Explaining regional disparities in Central and Eastern Europe: the role of geography and of structural change

by

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ABSTRACT

The paper analyses the determinants of within country regional income disparities and of their evolution in Central and Eastern European Countries (CEECs) between 1991 and 2011. We add to the literature in different ways. First, we look at the relevance of geo-sectoral groups (urban areas, old industrialised areas and peripheral areas) for CEECs regions, adapting the categories used by Rodriguez-Pose (1998) for studying convergence among regions of old (Western) EU members. Second, we propose a new category, that of "successful Foreign Direct Investment (FDI)-based restructuring", for understanding processes of catching-up/ falling behind in CEECs. This captures regions that, often through considerable FDI, manage to reconvert their old industrial base. By means of non-parametric and spatial regression analyses, we test the relevance of these groups finding that they help explaining the increase in within countries' regional disparities, particularly after the turn of the century.

Keywords: regional disparities, Central and Eastern European Countries, geography, specialization, structural change, foreign direct investment

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1. Introduction

After ten years or so of the often painful transition that followed the fall of the Iron Curtain, since the turn of the century the former centrally planned economies of Central and East European Countries (CEECs) started heading towards a virtuous path of growth and productivity gains.[1] By general consent, this is the result of a distinctive model of development, based on economic reforms, privatizations, trade and financial openness, integration into the West, membership in the European Union (EU) and substantial inflows of foreign direct investment (FDI).

Recovery, however, was not without costs. The collapse of central planning gave way to massive plant closures, soaring unemployment and falling national income. CEECs were forced to restructure industry, reconverting - or closing - whole lines of production. Disparities started building up *within* countries (divergence), as some regions jumped ahead while others lagged behind, sharply changing one of the main features of Socialism - that of a relatively egalitarian society, at least by Western standards.[2]

A growing body of the literature investigates the specificities of these processes in CEECs (Petrakos 2001; Ezcurra et al. 2007; Artelaris et al. 2010; Kallioras and Petrakos 2010; Meliciani 2016). Following different methodologies, all show an ongoing simultaneous process of between-country convergence coupled with within-country divergence. In each country some areas, notably the capital together with some other regions, jump ahead. Others, instead, simply lose industries and employment to international competition. Among the factors that appear to explain uneven patterns of

[1] On average, over 2000-10 the yearly growth rate of newcomers was more than double that of older members. On the point see Marrocu et al., 2013.

[2] By 2010 the variability of per capita GDP among newcomer regions was almost double that recorded in 2000 (see, among others, Meliciani 2016). The growth in disparities is likely to continue in the near future as some sectors - notably agriculture and some parts of industry - have far lower productivity than their Western counterparts and will have to cut employment. See Gorzelak (2006).

development, the productive structure of the regions is found to play an important role (Ezcurra et al. 2007). Other studies focus on geographic factors and find that regions sharing common borders with old EU members, being closer to the European core, benefit from integration more than far-off areas (Petrakos 2001; Artelaris et al. 2010). Another strand of the literature investigates the role of capital regions in determining uneven patterns of development in CEECs (Chapman et al. 2012). Extending the classification introduced by Rodriguez-Pose (1998) for the old Europe to regions in newcomers, Chapman and Meliciani (2012, 2016) find that socio-economic groups (urban areas, old industrialised regions, peripheral areas and intermediate regions) help explaining within countries divergence in the enlarged Europe. In this paper, we use a similar approach to study within country convergence/divergence in CEECs regions.

We add to the literature in different ways. First, we look at the relevance of geo-sectoral groups for CEECs regions. Identifying and testing the role of these groups for growth and convergence has important implications since it suggests that different policies should be adopted for regions belonging to groups with different features.

Second, we propose a new category, that of "successful Foreign Direct Investment (FDI)-based restructuring", for understanding processes of catching-up/ falling behind in CEECs. This captures regions that, often through considerable FDI, manage to reconvert their old industrial base and recover in terms of GDP and employment. While there is a growing debate on the role of FDI for local development in CEECs (EU Commission, 2014; Szent-Iványi and Balázs, 2017), to the best of our knowledge there are no empirical studies at the regional level assessing its role in the process of structural change and catching up in Eastern Europe[3]. Assessing the role of FDI-based

[3] Capello and Lenzi (2013) test the determinants of employment growth in CEEC regions over 2005-07 and find that FDI has a positive effect.

restructuring for explaining patterns of regional convergence/divergence in CEECs has relevant implications for European development and cohesion policies.

By collecting regional data on FDI from several national data sources and by combining them with data on gross value added at the regional/sectoral level, we build geo-sectoral regional groups and test their explanatory power in explaining the evolution of per capita GDP disparities in CEECs over 1991-2011 by means of non parametric and spatial regression analyses. It is found that geo-sectoral factors, although not important initially, gain a strong explicative power, particularly after the turn of the century.

The paper is organised as follows. The next section reviews the recent literature on regional income disparities in CEECs. Old and new patterns of industrialization are then described with the aim of capturing the interplay between the regional geography of production, specialization, FDI flows and local development (Section 2). Section 3 classifies CEEC regions in different geo-sectoral groups. Section 4 tests the relevance of these groups in explaining regional disparities in per capita GDP both by means of non-parametric methods (analysis of variance and kernel densities) and by regression analysis. Some final remarks follow.

2. Empirical evidence on regional convergence in CEECs: recent findings

A growing literature analyses the processes of convergence/divergence within CEECs. These countries are often claimed to represent a particularly interesting case for the study of convergence inasmuch as they provide a unique, quasi-laboratory, environment in which previously closed economies suddenly replace central planning with market mechanisms and open to integration with the West (Kallioras and Petrakos 2010; Artelaris et al. 2010; Marrocu et al. 2013). Furthermore, while all CEECs are located in

the eastern part of Europe, within each country regions are more or less distant from the core of Europe. Not only: in CEECs (as elsewhere) different locations often entail different historical records, different cultures and traditions. The end of central planning opened the way to regional development paths that differ also in relation to geography, local culture, history and institutions. In this sense CEECs represent an interesting sample to assess how spatial and local factors - institutions, traditions, culture - affect development paths (Ezcurra et al. 2007).

At the onset of transition CEECs presented, to differing extents, the following main features: i) specialization in heavy industry predominated. Production occurred in large-scale, vertically integrated plants using obsolete, materials- and labour-intensive technology, often leading to mono-industrial specialization; ii) regional disparities within countries were artificially low - a prominent feature of Socialism; also, (iii) the average levels of per capita GDP were far below Western ones.

The end of Socialism put an end to all this, changing the area's entire geo-political framework. Long-standing ties broke up as cheap supplies of raw materials and easy export markets closed. Trade flows turned away from the former Soviet Union while markets opened to competition with the West. This re-directed the main axes of development away from eastern borders and imposed massive restructuring locally. Petrakos (2001) and Kallioras and Petrakos (2010) study regional growth paths during the early years of transition. Due to data availability both studies consider only a limited number of countries[4] and find evidence of growing within-country inequality. By analysing a number of indicators (gross regional product, industrial production, investment and FDI - all in per capita terms - and average wages) Petrakos (2001) finds

[4] Results, however, seemingly apply to all CEECs, at least in general. Petrakos (2001) considers four countries (Poland, Hungary, Romania and Bulgaria) in the first half of the 1990s. Kallioras and Petrakos (2010) consider five (Hungary, Estonia, Slovenia, Bulgaria and Romania) over 1991-2000. Both studies adopt the NUTS 3 breakdown.

that densely populated areas - i.e. capital cities and major urban agglomerations - as well as regions sharing common borders with old EU members (particularly in Poland and in Hungary) fare better than other ones. The paper concludes that the proximity to large markets, coupled with a region's structural and historical features, is decisive for relative success or failure in the transition process. Kallioras and Petrakos (2010) confirm these results for the industrial sector. By estimating the determinants of the rate of growth (decline) of industrial employment they find a negative effect of economic integration and positive effects for regional industrial diversification, high shares in capital intensive industries, average firm size and proximity to metropolitan areas or to large markets. Artelaris et al. (2010) reach very similar conclusions: analysing a slightly longer period of time (1990-2005) and considering all CEECs (NUTS 3) regions, they find that per capita GDP in both urban and western regions grows more than the country average. They conclude that this confirms the importance of agglomeration economies and geography for regional growth. Estimating non-linear equations for the evolution of per capita GDP, they also find evidence of convergence clubs forming within each country,[5] pointing to a differentiated spatial impact of integration.

Also Ezcurra et al. (2007) find strong evidence of within country divergence, coupled with between countries convergence, in all CEECs over 1990-2001 (they consider the NUTS 2 breakdown, leading in all to 39 regions). This is confirmed by different inequality measures (the Gini coefficient, the Theil index) and also by the distribution dynamics of regional per capita income. They show that the density becomes somewhat less polarized over time, pointing to convergence. This, however, does not occur uniformly across the whole sample. In fact, the stochastic kernels show relative stability of the distribution, with some sign of convergence only for the poorer

[5] Except in Poland and Slovakia, where all regions diverge from the richest one (the capital).

regions. Moreover, the ergodic distribution highlights that convergence will not persist in the long run. Finally, using conditional distributions, they study the role of various factors - the national component, a region's location in space, its productive structure, agglomeration economies (proxied by employment density) and the percentage of GDP devoted to investment - in explaining the distribution dynamics. It is found that all factors matter, but that the productive structure is the only variable with a uniform effect on the whole distribution. Using a similar methodology, Meliciani (2016) finds evidence of the increasing importance of innovation and of socio-economic factors in explaining regional disparities both in the EU as a whole and in CEECs.

Finally, some studies have discussed the role of Foreign Direct Investment (FDI) for growth in CEECs. Flows are found to contribute positively to growth and - through technology transfers and spillovers - to productivity gains, both at the country level and in individual industries (in particular in manufacturing). However, their impact is found to be crucially linked to the recipient's absorptive capacity (ECB, 2009 and Damijan et al, 2008). Factors such as the quality of the human capital, the legal environment, the presence of infrastructures and the like, by providing a suitable setting, are central for the creation of spillovers. Put differently, local-specific features matter - for CEECs as elsewhere (see Borensztein et al, 1998). All these studies are at the national/industry level, while we are not aware of any contribution using data on FDI at the regional level to study whether they play a role in within country convergence/divergence in CEECs.

3. The geography of production in CEECs: old and new patterns

CEECs embarked towards transition starting from a production pattern that was largely shared both across countries and regions in each country: heavy industry was spread more or less uniformly, regardless of pre-existing patterns. Some countries (notably

Slovakia, Hungary and Romania) presented industrial clusters near their Eastern borders.[6] Big concentrations were also found in raw materials-rich areas (a feature inherited from pre-Socialist industrialization rarely discontinued by central planners) or in densely populated urban centres, where large urban-industrial agglomerations were formed. Instances are to be traced, among the others, in the huge industrial concentration (iron, steel, machine-building, chemistry) centered around the Great Coal Mine Basin (one of the biggest coal fields in Europe) in Upper Silesia/Slaskie (Poland) and along the Sudetes (Czech Republic) or in the energy axis running from the North-East of Hungary (Eszak-Magyarorszag) to the South-West (Del-Dunantul) around the city of Pecs, "exploiting coal, non ferrous ores and other raw materials" (Bachtler 1992, p. 666). Urban-industrial agglomerations were everywhere: among others, around Ostrava in Moravskoslezko (Czech Republic); near Bucharest in Sud (Romania) and Kosice in Vychodne (Slovakia). In Poland clusters formed around almost every town; apart from the capital, the biggest ones were near Lodz (in Lodzkie, specializing in light industry, notably textiles), Krakow (Malopolskie) and Wroclaw (Dolnoslaskie). In Bulgaria, planners took the elliptically-shaped transport route connecting the main towns (the so-called "ring") as the country's industrial axis.[7]

Agriculture was strong, too. Instead, apart from capitals, the service sector was virtually non-existent: before transition, only Poland had a (legal) private sector of any relevance.[8] Moreover, with reference to Marxist-type, egalitarian principles, disparities were kept extremely low, especially if compared to the West. As late as 1991 (the first year for which a complete data-set is available on a regional basis) in every CEEC except Slovakia a large group of regions (the 25th percentile) totalled over 80% of

[6] The spatial dimension of industrial areas and cities in each CEEC is analysed in Muller et al. (2005).
[7] With time the "ring" became so important that in the late '70s over 75% of the country's production was estimated to be concentrated around it. See Bachtler 1992, p. 666.
[8] The latter generated relatively high shares of GDP, mainly in agriculture and in urban services.

national per capita GDP. True, capitals were always ahead, but differences remained relatively modest.[9]

The end of Socialism put a halt to all this. The rigid centralization of economic activity ceased and regions - also within the same country - started moving along different paths on the road to restructuring, setting the foundation for future disparities, both in terms of per capita income and of the specialization of production.

In what follows, an attempt is made to describe the changes that occurred in CEECs during transition; in particular, the focus is on the extent, if any, to which regions changed their position with respect to their country average (or, in some cases, with respect to the EU average). The aim is to investigate the relation between regional growth and a number of factors that appear to be relevant in determining it. In particular, the following are singled out: (i) regional specialization, (ii) the ability to attract FDI flows and (iii) geographical position.

Specialization is measured by the revealed comparative advantage index on gross value added.[10] This is computed as the share of gross value added (*GVA*) in sector *s* over total gross value added in region *i* divided by the share of sector *s* in total country gross value added:

$$RCA_s = \frac{GVA_{i,s}}{\sum_{s=1}^{S} GVA_{i,s}} \Bigg/ \frac{\sum_{i=1}^{Nc} GVA_{i,s}}{\sum_{s=1}^{S}\sum_{i=}^{Nc} GVA_{i,s}}$$

[9] The only exceptions were Slovakia and the Czech Republic. Praha marked a striking exception, totalling in 1991 a per capita GDP that was one and half times the country average.

[10] Gross value added is preferred to employment since it provides better information on the economic value of each sector.

where S is the total number of sectors and N_C is the number of regions within each country. Values are referred to the country's total in order to measure regional specialization within countries. The sectors considered are agriculture, industry, construction and services. All data are from Cambridge Econometrics and cover the years from 1991 to 2011.

FDI inflows are important inasmuch as they are often believed to generate positive externalities both in the form of technology transfers and of knowledge spillovers, ultimately promoting permanent growth in the recipient country.[11] This applies to regions as well, although less attention has been given to the issue. While FDI can raise growth locally, it can also crowd out local firms, yielding ambiguous results (Figlio and Blonigen 2000). FDI is found to have a positive impact on regional growth when a sufficient level of "critical mass" is reached, be it in terms of the sheer amount of inflows (and of their stability over time - Bajo-Rubio et al. 2010, who consider Spanish regions), be it in terms of the local absorptive capacity, defined with reference to the amount and quality of local human capital, (Ford et al. 2008, who analyse USA States) and/or of firm agglomeration (Ng and Tuan 2006, who study regions in China). These results apply also to CEECs, who have attracted considerably higher amounts of FDI than those of other country groupings (Clausing and Dorobantu, 2005; Castejan and Worz, 2006). al, 2008). In this paper, differently from previous studies, we look at FDI in CEECs at the regional level. Data are taken from different national sources;[12] FDI shares are shown in Appendix 1.

[11] See Almafraji and Almsafir, 2014, for a recent review of the literature. See also de Mello (1997). Sometimes this view is challenged on the grounds of weak empirical evidence and generally modest spillover effects, especially in the short run. While FDI and growth are confirmed to be generally correlated, there is far weaker evidence of a causal link between the two, especially at the micro level. Results appear to be sensitive to sample selection, estimation techniques (addressing endogeneity problems) and to different control variables.

[12] Respectively, for Bulgaria from the Bulgarian National Bank; for the Czech Republic from the Czech National Bank; for Romania from the National Bank of Romania; for Slovenia from the Bank of Slovenia; for Slovakia from the Slovak Statistical Office. In all these cases data refer to FDI values. For

Table 1 and Figures 1, 2 and 3 summarize the main regional changes in CEECs. Table 1 reports some measures of within countries regional disparities in 1991 and in 2011. The maps in Figures 1 and 2 show respectively regions' per capita GDP (country-relative) and specialization both in 1991 and in 2011. Figure 3 maps the distribution of FDI flows in 2011.

(Table 1 and figures 1, 2 and 3 about here)

Even at a first glance Figure 1 points to marked growth in GDP disparities over 1991-2011. Table 1 confirms, and shows that the standard deviation of per capita GDP grows in all countries, the biggest changes occurring in Romania and Bulgaria. In all countries the share of per capita GDP of the poorest regions over the country average falls while that of the richest regions (which are the ones hosting capitals) leaps ahead.

Capitals are the great winners of transition. GDP jumps ahead and marks a widening gap with the other regions.[13] This occurs everywhere: capital region Mazowieckie (Poland) jumps from below 130% of the country average in 1991 to over 180% in 2011; Bratislavsky (Slovakia) goes from 177% to over 200%. The biggest jump is recorded by capital region Yugozapaden (Bulgaria), that passes from just above 100% of the country average in 1991 to 200% in 2011, and by Bucarest (Romania), that goes from 130% to 240% (see Table 1). As far as specialization is concerned, already in 1991 all capital regions specialize in services, except Yugozapaden in Bulgaria, that however switches to services by 2011 (see Figure 2). In some cases (Praha, Bratislava) this holds also EU-

Hungary and Poland, instead, data are respectively from the Hungarian Central Statistical Office and from the Central Statistical Office and refer to numbers of enterprises receiving FDI. All data are relative to 2011 except those for Slovakia which refer to 2010.

[13] The only exception is two-region Slovenia, where differentials are low initially and grow very little over time. Between 1991 and 2011 per capita GDP of the capital region goes from 1.16 of the country average to 1.19. A strong "capital effect" in CEECs is found also by Chapman et al. (2012).

relative. With time specialization in the sector deepens for almost all capitals. In the Czech Republic it grows also in the region surrounding the capital (Stredni Cechy) suggesting the possible forming of a virtuous cluster of tertiary activities. Last but not least, coming to host the headquarters of newly created companies and banks (both domestic and foreign), being relatively well endowed with infrastructures and qualified workforce, capital regions manage to attract by far the biggest shares of FDI flows country-relative (see Table 3 and the last column of Appendix 1).

Second, the East-West divide, which was already present in some countries (Poland, Slovakia, Hungary), deepens; in other cases it takes shape anew; in general, it becomes a distinctive feature o the area. Figure 1 shows that by 2011 all eastern regions lose position country-relative with respect to 1991 and fall below the country average per capita GDP (which was not the case in 1991). This occurs in Severoiztochen and Yugoiztochen, coasting the Black Sea in Bulgaria; in the three far eastern regions (Eszak-Magyarorszag, Eszak-Alfold and Del-Alfold) of Hungary; in Nord-Est and Sud-Est in Romania and in far eastern Vychodne in Slovakia. The Czech Republic and Poland are slightly different inasmuch as both show an East-West divide already in 1991. In 2011 the pattern is largely confirmed, eastern regions remaining among the poorest in both cases, even if some intra-group shifts occurs. In the Czech Republic an additional North-South division appears to be forming too. [14] In all countries, Figure 2 shows that by 2011 most eastern regions - which are generally specialized in industry in

[14] In Poland north-eastern Podlaskie bordering Lithuania improves its relative position while two other eastern regions, Lubelskie and Podkarpackie, fall behind. In the Czech Republic, the previously rich industrial North (Severozapad and Severovychod) faces serious restructuring problems and enters the poorest group while southern regions bordering Austria and West Germany (Jihozapad and Jihovychod) are more favoured. At the far East of the country, old industrialised Stredni Morava and Moravskoslezsko still present sharp restructuring problems and lag behind. In 2000 national policies define Severozapad and Moraskoslezsko as problem regions undergoing heavy structural change.

1991 - switch to agriculture (country-relative). Alternatively, when agriculture prevails already in 1991, it deepens.[15]

On the other hand, new opportunities open for the regions lying closer to the West. Sometimes, on the very account of their distance from the Soviet Union, these areas had been less affected by Soviet-type industrialization and were able to start from a more flexible economic structure. Trans-border cooperation with their western neighbours came to be favoured - and indeed financed - through EU Interreg programmes. Figure 3 shows that many regions closer to the West attract investors from abroad and receive consistent FDI shares country-relative, generally scoring second only to capitals. In 2011 shares go from almost 8% each of total national flows for Vest and Centru (Romania), to some 9% for Jihovychod in the Czech Republic, mainly concentrated around the city of Brno, to almost 14% for Yugoiztochen (Bulgaria), to over 19% for Zapadne Slovensko[16] (see Appendix 1). Sometimes this leads to the creation of home-grown companies linked to international networks. The growing needs for qualified labour stimulates local research units and institutions while firms upgrade production lines, trying to 'move up the value chain' (Condon 2004). By 2011 many regions close to western borders achieve per capita GDP levels around, or above, the country average. This occurs in Nyugat-Dunantul and Kozer-Dunantul in the West of Hungary close to, or on, the border with Austria; in Wielkopolskie, Dolnoslaskie and Lodskie in central-

[15] Exceptions are Yugoiztochen, in south-eastern Bulgaria, that passed from a specialization in agriculture to one in construction, and Podkarpackie in Poland, that became relatively specialised in industry. Actually Podkarpackie, although lagging behind, is part of the vast industrial belt that is forming in the south-western area of Poland and spreads from Lubuskie in the West to Dolnoslaskie, Opolskie, Slaskie and Podkarpaskie. These, with the exception of Opolskie, are industrial regions also relative to the EU average.

[16] Until the turn of the century consistent flows to Slovakia went also to far eastern Vychodne (in particular to the area of Kosice: 16% of total national FDI in 2001). However, over time projects were redirected and privileged the western regions. In 2010 a strictly decreasing order from West to East can be traced in the country, going from Bratislavsky (62% of total flows), to Zapadne (19.5%), Stredne (9.5%) and Vychodne (9%).

western Poland; in Vest and Centru in Romania;[17] in western Slovakia (Zapadne). In Bulgaria and in the Czech Republic the most successful areas - apart from the capitals - are in the South of each country: respectively Yugoiztochen and Jihovychod.

4. Explaining increasing regional disparities in CEECs

CEEC regions are now classified into geo-sectoral groups defined on the basis of the general features outlined above. The explanatory power of these groups is then assessed.

4.1 Classifying regions in geo-sectoral groups

The previous paragraphs underline some of the most important features and development paths of post-Socialist East European regions. With reference to these findings, we put forward a classification for CEECs regions that is similar to the one devised by Rodriguez-Pose (1998) for regions of twelve old (Western) EU members.[18] Rodriguez-Pose identifies the following four categories: urban, peripheral, old industrialised and intermediate. We follow this approach but add a new category, that of "successful FDI-based restructuring". This captures regions that, often through considerable FDI, manage to reconvert their old industrial base and recover in terms of GDP and employment. Therefore, the paper classifies CEEC regions into the following five groups: 1) Peripheral; 2) Capitals; 3) Old industrial; 4) FDI-based restructuring; 5) Other. Regions and groups are listed in Appendix 1, together with the indicators that are used to form them. Figure 4 maps the groups.

[17] The case of the Banat region (Vest) is particularly interesting. The region, that was Hungarian up to 1918, witnesses the localisation of groups of firms, especially in the Timis county, with the potential to form clusters. These are concentrated in the wood industry, textiles, shoes, software and electronics. In the last sector firms benefit from the presence of the Politechnica University of Timisoara and of foreign companies such as Alcatel, Siemens, etc. (Isfanescu 2010).

[18] The countries are: Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, UK.

(Figure 4 about here)

Peripheral regions are generally located at the far eastern borders of each country and are furthest from the centre of Europe. They include four Polish regions in the North and eastern parts of the country on the borders with Russia, Belarus and Ukraine; one far eastern region bordering Ukraine in Slovakia; one in Hungary, also bordering Ukraine; three north-eastern regions in Romania near Ukraine and Moldova; two eastern ones in Bulgaria on the Black Sea. No region qualifies as peripheral in the Czech Republic or in Slovenia. This leads in all to eleven regions. It is worth noting that all peripheral regions are specialised (country-relative) in agriculture both in 1991 and in 2011 and that most of them raise their specialisation in the sector over time (see Appendix 1).

Old industrial regions are defined with loose reference to EU criteria; they present both (i) a high specialization in industry country-relative in 1991 and (ii) employment rates below the country average in 1991-2000. Nine regions classify as old industrialised, two respectively in Bulgaria, the Czech Republic, Poland and Romania and one in Hungary.

By contrast, successful FDI-based restructuring regions (i) specialise country-relative in 2011 in either industry or services, (ii) raise their specialisation in one of the two sectors over 1991-2011 (in the case of services without considering the capital region) and (iii) attract a share of FDI that is above the country average (without the capital). On the basis of these criteria fourteen areas are identified, one respectively in Bulgaria and in Slovakia, three in the Czech Republic, two in Hungary and in Romania, five in Poland.

Finally, capital regions are the areas hosting capitals.

Whenever a region presents mixed features, which prevents unambiguous classification, it is assigned to a group with reference to the qualitative information discussed in Section 3. If even this is not possible, it is added to the least represented group in the country. Notwithstanding, nine regions do not to show any of the features described above and are included in a residual group of Other regions.

4.2 Testing the role of geo-sectoral factors for regional disparities

The paper tests the role of geographic and sectoral factors in explaining regional disparities in per capita GDP. This is done both by means of nonparametric tools and of regression analysis with spatial effects.

4.2.1 Nonparametric analysis

The nonparametric analysis reflects various techniques. First, total variance is decomposed into its within and between groups components. Second, the original (country-relative) distribution of regional per capita GDP is compared to that conditional on geo-sectoral factors both for 1991 and for 2011. Third, the hypothesis that the two distributions are statistically equal is formally verified by means of the Kolmogornov-Smirnov test. Conditional distributions are obtained by first regressing per capita GDP (expressed as the log of the difference from the country average) on geo-sectoral factors (dummy variables are introduced for each group) and then computing the distribution of residuals.

Table 2 reports the total variance of EU-relative per capita GDP of CEEC regions in 1991 and 2011; fractions explained by countries and by geo-sectoral groups are shown separately.

(Table 2 about here)

First of all, as mentioned above, intra-group variability more than doubles in the period under analysis. Second, coming to the impact of countries and of geo-sectoral groups, it is easily seen that while in 1991 countries explain 73% of total variance, their explanatory power falls over time, passing to 45% in 2011. Together, within-country differences grow. By contrast, geo-sectoral groups show the opposite trend. While explaining a minor 33% of total variance in 1991, in 2011 they account for 57%, gaining a higher explanatory power with respect to country groups. In addition, geo-sectoral groups become more similar internally. Overall, this points to geo-sectoral factors gaining importance in explaining differences across CEEC regions - and country factors losing it.

Figures 5 and 6 show the univariate distributions of country-relative per capita GDP and of country-relative per capita GDP conditional on geo-sectoral groups in 1991 and in 2011. The figures also report the contour plot for each distribution. In a contour plot, curves lying along the main diagonal indicate that the conditioning factor has a weak explicative power (the relative position of each region remains roughly unchanged). Instead curves that depart from the diagonal point to a relatively important conditioning factor. If the curves were perfectly horizontal, this would mean that regions belonging to a given group obtain very similar levels of per capita GDP, i.e. that regional disparities are largely explained by the conditioning factor. Finally, Table 3 reports the variance, skewness and kurtosis of the distributions and the respective Kolmogornov-Smirnov tests of equality between the original (country-relative) and the conditional distributions.

(Figures 5 and 6 about here)

(Table 3 about here)

Comparing the univariate distributions in Figures 5 and 6, in both years the conditional ones appear to be far more concentrated around the mean than the country-relative ones. This is particularly evident in 2011. The same information can be drawn from the contour plots: while conditioning for geo-sectoral factors in 1991 shows only a marginal impact of these elements, the 2011 plot results in lines that, especially for the higher densities, are almost parallel to the horizontal axis.

Moreover, Table 3 shows that while the variance of the country-relative distribution grows over time (from 0.039 to 0.113), in both years it is lower when conditioning for geo-sectoral factors (respectively, 0.017 instead of 0.039 and 0.023 instead of 0.113). In 2011 also the skewness of the distribution is lower when conditioning for geo-sectoral factors (-0.509 compared to 1.339) and the distribution from right skewed becomes left skewed. Finally, also the kurtosis is lower (4.00 instead of 4.26). The Kolmogornov-Smirnov test does not reject equality between the original and the conditional distribution for 1991, pointing to a conditional distribution roughly unchanged with respect to the original one, but does for 2011, marking significant difference between the two distributions. The result is consistent with the hypothesis that geo-sectoral groups gain increasing explanatory power, in line with what emerges from the analysis of variance.

4.2.2 Regression analysis

The econometric analysis estimates a simple growth equation respectively for (i) unconditional growth rates and for growth rates conditional on: (ii) countries, (iii) geo-sectoral groups, (iv) countries and geo-sectoral groups. The analysis aims at assessing whether regions belonging to different geo-sectoral groups converge to different levels of per capita GDP.

As it is common in regional growth analysis, estimations allow for spatial dependence. In particular, the analysis starts from the Spatial Durbin model (SDM) which is a general model that includes among its regressors not only the spatial lagged dependent variable, but also a spatial lagged set of independent variables:

$$Y = WY\rho + X\beta_1 + WX\beta_2 + \varepsilon \qquad (1)$$

where Y denotes a *Nx1* vector consisting of one observation for every spatial unit of the dependent variable, X is a *NxK* matrix of independent variables, where *N* is the number of regions and *K* the one of explanatory variables, W is an *NxN* non negative spatial weights matrix with zeros on the diagonal. A vector or matrix pre-multiplied by W denotes its spatially lagged value. Parameters ρ, β_1 and β_2 are response parameters, and ε is a *Nx1* vector of residuals with zero mean and variance σ^2.

In all models Y is the yearly rate of growth of per capita GDP over 1991-2011. The matrix W reflects the geographic distance between regions' centroids and is row normalised[19]. In the unconditional version X is per capita GDP in the initial year (1991). In the model conditional on countries X contains also country dummies in order

[19] Row standardization implies that the elements of the distance matrix measure the fraction in a region's overall spatial effect that is attributable to each neighbour. As a consequence the spatial lag of the dependent variable has the intuitive appeal of being a weighted average of neighbours' growth rates.

to allow each region to converge to the country-specific per capita GDP. In the model conditional on geo-sectoral groups X contains the initial level of per capita GDP and dummies for each of the groups in order to allow each region to converge to the group-specific per capita GDP. Finally the model conditional on both countries and geo-sectoral groups includes dummies for countries and for geo-sectoral groups.

The Spatial Durbin Model nests most models used in regional literature. In particular, imposing the restriction that $\beta_2=0$ leads to a spatial autoregressive (SAR) model that includes the spatially lagged dependent variable of neighbouring regions, (but does not account for other features of these areas). Imposing the restriction that $\beta_2=-\rho\beta_1$ yields the spatial error model (SEM) that allows for spatial dependence only in the error terms. Imposing the restriction that $\rho=0$ leads to a spatially lagged X regression model (SLX) that assumes independence among regional dependent variables, but includes values of neighbouring regions as explanatory variables. Finally, imposing the restriction that $\rho=0$ and $\beta_2=0$ leads to a non-spatial regression model. We choose the appropriate model by means of hypothesis testing.[20]

In both the SAR and the Spatial Durbin models, a change in a single explanatory variable in region *i* has a *direct impact* on the dependent variable in the region as well as an *indirect impact* (spillover) on that of other regions (see LeSage and Fischer 2008 for a discussion). This results from the spatial connectivity that is incorporated in spatial regression models; it raises the difficulty of interpreting the estimates. LeSage and Pace (2009) provide computationally feasible means of calculating scalar summary measures of the two types of impacts that arise from changes in the explanatory variables.

[20] Lagrange Multiplier tests and their robust versions are used to test the OLS versus the SAR and SEM; Likelihood ratio (LR) tests are used for testing the SAR and SEM versus the SDM while the test of the SLX versus the SDM is a t-test on the coefficient of the spatial lag of the dependent variable in the SDM.

Table 4 reports the results of the estimation of the preferred model (chosen according to the criteria described in footnote 21) for (i) unconditional growth rates and for growth rates conditional on: (ii) countries, (iii) geo-sectoral groups, (iv) countries and geo-sectoral groups.

(Table 4 about here)

Models not including country dummies show weak signs of positive spatial correlation (see the Lagrange Multiplier tests); the preferred model is the SEM (see the LM and the Robust LM tests for SEM against SAR and LR tests for SEM against SDM). By contrast, models including country dummies show negative spatial correlation and the preferred model is the SAR one. In this case, we report direct, indirect and total effects.

The negative spatial correlation for country-relative per capita GDP growth is an interesting result since it marks a difference between CEEC regions and the whole of European regions (on the presence of strong spatial correlation in regional per capita GDP in the EU see, among others, Ertur and Koch 2006 and Chapman and Meliciani 2016). This result may depend on CEEC capital regions that grow above the country average and are not clustered. In particular the Moran graph of per capita GDP growth and per capita GDP growth country-relative show respectively low positive and negative spatial correlation (see Figure 7). In both graphs capital regions contribute negatively to spatial correlation having above average growth rates (both in absolute terms and country-relative) and being surrounded by regions with below average growth rates.

Coming to the results of the estimation of the SEM and SAR models, both confirm, respectively, the lack of overall convergence (column 1) and the presence of within

country divergence (richer regions country-relative grow more than poorer ones, see the positive and significant direct and total effect of initial per capita GDP in column 2). Columns (3) and (4) show that it is indeed different growth performance across geo-sectoral groups that accounts for such divergence, as regions converge towards their geo-sectoral groups.

The estimates without country dummies (column 3), show that capital regions, that were already the richest ones in 1991, grow at a yearly rate about 3 percentage points higher than that achieved by old industrial regions (the reference group). FDI-based restructuring regions follow and grow more than old industrial areas by about 1% a year. The rate falls to 0.9% for the residual group; by contrast, the rate of growth of peripheral regions does not differ significantly from that of the reference group.

A similar pattern is confirmed when looking at country-relative growth rates (column 4). In this case the direct effect of urban, FDI-based restructuring and other regions is respectively about 3%, 1% and 0.5% higher than that of old industrialised regions. However, for urban and FDI-based restructuring areas there is also a significant negative indirect impact that makes the total effect fall to respectively 2% and 0.7%. The significance of the indirect effect signals that growth does not spill over from these regions to the surrounding ones.[21] On the opposite, being surrounded by capitals and restructuring regions has a displacing impact.

Overall the results of the regression analysis are in line with the evidence emerged from the nonparametric analysis and show the lack of overall convergence, divergence from the country mean and the existence of different convergence clubs based on geo-sectoral characteristics.

[21] This results also from the descriptive statistics of Section 3.

5. Conclusions

The paper focuses on economic disparities in newcomer regions. It confirms that the variability of per capita GDP across regions grows markedly over 1991-2011 and that this occurs largely because of the growing disparities building up within countries. This is consistent with previous evidence and highlights the consequences of a sudden shift from formerly centrally planned regimes to market economies. Coming to the main determinants of divergences, the paper argues that the factors identified by Rodriguez-Pose to explain disparities in EU old members in the Eighties may apply also to newcomers. First, urban areas, which in the case of CEECs identify capitals, all present common features of dynamic growth, a dominant service sector and high FDI inflows, setting them apart from other regions. Second, forced industrialization under Socialism privileging heavy industry leaves a large group of regions still facing deep restructuring problems. Third, even if all CEECs lie at the eastern borders of the EU, nevertheless some regions are closer to the EU core and share borders with older members, opening the question of whether the geographic configuration of newcomers determines a regional drawback putting the far eastern peripheral regions at a disadvantage with respect to more central ones. This leads to testing the explanatory power of the following categories: capital regions, old industrial and peripheral regions. On the grounds of the fact that some newcomer regions are able to reconvert successfully thanks to consistent FDI flows, a further category including FDI-based restructuring regions is added to the other ones.

Overall, it appears that the explanatory power of these geo-sectoral categories, while not particularly strong initially, rises over time. In fact, while in 1991 geo-sectoral groups do not explain regional GDP disparity any better than country factors, by 2011 they become significant and appear to account for a great part of disparities.

These results cast doubts on the ability of market forces to generate even patterns of development attracting investment (including that from abroad) and directing it where it is most needed. Put very simply, they contrast the general idea that growth is bound to "trickle down" from the fastest growing areas to the rest of the country.[22] Not only: while pointing to the need for future assistance, in a general sense the increasing polarization of growth also marks the limited impact that both national and EU-tailored programmes for revitalising lagging regions have produced so far. This adds to the on-going debate on the need to improve traditional EU development policies and to tailor targets and policies more carefully with reference to the socio-economic features and specific needs of recipient areas.

By finding evidence of a growing strength of geographic and structural features in CEECs, the paper points to the following main fields of intervention: on one hand to promote the integration of peripheral regions into the EU; on the other to help restructuring old, Soviet-type, industrial areas. In all cases, the paper suggests that FDI flows play a strategic role in fostering recovery and growth. Improving investment conditions locally (for foreign and domestic companies) becomes an important goal. This entails differentiating policy intervention in order to account for local features. For instance, in the case of far off, peripheral areas, measures could aim at encouraging more intense and effective use of local resources - land and labour. In this context, policies should assist local authorities in promoting the diversification of economic activity, fostering the introduction of new sectors (e.g. tourism), up-grading local production and ensuring sustainable development. In turn, the reconversion of old industrial areas requires co-ordinated innovation and industrial policies that consider the specific needs of low-tech sectors and/or of pre-existing specialization patterns.

[22] Indeed, in the whole sample of 51 NUTS2 regions considered in the paper, there is evidence of positive spillovers occurring only in one case, that between Praha and its neighbouring area. "Trickling down" effects, however, could be in action at a finer spatial breakdown.

Possible measures could aim at upgrading existing plants, introducing training schemes in order to raise human capital and help firms improve productivity encouraging the creation of new, small- and medium-sized firms.

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Table 1 Regional disparities within CEECs in 1991 and 2011 (per capita GDP standard deviation and regions' shares with respect to country average)

Country	**Standard Deviation**		**Poorest region over country average**		**Richest region over country average**	
	1991	**2011**	**1991**	**2011**	**1991**	**2011**
Bulgaria	0.114	0.510	0.828	0.667	1.148	2.024
Czech R.	0.301	0.473	0.795	0.791	1.727	2.167
Hungary	0.229	0.455	0.795	0.699	1.459	1.986
Poland	0.155	0.264	0.785	0.726	1.278	1.821
Romania	0.165	0.568	0.774	0.579	1.321	2.362
Slovenia	0.232	0.266	0.836	0.811	1.164	1.188
Slovakia	0.519	0.696	0.670	0.544	1.775	2.034

Source: calculated from Cambridge Econometrics.

Table 2 Variance in regional per capita GDP in 1991 and 2011: countries and geo-sectoral groups (total, between and within groups components)

Countries	Total	Between	Within	R-Squared
1991	0.8756	0.6363	0.2393	0.7267
2011	2.1507	0.9708	1.1800	0.4514
Geo-sectoral groups	Total	Between	Within	R-Squared
1991	0.8756	0.2861	0.5895	0.3268
2011	2.1507	1.2372	0.9136	0.5752

Source: calculated from Cambridge Econometrics.

Table 3 Regional per capita GDP distributions: summary statistics and Kolmogornov-Smirnov tests

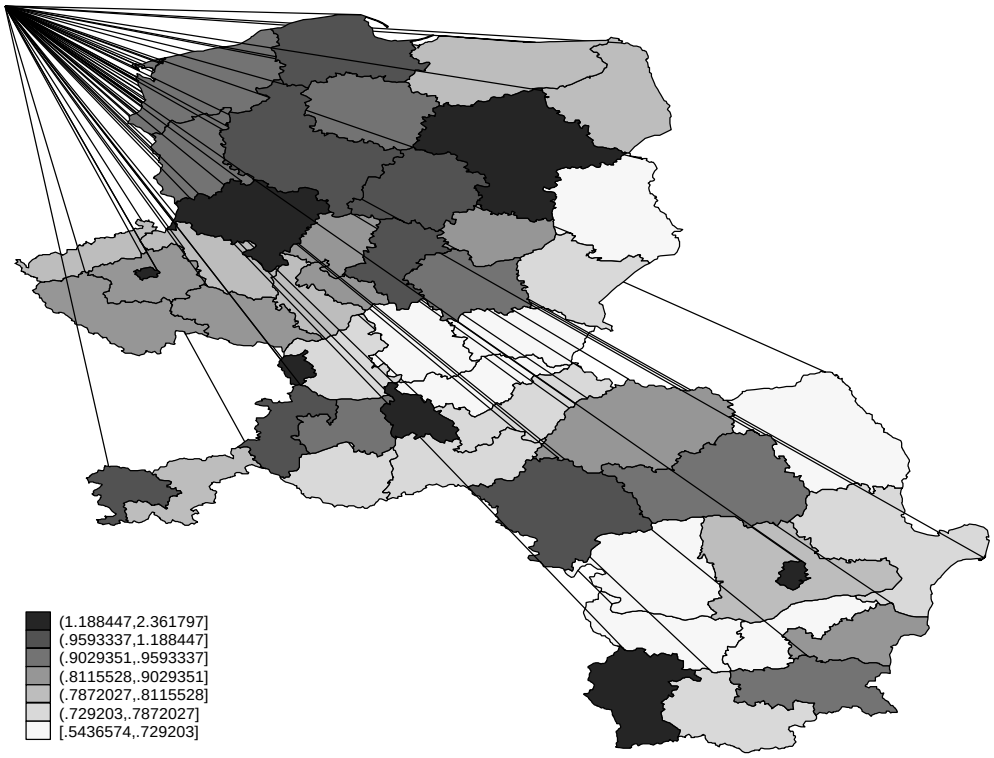
Distribution	Variance	Skewness	Kurtosis	K-S test
Country-relative 1991	0.039	0.988	4.225	
Country-relative 2011	0.113	1.339	4.264	0.314***
Conditional on geo-sectoral groups 1991	0.017	0.199	2.306	0.196
Conditional on geo-sectoral groups 2011	0.023	-0.509	4.000	0.451***

Note: the Kolmogornov-Smirnov tests compare the country-relative distribution in 2011 and the conditional distributions in 1991 and in 2011 to the country-relative one in 1991.
Source: calculated from Cambridge Econometrics.

Figure 1 Per capita GDP country-relative in 1991 and 2011

(a) 1991

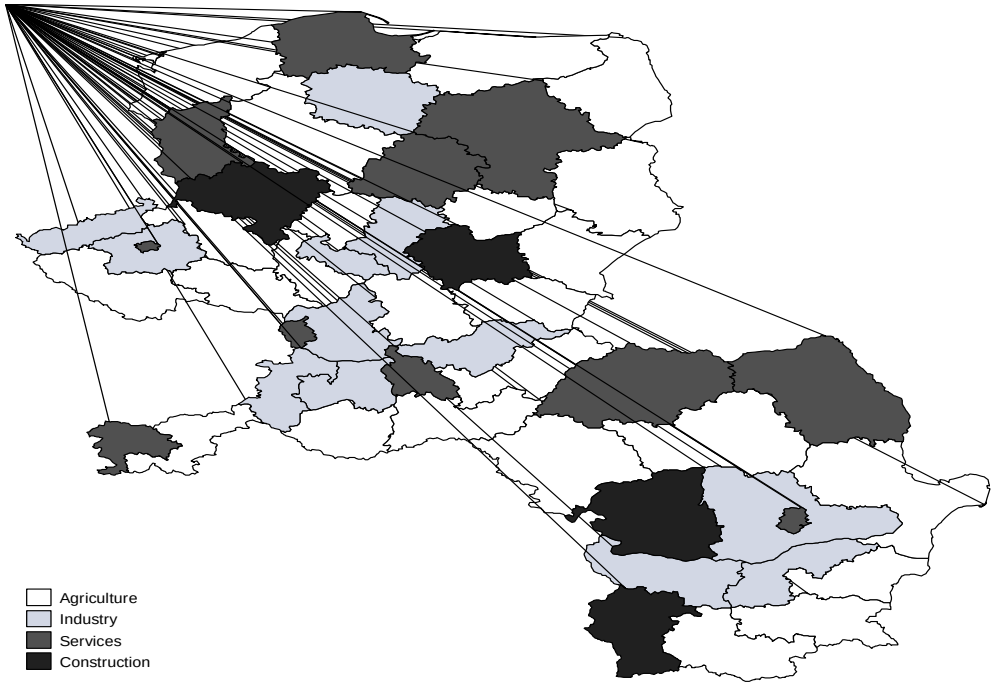
(b) 2011



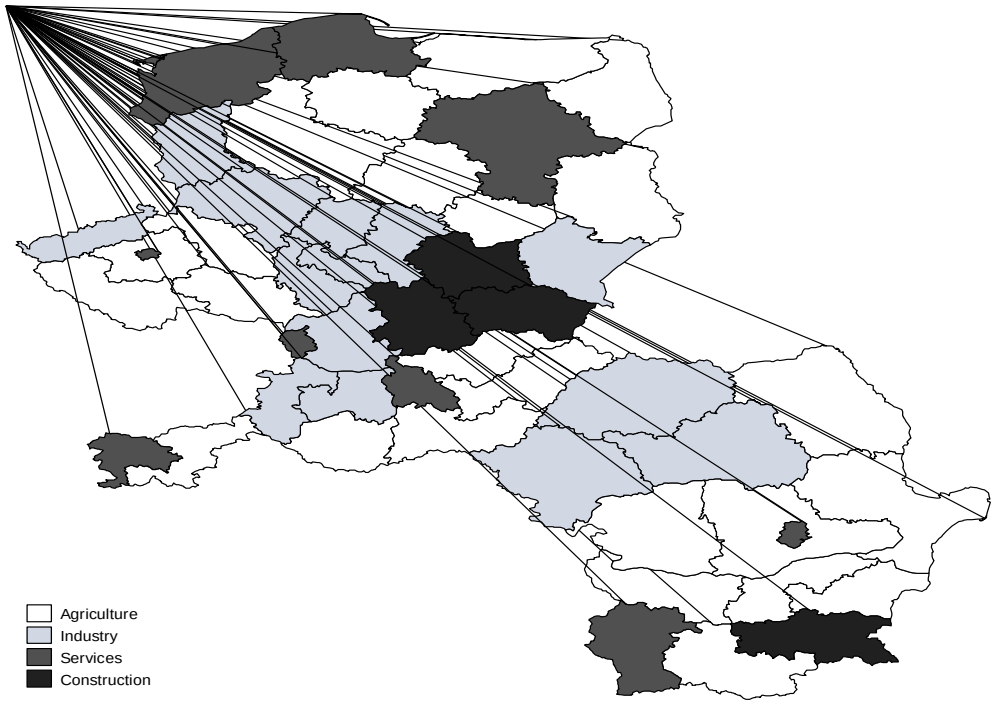
Source: calculated from Cambridge Econometrics.

Figure 2 Regional specialisation country-relative in 1991 and 2011

(a) 1991



(b) 2011

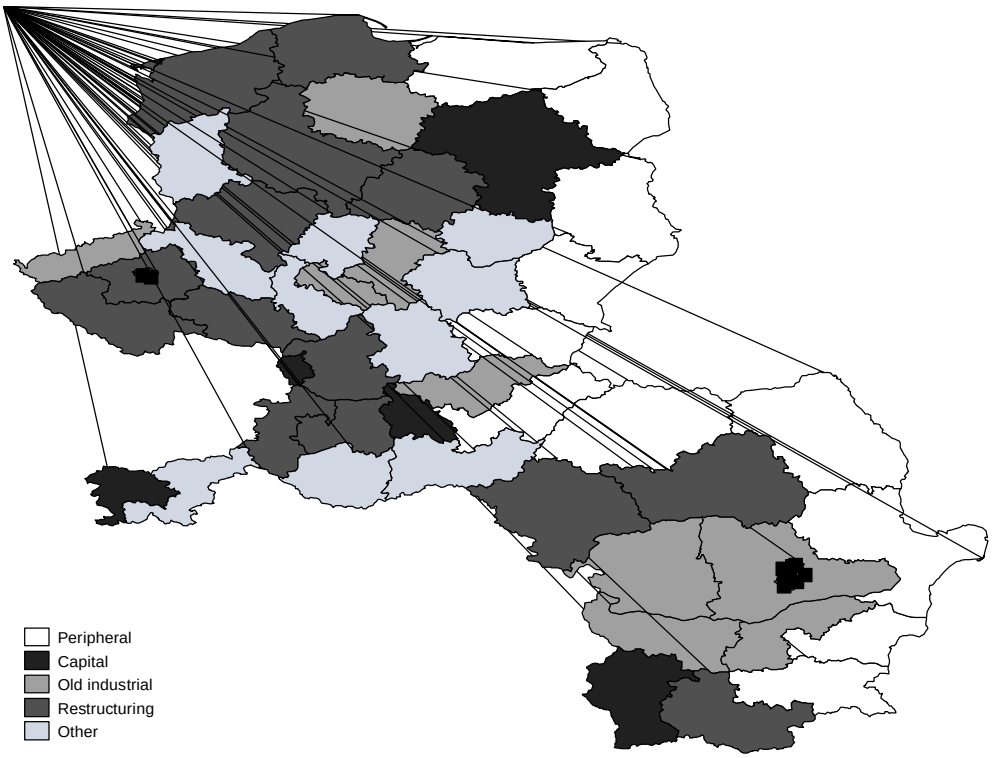


Source: calculated from Cambridge Econometrics.

Figure 3 Shares of regional FDI inflows country relative in 2011

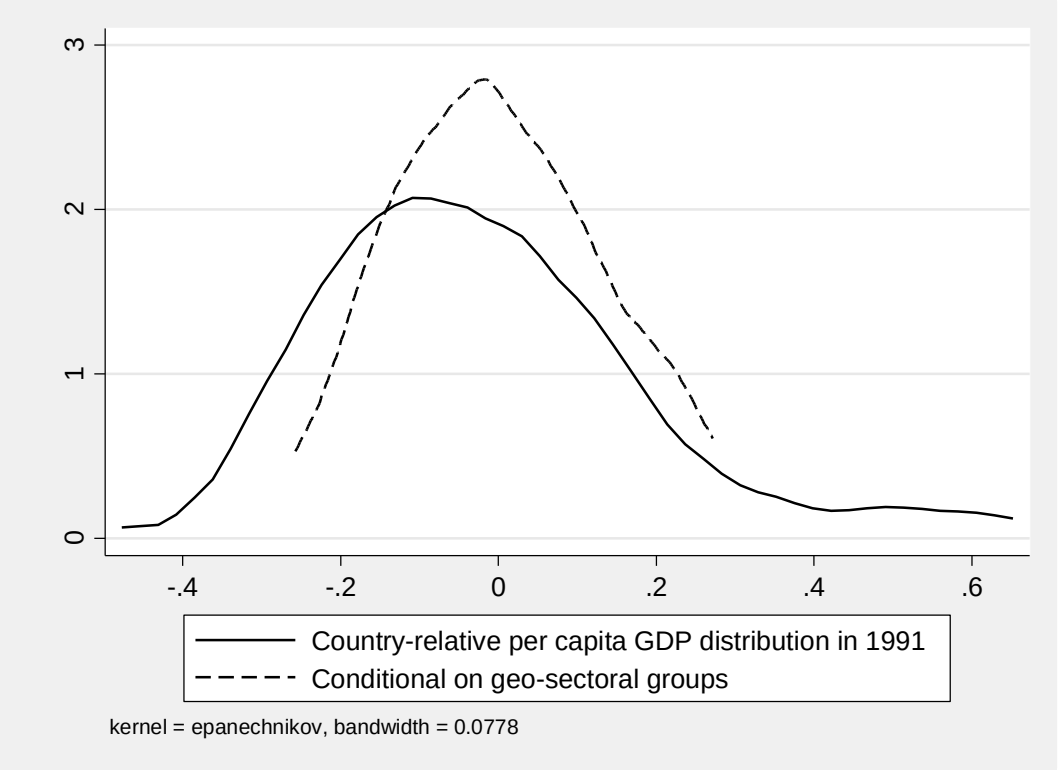
Source: calculated from Cambridge Econometrics.

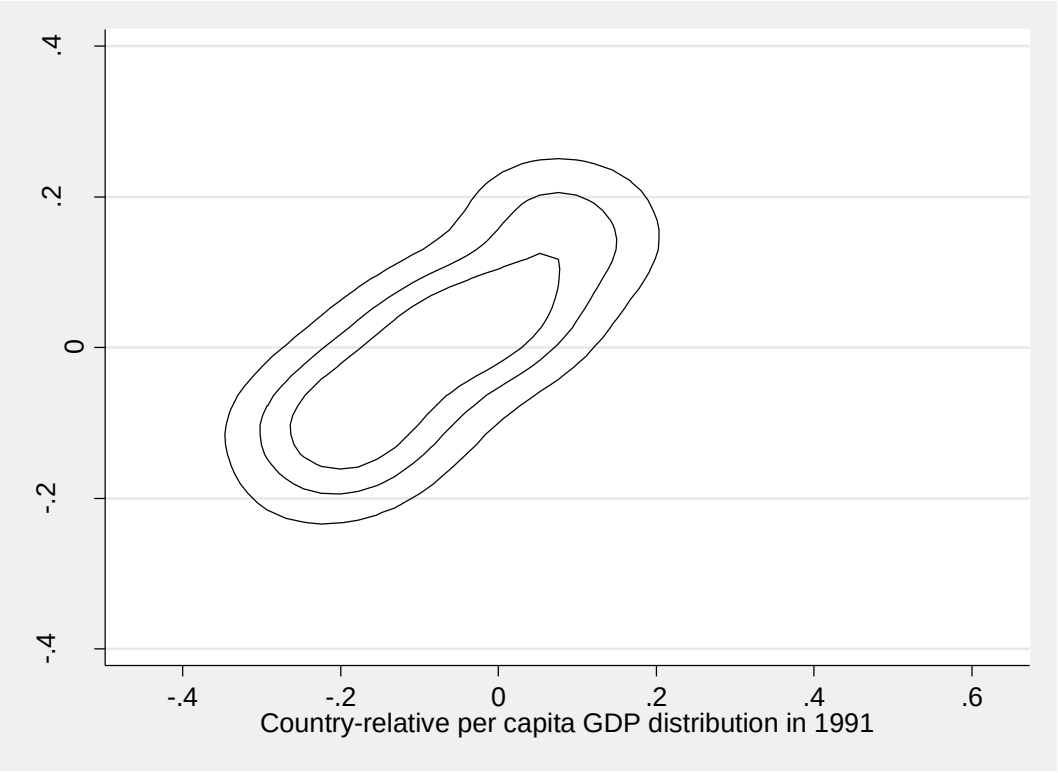
Figure 4 Geo-sectoral groups



Source: calculated from Cambridge Econometrics.

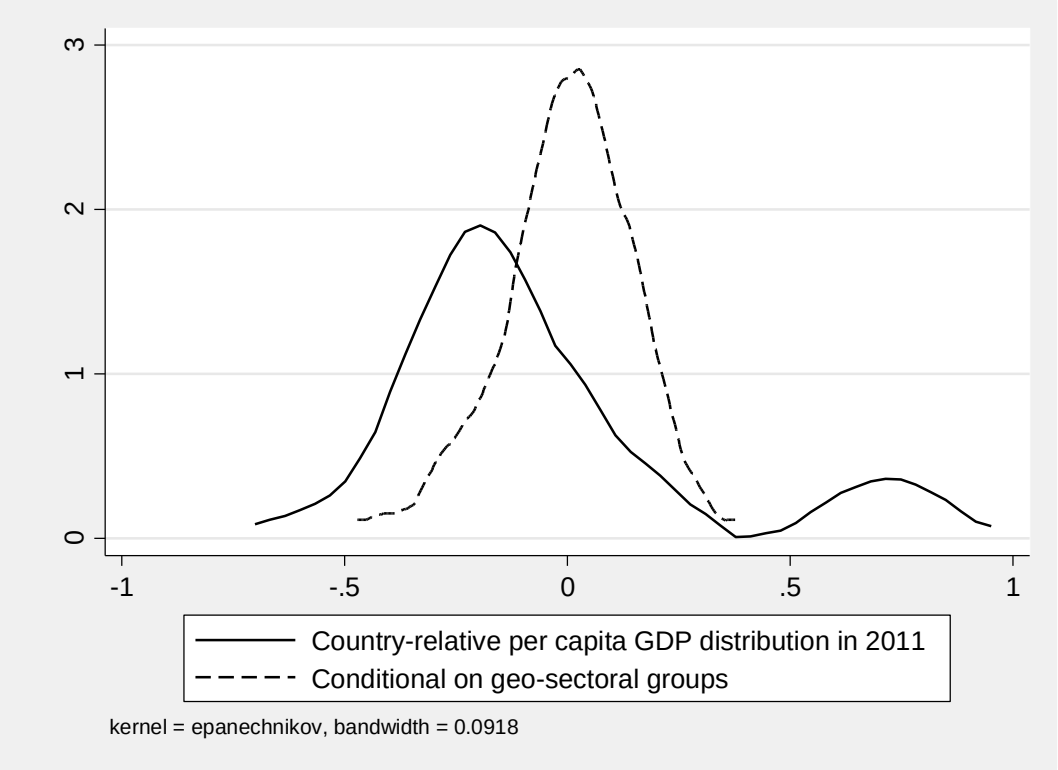
Figure 5 Country-relative per capita GDP in 1991: original distribution, conditional distribution and contour plot

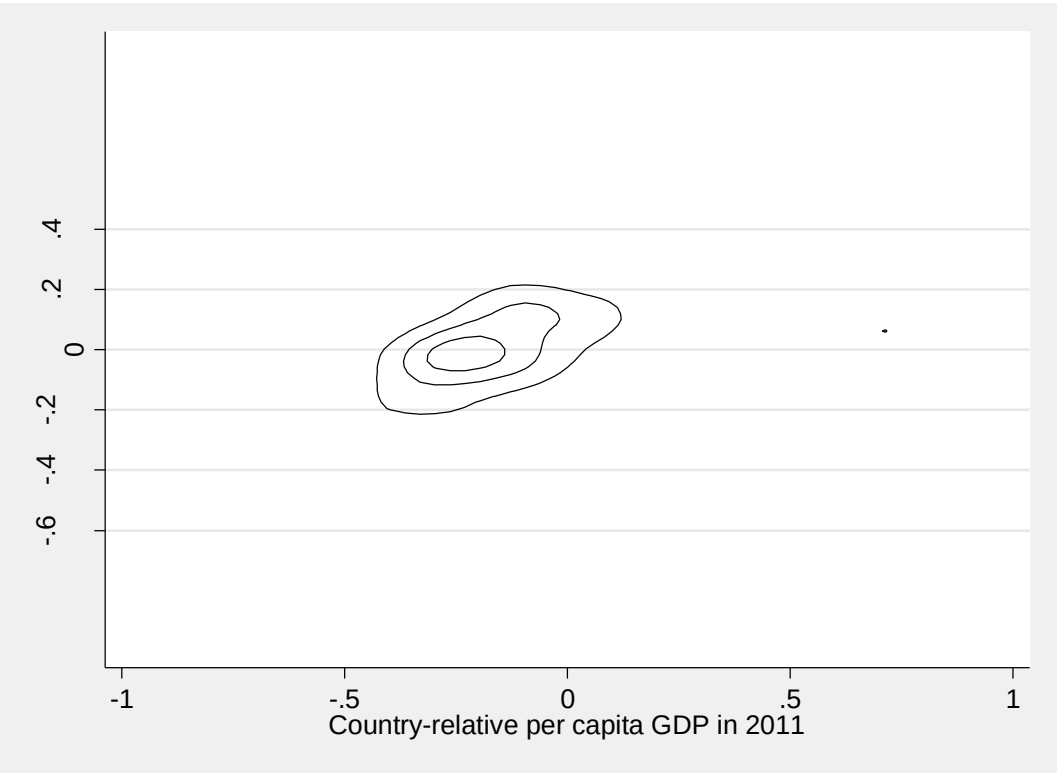




Source: calculated from Cambridge Econometrics.

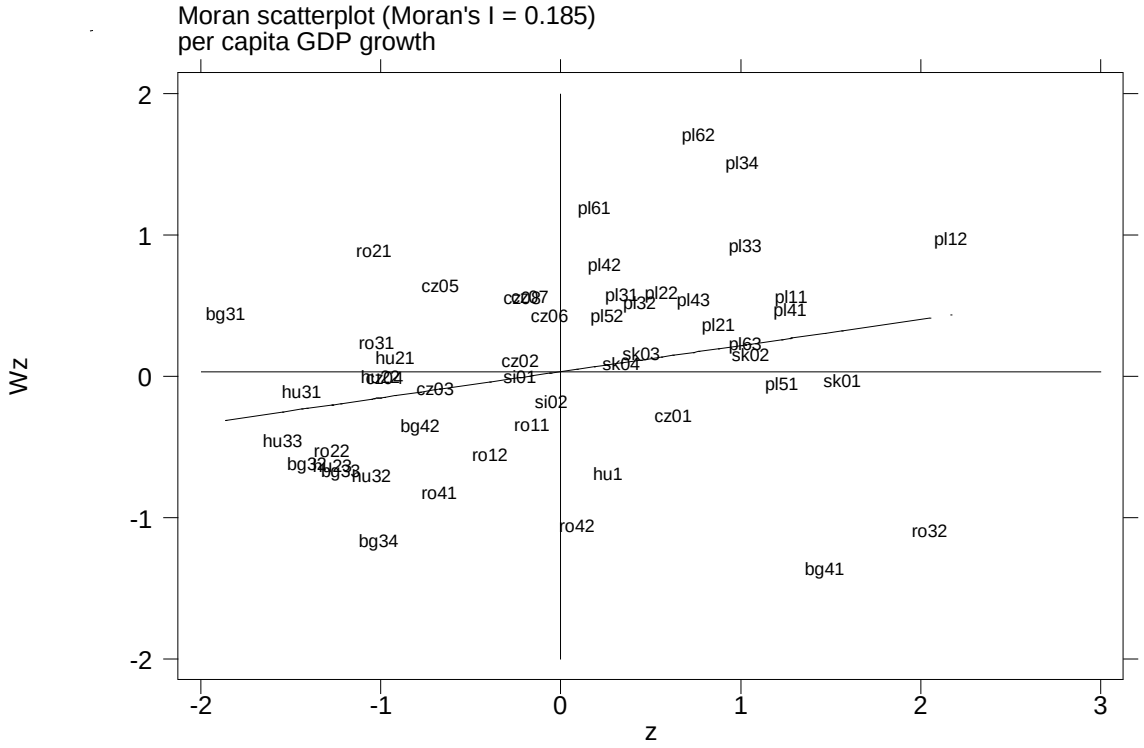
Figure 6 Country-relative per capita GDP distribution in 2011: original distribution, conditional distribution and contour plot

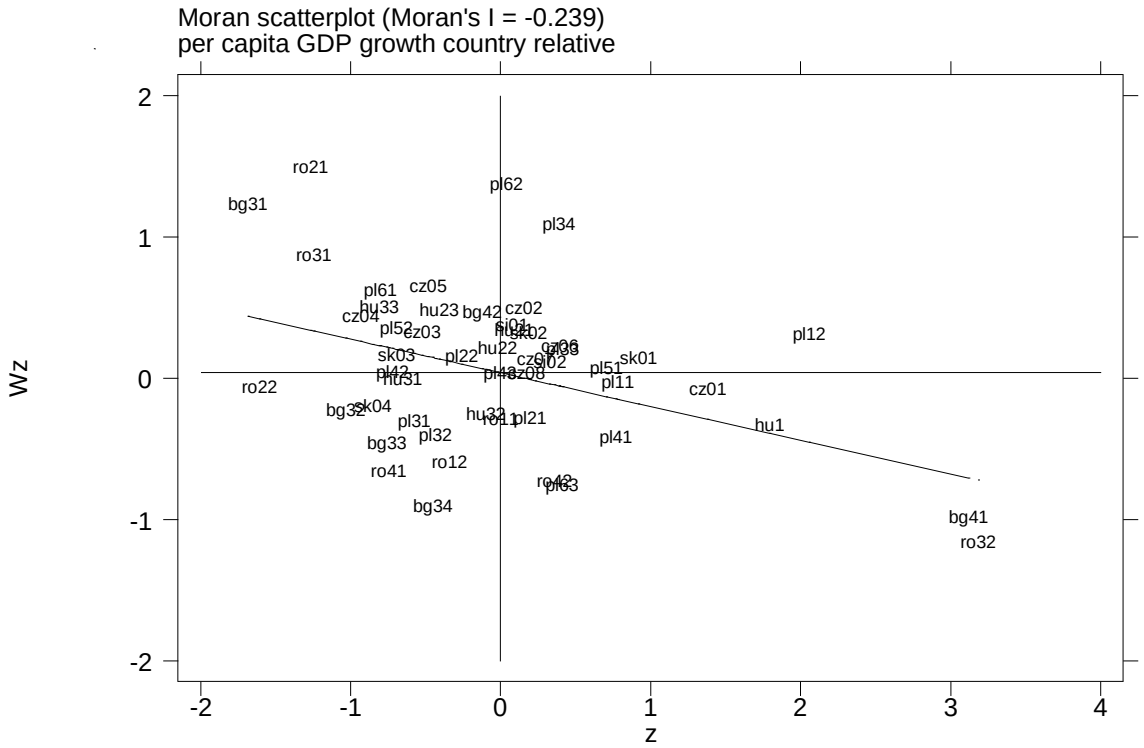




Source: calculated from Cambridge Econometrics.

Figure 7 Moran scatterplots of per capita GDP growth 1991-2011





Appendix 1: The classification of regions in geo-sectoral groups

Nuts_id	Name	Growth employm. 91-00	Country-rel. special. indus. 91	Country-rel. special. indus. 11	Country-rel. special. agric. 91	Country-rel. special. agric. 11	Country-rel. special. serv. 91	Country-rel. special. serv. 11	Country-rel. special. serv. 91*	Country-rel. special. serv. 11*	Foreign Direct Invest.	Category
bg31	Severozapaden	-0.28	1.20	1.17	1.10	2.92	0.89	0.84	1.00	0.97	2.5	OLDIND
bg32	Severen tsentralen	-0.04	1.13	1.29	1.10	2.06	0.94	0.85	1.05	0.98	3.7	OLDIND
bg33	Severoiztochen	-0.03	0.88	0.85	1.10	1.50	1.03	1.02	1.15	1.17	9.3	PERIPHERAL
bg34	Yugoiztochen	-0.11	1.33	1.26	1.45	1.08	0.73	0.81	0.82	0.93	13.6	PERIPHERAL
bg41	Yugozapaden	0.17	0.76	0.82	0.44	0.32	1.26	1.13			62	CAPITAL
bg42	Yuzhen tsentralen	0.13	0.96	1.30	1.32	1.48	0.91	0.83	1.01	0.96	8.8	NEWFDI
cz01	Praha	-0.13	0.68	0.44	0.06	0.21	1.32	1.35			52.3	CAPITAL
cz02	Střední Cechy	0.09	1.21	1.24	1.18	1.39	0.86	0.88	0.93	1.00	10.6	NEWFDI
cz03	Jihozápad	0.17	0.93	1.14	1.70	2.08	0.95	0.88	1.03	1.00	6.8	NEWFDI
cz04	Severozápad	-0.11	1.22	1.26	0.61	0.81	0.88	0.85	0.96	0.97	4.4	OLDIND
cz05	Severovýchod	0.02	1.02	1.21	1.22	1.46	0.95	0.87	1.03	0.99	6.6	OTHER
cz06	Jihovýchod	0.05	1.00	1.06	1.52	1.39	0.96	0.93	1.04	1.06	8.7	NEWFDI
cz07	Střední Morava	0.01	0.93	1.28	1.68	1.15	0.99	0.82	1.07	0.94	3.4	OTHER
cz08	Moravskoslezsko	-0.14	1.33	1.27	0.73	0.51	0.82	0.88	0.89	1.01	7.2	OLDIND
hu1	Közép-Magyarország	-0.14	0.85	0.73	0.27	0.16	1.19	1.18			71.5	CAPITAL
hu21	Közép-Dunántúl	0.22	1.24	1.73	1.18	1.56	0.82	0.67	0.93	0.82	5.4	NEWFDI
hu22	Nyugat-Dunántúl	0.11	1.25	1.60	1.20	1.26	0.83	0.74	0.94	0.91	9	NEWFDI
hu23	Dél-Dunántúl	0.11	0.87	0.89	1.60	2.02	0.99	0.93	1.13	1.14	4	OTHER
hu31	Észak-Magyarország	-0.14	1.30	1.30	0.93	1.49	0.85	0.83	0.97	1.01	2.5	OLDIND
hu32	Észak-Alföld	0.09	0.93	1.05	1.78	2.38	0.91	0.87	1.04	1.07	3	PERIPHERAL
hu33	Dél-Alföld	-0.04	0.98	0.94	2.04	2.41	0.88	0.91	1.01	1.11	4.6	OTHER
pl11	Lódzkie	-0.02	1.02	1.32	0.84	1.74	1.07	0.83	1.09	0.89	4.2	NEWFDI
pl12	Mazowieckie	0.00	0.84	0.55	0.91	0.79	1.11	1.22			43	CAPITAL
pl21	Malopolskie	-0.14	0.98	0.95	0.60	0.72	1.05	0.98	1.07	1.05	4.9	OTHER
pl22	Slaskie	0.00	1.41	1.36	0.37	0.21	0.84	0.92	0.86	0.98	9	OLDIND
pl31	Lubelskie	-0.20	0.85	0.86	1.86	2.27	0.96	0.96	0.98	1.03	1.4	PERIPHERAL
pl32	Podkarpackie	0.03	1.06	1.08	1.12	0.62	0.92	1.00	0.94	1.07	1.6	PERIPHERAL
pl33	Swietokrzyskie	0.12	0.88	1.02	1.60	1.19	1.00	0.96	1.02	1.03	1.1	OTHER
pl34	Podlaskie	-0.02	0.67	0.63	2.08	2.31	1.06	1.09	1.08	1.16	0.4	PERIPHERAL
pl41	Wielkopolskie	-0.04	1.02	1.27	1.49	1.74	0.87	0.82	0.89	0.88	9.3	NEWFDI
pl42	Zachodniopomorskie	-0.03	0.80	0.63	1.13	0.82	1.13	1.14	1.16	1.22	3	NEWFDI
pl43	Lubuskie	0.20	0.69	1.16	0.90	0.86	1.27	0.96	1.30	1.03	2.6	OTHER
pl51	Dolnoslaskie	0.17	1.05	1.47	0.85	0.55	0.96	0.84	0.98	0.90	9	NEWFDI
pl52	Opolskie	0.04	0.90	1.01	1.73	0.91	0.97	1.01	0.99	1.08	1.9	OTHER
pl61	Kujawsko-Pomorskie	-0.10	1.04	1.13	0.97	1.92	0.99	0.87	1.01	0.93	2.7	OLDIND
pl62	Warminsko-Mazurskie	0.06	0.79	0.96	1.84	1.80	1.02	0.96	1.04	1.03	1.1	PERIPHERAL
pl63	Pomorskie	0.19	0.90	0.83	0.76	0.51	1.12	1.09	1.15	1.17	4.9	NEWFDI
ro11	Nord-Vest	0.06	0.93	1.22	1.00	1.19	1.09	0.86	1.16	0.96	4.5	PERIPHERAL
ro12	Centru	0.12	1.13	1.16	1.24	0.95	0.85	0.91	0.90	1.02	7.6	NEWFDI
ro21	Nord-Est	-0.06	0.95	0.88	0.92	1.77	1.09	0.98	1.16	1.10	2.9	PERIPHERAL
ro22	Sud-Est	0.03	0.82	0.90	1.30	1.58	0.97	0.94	1.04	1.05	5.4	PERIPHERAL
ro31	Sud - Muntenia	-0.22	1.18	1.33	1.12	1.47	0.83	0.76	0.88	0.85	7.4	OLDIND
ro32	Bucuresti - Ilfov	0.11	0.99	0.71	0.10	0.03	1.38	1.30			61.7	CAPITAL
ro41	Sud-Vest Oltenia	-0.11	1.08	1.06	0.90	1.62	0.90	0.86	0.95	0.96	3.3	OLDIND
ro42	Vest	0.15	0.87	1.11	1.54	0.89	0.85	0.98	0.91	1.09	7.2	NEWFDI
si01	Vzhodna Slovenija	0.03	1.13	1.39	1.72	1.65	0.83	0.84	1.00	1.00	15.4	OTHER
si02	Zahodna Slovenija	-0.04	0.89	0.70	0.37	0.50	1.15	1.13			84.6	CAPITAL
sk01	Bratislavský kraj	-0.19	0.60	0.60	0.46	0.32	1.26	1.28			61.9	CAPITAL
sk02	Západné Slovensko	0.07	1.22	1.49	1.19	1.33	0.87	0.78	0.94	0.88	19.3	NEWFDI
sk03	Stredné Slovensko	0.00	1.05	0.91	1.22	1.32	0.95	0.96	1.03	1.09	9.3	OTHER
sk04	Východné Slovensko	0.00	1.04	0.85	1.06	1.12	0.98	0.99	1.06	1.12	9.5	PERIPHERAL

* excluding the capital