor costs	3.182**	2.260	2.880*	2.299	2.427	1.725	3.554*	2.553	2.318	4.893**	3.112	3.511*
	(2.08)	(1.33)	(1.77)	(1.33)	(1.41)	(1.01)	(1.79)	(1.21)	(1.10)	(2.24)	(1.51)	(1.75)
D × Unit labor costs	-1.505	-1.029	-1.644	-1.125	-1.168	-0.609	-2.795	0.981	-0.240	-3.130	-1.855	-2.587
	(-0.53)	(-0.34)	(-0.55)	(-0.37)	(-0.38)	(-0.19)	(-0.84)	(0.28)	(-0.07)	(-0.86)	(-0.55)	(-0.78)
Tert. edu. share		1.245*		1.798*	0.752	-0.161	0.607	0.216	0.876	0.547	0.157	0.706
		(1.78)		(1.84)	(0.98)	(-0.17)	(0.58)	(0.20)	(0.78)	(0.52)	(0.12)	(0.69)
D × Tert. edu. share		-0.775	-0.562	-1.689	-0.579	0.267	-0.329	-0.0420	-0.748	-0.132	0.701	-0.456
		(-0.69)	(-0.37)	(-1.19)	(-0.49)	(0.20)	(-0.22)	(-0.03)	(-0.47)	(-0.09)	(0.39)	(-0.30)
Prim. edu. share			-0.517	0.843								
			(-0.66)	(0.90)								
D × Prim. edu. share				-1.824								
				(-1.00)								
Patents					0.207	0.120	0.149	0.185	0.122	0.139	0.119	0.123
					(0.92)	(0.51)	(0.61)	(0.77)	(0.50)	(0.56)	(0.47)	(0.49)
D × Patents					-0.162	-0.0758	0.114	0.0366	0.235	0.0572	0.210	0.146
					(-0.49)	(-0.23)	(0.33)	(0.10)	(0.66)	(0.17)	(0.59)	(0.42)
Capital						1.362	1.150	0.771	1.926**	0.665	0.887	1.347
						(1.27)	(1.18)	(0.78)	(2.05)	(0.63)	(0.86)	(1.39)
D × Capital						-1.253	-1.121	-0.132	-2.404*	-0.702	-0.712	-1.370
						(-1.01)	(-0.92)	(-0.11)	(-1.93)	(-0.55)	(-0.56)	(-1.11)
Spatial lag							1.735	0.927	2.734	0.651	1.142	1.598
							(0.72)	(0.41)	(1.17)	(0.25)	(0.46)	(0.68)
D × Spatial lag							-6.052**	-6.151**	-7.154**	-4.477	-5.758*	-6.275**
							(-2.08)	(-2.17)	(-2.52)	(-1.45)	(-1.93)	(-2.17)
Agriculture share								-0.317				
								(-0.85)				
D × Agriculture share								1.145**				
								(2.18)				
Industry share									1.311*			
									(1.69)			
D × Industry share									-2.438***			
									(-2.59)			
Trade serv. share										2.139		
										(1.48)		
D × Trade serv. Share										0.956		
										(0.48)		
Fin. serv. share											0.684	
											(0.60)	
D × Fin. serv. Share											-1.766	
											(-1.19)	
Turbulence												0.735
												(1.10)
D × Turbulence												-1.020
												(-1.28)
Constant	-2.608	1.109	0.644	-2.672	-2.754	10.41	-9.119	1.764	-23.80	-4.969	-3.107	-7.644
	(-0.26)	(0.11)	(0.06)	(-0.26)	(-0.28)	(0.70)	(-0.31)	(0.07)	(-0.80)	(-0.18)	(-0.11)	(-0.28)
D × Constant	-2.939	-5.192	0.413	3.470	-1.647	-13.93	54.48	35.27	77.11**	39.90	48.36	56.62
	(-0.22)	(-0.38)	(0.03)	(0.21)	(-0.12)	(-0.76)	(1.51)	(1.07)	(2.09)	(1.11)	(1.39)	(1.62)
N	197	197	197	197	193	193	193	193	193	193	193	193
pseudo R^2	0.240	0.252	0.244	0.255	0.262	0.273	0.327	0.356	0.353	0.351	0.333	0.333
AIC	273.0	273.8	275.9	277.0	269.0	270.1	264.3	260.8	261.7	262.2	266.8	266.7

Source: Cambridge Econometrics, OECD, EUROSTAT. Table reports coefficients of a probit regression on the probability of poor regions to grow with an above national average rate. Country fixed effects are not reported. ***, (**), [*] indicate significant coefficients at the 1%, (5%), [10%] level, respectively. Values in brackets are t-statistics of the estimates.

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Project Information

Welfare, Wealth and Work for Europe

A European research consortium is working on the analytical foundations for a socio-ecological transition

Abstract

Europe needs a change: The financial crisis has exposed long neglected deficiencies in the present growth path, most visibly in unemployment and public debt. At the same time Europe has to cope with new challenges ranging from globalisation and demographic shifts to new technologies and ecological challenges. Under the title of Welfare, Wealth and Work for Europe – WWWforEurope – a European research consortium is laying the analytical foundations for a new development strategy that enables a socio-ecological transition to high levels of employment, social inclusion, gender equity and environmental sustainability. The four year research project within the 7th Framework Programme funded by the European Commission started in April 2012. The consortium brings together researchers from 33 scientific institutions in 12 European countries and is coordinated by the Austrian Institute of Economic Research (WIFO). Project coordinator is Karl Aiginger, director of WIFO.

For details on WWWforEurope see: www.foreurope.eu

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