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## National and regional trajectories of convergence and economic integration in Central and Eastern Europe

Sebastien Bourdin

Territorial Development Institute (France), Normandy Business School. Address comments to [sbourdin@em-normandie.fr](mailto:sbourdin@em-normandie.fr).

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This article tests the hypothesis that the geographical location plays a major role in differentiated economic integration of central and eastern regions at different geographical scales. We implement a local measure of Gini index allowing to measure the economic catching-up of regions (across the period 1995-2007 at the NUTS 2-3 level). The findings indicate that a convergence of the CEEC toward the EU-15 seems to take place but at the cost of widening regional inequalities within each state. Our results suggest also the existence of a west-east gradient of regional economic integration.

Scaling up and convergence are recurrent difficulties for countries wishing to join the European Union. Over the previous decade, the ten Central and Eastern European Countries (CEEC) applying to join have pursued the same strategy of restructuring and approach to European standards. To reach their targets, these countries have taken different paths, and implemented specific policies that have affected the rate and extent of their convergence. While the last two enlargements of the European Union to the East (2004 and 2007) both contributed to economic growth in the new EU Member States (EU NMS), increased economic inequalities at regional level have been observed for these countries (Petraikos, 1996, 2000; Henderson, McNab, & Rozsas, 2008; Aristei & Perugini, 2012).

At stake in transition is the passage of the former communist countries and developing countries with authoritarian regimes towards a more democratic society and an economy where markets play a dominant role. Despite the specific character of na-

tional and regional trajectories, the manner of transition was similar in all countries: a drastic reduction in budget subsidies, a substantial drop in purchasing power and a sharp increase in unemployment, political and democratic transition, and modifications to economic structures (Milanovic, 1998, 1999).

Since 1989, three sets of forces have predominated in Central and Eastern Europe, conditioning the institutional change of economies and of post-socialist countries. There have been endogenous or internal forces, determined primarily by organisations and national stakeholders, European forces driven by the Member States and EU institutions, and finally global forces resulting from international organisations (IMF, OECD, etc.) and multinationals. These three force fields (which can also change) have constantly interfered with each other to varying degrees depending on the phase and the country, and made a significant contribution to the formation of national and regional paths of change.

In this context, it seems to be of interest to consider the differentiated regional integration of Central and Eastern European countries and regions. Beyond the convergence observed between countries and the divergence observed within each country (Ezcurra, Pascual, & Rapún, 2007; Sukiassyan, 2007), the trajectories of convergence between each Central and Eastern European country are different. Several recent studies (Sokol, 2001; Melchior, 2009; Gorzelak, Maier, & Petrakos, 2013) show that there is a West-East gradient for regional economic integration. In this context, we assume that geographic location plays a dominant role in the differential catch-up of countries and regions. Introducing location into the analysis of regional inequalities enables the presence of spatial effects to be highlighted, characterized by spatial autocorrelation and spatial heterogeneity of the convergence process (Le Gallo & Dall'Erba, 2006). In recent years, there have been many studies taking into account the spatial dimension of the data in the analysis of convergence from an empirical point of view (Fingleton & Lopez-Bazo, 2006; Ertur & Koch, 2006; Dall'Erba & Le Gallo, 2008), or integrating spatial interdependencies from a theoretical point of view (Ertur & Le Gallo, 2009). The interest in the geographical nature of regional economic trajectories is thus justified. Ordinarily, the Gini coefficient is a whole-map, locationally invariant measure of inequality (Rey & Smith, 2013). By instead measuring this index locally, we determine a geography of spatial integration of EU countries and regions. In this context, we propose a multiscale approach to the measurement of economic inequalities using the Gini index. Convergence is approached on a local level and a coefficient is estimated for each region. By doing this, we deal with the spatial heterogeneity mentioned in literature, as our model of local spatial convergence divides our sample into cross-sections, by treating each region and the nearby regions as subsamples. We will thus be able to observe whether this local convergence approach brings a spatial structuring of the convergence process to the fore-

ground. According to the works by Rey (2003, 2004), we hypothesize that the emphasis placed on a global measurement of regional inequality may hide different regional trajectories that may have explicit spatial representations reflecting pockets of poverty, convergence clubs and other forms of geographical grouping.

The first part of this article presents the theoretical foundations and conceptual framework of our analysis. We then present the methodology and data used. The third part of the article sets out the results of this approach which aims at demonstrating that the process of convergence and regional integration in Central and Eastern Europe is geographical by nature.

### Theoretical foundations and conceptual framework

The neoclassical growth theory developed by Solow (1956) stating that economic convergence between countries with uneven development is possible, is at the origin of work on economic convergence. He works on the assumption that there are regional disparities at the beginning and that these disparities tend to decrease over time. Each region converges towards a long-run income per capita growth rate called “steady-state rate”. This explains how a country’s economy tends to converge more rapidly if it is below its steady state. The beta and sigma convergence econometric and statistical tests performed on a wide sample of countries, over a period of nearly thirty years, lead us to reject the catch-up hypothesis.<sup>2</sup> In other words, the growth of the countries that are initially the least developed is not systematically quicker than that of developed countries.

Subsequent to these studies, new theories on economic convergence were developed. They are based on Myrdal’s research (1957) which states that growth is a spatially cumulative process likely to increase inequalities. This saw the emergence of new endogenous growth theories resulting from the introductory work of Romer (1986) and Lucas (1988). These models

underline the lack of “diminishing returns to capital”, which is related to the endogenous nature of “production technology”. The level of human capital, the amount of investment in R&D or even “knowledge spillovers” are explanations for divergent growth trends. Another theoretical movement developed following the lead by Paul Krugman (1991): the New Geographic Economy (NGE). It acknowledges that economic activities are focused on clusters and this polarization modifies the spatial distribution of wealth between regions (Fujita & Thisse, 1996). Williamson (1965) is at the origin of the emergence of this economic trend as the author was already highlighting the role of space to explain regional growth at that time. The role of space in this economic theory is essential, as it helps explain the phenomena of economic growth. The geographical distribution of regional growth phenomena is hardly ever random: on the contrary, the economic performance of adjacent regions is often similar.

Studies on convergence resulting from the NGE show that some countries manage to take more advantage of growth, while others fail to do so. We can thus observe two phenomena: economic convergence for some countries, and divergence for others in a synchronous movement. The result of this process is not predetermined, and the new theoretical models that highlight the role of geographic space show that there can be both economic convergence and divergence. As a result, the effects of economic convergence on regional integration can be both positive and negative. It therefore depends a lot on the initial situation, on the ability of the regions to adapt and on the neighbourhood effects. This article proposes the measurement of local convergence in this framework, to assess the simultaneous phenomena of economic convergence and divergence, using the breakdown of inequalities on a local scale.

The neoclassical theory implies that uneven development between countries tends to decrease over time. Having said this, it does not give a satisfactory explanation for the long-run

factors of economic growth. This is why we have favoured an approach based on the arguments of the endogenous growth theory (Romer, 1986; Lucas, 1988) and geographic economy in our article, as they show that the economic situation of a region depends on its interrelations with its neighbours.

Measuring economic convergence at local level is of interest as it enables us to understand the origin of the persistence or reduction in regional disparities in some parts of the EU. Local convergence can be defined as a situation in which convergence rates in terms of economic growth are similar for observations located nearby in space (Ertur, Gallo, & LeSage, 2007). In other words, there could be a spatial clustering of regions with similar sigma convergence coefficients, thus confirming the geographical nature of the regional catch-up process. We can therefore estimate a local convergence index for each region in our sample, then investigate whether these estimations provide empirical confirmation of our concept of local convergence. The interest is therefore to consider both economic conditions and geographic proximity as being potential influences on economic convergence. For instance, the lack of catch-up (even divergence) of a lagging region could be explained by the fact that it is surrounded by other lagging regions with similar convergence rates.

Local convergence measures the reduction (or increase) in economic disparities within a group of adjacent regions. In other words, there is local convergence when the GDP per capita of the regions included in the delineated area tend towards the average level of the GDP per capita of the area in question.

### Methodology and data

During the last decade, the empirical research on economic convergence has rapidly developed and often produces contradictory results (Quah, 1996; Islam, 2003; Abreu, de Groot, & Florax, 2005; Dall’erba & Le Gallo, 2008; Le Pen, 2011). The origin of the

## Equations

$$G(i) = 1 - \sum_{k=0}^n (Y_{k-1} - Y_k)(X_{k-1} - X_k) \quad (1)$$

$$p = \sum_{i=1}^n z_i \quad p_i = \frac{z_i}{p} \quad q = \sum_{i=1}^n x_i \quad q_i = \frac{x_i}{p} \quad s_i = \frac{q_i}{p_i} \quad (2)$$

$$P_i = \sum_{j=1}^i p_j \quad \text{which is the sum of the smallest population values } i. \quad (3)$$

$$Q_i = \sum_{j=1}^i q_j \quad \text{and we also say } P_0 = 0 \text{ and } Q_0 = 0. \quad (4)$$

$$G_\delta(i) = 1 - 2 \sum_{j \in V_\delta(i)} p_j \left[ \frac{q_j}{2} + Q_{j-1} \right] \quad (5)$$

$$\begin{cases} w_{ij}^*(k) = 0 & \text{if } i = j, \forall k \\ w_{ij}^*(k) = 1 & \text{if } d_{ij} \leq d_i(k) \\ w_{ij}^*(k) = 0 & \text{if } d_{ij} > d_i(k) \end{cases} \quad \text{and} \quad w_{ij}(k) = \frac{w_{ij}^*(k)}{\sum_j w_{ij}^*(k)} \quad (6)$$

sensitivity of these results can be found in the differences in ideas about convergence and therefore in the methodology inherent to each approach.

One of these approaches consists in cross-sectional convergence tests introduced by Baumol (1986), and developed by Barro & Sala-i-Martin (1991, 1992). There are two tests (beta and sigma convergence).  $\beta$ -convergence attempts to highlight the fact that poor countries can catch up with rich ones (negative relationship between the variation rate and the initial level), while  $\sigma$ -convergence tries to measure the change in economic disparities (reduction in the difference of GDP per capita between two dates).

In order to highlight the effects of geographic location on the differential catch-up of regions, we propose the development of a local convergence index based on spatialization of the Gini index. Local convergence is an indicator measuring the reduction (or increase) in economic disparities within a group of adjacent regions. In other words, there is local convergence when the GDP per capita of the regions included in the delineated area tend towards the average level of the GDP per capita of the area in question.

Our article proposes a multiscale analysis of convergence thanks to the calculation of a standard Gini index for each country, and the calculation of a local Gini index on regional subsamples. We have chosen the following Gini index—see equation (1)—where  $X_k$  corresponds to the cumulative percentages of the number of regions and  $Y_k$  the cumulative percentages of the GDP per capita of these regions.

We have developed a formalisation of local convergence in order to calculate the local Gini index. We have a spatial measurement  $X = (x_1, x_2, \dots, x_n)$  (for this case study, GDP is in PPS<sup>3</sup>) over a population  $I = \{1, 2, \dots, n\}$  consisting of regions, and over which a spatial measurement is defined (the total population of a region) denoted by  $Z = (z_1, z_2, \dots, z_n)$ . The following notations can be used—see equation (2)—wherein  $s_i$  is the density of  $Q$  compared to  $P$  and is also the density of  $X$  compared to  $Z$ . The order of values is fundamental because the shape of the Lorenz curve depends directly on them. Individuals are thus ordered by increasing density such that  $s_1 \leq s_2 \leq \dots \leq s_n$  (referred to as the Lorenz order). We can define totals using these Lorenz order conditions on individuals: see equations (3) and (4).

We can use these notations to define  $G_\delta(i)$  as the measurement of the

local Gini index of the distribution of the GDP per capita for a region  $i$  and its neighbours  $j$ . This index depends on a neighbourhood  $V_\delta(i)$  of the region  $i$  defined by a spatial weight matrix that may take different forms (inverse of the distance,  $k$ -nearest neighbours or contiguity).

It can be shown that this local index around the region  $i$  is calculated using equation (5):

We have chosen to use a nearest neighbour matrix defined as follows, for our study—see equation (6)—where  $w_{ij}^*(k)$  is an element in the non-standardised weight matrix,  $w_{ij}(k)$  is an element in the standardised row matrix. Also,  $d_{ij}(k)$  is the threshold value defined for each region  $i$  it is the shortest distance of order  $k$  between regions  $i$  and  $j$  such that region  $i$  has exactly  $k$  adjacent regions. In order to make sure that our results are robust, we have implemented the estimations of the local Gini index for  $k = 15$ .

As regards the territorial unit chosen, the NUTS 2 suffers from the MAUP (Modifiable Areal Unit Problem) due to the variability in the size of the European regions. Grasland & Madelin (2006) recommend using a unit in between levels NUTS 2 and NUTS 3: level NUTS 2/3. The data we have used in our article are those from

**Table 1.** Analysis of state trajectories.

	CONVERGENCE (EXTERNAL CATCH-UP)	DIVERGENCE (ABSENCE OF EXTERNAL CATCH-UP)
INCREASE IN INTRA-STATE INEQUALITIES (ABSENCE OF INTERNAL CATCH-UP)		
DECREASE IN INTRA-STATE INEQUALITIES (INTERNAL CATCH-UP)		

Eurostat on the GDP per capita in PPS between 1995 and 2007 at level NUTS 2/3 for all the EU-27 countries. We chose to not use data after 2008 for two reasons; firstly, the economic crisis would have made it more difficult to interpret our results, and secondly, because Eurostat data are incomplete for the chosen unit for the years after 2011 (especially for some Eastern European countries and Italy).

### Results: from global analysis to local analysis of the Gini index

Figure 1 shows the trajectory (overall trend) for each country and the extent of its internal inequalities. The direction and inclination of the arrows (Table 1) make it possible to assess whether there is a situation of convergence or divergence in the European Union between 1995 and 2007.

Figure 1 helps answer the question of whether what we see is a double catch-up – internal (between regions of the same country) and external (between the EU countries) – or if one of the two conditions is not met. First of all, there is a fairly clear-cut difference between the EU-15 countries and the CEECs. Indeed, in 2007, all of the EU-15 countries, except for Portugal and Greece, were above the EU average in terms of GDP per capita, while those of the CEECs were all below. Moreover, the evolution of the regional distribution of GDP per capita for a given country is more even in the EU-15 countries than in the CEECs. Reading this graph, it is possible to conclude

that convergence between the EU-27 countries began between 1995 and 2007. Convergence in the CEECs seems to be present but at the cost of widening regional inequalities within each state confirming former work (Sokol, 2001; Egger, Huber, & Pfaffermayr, 2005; Perugini & Martino, 2008; Sme, Tkowski, & Wójcik, 2012; Gorzelak, Maier, & Petrakos, 2013). The length of the straight lines on the graph for the CEECs shows how these inequalities have consistently widened.

When the communist period ended, market liberalisation in these countries created severe inequalities with, on the one hand, the regions connected to the European or even global system (this is particularly true of capitals) and on the other hand, remote regions where the conversion process is currently underway but remains largely incomplete. The end of this system firstly signalled the rapid disengagement of the government, to which were added budgetary and fiscal crises, significantly reducing the resources to be redistributed, while support for growth centres was favoured over regional planning policies (Bogalska-Martin, 2005; Prchniak, 2011). In this context, regional disparities will widen even faster if the old system is rapidly left behind, and these differences are driven by the strong growth achieved by the capital city regions.

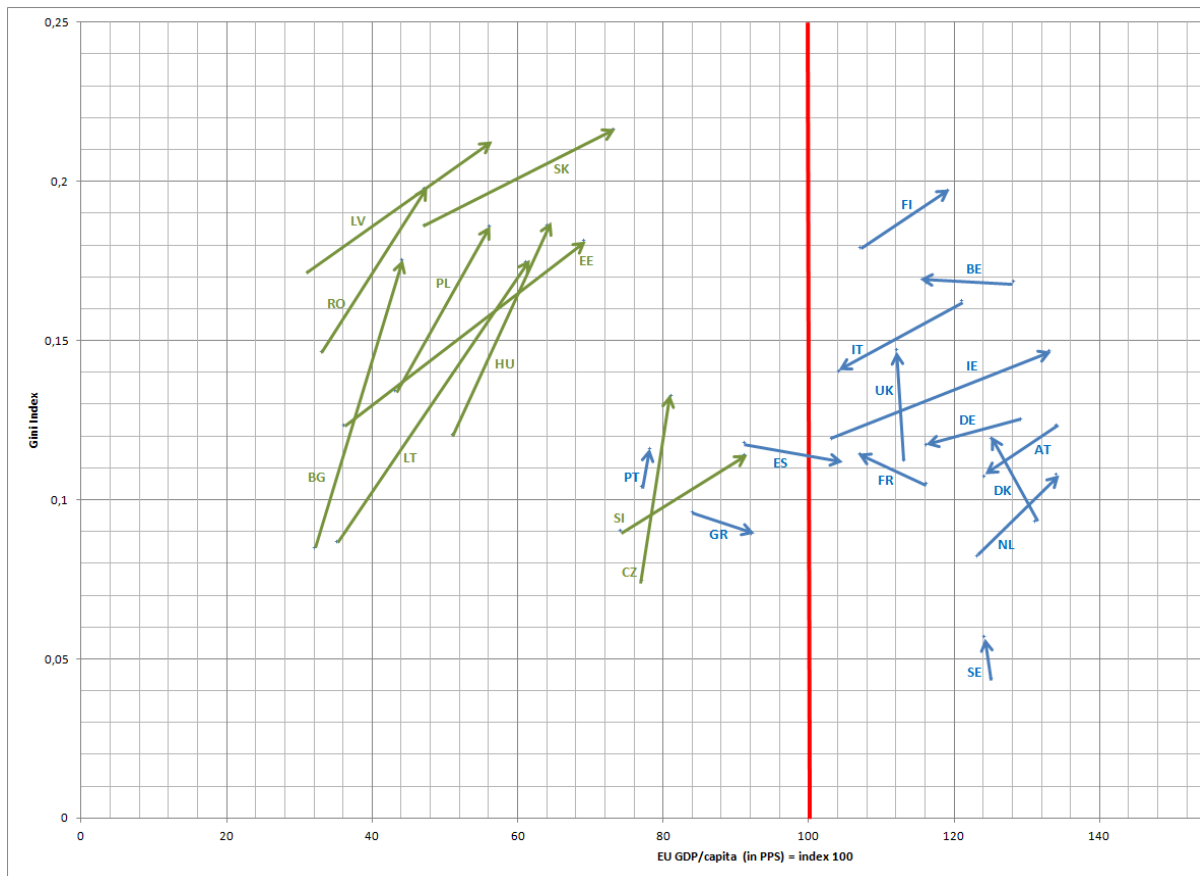
These inequalities in regional integration between metropolitan regions and rural regions farther to the East

question the effectiveness of the different policies pursued by the EU (notably via the cohesion policy) in the opening up of the Central-Eastern territories and their convergence.

The analysis of local convergence (change in the spatialized Gini index  $G\delta$  between 1995 and 2007) shows the formation of a (multi-)polarisation of the convergence process (Figure 2). There is indeed a geographical distribution of convergence phenomena which takes shape in space as a trend toward a grouping of regions in a situation of either local convergence or of local divergence.

The mapping of the variation of the Gini index between 1995 and 2007 highlights the presence of a spatial concentration of regions along the former iron curtain, characterised by local convergence. This wide area is made up of more urbanised regions, with great economic dynamics offering better infrastructures than the rest of Central and Eastern Europe. Exchanges are possible thanks to the existence of differentials (in cost, supply, structure according to age, etc.) between the regions either side of the former iron curtain. In the words of Szűcs (1983), this buffer zone can be characterised as an “in-between” space. It can generally be said that the model of development with a West-East gradient seems appropriate to account for disparities both at a supranational level and on a regional scale. This local convergence area is a privileged space for economic integration with the emergence of cross-border cooperation between the EU and East-Central Europe as well as between East-Central European states. The rapid development of trade relations between Western and Eastern Europe – thanks to the entry of the CEECs into the EU – has led to strong integration between the old blocks (Western capitalist and Eastern communist), so much so that it now seems appropriate to wonder whether the convergence process is not complete, at least for some countries (Festoc-Louis & Roudaut, 2012).

Figure 1. The trajectories of convergence.



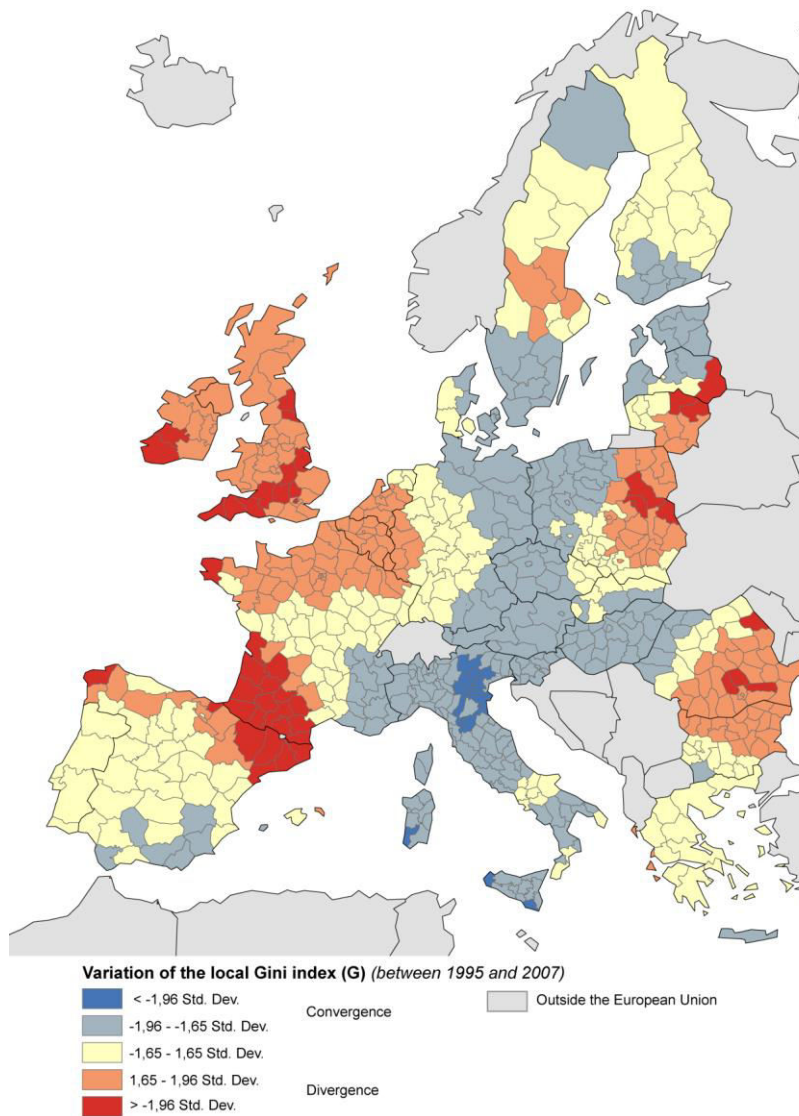
On the other hand, we have found a spatial concentration of regions with high, or even very high, local divergence in Romania and Bulgaria. These considerations refute the results of the empirical research into convergence based on the neoclassical growth theory which assumes that there is a negative correlation between the GDP per capita and the economic growth of regions. Indeed, most of these regions have the lowest GDP per capita in the EU, and despite this, have not recorded the expected growth rates. Other explanations therefore need to be found, and we can find them in the endogenous growth theory and geographic economy. The spectacular economic development of Bucharest may be at the origin of an increase in local inequalities. The capital of Romania has developed, leaving its adjacent regions to one side, at the origin of this sustainable local divergence process. This development in Bucharest at the ex-

pense of other regions is explained in part by the considerable polarisation of foreign direct investment generally in the capital city regions of Central and Eastern European countries. This concentration of investment<sup>4</sup> helps explain the heterogeneity of Romanian regional development (Serbu Mascu, 2007; Petrakos, 2008; Danciu, Goschin, & Gruiescu, 2010). This pocket of local divergence marked by sharp discontinuities provides a concrete example of what Krugman (1996) calls the “agglomeration shadow” effect. This occurs when there is significant domination by an economic centre over the rest of its territory. Given centripetal forces, activities and individuals are attracted by the Romanian capital at the expense of surrounding regions, following the predictions of the gravity model. Therefore, the secondary poles can appear only at a distance sufficient enough to avoid the phenomenon of attraction, leaving the intermediate spaces relatively empty.

From this point of view, the European cohesion policy is confronted with endogenous factors specific to Romania such as administrative inertia, low human capital accumulation, low investment in R&D and its location on the edge of Europe.

A final example is Poland, marked by economic disparity dividing the territory between a local convergence area and a local divergence area (Figure 2). This structural division puts a richer, more urbanised<sup>5</sup> Poland, marked by the domination of Royal Prussia since the 13<sup>th</sup> century, then by Germany until after the Second World War, on one side. Besides, the majority of direct foreign investments are located in the western regions of Poland (Chidlow, Salciuviene, & Young, 2009). In addition, the price differential between Germany and Poland due to the relatively low standard of living of Poles and the low tax on products benefitted Polish border territories

**Figure 2.** A multipolarization of local convergence.



Source: Eurostat and own calculations

which captured German consumers. In contrast, the Eastern Polish regions hardly benefit from this “return to Europe”. This part of the country was once within the Russian sphere of influence (Gorzalak, 2006; Bański, 2010). The pocket of local divergence is characterised by a lack of infrastructure, poor urban fabric, few industries and fragmented agriculture which is not very competitive. It should be noted that between 1950 and 1985, 18 regions (out of 49) in the Eastern part of Poland were entitled to only 0.1% of industrial investments made by the former USSR.

Thanks to the examples of East-Central Europe, Romania and Poland, we have found a process of regional integration that is spatially very differential and highlighted by our local convergence index. We can thus confirm our two original hypotheses. First of all, geographic location (both neighbourhood effects and effects of absolute location in Europe) play a dominant role in the differential catch-up of regions. Secondly, the various regional trajectories observed at a local level are characterised by explicit spatial representations, revealing pockets of poverty or, on the contrary,

grouping of regions with strong economic and territorial dynamics.

### Conclusion

The aim of this article was to question the existence of a “geography of regional integration” with reference to the endogenous growth theory and contribution from the geographic economy. It was also to analyse the process of economic catch-up of states and regions with respect to the EU. Thus, the convergence observed between EU states sometimes conceals an increase in intra-state regional inequalities (global analysis of the Gini index). Moreover, the convergence phenomena observed at a global level produce either convergence or divergence at a local level (local analysis of the Gini index), thus confirming the empirical research stemming from the endogenous growth theory and the NGE. The mapping of the results enables us to account for differential and territorialised regional integration. A large number of regions located either side of the former iron curtain are characterised by a situation of local economic convergence despite very different levels of GDP per capita along the borders (see map 1). In fact, the “wall of money” (Grasland, 2004) that replaced the “iron curtain” seems to be slowly cracking too. These regions recorded high local convergence between the two periods of analysis, and may form an economic convergence club creating long-run growth dynamics, thanks to their geographical grouping.

This differential economic catch-up and these trajectories of local convergence or divergence are based on spatial development considerations of various scales, as well as on the history, both recent and more distant, of the country concerned. At the beginning of the systemic transformation process, certain regions benefitted from “initial” advantages linked to their faster growth, thanks to their past and their infrastructure and equipment endowment. The heterogeneity of geographic space thus appears as an explanation for regional inequalities in development, highlight-

ed in particular by the opening up of the country to the West. From this point of view, the 90s were a watershed and resulted in profound changes for the CEECs, which had to manage the question of the socialist past, while also turning towards the EU.

Spatial clustering of the local convergence process highlighted in this article calls for differentiated political responses. They must take into account the various factors at the origin of regional economic convergence, which include the effects of heritage and context, effects of proximity and European Structural Funds.

In this regard, the latest survey reports about the cohesion policy revealed two points of view that oppose discussion about regional policy (Pike, Rodríguez-Pose, & Tomaney, 2010; Barca, McCann, & Rodríguez-Pose, 2012). On the one hand, the idea of a “space neutral” regional development policy, emphasising the advantages of urban areas and spillovers from geographical concentration (World Bank, 2009; Gill, 2010). On the other hand, a territorial or “place-based” approach that assumes that the territorial/local context must be taken into account – especially the role of institutions, the importance of local knowledge, the socioeconomic characteristics – (Garcilazo, Martins, & Tompson, 2010; ESPON, 2010 and 2013). In this context, the new architecture of the cohesion policy breaks tradition with the projects supported by the European Funds beforehand<sup>6</sup> (European Commission, 2014). For the period 2014–2020, the European Commission has invited each region to present its strengths and to establish a Smart Specialisation Strategy, known as RIS3. Our article shows that local divergence observed in many regions of Central and Eastern Europe questions their ability to implement such strategies due to their structural lag (low capacity of innovation, declining demographics, low level of training, low capacity to unleash European Funds, etc.). Besides, our results question the EU’s capacity to pursue its objectives of cohesion and competitiveness at the same time.

This study must be considered as the first step in the analysis of local convergence as an operative concept to understand the geographical nature of the process to reduce regional inequalities. We have studied convergence in a relatively stable economic context. Future studies could explore the territorial dimension of the European economic crisis (ESPON, 2014) and its impact on the results, and analyse the extent to which spatial clustering of local convergence or divergence could vary in such a context.

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<sup>1</sup> A steady state is an important phenomenon for two reasons: an economy that has reached this state no longer changes, and an economy that has not reached it tends towards it. A steady state represents the long-run balance of an economy.

<sup>2</sup> In order to evaluate the economic convergence of countries/regions, it is possible to rely on the beta or sigma-convergence test.

While beta-convergence focuses on detecting possible catching-up processes, sigma-convergence refers to a reduction of disparities among countries/regions over time. As Quah (1993) shows, the concept of sigma-convergence is more revealing of the reality because it directly describes the distribution of income across countries/regions without relying on the estimation of a particular model. The Gini index is one of the measure to quantify the evolution of dispersion of the GDP over time (sigma-convergence).

<sup>3</sup> Eurostat database (1995-2007)

<sup>4</sup> Although the election of Constantinescu in 1996 led to a significant influx of FDI characterised by economic growth, FDI has not been evenly distributed over the territory (Goschin, Danciu, & Gruiescu, 2008; Raluca and Mihaela, 2011). Bucharest accounts for 85% of national GDP, it holds more than 20% of national export volume and almost 40% of imports, it hoards 55% of national GDP spending on R&D and has an unemployment rate lower than half the national average (3.4% against 7.2% for Romania).

<sup>5</sup> The urbanisation rate is over 65% in the West, while it is under 45% in the East.



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<sup>6</sup> Following the integration of ten CEECs into the EU, a debate about the development of the most lagging regions was initiated. The European Commission (2008) wanted massive investment in resources so that these regions could develop at a quicker pace. Grzegorz Gorzelak (2010) nevertheless asserts that lagging Central-Eastern regions (where agriculture is dominant, there is hardly any industry or services, and even less capital, including social and cultural capital) have never managed to develop thanks to a large influx of European funds.