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Urban Growth Pole Policy and Regional Development: Old Wine in New Bottles?

József Benedek, Ștefana Varvari and Cristian Marius Litan

1 Introduction, Theoretical Background, Goals and Methodology

The concept of growth poles has been introduced by the French economist Francois Perroux (Perroux 1950, 1988) and further developed by Jacques-Raoul Boudeville and José Ramón Lasuén (Lasuén 1973; Schätzl 1998). These authors consider growth poles as urban centres polarising a larger region, where a single large firm or an economic sector generates a growth process, and where sectorial polarisation determines the regional polarisation of firms and population (Benedek and Moldovan 2015). The intensity of regional polarisation depends on the market share size of the dominant economic sector, and can be counterbalanced through the establishment of new growth centres, which may reshape the regional spatial structure.

J. Benedek (✉) · Ş. Varvari · C. M. Litan
Babeş-Bolyai-University, Cluj-Napoca, Romania

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An important effect is attributed to growth poles, namely that they can bring about spatial diffusion of growth towards their zone of influence.

In his overview of growth pole strategies, Parr (1999) demonstrated how the scientific concept of dominance and economic space elaborated by François Perroux became a normative concept in regional economic planning. Moreover, Lang and Török demonstrated in a recent paper how the view of supporting metropolitan areas as national growth engines also became a central element of national urban policies (Lang and Török 2017). The greatest academic and practical interest in growth pole strategies characterised the period from the mid-1960s to the mid-1970s (Parr 1999). However, it failed to achieve its main objective, namely the diffusion of growth, and was consequently largely abandoned in the period following the mid-1970s. For this reason, its revival during the 2000s in Europe came as a surprising evolution.

Against this background, the main aim of this chapter is to evaluate the process and outcome of establishing urban growth poles as key elements of the new regional policy in Romania. This question is particularly relevant for the production and reproduction of socio-spatial disparities. Therefore, we will address in particular the question of whether the strong prioritisation of urban growth poles has reduced or increased regional disparities in Romania in demographic and economic terms. The evaluation of urban growth poles will follow a twofold logic: one is based on quantitative estimation of the economic effects of the urban growth pole strategy (priority axis 1, ROP 2007–2013); the second line of argumentation evaluates the qualitative effect of the growth pole strategy in relation to the main objectives of the major strategic planning documents: Law 315/2004 on regional development and the National Strategic Reference Framework (NSRF) for the period 2007–2013. We argue that growth pole strategies have different features within the Romanian planning context reflecting space, society and governance. Our aim is not to come up with a “total impact” assessment

but rather to emphasise the "conditioning factors" of growth pole policy effectiveness (Fratesi and Wishlade 2017).

2 Setting the Scene for the Growth Pole Strategy: Regional Inequalities in Romania

Following EU accession in 2007, internal spatial inequalities have increased significantly in Romania (Benedek and Török 2014). This process is not particularly specific to Romania, being significant in other CEE countries as well. Moreover, the idea is generally accepted that regional disparities tend to increase during phases of national economic growth, followed by a phase of decrease. According to this perspective, the increase of economic inequalities in Romania seems to fit into this general picture. The difference in GDP per capita from the EU average (EU28 = 100) of the poorest (Nord-Est 34) and richest (București-Ilfov 136) Romanian NUTS-2 region reached in 2015 its maximum level (Eurostat 2017). It is an expression of the strong spatial concentration on the development of very few regions, mostly the capital region. This value is exceeded only by four EU countries (France, Slovakia, Belgium and Germany). If we compare the gaps in GDP per capita from the EU average between the poorest and richest NUTS-2 regions for 2015 and 2004 (102, respectively 40), we see a strong internal spatial polarisation process in a short period of time, unique among EU countries. At the same time, Romania converged significantly at the national level: GDP per capita compared to the EU average increased from 26% in 2000 to 49% in 2012, achieving and exceeding the main goal set in the NSRF 2007–2013: increasing GDP per capita in Romania by 15–20% by 2015.

In other words, the external, country-level convergence to the EU average was accompanied by a strong internal territorial polarisation, creating a dual spatial structure (Benedek 2015). This development contradicts the regional development goals based upon the principles of

subsidiarity, decentralisation and partnership set out in the main planning document, the Regional Development Act 315/2004.

3 The Growth Pole Strategy of Romania: Description and Implementation

Generally, the Romanian case confirms the findings of the territorial governance and regional studies literature which states that EU Cohesion Policy has two major territorial influences: first, it has contributed to a change in the structure of territorial administration with the creation of development regions and a corresponding new institutional framework at the regional level, and, second, it has contributed to a change in the territorial relations between institutions and across different levels of territorial government (Bachtler and McMaster 2008). Before EU accession, it was an obligation for the EU candidate country Romania to meet the requirements of Chapter 21 of the acquis communautaire which sets the conditions and rules for regional policy and requires adoption of the NUTS system. The European Commission (EC) exercises in this way huge influence over the outcome. In addition, the pre-accession EU funding programmes PHARE, ISPA and SAPARD supported among other activities the institution building process. However, the EC does not regulate the status of regional institutions in the member states, which has hindered deeper regionalisation. In other words, the EC has contributed little to the strengthening of regional powers and resources in CEE (Bachtler and McMaster 2008).

The **Regional Development Act** adopted in 1998 and subsequently amended in 2004 stipulates three fundamental principles (subsidiarity, decentralisation and partnership), as well as three fundamental goals (reduction of regional disparities, regional harmonisation of sectoral government policy, supporting regional collaboration) of regional policy. These goals are part of the uncritically adopted European policies in Romanian spatial planning following the collapse of communism (Stringer et al. 2009; Tănăsoiu 2012; Benedek 2014). As part of this

process the general guidelines and principles of the European spatial planning documents have been superseded by the Romanian spatial planning system (Pușcașu 2009; Cotella et al. 2012; Benedek 2013; Benedek and Cristea 2014). More specifically, the **NSRF 2007–2013** defines five EU-financed development priorities (Government of Romania 2007), among them sustaining a balanced territorial development which represents an adoption of mainstream European spatial documents. A second main development goal of Romania was the reduction of the economic and social disparities between Romania and other EU member states by a GDP increase of 15–20% by 2015. These main goals were supported—within the scope of convergence—by seven Operational Programmes (OP). The stated strategic goal of one of these, the **Regional Operational Programme (ROP)**, was to support balanced and sustainable regional development. This is further sustained by five specific aims: increasing the social and economic importance of cities; applying the principle of polycentric development; providing better access to regions, especially by enabling access to city centres and improving public transportation in cities and their surrounding areas; improving regional social infrastructure; enhancing regional competitiveness; increasing the regional economic importance of tourism (MRDT 2012). All except one (tourism) targeted cities, the first two expressly, the next two indirectly. The support given to social and economic infrastructure development was concentrated in cities (Benedek 2016). In other words, the specific aims attributed to the strategic goal of regional development gave a structural advantage to NUTS-3 units (counties) with higher urbanisation rates, contributing in this way to the widening of regional disparities. Within the ROP, each goal was assigned to a priority axis and the corresponding budget allocation, all of which favoured large urban concentration: (1) sustainable development of city growth poles 31.36%; (2) improvement in regional and local transportation infrastructure 19.76%; (3) improvement in social infrastructure 14.81%; (4) consolidation of regional and local business environments 17.93%; development and promotion of tourism 16.14% (MRDT 2012). The projects implemented in Axis 1 of the ROP amounted to

around 2.26 billion EUR, of which 621 million EUR were dedicated to just seven growth poles.

These seven urban growth poles have been defined in **Law 1149/2008 of Urban Growth Centres** as polarising cities, transport hubs, concentrating economic and cultural activities, which will benefit by being given priority for from European and national financing (MRDPA 2008; MRDT 2012). In addition, the same law has defined 13 urban development poles and 170 urban centres as parts of a polycentric regional development policy.

One specific feature of the growth pole strategy in Romania is represented by its strong connection to urban development and planning. All growth poles follow the classification of urban centres by **Law 351/2001 National Spatial Development Plan—Section 4: The Settlement Network**, which has differentiated 12 upper tier cities: the capital city Bucharest (ranked 0) and 11 other cities ranked 1. The seven growth poles were selected from the latter category, one from each development region except the capital region: Cluj-Napoca, Iași, Timișoara, Constanța, Craiova, Brașov and Ploiești.

The same is valid for their governance structure, the newly created metropolitan areas being based in the same legal framework, where metropolitan areas are defined as "territories surrounding major urban agglomerations, where strong transportation, economic, social, cultural and infrastructural interrelations are established" (RP 2001). They differ from the "Suburban Areas", which are "territories surrounding cities, where economic, infrastructural, commuting and leisure interdependencies are established" (RP 2001).

The seven designated growth poles established associations of local administrations called "metropolitan areas" with their neighbouring settlements, an eligibility requirement to obtain European Regional Development Fund (ERDF) funding through the 2007–2013 ROP for urban integrated development projects.

They received ERDF financial support to implement so-called *Integrated Urban Development Plans*, planning documents that were supposed to identify urban and metropolitan areas in need of urban

integrated development investments (urban, transport, social and economic infrastructure) (Benedek and Cristea 2014).

4 Impact Evaluation of the Growth Poles Programme from the Perspective of Regional Inequalities

4.1 Data

In order to estimate the impact of the growth poles policy during the 2007–2013 programming period we took into consideration two main indicators: population by residence as at 1 January each year and local public administration's own incomes for each year for each administrative-territorial unit of Romania (own incomes are mainly made up of local taxes, fees and income tax payable by residents, economic agents, legal entities and public institutions of local importance). The time period analysed is 2004–2016 and was divided into three subperiods: 2004–2007 (pre-programming period), 2007–2013 (programming period) and 2014–2016 (post-programming period). We have to mention that Romania only started to receive European funds after 2009 and received some of them after the programming period ended (in 2014–2016). Population data were collected from official statistics provided by the National Statistics Institute (http://statistici.insse.ro/shop/), and official data for own incomes from the Department for Fiscal Policy and Local Budgeting within the Ministry of Regional Development, Public Administration and European Funds from income and expenditure statements at the administrative-territorial unit level (http://www.dpfbl.mdrap.ro/sit_ven_si_chelt_uat.html).

4.2 Methodology

The data for each year were collected at NUTS-5 level and aggregated at county level. Taking into consideration the way in which the cities

were classified for the 2007–2013 programming period, we organised the data in three groups of counties (the groups were determined by the different types of urban areas in the county that received funding over the 2007–2013 programming period from the Regional Operational Programme Axis 1): Group 1, representing the growth poles and the counties that had growth poles; Group 2, representing the urban development poles and the counties that had urban development poles; and Group 3, representing urban centres and counties with urban centres. Because Bucharest is a much more highly developed municipality than the rest of the cities, it was excluded from the analysis in order not to distort the results. For each county and for every year of the analysed period, we calculated the income disparities among the cities within the same county and income disparities between all localities in the county, even rural ones, respectively. Furthermore, we conducted two types of analysis: (1) comparison between Group 1 (*treated*) and the rest of the country (Groups 2 and 3—*non-treated*); (2) comparison between Groups 1 and 2 (*treated*) and the rest of the country (Group 3—*non-treated*) in order to assess the changes in disparities during the analysed period and draw some conclusions regarding changes in the three different sub-periods of time and the effect that the input of European funds might have had in this evolution.

Inequalities/disparities were measured using Gini coefficients, which were based on own income per capita of localities, as shown in the following formulas:

$$G\_cities_{k,t} = \frac{\sum_{i=1}^{n_{kt}} \sum_{j=1}^{n_{kt}} \left| x_{ikt} - x_{jkt} \right|}{2 \cdot n_{kt} \cdot \sum_{i=1}^{n_{kt}} x_{ikt}} \quad (1)$$

where k represents the county, t represents the year for which the Gini coefficient characterising the county is calculated, n_{kt} represents the total number of cities in the county k in year t (usually constant for the analysed period), x_{ikt} represents own income per capita in year t for city i in county k.

$$G\_alloc_{k,t} = \frac{\sum_{i=1}^{m_{kt}} \sum_{j=1}^{m_{kt}} \left| x_{ikt} - x_{jkt} \right|}{2 \cdot m_{kt} \cdot \sum_{i=1}^{m_{kt}} x_{ikt}} \tag{2}$$

where k represents the county, t represents the year for which the Gini coefficient characterising the county is calculated, m_{kt} represents the total number of *administrative-territorial units* in county k in year t (usually constant for the analysed period), x_{ikt} represents own income per capita in year t for locality i in county k.

According to the proposed grouping of the counties k belongs to $GR1 \cup GR2 \cup GR3$, where $GR1$ are those counties which had growth poles, $GR2$ is the group of those counties which had urban development poles and $GR3$ is represented by the rest of the counties. The groups $\{GR_i\}_{i=\overline{1,3}}$ represent a partition of the total set of counties (except for Ilfov county, which includes the city of Bucharest). Nevertheless, if we calculated the Gini coefficient of the Ilfov county without considering the city of Bucharest, the results did not qualitatively change irrespective of including this country in the analysis of *GR3* or not.

In this chapter we have not considered analysing the amount per capita received by different urban areas through the ROP Axis 1. Understanding such an influence remains for further research. Our purpose here in partitioning the set of counties was to get a clear picture of the way municipalities were treated and how they benefited through the ROP.

Both analyses conducted are concerned with the mean comparison of disparities between treated and non-treated groups of counties and its evolution in time. The names and definitions of the time series investigated and graphically represented in the next section are relegated to Table 1 (see Appendix).

Since one of our aims in this chapter was to understand the time pattern of the difference between the (average) disparities in treated counties and the (average) disparities in non-treated ones, we also employed statistical tests to determine whether, at a specific moment in time, the distributions of Gini coefficients were significantly different between

the two sets of counties (Student's *t*-test, or the more general Mann–Whitney *U*-test). Moreover, in the spirit of the difference-in-difference methodology (DID) we also compared the average change over time in the Gini coefficient of the treated group of counties versus the average change over time in the Gini coefficient of the non-treated group (the two moments in time were usually represented by one year within the pre-programming period and another within the post-programming period). Detailed results of statistical tests relating to the next section are available upon request.

There are certain caveats to the presented methodology: the non-treated group of counties cannot really be assimilated to a control group in a natural experiment, the sizes of the groups of counties are small for both parametric and especially non-parametric tests, own income per capita should be robustly tested whether representing or not a good proxy to measure income inequality between the cities/localities within a county, the DID method is subject to certain biases, etc.

Nevertheless, the patterns evidenced by this methodology in the next section should be taken into discussion when evaluating whether the regional policy has achieved its essential objective, which is the reduction of regional disparities.

4.3 Main Results of the Evaluation

According to the Final Implementation Report published in March 2017 by the Management Authority of the 2007–2013 ROP, a total sum of EUR 3.97 billion was allocated for the entire programme from the European Regional Development Fund and the absorption rate of community funds was 93.5%, for implementing 4491 finalised projects and the creation of 24,994 jobs. When it comes to Priority Axis 1 (major intervention area 1.1) the situation shows that a total of EUR 1.05 billion was paid to beneficiaries, of which EUR 770 million came from the ERDF, for 505 finalised contracts (the absorption rate from the ERDF was 72% of the amount allocated for this axis).

This section presents the main results obtained by applying the above methodology in order to see how the disparities within counties changed

during 2004–2016 and the degree to which funds of different types, allocated through the 2007–2014 ROP, influenced these disparities.

The general picture is shown in Figs. 1–6 in the Appendix. On the one hand, Figs. 1 and 2a show for the whole analysed period a decreasing trend in the Gini coefficients for all groups of counties, when the measure of inequality is calculated only for the cities within a county. However, more careful analysis reveals that the average Gini coefficient for the counties in *GR*1 has a sharp decrease (except year 2008) until 2009, and then a steady increase until 2014, followed by a slight decrease for the years 2015–2016. The average Gini coefficients of *GR*2 and *GR*3 show an almost continuous decrease during the period 2004–2016, except for a sharp increase for the years 2010 and 2011. The average Gini coefficient of the reunion $GR2 \cup GR3$ follows the same evolution as each of the individual sets *GR*2 and *GR*3 (see Fig. 2a).

On the other hand, Figs. 3 and 4a present the evolution of the average Gini coefficients for the groups of counties, when the measure of inequality is calculated for all localities within a county. In this case the evolution is similar for all three groups, the average Gini coefficients showing an almost continuous decrease until 2014, except for a slight increase for the years 2010 and 2011. There is an abrupt increase in 2015 for all three groups, followed by a decrease in 2016. The average Gini coefficient of the reunion $GR2 \cup GR3$ follows the same evolution as each of the individual sets *GR*2 and *GR*3 (see Fig. 4a).

When analysing the time pattern of the difference between the average Gini coefficient characterising the counties of *GR*1 with respect to the average Gini coefficient for the rest of the counties, a clear U-shape pattern can be identified (see Figs. 2b and 4b, Analysis 1).

In Fig. 2b this pattern means that the counties in *GR*1 start with statistically significant higher Gini coefficients than $GR2 \cup GR3$ for the pre-programming period (2004–2006), then there are no statistically significant differences between the Gini coefficients for the two groups analysed for most of the programming period (2007–2012, except the year 2008). The difference sharply increases to positive statistically significant values for the post-programming period. (The significance is based on *t*-tests and/or Mann–Whitney tests with a $p\text{-value} < 0.05$. See Fay and Proschan (2010) for a comprehensive

survey on the ways in which the decision rule and the *p*-value from either test of the two could be associated.) The DID technique proves that the difference in the average Gini coefficient between *GR*1 and *GR*2∪*GR*3 has returned to the same values in the post-programming period as was the case in the pre-programming period. The same qualitative view is offered by Fig. 4b, when the Gini coefficients as measures of inequality within counties are calculated based on all the localities of a county.

Figure 6 (Analysis 2) presents the evolution of the average Gini coefficients when the treated group is *GR*1∪*GR*2 compared with change in *GR*3 (considered non-treated). Even with this change in the combination of groups, the average Gini coefficients follow the pattern already evidenced by Fig. 3 (see Fig. 6a), and the difference between the average Gini coefficients has a U-shape pattern (see Fig. 6b) similar to that given earlier in Fig. 4b.

Figure 5 alone does not show the patterns identified. The Gini coefficients calculated based on cities within counties move very close to each other when averaged for *GR*3, and *GR*1∪*GR*2, respectively.

The most important results of our empirical evaluation can be summarised as follows:

a. during the programming period, the group of counties with growth poles show a steady increase in those Gini coefficients which are based only on cities in the counties;
b. immediately after the programming period, all considered groups of counties exhibit a sharp increase in average in those Gini coefficients which are based on all localities in the counties;
c. the most stable pattern statistically tested is represented by the U-shape difference between the average disparities of treated counties versus non-treated ones (in both Analysis 1 or 2, irrespective of how disparities within a county are calculated). This suggests that the programming period is just a transitory period of uniformity between treated counties and non-treated counties in terms of disparities. Whenever inequality rises again (after the programming period),

the treated group of counties always increases more rapidly than the non-treated counties.

5 Regional Policy and Growth Pole Strategy Between 2014 and 2020

The Partnership Agreement of Romania to the European Commission identifies the following challenges: poor competitiveness, high and rising social inequalities, underdevelopment of transportation and communication infrastructure, low energy efficiency, significant environmental risks and low administrative capacity. They do not differ from the goals of the previous programming period: catching up with the EU average and increasing the employment rate. This is by no means surprising, since the biggest delays have been registered in these two sectors and the rate of employment is closely linked to productivity (Benedek 2016).

Of the European Union's seven-year budget for 2014–2020, Romania will receive resources amounting to 21.826 billion euros, which should sustain the goals of the EU's Cohesion and Rural Development Policies, helping Romania and its regions to catch up with the EU average, as well as improving the competitiveness of agriculture and the retention rate of rural areas.

For the 2014–2020 programming period, approximately the same amount will be allocated for sustainable urban development (Priority Axis 4 of the new ROP set at EUR 1.39 billion, of which EUR 1.18 billion came from European Structural and Investment Funds) as in the previous period (Priority Axis 1 set at EUR 1.35 billion, of which EUR 1.08 billion came from Structural Funds). Of the various regional problems the growth pole strategy was initially set up to address (depressed-area revival, regional deconcentration of population and economy, equilibration of the national urban system, etc.) the pursuit of interregional balance and the reduction of regional disparities therefore represent the prevailing goals of implementing the growth pole concept in the Romanian context.

Considering increasing criticism of concentrating public resources in a small number of growth poles in the 2007–2013 programming period, the Romanian Regional Development Strategy for the 2014–2020 cycle proposes a new approach, in which more attention is given to medium-size cities, especially the ones with the capacity to spread growth in their surroundings (Benedek and Cristea 2014).

To this end a new urban ranking methodology has been proposed by the Romanian Ministry of Regional Development and Public Administration for the 2014–2020 ROP. While the initial proposal was based on demographic, economic, accessibility and geographic criteria, the final outcome reflects rather a simplistic view: all county seats will function as growth poles (39 county seats), except Tulcea, which will benefit from the Danube Delta Integrated Territorial Investment instrument and the municipality of Bucharest, which is the country capital and is considered a more developed region at the EU level, its GDP/capita surpassing the EU average.

These county seats are eligible for funding under Axis 4 "Support sustainable urban development" of the 2014–2020 ROP. Main priority investments refer to: public transport based on Sustainable Urban Mobility Plans (roads, bike paths, acquisition of green/electric vehicles, etc.), rehabilitation of urban areas (brownfield redevelopment, etc.), urban marginalised communities (educational, cultural, and recreational facilities, green areas, public squares, parks, urban streets, and small-scale public utilities) and educational infrastructure (nurseries, kindergartens, technical and professional high-schools).

As a prerequisite for obtaining funds through Axis 4 of the new ROP, the 39 county seats must put together an integrated urban development strategy at the administrative territorial unit level or the functional urban zone level of the county capital. The strategy should address the economic, environmental, climate, social and demographic challenges of the city (according to Art. 7 of the ERDF Regulation No. 1301/2013). Another novelty in the institutional framework, as specified in Art.

7 of the Regulation (EU) No. 1301/2013 of the European Regional Development Fund, is the requirement to appoint an "urban authority". These institutions will be established at the county seat level by order of the mayor and act as Intermediate Bodies. The Managing Authority of the ROP will task them with for selecting the priority list of projects to be financed by the Priority Axis 4 of the 2014–2020 ROP and other axes of the ROP, including those which could be funded from other sources (other operational programmes, local budget, national budget, etc.).

6 Conclusions

During the transition period, Romania has rapidly adopted the European mainstream discourse on polycentric regional development. Urban growth poles have been defined as main tools in achieving equilibrated spatial development. Classifying the growth pole concept as part of the national urban system represents a specific feature of Romanian planning. Unfortunately, this could have contributed to the widening of regional inequalities. Our empirical analysis suggests that by proceeding in this way the national regional policy might have failed to achieve its main goal: to reduce regional differences at the development level in the medium or long run.

There are other instances of growth pole strategies that present similar stumbling blocks to those in Romania. For example, in the case of Greece (Christofakis and Papadaskalopoulos 2011) critics have focused on such aspects as: the absence of a fixed and long-term typology of urban centres, the lack of empirical studies on the growth potential of designated cities, the absence of additional sectoral policies supporting the growth pole strategy (transportation policy, mobility policy, etc.), urban governance difficulties, absence of integrated development plans.

Urban agglomerations in general and growth poles in particular took centre stage in the current programming period. However, as an

indirect recognition of the fact that the high prioritisation of urban growth poles development in the previous programming period might have increased the level of regional disparities in Romania, the actual plans expanded the number of growth poles. They included one growth pole for each county (NUTS 3 level), namely their administrative centres. In this way, it is expected that the allocation of different financial instruments to support these new spatial planning categories could be a powerful instrument for the reduction of regional disparities.

The introduction of the growth pole concept in Romania can be considered a good example of the Europeanisation process. Nevertheless, the general guidelines and principles of European spatial planning documents have not been accounted for in a critical way.

The main scientific contribution of this chapter lies in its empirical demonstration of the medium and long run failure of regional policy in achieving its essential objective: the reduction of disparities between different regions/counties.

Indeed, our results show that, irrespective of whether just the cities or all the localities are considered in the calculation of within county inequalities, there is a decreasing trend in disparities within counties along the analysed period. Even so, when looking at different sub-periods of time, it is noticeable that on average the disparities between cities within a county which has a growth pole slowly increased during most parts of the programming period.

Furthermore, analysis of the time pattern of disparities between counties with growth poles (or with urban development centres) and the rest of the counties showed that, for the post-programming period, the former group (*treated* ones) exhibits a higher pace of re-increasing inequalities within a county than the latter group (*non-treated* ones). With its focus on sustaining large urban agglomerations, regional policies in Romania do not seem to have a medium- or long-term effect on reducing inequalities within those counties comprising large urban centres. This adds some new arguments to re-thinking spatial policies in Europe in times of increasing local and regional polarisation.

Our future work will look at the influence that funds from ROP Axis 1 have on the different urban areas. We also want to include the municipality of Bucharest in the analysis, investigate the driving role Bucharest and Ilfov play in regional polarisation, as well as whether the regional policies applied to Romania are able to influence this process. The third direction is to compare *treated* cities with *non-treated* localities (cities and rural areas) without aggregation at the county level.

Appendix: Tables and Figures

See Table 1 and Figs. 1, 2, 3, 4, 5, and 6.

Table 1 The names and definitions of the analysed time series

Variable name	Definition
$GINI\_COUNTY\_CITIES\_GR1_t$ $GINI\_COUNTY\_ALLOC\_GR1_t$	The average Gini coefficient calculated for the counties in *GR*1 in period t: $\frac{\sum_{k \in GR1} G\_cities_{k,t}}{7}$ or $\frac{\sum_{k \in GR1} G\_alloc_{k,t}}{7}$, where the sum is over the set of 7 counties with growth poles (Gini calculated based only on cities or on all localities)
$GINI\_COUNTY\_CITIES\_GR2_t$ $GINI\_COUNTY\_ALLOC\_GR2_t$	The average Gini coefficient calculated for the counties in *GR*2 in period t: $\frac{\sum_{k \in GR2} G\_cities_{k,t}}{13}$ or $\frac{\sum_{k \in GR2} G\_alloc_{k,t}}{13}$, where the sum is over the set of 13 counties with urban development centres (Gini calculated based only on cities or on all localities)
$GINI\_COUNTY\_CITIES\_GR3_t$ $GINI\_COUNTY\_ALLOC\_GR3_t$	The average Gini coefficient calculated for the counties in *GR*3 in period t: $\frac{\sum_{k \in GR3} G\_cities_{k,t}}{21}$ or $\frac{\sum_{k \in GR3} G\_alloc_{k,t}}{21}$, where the sum is over the rest of counties (Gini calculated based only on cities or on all localities)
$GINI\_COUNTY\_CITIES\_2AND3_t$ $GINI\_COUNTY\_ALLOC\_2AND3_t$	The average Gini coefficient calculated for the counties in *GR*2∪*GR*3 in period t: $\frac{\sum_{k \in GR2 \cup GR3} G\_cities_{k,t}}{34}$ or $\frac{\sum_{k \in GR2 \cup GR3} G\_alloc_{k,t}}{34}$ (Gini calculated based only on cities or on all localities)
$GINI\_COUNTY\_CITIES\_1AND2_t$ $GINI\_COUNTY\_ALLOC\_1AND2_t$	The average Gini coefficient calculated for the counties in *GR*1∪*GR*2 in period t: $\frac{\sum_{k \in GR1 \cup GR2} G\_cities_{k,t}}{20}$ or $\frac{\sum_{k \in GR1 \cup GR2} G\_alloc_{k,t}}{20}$ (Gini calculated based only on cities or on all localities)

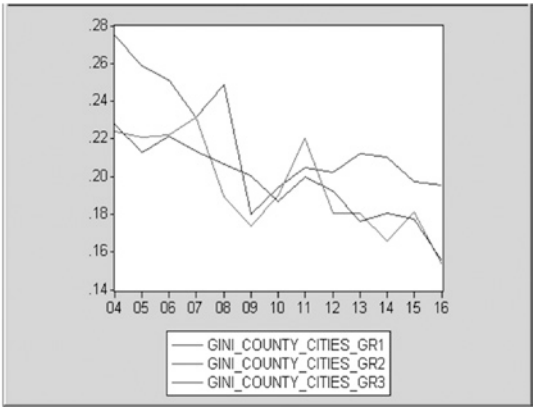

Fig. 1 Evolution in time of average Gini coefficients for all three groups of counties (Gini coefficients are based only on disparities between the cities of a county)

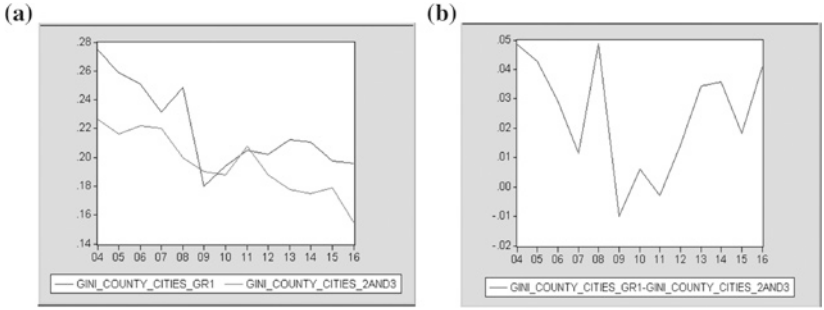

Fig. 2 (Analysis 1): **a** Evolution in time of average Gini coefficients for *GR*1 (*treated*) and *GR*2∪*GR*3 (*non-treated*), respectively. **b** Evolution in time of the difference between the average Gini coefficients of the treated versus non-treated groups of counties (Gini coefficients are based only on disparities between the cities of a county)

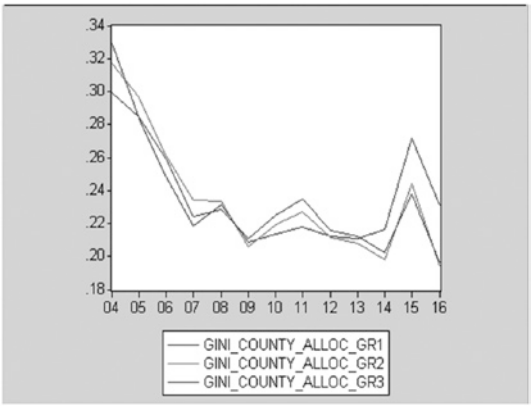

Fig. 3 Evolution in time of average Gini coefficients for all three groups of counties (Gini coefficients are based on disparities between all localities of a county)

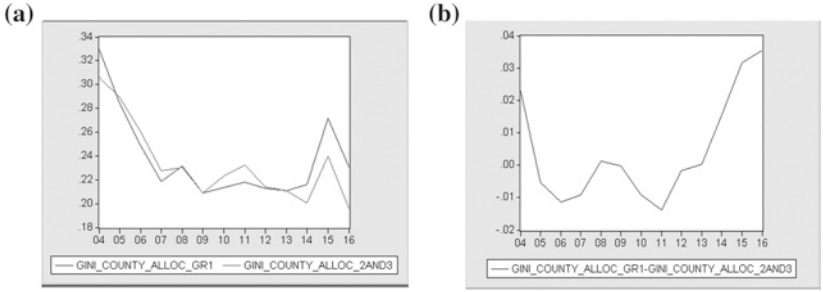

Fig. 4 (Analysis 1): **a** Evolution in time of average Gini coefficients for *GR*1 (*treated*) and *GR*2∪*GR*3 (*non-treated*), respectively. **b** Evolution in time of the difference between the average Gini coefficients of the treated versus non-treated groups of counties (Gini coefficients are based on disparities between all localities of a county)

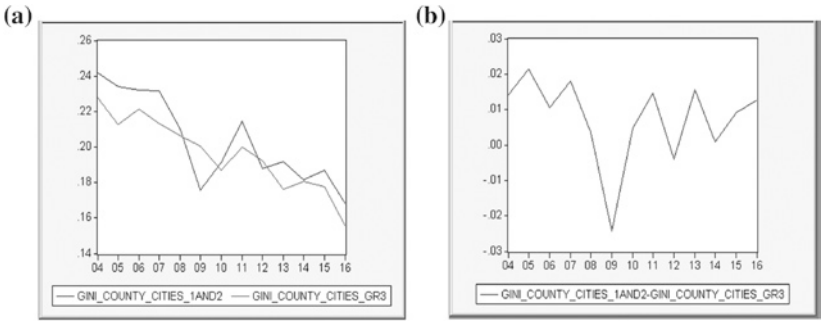

Fig. 5 (Analysis 2): **a** Evolution in time of average Gini coefficients for *GR*1∪*GR*2 (*treated*) and *GR*3 (*non-treated*), respectively. **b** Evolution in time of the difference between the average Gini coefficients of the treated versus non-treated groups of counties (Gini coefficients are based only on disparities between the cities of a county)

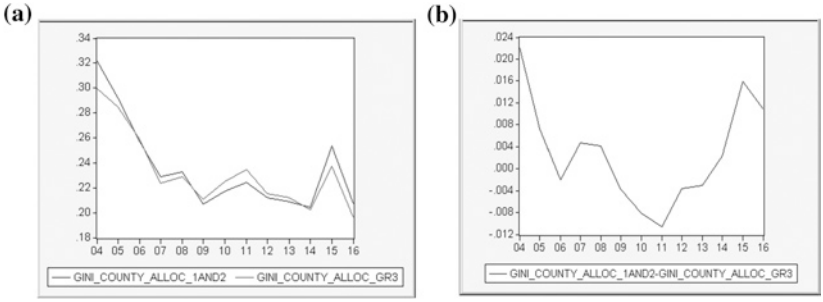

Fig. 6 (Analysis 2): **a** Evolution in time of average Gini coefficients for *GR*1∪*GR*2 (*treated*) and *GR*3 (*non-treated*), respectively. **b** Evolution in time of the difference between the average Gini coefficients of the treated versus non-treated groups of counties (Gini coefficients are based on disparities between all localities of a county)

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