

Regional clubs and structural change in the European Union

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Abstract

Uneven development is an outstanding characteristic of the European economic landscape. A significant share of the available EU budget is allocated to the Cohesion Policy, with the aim to augment the wealth-creating capabilities of Europe's regions and of the people who live in them, paying most attention to areas that are lagging in their development. In a period characterized by deindustrialization and potential structural change into a service based economy, defining appropriate policies for a stable and widespread recovery –and in the spirit of the principle of solidarity- requires a deep understanding on the territorial organization of production and wealth across Europe. On this background, this paper aims to shed lights on the evolution of spatial inequalities after the common shock of the global financial crisis. The findings confirm that there is no overall convergence in per capita income; instead four clubs of regions can be identified on the basis of the clustering algorithm developed by Phillips and Sul (2007) for panel data analysis. The results from the ordered probit model confirms that initial structural characteristics and opposing dynamics in terms of industrialization and specialization in high-productivity services activities, can indeed explain the different club membership of regions. Therefore, policy interventions should be more sensitive to the different paths of recovery, deadlocks and structural transformation. A particular attention should be devoted to satisfy the training and educational requirements that are needed to sustain specific regional structural change.

Keywords:

Club convergence; Regional development; Log t regression test; Logit model, Structural change; EU Manufacturing Core

1. Introduction

The first decade of the European Monetary Union was marked by a substantial increase in trade and financial integration, even though structural and real convergence among participating countries was not attained. Until the Great Crisis, many initial concerns regarding the effects that the single monetary policy might have on divergence across member countries and regions have been dispelled.

The debt crisis, with all its facets, disclosed the relevance of various asymmetries among countries in an incomplete and still fragile European Monetary Union. The management of macroeconomic imbalances has become a main concern in the context of low growth and deleveraging. In the aftermath of the Great Crisis, new divides at the supra-national scale within the European Union (EU) and regional disparities within countries are the most relevant economic challenges for the stability of Europe, together with the main political threats such as security, refugees, the mounting of Euroscepticism.

Uneven development is an outstanding characteristic of the European economic landscape. Although, there are several reasons why we should deepen our knowledge of the ongoing changes in manufacturing location and services within Europe to inform both regional Cohesion policy and industrial policy. First, the long recession has significantly disrupted wealth and employment with heterogeneous effects across countries and regions. Second, this period was characterized by accelerated structural change, namely a shift away from manufacturing for most of the European countries and a growing relevance of transnational production networks.

Third, current account imbalances have raised concerns among economists and policy makers, as the debt crisis in Europe was ultimately conceived as a balance of payment crisis, due to the central role of external debt in explaining country-specific fragilities. Large and persistent external imbalances, international fragmentation and geographic dispersion of production processes at the global level may be linked (e.g. Brumm *et al.*, 2015; ECB, 2015; Haltmaier, 2015).

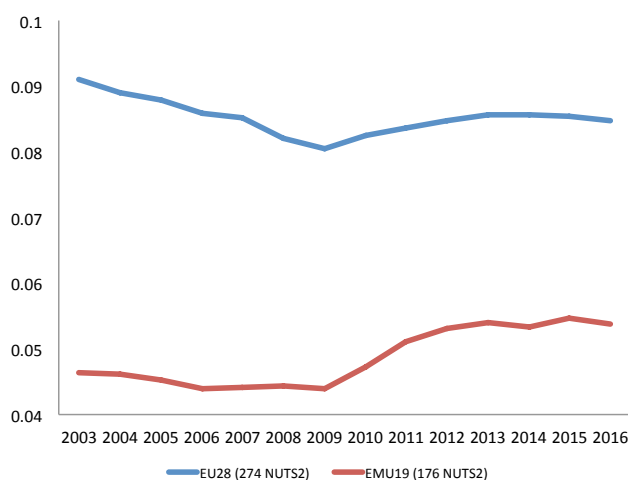
These macroeconomic asymmetries can be put in relation to the emergence of a “Central European Manufacturing Core” (CE) (IMF, 2013; Stehrer and Stöllinger, 2014; Landesmann and Stöllinger, 2018; IBRD, 2017). Recent empirical studies with international trade data and the World Input-Output Database (WIOD) have highlighted that Germany plays a pivotal role in the organisation of the region’s production networks. The CE Manufacturing Core comprises Austria and the four Visegrád countries, i.e. the Czech Republic, Slovakia, Hungary and Poland.

A basic assumption in this study is that the manufacturing sector represents a source of innovation and productivity growth, a starting point that has been reaffirmed in a number of influential contributions. The decline of manufacturing can have important

spillovers' effects on the whole economic system, due to the depressing effects on the demand for services. On this line of reasoning, a flourishing manufacturing sector is still regarded as an imperative both by academic researchers and by policy makers (Rodrik, 2012; European Commission, 2012).

According to available studies, income inequality decreased across EU countries and it increased within-countries before the global financial crisis (See, e.g., Marelli and Signorelli, 2010a, 2010b; Doran and Jordan, 2013). The attention to regional income inequality in Europe rebounded after the global financial crisis and focused on the different capacity of regions to overcome the Great recession. The characteristics ensuring regional resilience were deeply investigated (Martin, 2012; Martin *et al.*, 2016) as the emphasis was on regional vulnerability in the absence of a common automatic fiscal stabilization mechanism and with limited geographical mobility of factors in a single currency area (Fingleton *et al.*, 2015). In this debate, the role of structural change for regional growth and convergence has also received a renewed interest by scholars (O'Leary and Webber, 2015).

Figure 1 – Regional inequality in GDP per head, pps



A look at the data confirms that dispersion in EU regional GDP per capita decreased before the Great Recession. After the 2008's financial crisis this overall convergence period halted and regional disparities across the EU-NUTS-2 regions started to rise again (Figure 1). In a recent work, Iammarino *et al.* (2017) point to the existence of several different economic clubs of regions in Europe, each with different development challenges and opportunities. Hence, to improve convergence process among them, they suggest treating this heterogeneity with “place-sensitive distributed development policy” (PSDDP).

On this background, this article aims to provide an overall picture of the evolving regional disparities and the connected changing geography of industrial and service activities.

We are interested in identifying clusters of regions to understand whether the different paces of regional structural change from manufacturing to services in the post-crisis can be at the root of the deepening uneven development in Europe. For this reason we adopt the two-stages methodology used Bartkowska and Riedl (2012). In a first stage, we use the Phillips and Sul (2007) clustering approach on a sample of 270 NUTS2 regions over the period 2003-2016. In a second stage, we examine, through an ordered logit probit, the characteristics of the different clusters according to relevant post-crisis initial conditions and variables capturing the subsequent structural change.

Previous studies have investigated regional club convergence in Europe with panel data analysis. Nevertheless, most of them consider time spans before the Great Recession, thus they do not account for the possibility that diverging recovery paths in the aftermath of the Global Financial Crisis may have had further polarized the geography of wealth and the capacity of job creation.

Our findings suggest that the null hypothesis of convergence is clearly rejected in the whole sample of EU regions. In other words, there is no overall convergence in per capita income; but European regions are scattered in four separate groups converging to their own steady state paths. The structural characteristics of regions and their opposing dynamics, in terms of industrialization and specialization in high-productivity services activities, can indeed explain the divergence among clusters. The overall picture of diverging economic clubs driven by different structural changes is not altered if the ordered logit procedure is conducted on the basis of the 5 clubs identified from the adjusted clustering procedure suggested by Schnurbus, Haupt, and Meier (2017).

2. The method for identifying and characterizing regional economic clubs

Instead of defining clusters with a-priori criteria, we refer to the method developed by Phillips and Sul (2007, 2009) that, on the basis of a nonlinear time varying factor model, endogenously define clusters of convergence subgroups (For details on the *log t test*, see Appendix A). The method is particularly suitable for the present analysis that focuses on the aftermath of the Great Recession. In fact, after the significant common external shock - the Global Financial Crisis - diverging recovery paths may have emerged. Moreover, this framework has several advantages in the context of our analysis of structural change. It relaxes the assumption of homogeneous (exogenous) technological progress across regions and over time. Moreover, differently from other time series

approaches, it does not require a common stochastic trend; hence it allows accounting for temporal transitional heterogeneity across regions – substantially different relative transition paths (hit)-, eventually followed by catching-up and convergence. It considers a form of panel convergence comparable to the concept of conditional σ -convergence, treated as an asymptotic property. Thanks to these characteristics, this empirical approach encompasses different scenarios that can be reconciled with a variety of theoretical models, ranging from the neoclassical growth model that predicts a single steady state for all regions, to club convergence that, instead, can be related to multiple equilibria models.

The algorithm proposed by Phillips and Sul (2007, 2009) to identify club convergence clusters was already applied to panels of EU national data (Apergis et al. 2010; Fritsche and Kuzin 2011; Monfort et al. 2013; Borsi and Metiu 2015) and to panels of NUTS-2 regions (e.g. Bartkowska and Riedl, 2012; Lyncker and Thoennessen, 2017). An overview of this literature confirms the economic reality of a multispeed Europe based on the emergence of North-South and West-East divides. Above-mentioned studies also suggest that in recent years the geographical pattern have become more complex. Specifically, the number of economic clubs identified doubles from two to four when the time span of the analysis includes the period of the Great Recession (e.g. Borsi and Metiu, 2015, Lyncker and Thoennessen, 2017).

In our analysis we apply the same clustering approach on EU NUTS-2 regions over the period 2003-2016. Then, we analyze the characteristics of the different clusters identified according to relevant initial conditions and structural change variables. We estimate an ordered logit model and compute the predicted probability that is the implied probability that a given region belongs to a certain convergence club. To evaluate the relevance of our variables of interest in determining club membership we compute the marginal effects of the predicted probabilities. They show the change in probability when the predictor increases by one unit, while all other explanatory variables are set at their sample average.

3. Results: overall regional divergence and convergence clubs

We collected a panel data on per capita income covering 274 EU regions during the period 2003-2016 (Source: Eurostat). We first examined whether the convergence hypothesis holds for the whole sample. To perform the *log t* test we use the routine “logtreg” developed for Stata users (See Du, 2017). To focus attention on the latter part of the sample data, as suggested by Phillips and Sul (2007) on the basis of their simulation experiments, the first 4 periods (2003-2006) are discarded before regression (truncation parameter $r=0.333$). Results for the whole sample of regions clearly reject

the null hypothesis of overall convergence in real income per capita at the 1% level ($t_{\hat{b}} = -30.806$). Hence we can conclude that European regions did not converge to the same steady state in terms of per capita income.

Then we investigated the possibility of club convergence using the clustering algorithm proposed by Phillips and Sul (2007). According to this methodology, groups of regions may converge to a steady state, which is common to all the regions of the same group but different from the steady state of other groups of regions. Table 1 shows the results of the cluster analysis, after merging adjacent clusters. Consistent with previous literature on club convergence in Europe based on regional data (See e.g. Bartkowska and Riedl, 2012; Lyncker and Thoennesen, 2017), the method leads us to distinguish 4 economic clubs and two diverging regions, namely Luxembourg and Inner London-West. The full list of regions by club memberships is reported in Appendix B.

Table 1 Cluster analysis. Sample 2003–2016.

Club	N. of regions	$\hat{b}(SE)$	$t_{\hat{b}}$	$\hat{\alpha}$	Average income	
					2008	2016
1	20	0.332 (0.059)	5.601	0.166	49675	57035
2	89	-0.084 (0.061)	-1.433	-0.042	28322	32421
3	141	-0.086 (0.060)	3.034	-0.043	21770	23356
4	22	0.288 (0.095)	-64.2	0.144	16295	14845

Applied truncation parameter: $r = 0.333$; applied critical value: $c = 0.05$; t-statistic at the 5% significance level: -1.645 ; t-statistic at the 1% significance level: -2.326 ; $\hat{\alpha}$: speed of convergence.

Club 1 (n = 20): AT(2), BE(1), CZ (1), **DE(5)**, DK(1), FR(1), IE(1), NL(2), PL(1), RO(1), SE(1), SK(1), UK(2)

Club 2 (n = 89): **AT(6)**, **BE (5)**, BG(1), CZ (1), **DE (32)**, DK(3), EE(1), ES(3), FI(2), HU(1), **IT(5)**, LT(1), MT(1), NL(6), **PL(6)**, RO(3), SE(5), SK(1), UK(6)

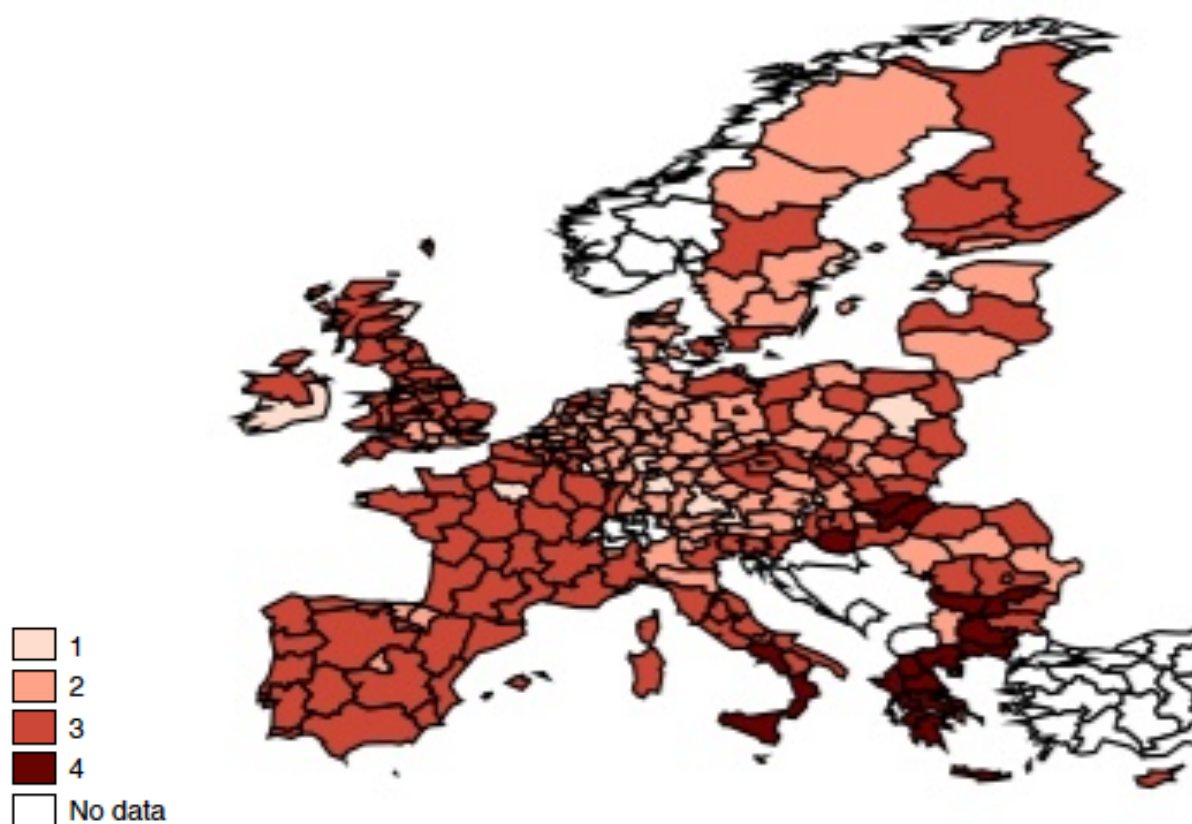
Club 3 (n = 141): AT(1), **BE(5)**, BG(2), CY(1), **CZ (7)**, DE(1), DK(1), EL(2), **ES(15)**, FI(3), **FR(25)**, HU(3), IE(1), **IT(13)**, LV(1), NL(4), **PL(9)**, **PT(7)**, RO(4), SE(2), SI(2), SK(2), **UK(31)**

Club 4 (n = 22): **BG(3)**, **EL(11)**, ES(1), FR(1), **HU(3)**, **IT(3)**

Not converging regions (n = 2): Inner London – West and Luxembourg

The algorithm detects a relative convergence for the extreme clusters ($0 \leq \hat{b} < 2$). In other words, the members of these two clubs neither diverge nor converge to the same level, but converge conditionally and diverge with respect to their income level. The \hat{b} value for Club 2 is negative, but is not statistically significant from zero. As suggested by Phillips and Sul (2009), we take this as evidence that Clubs 2 is weaker convergence club compared to Club 3. In the latter case, the \hat{b} value is negative and statistically significant. The map in Figure 2 illustrates the spatial distribution of the identified clubs.

Figure 2 – Club clustering in the EU-28 panel (2003-2016)



The first cluster (Club 1), that is achieving a higher steady state, is mainly composed by metropolitan and capital cities of North and Central Europe, such as Vienna, Bruxelles, Praha, Paris, Dublin, Bratislava, Bucarest, Stockholm, London, Amsterdam, Hamburg, Stuttgart. This is the group of regions with the lowest share of manufacturing employment (18% on average, See Table C2, Appendix C).

The second cluster (Club 2) comprises regions from a variety of EU countries. Although, regions belonging to the so-called Central European manufacturing core are highly represented in this cluster. Notice that this cluster has the highest share of manufacturing employment (31% on average) and the lowest rate of de-industrialization (-1% on average).

The third cluster (Club 3) is the largest with more than half of the sample's regions. Most of them are Italian, British, French, Spanish and Czech regions. This club encompasses all Portuguese regions while only one Austrian region and one Deutsch region, the rest of Austrian and Deutsch regions being included in the first two clusters. Belgium regions are equally spitted between Club 2 and Club 3. Also, most Polish, Romanian and Hungarian regions belong to Club 2 and Club 3, while Slovak regions are scattered among the first three clusters.

The fourth cluster (club 4) is composed by regions with sluggish economic growth, mainly belonging to Mediterranean and South Eastern countries. 85% of all Greek regions end up in this cluster. It also includes southern Italy, and the remaining regions of Spain, Hungary and Bulgaria. Not only this cluster has the lowest end-of period average income (last column of Table 1), but it is also diminishing its possibility of catching up with the rest of the EU.

The characteristics of the four clubs suggests that they may be categorized as “Metropolitan areas and capital regions” (Club 1), The “Central European Manufacturing Core” (Club 2) “De-industrializing regions with intermediate average per capita income levels” (Club 3), and “Mediterranean lagging-behind regions” (Club 4).

4. Heterogeneous structural changes in the context of the European economic integration

We suggest that economic clubs follow rather different structural change. To investigate this hypothesis, we conduct an ordered logit regression aimed at verifying whether the initial conditions and the structural change dynamics can indeed explain to which club the region converges. The dependent variable is the categorical variable “Economic club”, which varies from 1 to 4. The sample consists of 263 NUTS-2 regions because of missing data for some variables of interest. An overview of the variables and sources used in the ordered logit model is provided in Table 2.

We select employment by sector as the main variable of interest to assess structural change, as the 2008 crisis has deeply affected European jobs and such job losses have been highly uneven. We focus on manufacturing in relational to the debate on the “manufacturing imperative” but we also consider service sectors because they constitute the major part of most European economies. In particular we distinguish between knowledge-intensive services (Information and communication) and tourism-related services (Accommodation and food Service activities) for the different capacity of wealth and job creation. The summary statistics for the variables are shown in Table C1, Appendix C.

Table 2 Definition of variables and sources

Variable	Definition	Source
<i>Initial conditions (in 2008)</i>		
Log income p.c., 2008	Per capita GDP pps, 2008	Eurostat
Manufacturing share, 2008	Employment in manufacturing (C) divided by employment in <i>total manufacturing and non-financial private service activities*</i>	
Information and communication share, 2008	Employment in Information and Communication (J) divided by employment in <i>total manufacturing and non-financial private service activities*</i>	SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards) -Eurostat
Accommodation and food services share, 2008	Employment in Accommodation and food service activities (I) divided by employment in <i>total manufacturing and non-financial private service activities*</i>	
<i>Structural change variables, rate of change (2008-2015)</i>		
Manufacturing, rate of change	Rate of change of employment in manufacturing between 2008 and 2015	
Information and communication, rate of change	Rate of change of employment in Information and communication between 2008 and 2015	SBS data by NUTS 2 regions and NACE Rev. 2 (from 2008 onwards) -Eurostat
Accommodation and food services, rate of change	Rate of change of employment in Accommodation and food service activities between 2008 and 2015	
Human capital, rate of change	Rate of change of employment rate for population from 20 to 34 years with upper secondary, post-secondary non-tertiary and tertiary education (levels 3-8), between 2008 and 2015	Employment rates of young people not in education and training by sex, educational attainment level, years since completion of highest level of education and NUTS 2 regions -Eurostat
<i>Geographic controls</i>		
Metropolitan region	Dummy variable based on the presence of one or more NUTS-3 metroregion. Own elaborations on Eurostat data on typologies and local information corresponding to NUTS3 - Urban-rural typology	Eurostat, JRC and European Commission Directorate-General for Regional Policy

**Total employment in manufacturing and non-financial private services* includes Manufacturing (C), Wholesale and retail trade; Repair of motor vehicles and motorcycles (G), Transportation and storage (H), Accommodation and food service activities (I), Information and Communication (J), Professional, scientific and technical activities (M), Administrative and support service activities (N). Total employment does not include Financial and insurance activities (K), Real estate activities (L) and Other service activities (S)

The ordered logit probit confirms the general idea of diverging clusters with different structural change dynamics. The marginal effects on probabilities are shown in Table 3. Results suggest that, among the initial conditions considered in the analysis, the

employment share of Information and communication over total employment is the most relevant feature in explaining club membership; it has an explanatory power higher than log income per capita.

Table 3 Marginal effects on probabilities (ordered logit)

	Club 1	Club 2	Club 3	Club 4
<i>Initial conditions (in 2008)</i>				
Log income p.c., 2008	0.0260** (0.0114)	1.173*** (0.155)	-1.172*** (0.157)	-0.0266** (0.0122)
Manufacturing share, 2008	0.0217* (0.0127)	0.980** (0.408)	-0.979** (0.408)	-0.0222 (0.0136)
Information and communication share, 2008	0.131** (0.0666)	5.907*** (1.923)	-5.904*** (1.912)	-0.134* (0.0787)
Accommodation and food services share, 2008	-0.0340 (0.0241)	-1.531* (0.864)	1.530* (0.864)	0.0347 (0.0247)
<i>Structural change variables, rate of change (2008-2015)</i>				
Manufacturing, rate of change, 2008-2015	0.0107* (0.00630)	0.482** (0.208)	-0.481** (0.208)	-0.0109 (0.00677)
Information and communication, rate of change, 2008-2015	0.0150** (0.00729)	0.676*** (0.151)	-0.676*** (0.152)	-0.0154** (0.00756)
Accommodation and food services, rate of change, 2008-2015	-0.00374 (0.00362)	-0.169 (0.138)	0.169 (0.138)	0.00383 (0.00339)
Human capital, change 2008-2016	0.0380** (0.0189)	1.712*** (0.406)	-1.711*** (0.409)	-0.0389** (0.0194)
<i>Geographic controls</i>				
Metropolitan region	0.00192 (0.00238)	0.0864 (0.103)	-0.0864 (0.103)	-0.00196 (0.00245)
Observations	263	263	263	263

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

NOTE: All predictors at their mean value

LR chi2(9) = 274.98
 Prob > chi2 = 0.0000
 Log likelihood = -151.88774
 Pseudo R2 = 0.4751

More in general, apart from the share of employment in tourism-related activities, the probability of membership in the first three clusters (from 1 to 3) is explained quite well by the selected variables. In particular, the effects of some initial conditions such as log income and Information and Communication are significant for the 4 clubs. More specifically, a small positive change in these variables raises the probability of belonging to a high-income club (club 1 or club 2), while it decreases the probability of belonging

to a lower-income club (club 3 or club 4).

The initial specialization in manufacturing and tourism-related activities plays a role in explaining club membership. The partial derivatives suggest that a high manufacturing share in the aftermath of the crisis have the expected positive influence on the probability of belonging to a high-income club (clubs 1 to 2) and a negative impact on the probability of ending up in a low-income club (clubs 3 to 4). The marginal effects are significant for the first three clusters. Instead, a high share in accommodation and food service activities increases the probability of belonging to Cluster 3 and 4 while decreases the probability of ending up in Cluster 1 and 2. In this case, the marginal effects are significant for the Clusters 2 and 3.

The signs of the marginal effects for the subsequent structural changes complete the broad picture. The chosen variables appear to be relevant in explaining club formation among European NUTS2 regions. The marginal effects are also highly significant for the large Clubs 2 and 3. Different structural changes emerge over time for different clusters: club 1 and club 2 saw an increase in manufacturing and knowledge intensive services employment while less important is the increase in accommodation and food services. The opposite scenario emerges for Club 3 and 4; this evidence contributes to explain the cumulative process of “peripherisation”, giving rise to widening regional disparities.

To summarize, the probit analysis confirms that the economic structure of regions belonging to the “Central European Manufacturing Core” is characterized by a significant initial specialization in manufacturing, while the metropolitan and capital regions had already shifted their economic structure toward services, before the Crisis, hence their degree of specialization in manufacturing is lower, with a marginal effect that is positive and significant. The marginal effect on human capital is positive and highly significant for the metropolitan regions and the Central European Manufacturing Core implying that the mix “industrialization and high-tech services’ specialization” is more apt to absorb the well-educated and younger workforce than it happens in the de-industrializing, intermediate-income and Mediterranean clusters, where instead the marginal effect on human capital is negative and significant. These findings corroborate that agglomeration processes are cumulative and lead to drainage of skilled personal and purchasing power from other regions, thus explaining the widening of regional disparities.

Furthermore, the sign of the marginal effect of metropolitan region is consistent with the relevance of the urban-rural divide, although marginal effects are not significant. We use a dummy variable to capture this dimension of regional disparities (See table 2 for details on how the variable is constructed). Results imply that the probability of belonging to the higher-income Clubs 1 or 2 is higher for metropolitan areas, while the

probability of belonging to the lower-income Clubs 3 and 4 is higher for non-metropolitan areas.

The evolution of spatial disparities may be connected to two main institutional and economic developments: (1) the different institutional framework that shape the national capability to react to the common shock, and (2) the different GVC participation of regional economies in wider productive networks. Both subjects are beyond the scope of the present analysis and are left for future research; but some considerations are worth to be done in relation to the possible link between territorial imbalances and the wider integration across Europe along regional value chains.

The results of our analysis sound complementary and give support to the recent empirical evidence on the increasing concentration of European manufacturing in a new Core macroregion centered on Germany (IMF, 2013; Stehrer and Stöllinger, 2014; Landesmann and Stöllinger, 2018; IBRD, 2017). Stehrer and Stöllinger (2014) analyzed the CE manufacturing core and explored in detail the structure and development of the regional supply chains over the period 1995-2011. They found that in the EU Core countries the structural shift out of manufacturing was less pronounced than in other EU Member States – or it was even positive¹. The authors also highlighted how asymmetric evolutions took place starting from the 2000s onwards on international competitiveness. The average manufacturing export intensity- measured as value added export per capita- was not very different in the CE manufacturing core countries and in the other EU Member States in 1995, while in more recent years the differential in export intensities between the two groups is huge, it was 40% in 2011. This positive development of export market shares in manufacturing industries is found in each single member of the CE manufacturing core (Germany, Czech Republic, Slovakia, Hungary and Poland), but the contribution to the increase in market shares was higher for Germany and Poland, due to their economic size. Interestingly, Stehrer and Stöllinger (2014) evaluated the link between industrial dynamics and the insertion in GVC, and found that this nexus has asymmetric effects for countries belonging to the EU Core compared to the other EU Member States. Particularly, international production sharing can positively impact on EU Core, while accelerates de-industrialization in no-Core countries². Moreover, they suggest that the integration into supply chains has contributed to the concentration of manufacturing activities. The agglomeration of manufacturing activities in CE core was mirrored by a significant decline in the share of

¹ Core countries are among the EU countries with the highest share in manufacturing in GDP, reaching close to 20% in most countries.

² Particularly, a 10 percentage point higher GVC participation rate slows down the structural shift out of manufacturing by 0.26 percentage points for countries belonging to the EU Core. Instead, for the average EU Member State not belonging to the EU Core, a 10 percentage point higher GVC participation rate accelerates de-industrialization by 0.35 percentage points.

the other EU Member States, in particular high-income countries, such as Nordic and Benelux countries, and above all France and the United Kingdom.

In general, regional production networks attempt to minimize transport and logistic costs and also reap the benefit of agglomeration economies. Hence they may give rise to strong regional concentration in areas where transport costs are low, such as regions bordering the more advanced Western European countries in the CEE-5. It is worth noting that international East-West production networks in Europe are driven by trade-offs between wages and coordination costs (Frensch *et al.*, 2015)³.

5. Robustness Checks

We applied the adjusted method proposed by Schnurbus, Haupt, and Meier (2017) to verify whether our general results might be affected by the clustering approach used to identify different economic clubs. We also reduce the trimming parameter to $r=0.3$.

In this case, clusters identified are 5 instead of 4 but the overall picture that emerges from the ordered logit analysis is not different.

Club1, Club2 and Club3 are higher income clusters with favorable structural change while Club 4 and 5 are lagging behind in income, possibly because of substantial de-industrialization and an adverse structural change towards low productivity service activities.

In summary, the findings in Table 4 confirm that the initial conditions are relevant in explaining club membership. Particularly, initial employment share in Information and communication is the most dominant driver of club membership, more than log income per capita. Regions with a higher share of manufacturing over total regional employment are more likely to end up in club 1, 2 and, especially, in club 3. A one-unit increase in this variable increases the probability of a region to belong to the higher-income clusters, clubs 1, 2 and 3, and accordingly, decreases the probability of a region to belong to cluster 4 and 5. The opposite scenario emerges for accommodation and food services; these activities are more prone to locate in clusters 4 and 5. As for the different structural changes: club 1, club 2 and club 3 share a sustained increase in knowledge intensive services employment while less important is the increase in accommodation and food services.

Table 4 Marginal effects on probabilities

³ Clearly, low wages are not enough to explain GVC development, they play an important role in the ex ante investment decision to establish a new production network, but when the production relationships are already established, the ex post decisions to intensify outsourcing abroad is based on wage differences, to a much lesser extent (Frensch *et al.*, 2015). Instead, other factors related to geography, culture, institutions, quality of infrastructure surely come into play (Hanousek and Kočenda, 2014).

Ordered logit on 5 clubs using the adjusted clustering algorithm proposed by Schnurbus, Haupt, and Meier (2017), truncation parameter $\tau=0.3$

	Club 1 (20)	Club 2 (39)	Club 3 (83)	Club 4 (106)	Club 5 (24)
<i>Initial conditions (in 2008)</i>					
Log income p.c., 2008	0.0301** (0.0122)	0.291*** (0.0652)	1.476*** (0.215)	-1.762*** (0.196)	-0.0360** (0.0147)
Manufacturing share, 2008	0.0194* (0.0109)	0.187** (0.0844)	0.948** (0.401)	-1.132** (0.465)	-0.0231* (0.0132)
Information and communication share, 2008	0.125** (0.0594)	1.205*** (0.452)	6.107*** (1.813)	-7.287*** (2.091)	-0.149* (0.0785)
Accommodation and food services share, 2008	-0.0458* (0.0251)	-0.442** (0.189)	-2.241*** (0.865)	2.674*** (1.004)	0.0547* (0.0301)
<i>Structural change variables, rate of change (2008-2015)</i>					
Manufacturing, rate of change, 2008-2015	0.00999* (0.00553)	0.0965** (0.0451)	0.489** (0.208)	-0.584** (0.242)	-0.0119* (0.00684)
Information and communication, rate of change, 2008-2015	0.0108** (0.00537)	0.105*** (0.0379)	0.530*** (0.166)	-0.633*** (0.190)	-0.0129** (0.00646)
Accommodation and food services, rate of change, 2008-2015	-0.00352 (0.00318)	-0.0341 (0.0280)	-0.173 (0.137)	0.206 (0.163)	0.00421 (0.00347)
Human capital, change 2008-2016	0.0333** (0.0160)	0.322*** (0.102)	1.631*** (0.432)	-1.946*** (0.485)	-0.0398** (0.0181)
<i>Geographic controls</i>	-0.00198 (0.00214)	-0.0192 (0.0194)	-0.0971 (0.0975)	0.116 (0.116)	0.00237 (0.00259)
Metropolitan region	-0.002	-0.019	-0.098	-0.116	-0.003
Observations	263	263	263	263	263

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

NOTE: All predictors at their mean value

The results in Table 4 confirm that structural change might play a role in determining the club membership of a region. In this case the three highest income clubs follows the path of industrialization and increasing specialization in high-tech knowledge intensive service activities, that also characterizes Club1 and Club2 of the baseline identification. The counterpart of this divergent structural change is the substantially different capacity of absorbing young and well-educated active population. The lock-in of the Mediterranean club is also confirmed.

The sign of the marginal effect of metropolitan region seems counterintuitive, since it implies that a one-unit increase in this variable decreases the probability of belonging to the higher-income Clubs 1 or 2 and 3.

6. Conclusions

We first test the hypothesis of convergence for different groups of regions, and then, with an ordered probit analysis, we identify commonalities and differences between panels of regions in terms of structural change dynamics.

Our main contribution is to highlight four main supra-national areas within the European Union –economic clubs- that may be relevant for designing policies aimed at reducing territorial imbalances. To promote a balanced regional development it is important to understand the diversity in industrial structure and their different evolutions.

A successful structural change toward high-value added and high-wage services in the higher-income clubs may have helped the regional economies to counteract the adverse effects of the crisis. Instead, a strong de-industrialization coupled with the slow transition toward low-wage and low-value added services can be at the root of the “peripherisation” of regions that are drifting apart from the core dynamics. We believe that the structuring of regional production networks is part of the explanation of the current developments in regional disparities.

On the basis of our results, there is a need to develop policy interventions more sensitive to the different paths of recovery, deadlocks and structural transformation, instead of following the ‘same size fits all’ approach. It is important to find the right balance between the implementation of the European regional and competition policy, and a sufficient leeway to countries and regions to define their regional and industrial policy according to their specific development challenges and opportunities. Policy makers should also devote a particular attention to satisfy the training and educational requirements that are needed to accompany specific regional structural change.

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