# Economic Specialization of Romanian Regions and Counties. Insights Drawn from Static and Dynamic Location Quotients

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***Abstract:*** *Although being a simple measure of regional specialization, the location quotient is able to reveal the force, scope and emerging trends of the economic sectors acting in a region. Combining the information from static and dynamic location quotients allows to understand not only the relative importance of economic activities in a region, their current strengths and weaknesses, but also helps to identify the industries that have the potential to enhance regional development in the future. In addition, Herfindahl and Krugman indices are useful for assesing absolute and relative economic specialization at different regional levels. Using these statistical tools for analysing the economic structure of Romanian regions and counties, we found empirical evidence on important changes in regional specialization patterns in the context of the 2008-2010 economic crisis. There has been significant rise in absolute specialization of all Romanian regions, except for Bucharest-Ilfov Region, while relative specialization dissimilarities of regional economies from the national economy tend to level. Manufacturing seems to be the sector leading economic growth for most Romanian counties, in the wake of the crisis.*

***Keywords****: regional specialization, static and dynamic location quotient, Herfindahl index, Krugman Index, Romania*

***JEL Classification****: R12, R23*

## Introduction

Understanding the spatial variation of economic and social phenomena involves the statistical measurement of territorial proportions, identifying economic agglomerations and assessing the specific level of specialization or diversification of economic activities. Regional specialization continues to be recognized as an effective path for harnessing

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local resources and increasing productivity and competitiveness, although, on the flip side, it might escalate vulnerability to economic shocks. There is a renewed interest for this topic in the context of the research aiming to understand the factors explaining the differentiated responses of countries and regions to the most recent economic crisis. Although it is believed that specialization weakens the ability to combat economic adversities, such as recessions, the more nuanced positions that have resulted from research such as Cuadrado-Roura and Maroto (2016) support the idea that not every type of specialization hampers economic resilience. Only if certain sensitive sectors (such as the mining industry, construction and parts of the low-tech production sector) prevail, do highly specialized regions incur bigger risks during economic crises (De Groot et al., 2011).

In the context of empirical investigations addressing regional specialization patterns, the location quotient is a simple yet useful tool for assessing the importance and position of different sectors of activity in the regional economies, thus gaining more knowledge on the industries having the potential to enhance regional development. The location quotients (LQ) gauge the regional intensity of economic specialization by comparing the shares of each sector in the region and in the overall (national) economy (Florence, 1939; Glaeser et al., 1992). A large LQ points to existing regional strengths and new growth opportunities (Lesage and Reed, 1989; Isard et al., 1998; Baer and Brown, 2006). By measuring the relative contribution of industries in a particular region, the location quotients are also helping to forecast the likely future effects of increasing or decreasing the activity in a certain sector, thus being an influential instrument for decision-making. To mitigate the limits of static (standard) location quotients, a dynamic variant was devised, allowing to capture the emerging trends in specialization patterns and to find the most promising industries for supporting future economic growth in a certain region (Antara et al., 2017; Misbah et al., 2018). Combining the analysis of static and dynamic location quotients, the regional typology of economic specialization can be explored in more depths, gaining valuable insights that might inform the regional economic policy.

## Literature review

Specialisation patterns have long been discussed in the regional economics literature, with numerous empirical studies aiming at revealing their relevance for regional development. Early studies focused on explaining the determinants of economic specialization by means of local comparative advantages, specific endowment with production factors, the effects of trade factors, etc. In this context, trade theories asserted that specialization results from exploiting local comparative advantages in terms of technology advancement, natural resources, and human capital (Traistaru and

Pauna, 2003). Since these theories were unable to fully clarify regional specialisation patterns, new explanations included additional factors such as returns to scale, product differentiation, monopolistic competition and market access (Krugman and Venables, 1990).

Scholars also tried to estimate the impact of regional specialization in terms of productivity, competitivity, economic growth, but also vulnerability and decline during economic crises (Hallet, 2002; Aiginger and Davies, 2004; Ezcurra et al., 2006; Marelli, 2006; De Groot et al., 2011; Boschma et al., 2012). A very important stream of recent research tackled the issue of smart specialization policies (Boschma, 2014; McCann and Ortega-Argilés, 2015; Naldi et al., 2015), viewed as a (partial) solution even for Europe's disadvantaged rural and peripheral regions. Recent research also addressed the risks entailed by high specialisation in the context of economic crises (De Groot et al., 2011), although studies such as Cuadrado-Roura and Maroto (2016) support the idea that only specialization in low-tech and vulnerable sectors lessens economic resilience.

There are many factors that can influence the locational decisions of the economic agents, leading to the specific economic structure of each region, dominated by certain industries. One such factor is the general level of development of a country, which correlates negatively with the degree of specialization. The rationale is that the more developed a country, the more economic growth opportunities are evenly distributed across regions, reducing entrepreneurs' preferences for certain locations. The periods of economic growth lead to spatial restructuring towards alleviating regional inequalities. Although economic growth is territorially uneven, development radiating from the development poles to periphery generates economic opportunities that benefit all regions, helping the convergence process.

Often the economic specialization of a region is driven by the existence of specific natural resources, such as ores, oil and natural gas, thermal water, a certain climate, etc. This determines spatial concentrations of economic sectors that exploit such resources: extractive and processing industries, spa tourism, etc. Not only the size, but also the quality and accessibility of the natural resources is important. Economic specialization is strongly linked to industry concentration, usually moving in the same direction. Higher regional specialization leads to further spatial concentration of industries attracted by the existing economic infrastructure and the skilled labour force.

A big size of the region is believed to impede economic specialization. The larger a region, the bigger is the variety of production factors (labour force with diverse qualifications, variety of natural resources and landforms, larger infrastructure, etc.) leading to potentially more diversified activities (Ezcurra et al., 2006).

Finally, national and regional economic policies influence the territorial location of economic activities by differentially applying economic incentives (e.g., setting up free zones) or by specific funding, for instance allotting special funds to support the development of disadvantaged areas.

The action of these factors varies over time and manifests differently in each region, determining the continuous territorial variation of the distribution of economic activities. Consequently, regions with similar natural resources do not necessarily specialize in the same industries and do not have the same level of development. The territorial structure of the national economy, the role and relative importance of its regions are constantly changing, as a result of continuous fluctuations in the direction and intensity of a large range of factors.

Current theories of regional growth are increasingly focused on the role of smart specialization in supporting performance and in boosting the competitiveness of local economies, within the wider framework of European economic development (McCann and Ortega-Argilés, 2015; Naldi et al., 2015). Smart growth and the related concept of smart specialization are key factors in the development strategy formulated under the Europe 2020 Strategy, which includes a broad set of policies designed to stimulate knowledge transfer, innovation and investment in R&D (European Commission, 2010). In this context, smart specialization relates to regional strategies of economic growth which are grounded on specific competitive advantages of regions (Camagni and Cappello, 2013). It is believed that smart specialization could be attained by implementing appropriate research strategies, i.e. by developing those R&D and innovation activities that exploit the particular competitive advantages of a region.

Economic specialization is a topic of interest in Romania as well, given the strategic goal of boosting regional development and reducing the existing regional gaps. Adequate strategies for smart regional specialization can stimulate economic growth, leading to a more balanced regional development in Romania (Sandu, 2010), although there are still obstacles on this R&D-led growth path in all EU New Member States (Radosevic and Stancova, 2018), including Romania (Ionescu, 2015).

In this context, there were some attempts at empirically investigating various aspects of economic specialization at regional level. Empirical research undertaken so far revealed that the degree of economic specialization of Romanian regions was low and in decline during the transition period (Traistaru and Pauna, 2003; Andrei et al., 2007), as well as further, in the 2000-2013 interval, while regional-national sectoral dissimilarities increased (Neagu, O. and Neagu, M.I., 2016).

The specialization and concentration patterns of the Romanian regions are dissimilar (Goschin et al., 2009; Neagu, O. and Neagu, M.I., 2016) and are largely impacted by

economic policies that variate according to election cycles (Andrei et al., 2009). Not only did Romania start from a low specialization level at the beginning of the 90s, but changes in the industry structure have been inefficient during the transition to market economy (Russu, 2001), failing to harvest regional strengths. Nevertheless, some regions with industrial tradition and growth potential (Bucharest-Ilfov, West, North-West) succeeded at preserving their industrial structures, largely by attracting FDIs (Russu, 2016). According to the evolution of Krugman Indices, relative dissimilarities in economic specialization were on the rise during 2000-2013 period (Neagu, O. and Neagu, M.I., 2016), most activities tending to strengthen their spatial concentration (Yaskal et al., 2018). The studies investigating the impact of regional specialisation on economic growth in Romania found that specialisation negatively correlates with regional development level and regional growth pace (Traistaru et al., 2002; Andrei et al., 2007).

## Method and data

The analysis of regional economic specialization uses a wide range of traditional statistical methods, from simple rates to synthetic coefficients. Since high regional specialization means that one or a few economic activities dominate or hold large shares in the region's economy, the most common starting point of the analysis is the **specialisation rate**, computed as the share of an economic sector in the regional economy. Although these specialization rates are only the first step for calculating synthetic indicators, they provide useful information, outlining a comprehensive image of the spatial distribution of economic activities and allowing to detect spatial irregularities that point to diversification or specialization patterns.

**The location quotient** (Florence, 1939), also known as the Hoover-Balassa coefficient, is a simple indicator that captures the importance of each economic activity in the regional economy. The location coefficient for activity j in region i can be calculated using either the concentration rate $\boldsymbol{g_{ij}^{C}}$, or the specialization rate $\boldsymbol{g_{ij}^{S}}$, as follows:

$$LQ_{ij} = \frac{E_{ij}/E_j}{E_i/E} = \frac{E_{ij}/E_i}{E_j/E} \Leftrightarrow LQ_{ij} = \frac{g_{ij}^{C}}{E_i/E} = \frac{g_{ij}^{S}}{E_j/E},$$

where:

$E_{ij}$ - employment (alternatively, Gross Value Added or other economic indicator relevant for the regional economy) in sector j and region i;

$E_j$ – total employment in sector j (at national level);

$E_i$ - total employment in region i;

E - total employment in the country;

$g_{ij}^{C}$ - the share of region i in sector j;

$g_{ij}^{S}$ - the share of sector j in region i.

Location quotients (LQ) over 1 indicate above-average specialization in a particular sector, while LQ less than 1 are specific to sub-specialized territorial units. Another common interpretation of the LQ is related to the export/import potential of economic activities. Values of LQ>1 point to activities with a higher role in the regional economy comparative to the national economy (i.e. specialization). From the perspective of local demand, they have an employment surplus which leads to potential export from the region, thus reflect a competitive advantage. On the opposite, activities having LQ <1 correspond to insufficient employment, signalling the need for imports in order to meet the regional demand. This information is important for designing the appropriate regional strategies for building the befitting economic environment, able to attract additional investments in the sectors with competitive advantage, while also caring for lesser sectors of activity. The simplicity of the localization coefficients makes them useful tools in the initial stages of the research, although they have certain limits. First, they are static, therefore analysis of sectoral changes in time requires multiple annual calculations. Secondly, there can be significant variations in the coefficients' level determined by the degree of disaggregation of the data by economic activities.

The dynamic variant of LQ overcomes the static character of standard LQ by capturing the changes in sectoral structure over time. It allows for identifying the emerging trends in regional specialization and helps estimating future changes in the regional economy. **The dynamic location quotient** (DLQ) is computed as follows:

$$DLQ = \left[\frac{(1+r_{ij})/(1+r_i)}{(1+R_j)/(1+R)}\right]^t$$

where:

$r_{ij}$ - average annual growth rate of employment in sector j and region i

$r_i$ - average annual growth rate of the overall economy of region i;

$R_j$ - average annual growth rate of sector j at national level

R - average annual growth rate of the national economy

t - total time span (years).

The values above unit indicate faster than average dynamics of sector j in region i (expanding activities), whereas the subunit values are specific to the activities with below average growth in region i (shrinking activities). DLQ illustrate the role played by each activity j in the region. They reveal which industries are leading regional growth and are having potential for export.

The location quotient, both in its static and dynamic form, is a significant tool for evaluating the force, scope and emerging trends of the economic sectors acting in a region. Combining the information from static and dynamic location quotients helps understanding the relative importance of economic activities, while also identifying future growth opportunities.

In addition to these simple indicators, there are also various synthetic indices that can be used to measure overall economic specialization at different spatial levels: counties, regions, countries or even a wider economic space. Many of these were initially used in other fields of research, for example, the Gini and Herfindahl indices were initially employed for measuring income inequalities of individuals and for analyzing demographic phenomena.

**The Herfindahl-Hirschman index** (Hirschman, 1964) is an absolute indicator of specialization that captures the general level of specialization in a certain area. It is calculated by summing the squares of the weights $g_{ij}$ of all economic sectors j in the regional economy i, as follows:

$$H_i^S = \sum_{j=1}^{m} (g_{ij}^S)^2 .$$

The Herfindahl index increases with the degree of specialization, reaching the upper limit 1 if a region is specialized in a single activity. The lower limit of 1/m is reached when all sectors have equal shares in the region. The Herfindahl index has some disadvantages. First, being an absolute measure of specialization means that large regions, holding high shares in the national economy, strongly lead the changes in indicator's size. Secondly, the values of the index largely depend on disaggregation level of the data employed.

**The Krugman dissimilarity index** (Krugman, 1991) is another widely used statistical indicator for measuring the degree of specialization ( $\boldsymbol{K_i^S}$ ):

$$K_i^S = \sum_{j=1}^{m} \left| g_{ij}^S - g_j \right|,$$

where $g_j = E_j/E$.

The Krugman Index is a relative measure of specialization that compares the shares of economic activities in each region ($g_{ij}$) with the economic structure of the national economy as a whole ($g_j$). Values range from 0, corresponding to all regional economic structures being identic, to 2, the latter meaning totally opposite structures.

Most commonly, the analysis of economic specialization of the regions in the literature is based on statistical data regarding spatial and sectoral distributions of some relevant economic indicators, usually the regional values of gross value added or employment. This study uses official statistical data on civil employed population at NUTS 2 and NUTS 3 level, issued by the Romanian National Institute of Statistics. Employment was broken down in 16 major sectors of activity. The time span is 2001-2017, long enough to include the 2009-2010 depression and the subsequent recovery, as we aim at capturing the changes in regional specialization related to the economic cycle.

## Results and discussion

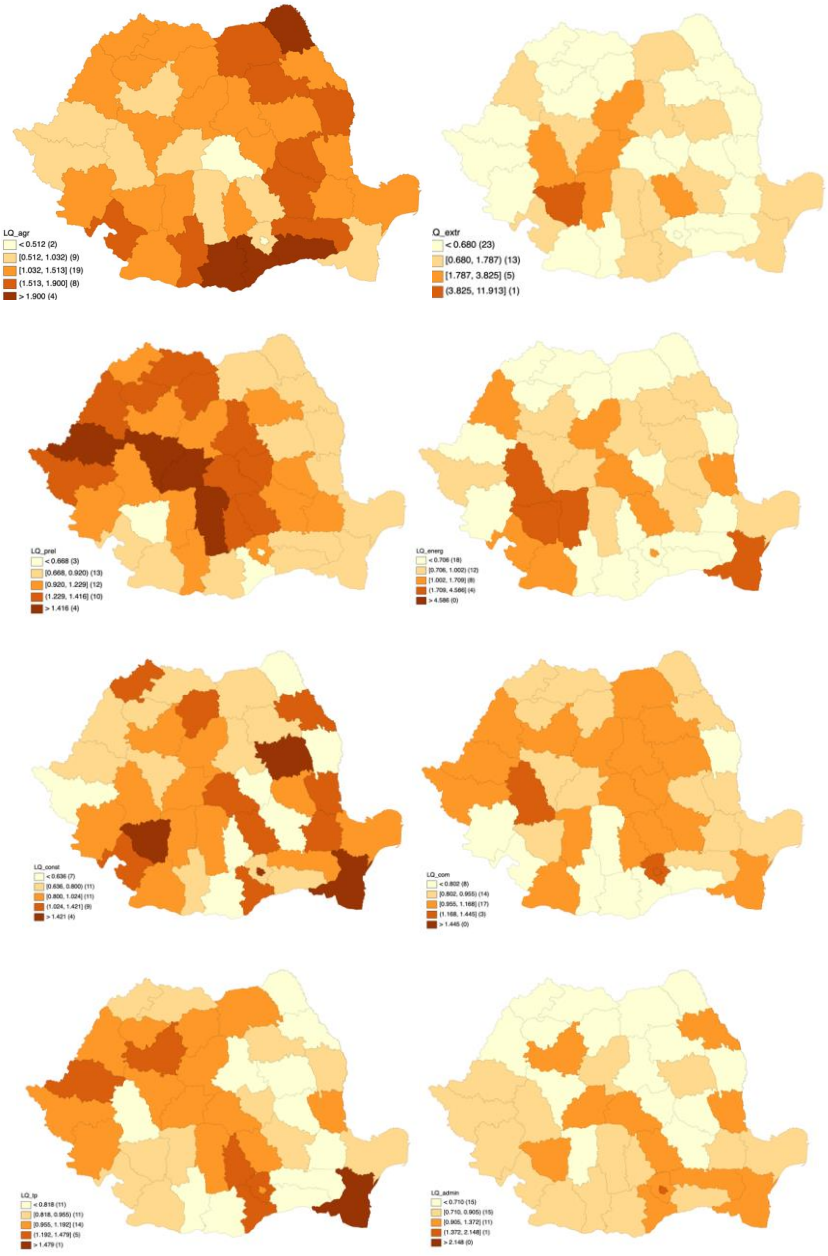
Specialization rates are the necessary first step for our analysis, both simple and synthetic specialization indicators using them as base for calculus. Specialization rates also provide useful information *per se*, outlining a comprehensive image of the spatial distribution of economic activities and allowing to detect spatial irregularities that point to diversification or specialization patterns. Since at county level there is too much information to be displayed entirely (42 counties and 16 sectors, by 10 years), we selected and presented in Annex 4 only the shares for the main three sectors. The graphs in Annex 4 show that the largest sectors in the Romanian economy, namely agriculture and manufacturing, changed their trajectories over 2008-2017 in opposite directions. Agriculture slightly increased its share during the depression and at the beginning of the recovery period, followed by a significant drop since 2014. Manufacturing, although negatively affected in the first year of the crisis, made a quick recovery and is on an upward path since 2010. The third largest sector, trade, displayed a less clear trend, with fluctuations largely dissimilar across counties, but achieving a

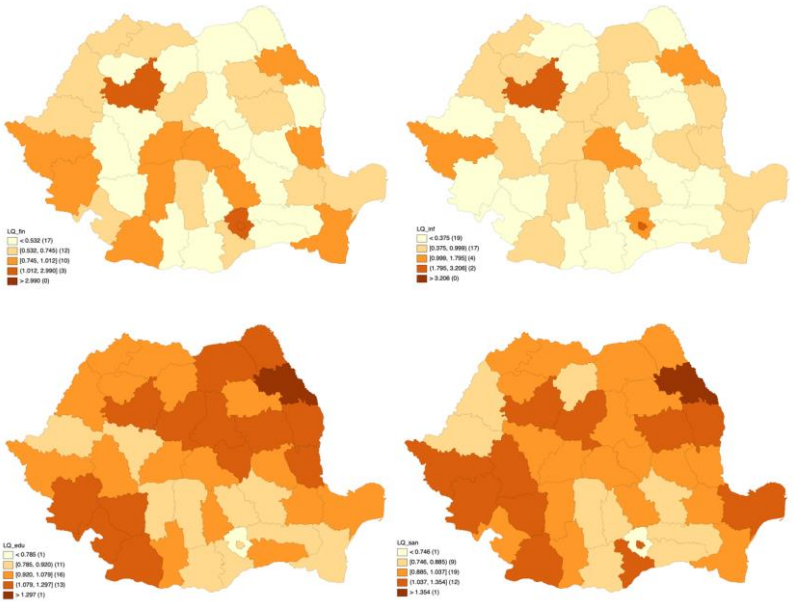
slight increase overall. These results suggest that manufacturing has been leading the economic growth for most counties during the recovery period and even after full recovery from the 2009-2010 depression.

The next step was the computation of the location quotients, which represent a quick and easy way to gather information about the size and relative importance of local industries by comparing regional and national economic structures. The location quotients are also useful for forecasting the regional models of economic growth. Annex 1 presents the static location quotients by economic sector and region. Both mining and quarrying industry and electricity, gas, steam and air conditioning industry are mainly concentrated in the South-West Region, having, during 2008-2017, LQ constantly over 2.75 for the former and between 1.75 and 2.22 for the latter. Such high location quotients (which are to be expected given the dependence of those industries on specific natural resources) indicate the powerful positions and export potential of these two industries in the South-West Region. The Bucharest-Ilfov Region heavily concentrates the financial and real estate services (LQ between 2.6 and 3.5), as well as administration and related services (having LQ>2, while in all other regions LQ<1). Bucharest increased its specialization in services, and constantly reduced its share in manufacturing (as already discussed in Traistaru and Pauna, 2003). Agriculture is dominant in south and east, while manufacturing displays a clear west – east divide. Constructions play an important role only in the Bucharest-Ilfov Region, while for the rest of the country LQ<1. Trade is relatively more developed in Bucharest-Ilfov, Center and West, but spatial inequalities are not very large. Activities such as education and healthcare are more evenly distributed across counties.

Although location quotients have been also calculated for each county, sector and year, given the very large amount of information we present in the maps included in Figure 1 only the results for the most recent year (while the rest are available on demand). These maps reveal large differences between economic sectors in terms of their spatial distribution at NUTS3 (county) level, as well as high inequalities in intensity of regional specialization of counties.

***Figure 1. Static location coefficients by economic sectors and counties in 2017***





*Note: AGR - Agriculture, forestry and fishing; PREL - Manufacturing; EXT - Mining and quarrying; ENER - Electricity, gas, steam and air conditioning; CONS – Construction; COM – wholesale and retail trade; TP - Transportation and storage services; FIN – financial services; INF - Information and communication services; ADMIN - Public administration and defence; social insurance from the public system, administrative and support service activities; EDU – Education; SAN – Health and social care.*

The significant spatial polarisation showed in the maps displayed in Figure 1 is an indication of differences in counties' specialization level, as well as inequalities in the concentration of industries. The disparities are larger than the ones previously discussed for the regional level. For instance, the highest LQ is now 12, corresponding to the mining and quarrying industry in Gorj, followed by a LQ of 4 in Hunedoara. Electricity, gas, steam and air conditioning industry is strongly concentrated in the same two counties, having a LQ of 4 in Gorj and 2 in Hunedoara.

Although location quotients are useful tools for understanding regional strengths and economic opportunities, there are however some limitations to consider when analysing the results of this method. First, the coefficients illustrate the existing situation at a certain moment, so it is necessary to calculate and compare them for successive intervals to represent the changing relations between regional and national sectoral structures.

Secondly, the location quotients assume that the labour productivity is the same across regions. Since this is not always the case, a thorough investigation needs to take into account whether higher employment in a sector comes from regional competitive advantages or low productivity in the region.

Third, the level of disaggregation of employment data influences the results. Official statistics usually provide information on broad sectors of activity, which might lead to neglecting smaller yet significant niche activities, that are able to boost economic growth as well.

Information on the specific mix of economic activities in a region is useful for predicting future growth based on previous dynamics. One possibility for including emerging specialization trends in the analysis is to compare the evolution of the location coefficients over time. The alternative is the use of a dynamic location coefficient. To confirm the dynamic changes in employment, the dynamic location coefficient (DLQ) has been estimated as a percentage change in the level of employment in a sector of activity in a certain region, compared to the percentage change of that sector in national level (Table 1).

**Table 1. Dynamic location coefficients by regions, counties and economic sectors over 2008-2017**

| | REGIONS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Bucharest - Ilfov** | **Center** | **Nord-East** | **Nord-West** | **South-East** | **South - Muntenia** | **South - West Oltenia** | **West** |
| AGR | 0,96 | 0,96 | 1,02 | 0,99 | 1,04 | 1,01 | 1,04 | 1,00 |
| PREL | 0,91 | 1,07 | 0,97 | 1,04 | 0,92 | 1,11 | 1,00 | 1,06 |
| EXTR | 0,85 | 0,75 | 0,82 | 1,23 | 0,86 | 0,93 | 1,09 | 0,81 |
| ENER | 0,95 | 0,92 | 0,88 | 1,20 | 0,98 | 0,93 | 1,13 | 0,98 |
| CONSTR | 0,81 | 1,00 | 1,03 | 1,01 | 0,99 | 1,02 | 1,05 | 0,93 |
| COMERT | 0,95 | 0,96 | 1,05 | 0,98 | 1,02 | 1,03 | 1,04 | 0,98 |
| HOTEL | 1,21 | 0,91 | 1,06 | 1,06 | 0,91 | 0,99 | 1,17 | 0,92 |
| ADMIN | 1,05 | 0,99 | 0,93 | 1,10 | 0,91 | 1,04 | 0,96 | 1,15 |
| SERV | 1,43 | 0,74 | 0,99 | 1,14 | 0,85 | 1,27 | 1,04 | 0,82 |
| PROF | 0,95 | 0,97 | 1,04 | 0,89 | 1,05 | 0,99 | 1,09 | 0,98 |
| SAN | 1,09 | 0,95 | 0,98 | 0,97 | 1,01 | 1,04 | 1,04 | 1,00 |
| EDU | 0,89 | 0,98 | 1,05 | 0,98 | 1,03 | 1,00 | 1,05 | 1,01 |
| INFOR | 0,66 | 1,21 | 1,09 | 1,10 | 0,81 | 0,93 | 1,13 | 0,96 |
| TP | 0,95 | 1,01 | 1,03 | 1,04 | 0,91 | 1,13 | 0,99 | 1,03 |
| APA | 0,96 | 0,97 | 1,00 | 1,05 | 0,98 | 1,11 | 0,99 | 0,99 |

| COUNTIES | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AGR | PREL | EXTR | ENER | CONS | COM | HOT | ADM | SERV | PROF | SAN | EDU | INF | TP | APA |
| Alba | 0,99 | 1,04 | 1,77 | 0,98 | 1,04 | 0,99 | 0,93 | 0,98 | 0,80 | 0,99 | 1,01 | 0,95 | 0,74 | 1,01 | 0,98 |
| Arad | 1,00 | 0,99 | 0,45 | 0,94 | 0,95 | 0,96 | 1,09 | 1,08 | 0,98 | 0,92 | 0,91 | 1,03 | 1,05 | 1,01 | 0,99 |
| Arges | 0,97 | 0,99 | 1,22 | 0,91 | 0,93 | 0,98 | 0,84 | 0,86 | 1,21 | 1,01 | 1,11 | 0,94 | 1,57 | 1,05 | 1,09 |
| Bacau | 1,04 | 0,93 | 0,85 | 0,98 | 1,14 | 1,06 | 1,22 | 0,99 | 0,89 | 1,05 | 0,94 | 1,09 | 0,61 | 0,84 | 0,84 |
| Bihor | 1,02 | 1,09 | 1,35 | 1,27 | 0,94 | 0,98 | 1,02 | 1,17 | 1,40 | 0,83 | 0,94 | 1,00 | 1,16 | 1,18 | 1,33 |
| Bistrita-Nasaud | 0,98 | 1,04 | 1,11 | 0,95 | 1,14 | 1,03 | 1,05 | 0,85 | 0,63 | 1,05 | 1,06 | 0,98 | 1,06 | 0,98 | 0,77 |
| Botosani | 1,04 | 0,99 | 0,00 | 0,97 | 0,86 | 1,07 | 1,05 | 1,00 | 1,03 | 1,34 | 1,03 | 1,03 | 0,82 | 1,02 | 1,07 |
| Braila | 1,05 | 0,95 | 0,00 | 0,82 | 1,14 | 0,94 | 0,94 | 1,03 | 1,38 | 0,78 | 1,00 | 1,05 | 1,21 | 0,92 | 1,06 |
| Brasov | 0,94 | 1,07 | 1,08 | 1,32 | 0,88 | 0,98 | 0,92 | 1,24 | 1,00 | 1,18 | 1,11 | 0,89 | 1,33 | 1,01 | 0,97 |
| Buzau | 1,03 | 0,93 | 1,05 | 1,07 | 0,99 | 1,06 | 1,11 | 0,83 | 0,83 | 1,06 | 0,92 | 1,07 | 0,69 | 1,10 | 1,29 |
| Calarasi | 1,08 | 1,02 | 1,39 | 1,06 | 1,24 | 1,06 | 1,13 | 1,02 | 1,49 | 0,80 | 0,94 | 1,02 | 1,37 | 1,00 | 0,74 |
| Caras-Severin | 1,03 | 1,07 | 0,67 | 0,71 | 0,91 | 1,04 | 0,87 | 1,01 | 0,99 | 1,00 | 1,15 | 1,16 | 0,81 | 1,04 | 1,07 |
| Cluj | 0,94 | 1,02 | 1,59 | 1,48 | 1,02 | 0,97 | 1,05 | 1,36 | 0,91 | 1,24 | 1,01 | 0,95 | 1,86 | 1,07 | 1,01 |
| Constanta | 1,03 | 0,91 | 0,74 | 1,00 | 0,98 | 1,02 | 0,87 | 0,79 | 0,76 | 1,00 | 1,02 | 1,00 | 0,70 | 0,84 | 0,93 |
| Covasna | 1,01 | 1,08 | 1,06 | 1,11 | 1,03 | 0,97 | 1,22 | 1,03 | 1,09 | 0,92 | 1,03 | 0,98 | 0,74 | 1,24 | 1,04 |
| Dambovita | 0,99 | 1,07 | 0,80 | 0,66 | 0,94 | 1,08 | 0,92 | 1,03 | 1,05 | 1,18 | 0,91 | 1,02 | 1,21 | 0,95 | 1,17 |
| Dolj | 1,05 | 0,96 | 1,19 | 1,42 | 1,09 | 0,97 | 1,04 | 1,02 | 1,29 | 1,08 | 1,16 | 1,06 | 1,12 | 0,97 | 1,01 |
| Galati | 1,07 | 0,96 | 1,32 | 0,90 | 1,05 | 1,06 | 1,11 | 1,11 | 0,83 | 0,92 | 1,00 | 1,08 | 1,04 | 0,94 | 0,98 |
| Giurgiu | 1,03 | 1,21 | 0,80 | 0,91 | 1,21 | 1,05 | 1,06 | 0,92 | 1,65 | 0,89 | 1,14 | 1,04 | 0,67 | 1,34 | 1,43 |
| Gorj | 1,03 | 0,97 | 1,12 | 1,44 | 1,00 | 1,14 | 1,02 | 0,96 | 0,79 | 1,18 | 0,98 | 1,00 | 1,14 | 0,93 | 0,87 |
| Harghita | 0,99 | 1,03 | 1,28 | 0,93 | 0,98 | 0,94 | 1,04 | 1,11 | 0,88 | 1,11 | 1,04 | 1,00 | 1,93 | 0,91 | 0,95 |
| Hunedoara | 1,05 | 1,05 | 0,62 | 1,01 | 0,91 | 0,99 | 0,95 | 1,00 | 0,93 | 0,88 | 0,97 | 1,04 | 0,75 | 0,98 | 1,08 |
| Ialomita | 1,05 | 1,01 | 1,77 | 0,89 | 1,12 | 1,04 | 1,22 | 1,10 | 1,04 | 1,02 | 1,05 | 1,02 | 0,82 | 1,12 | 1,14 |
| Iasi | 0,98 | 1,01 | 1,00 | 0,97 | 1,00 | 1,02 | 0,92 | 1,15 | 1,09 | 1,27 | 1,07 | 1,02 | 1,74 | 1,03 | 0,82 |
| Ilfov | 0,91 | 1,00 | 1,03 | 0,93 | 1,00 | 1,00 | 0,84 | 0,99 | 1,88 | 0,94 | 0,91 | 1,04 | 0,80 | 1,03 | 0,95 |
| Maramures | 0,98 | 0,99 | 0,78 | 1,21 | 0,89 | 0,93 | 1,04 | 0,84 | 0,45 | 0,95 | 0,94 | 0,84 | 0,67 | 0,88 | 1,06 |
| Mehedinti | 1,06 | 0,92 | 0,76 | 0,68 | 1,14 | 1,03 | 1,22 | 0,88 | 1,35 | 0,83 | 0,98 | 1,15 | 0,89 | 0,98 | 0,98 |
| Municipiul Bucuresti | 1,18 | 0,92 | 1,88 | 1,54 | 0,87 | 0,94 | 0,83 | 1,17 | 1,00 | 1,16 | 1,10 | 0,86 | 1,24 | 0,98 | 0,93 |
| Mures | 0,82 | 1,09 | 0,71 | 0,94 | 1,04 | 1,06 | 0,88 | 1,08 | 0,66 | 0,92 | 0,96 | 1,05 | 1,21 | 1,01 | 1,00 |
| Neamt | 1,04 | 1,02 | 1,14 | 1,11 | 1,03 | 1,00 | 1,04 | 0,82 | 1,68 | 1,08 | 1,00 | 1,04 | 1,01 | 1,18 | 0,93 |
| Olt | 1,06 | 1,05 | 0,71 | 0,78 | 0,99 | 1,09 | 1,12 | 1,09 | 0,63 | 1,19 | 1,03 | 1,02 | 1,29 | 0,95 | 1,16 |
| Prahova | 0,99 | 1,00 | 1,16 | 1,35 | 1,03 | 0,97 | 0,83 | 1,12 | 1,43 | 0,83 | 1,03 | 1,01 | 0,71 | 1,00 | 1,05 |
| Salaj | 1,01 | 1,05 | 1,54 | 0,78 | 1,16 | 0,96 | 1,57 | 0,92 | 0,84 | 1,07 | 1,02 | 1,00 | 1,77 | 1,00 | 1,15 |
| Satu Mare | 1,00 | 0,97 | 0,82 | 1,41 | 0,98 | 1,05 | 0,90 | 1,00 | 0,96 | 0,93 | 0,99 | 0,97 | 0,78 | 1,08 | 0,77 |
| Sibiu | 0,96 | 1,04 | 0,95 | 0,76 | 0,87 | 0,87 | 0,74 | 1,02 | 0,97 | 1,24 | 0,97 | 0,98 | 0,83 | 0,94 | 1,06 |
| Suceava | 1,00 | 0,98 | 0,94 | 0,86 | 0,99 | 1,13 | 1,07 | 0,95 | 0,77 | 0,92 | 0,96 | 1,04 | 1,15 | 1,00 | 1,07 |
| Teleorman | 1,06 | 1,05 | 0,74 | 0,98 | 1,09 | 1,06 | 1,37 | 1,01 | 1,56 | 1,02 | 1,06 | 1,07 | 0,48 | 1,07 | 1,10 |
| Timis | 0,97 | 1,00 | 1,33 | 1,35 | 0,84 | 0,93 | 0,73 | 1,22 | 0,79 | 0,97 | 1,03 | 0,96 | 1,76 | 1,02 | 0,87 |
| Tulcea | 1,02 | 0,87 | 1,07 | 1,16 | 1,18 | 1,09 | 1,26 | 0,79 | 0,77 | 0,97 | 0,92 | 0,97 | 1,31 | 0,94 | 1,19 |
| Valcea | 1,01 | 1,14 | 0,94 | 0,85 | 0,96 | 0,97 | 0,95 | 0,94 | 1,84 | 0,90 | 1,04 | 0,98 | 0,93 | 1,03 | 0,85 |
| Vaslui | 1,06 | 0,97 | 0,00 | 0,91 | 1,13 | 1,05 | 0,92 | 1,14 | 0,87 | 1,12 | 1,08 | 1,12 | 1,23 | 1,12 | 1,13 |
| Vrancea | 1,04 | 1,10 | 0,00 | 1,28 | 1,16 | 1,02 | 0,91 | 1,11 | 0,89 | 1,15 | 0,98 | 1,09 | 0,95 | 0,93 | 0,98 |

*Note: AGR - Agriculture, forestry and fishing; PREL - Manufacturing; EXT - Mining and quarrying; ENER - Electricity, gas, steam and air conditioning; CONS – Construction; COM – wholesale and retail trade; TRA - Transportation and storage services; HOT - Accommodation and food service activities; INF - Information and communication services; PROF - Professional, scientific and technical activities; SERV – services; ADMIN - Public administration and defence; social insurance from the public system, administrative and support service activities; EDU – Education; SAN – Health and social care; APA - Water supply; sewerage, waste management and remediation activities*.

The results from the DLQ calculation indicate the 2008-2017 trends in regional specialization: agriculture was expanding in Nord-East, West and in all three South regions; manufacturing was thriving in Center, Nord-West, South and West; mining and quarrying and electricity, gas, steam and air conditioning shared similar trends, enlarging in Nord-West and South-West, but shrinking everywhere else, Wholesale was on the rise in Nord-East, South-East, South and South-West, Services were expanding in Bucharest – Ilfov, Nord-West, South and South-West, health services were getting stronger in Bucharest – Ilfov, South-East, South and South-West, West, etc. (Table 1, regions).

Overall, the values of DLQ at regional level range from 0,75 (mining and quarrying in in Center) to 1,43 (services in Bucharest). A deeper understanding of local trends can be attained by looking into DLQ at county level. Differences between locations became more pregnant and the extremes are further apart. The lowest DLQ is now 0,45 (mining and quarrying in Arad and services in Maramures), while the highest value of 1,84 is achieved in Valcea (services).

By combining the dynamic location quotient (considering the growth rates over 2008-2017) and the 2017 level of the location quotient, the sectors of activity in a region have been grouped into four categories (following Antara et al., 2017; Misbah et al., 2018).

1. Competitive activities: sectors having a location quotient above 1 and DLQ> 1 or an increase in employment. These activities have a comparative advantage over other sectors in the reference region and extend their advantage over time (extending industries).
2. Emerging activities have the LQ level lower than 1, but DLQ> 1. They are likely to get a leading role in the future development of the region.
3. Activities at risk to decline are those having industries with a static localization coefficient of 1 or greater and with DLQ <1. While still being in a leading position, they tend to lose ground. The decision makers should take note of the situation and adjust the regional growth strategy or provide more investments to prevent major employment loss.
4. Activities in decline: LQ < 1 and DLQ <1. Although of less past importance for the region and with no sign of improvement, such activities should nevertheless be supported in order to preserve balance and diversification in the regional economy.

**Table 2. Typology of regional specialization for the period 2008-2017**

| Region | *Competitive activities* | *Emergent activities* | *Activities at risk* | *Activities in decline* |
|---|---|---|---|---|
| | LQ >1<br>DLQ >1 | LQ <1<br>DLQ >1 | LQ >1<br>DLQ <1 | LQ <1<br>DLQ <1 |
| **Bucharest - Ilfov** | HOTEL, ADMIN, SERV, SAN | | ENER, CONSTR, COMERT, INFOR, TP, PROF | APA, AGR, PREL, EXTR |
| **Center** | PREL, TP | INFOR, SAN, EDU | EXTR, HOTEL | ENER, CONSTR, COMERT, ADMIN, SERV, PROF, APA, AGR |
| **Nord-East** | AGR, EDU | CONSTR, COMERT, HOTEL, PROF, INFOR, TP | SAN | PREL, EXTR, ENER, ADMIN, SERV, APA |
| **Nord-West** | TP, PREL | CONSTR, HOTEL, INFOR, EXTR, ENER, ADMIN, SERV, APA | AGR, EDU | COM, PROF, SAN |
| **South-East** | AGR | EDU, SAN, COMERT, PROF | CONSTR, HOTEL, TP, ENER, SERV, APA | INFOR, PREL, EXTR, ADMIN |
| **South -Muntenia** | AGR, TP, PREL, APA | SAN, CONSTR, COMERT, ADMIN, SERV | EXTR | EDU, HOTEL, PROF, INFOR, ENER |
| **South -West Oltenia** | AGR, EXTR, SAN, CONSTR, EDU, ENER | COMERT, SERV, HOTEL, ACT PROF, INFOR | APA | TP, PREL, ADMIN |
| **West** | SAN, TP, PREL | AGR, EDU, ADMIN | EXTR, ENER, APA, COMERT | CONSTR, SERV, HOTEL, PROF, INFOR |

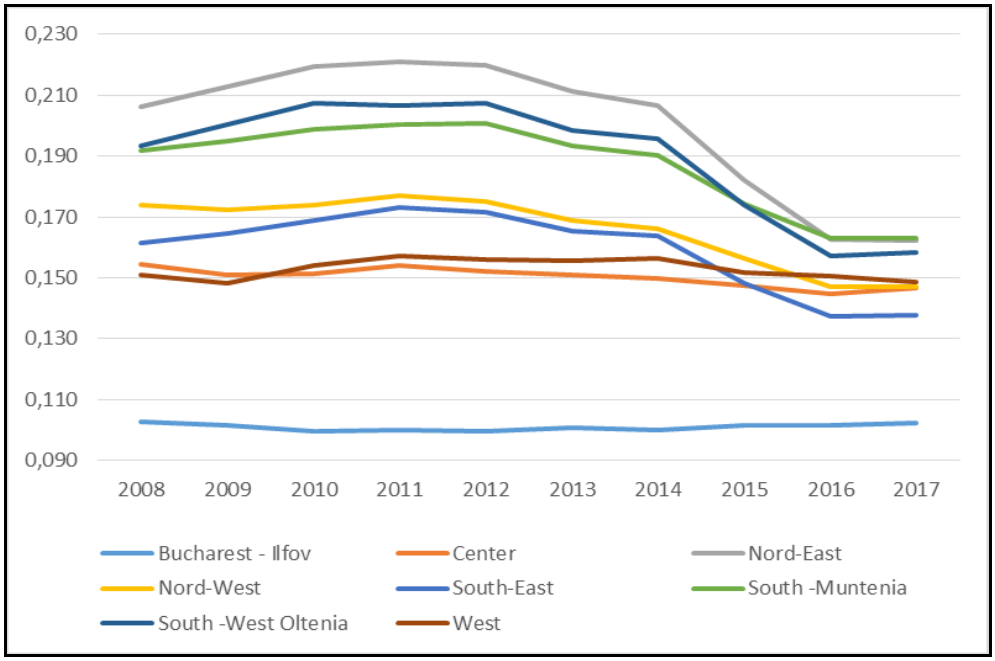
*Note: AGR - Agriculture, forestry and fishing; PREL - Manufacturing; EXTR - Mining and quarrying; ENER - Electricity, gas, steam and air conditioning; CONSTR – Construction; COM – wholesale and retail trade; TP - Transportation and storage services; HOTEL - Accommodation and food service activities; INFOR - Information and communication services; PROF - Professional, scientific and technical activities; SERV –diverse services; ADMIN - Public administration and defence; social insurance from the public system, administrative and support service activities; EDU – Education; SAN - Health and social care; APA - Water supply; sewerage, waste management and remediation activities*.

The typology of regional specialization for the period 2008-2017, displayed in Table 2, reveals the sectors that are competitive, emerging, at risk (showing signs of decline), or currently in decline in each region. For instance, Bucharest – Ilfov, although the leading region, holds only four competitive sectors, all services (Accommodation and food service activities, Public administration and defence; Social insurance from the public system, administrative and support service activities; Diverse services; Health and social care), while all other activities are either at risk or already in decline.

Going further with our investigation of regional specialization patterns, we use the Herfindahl index which provides insights on absolute specialisation trends for all regional economies and for counties (Figure 2 and 3, respectively). Previous research

showed a relatively small level of regional specialization during Romania's transition to market economy and a declining trend (Traistaru and Pauna, 2003; Andrei et al., 2007). While our results support these findings, we also found that the trend reversed during the recent economic crisis. As Figure 2 clearly illustrates, during the 2009-2010 crisis there has been a significant rise in absolute specialization of all Romanian regions, except for Bucharest-Ilfov Region.

***Figure 2. Herfindahl specialization index by regions, 2008-2017***



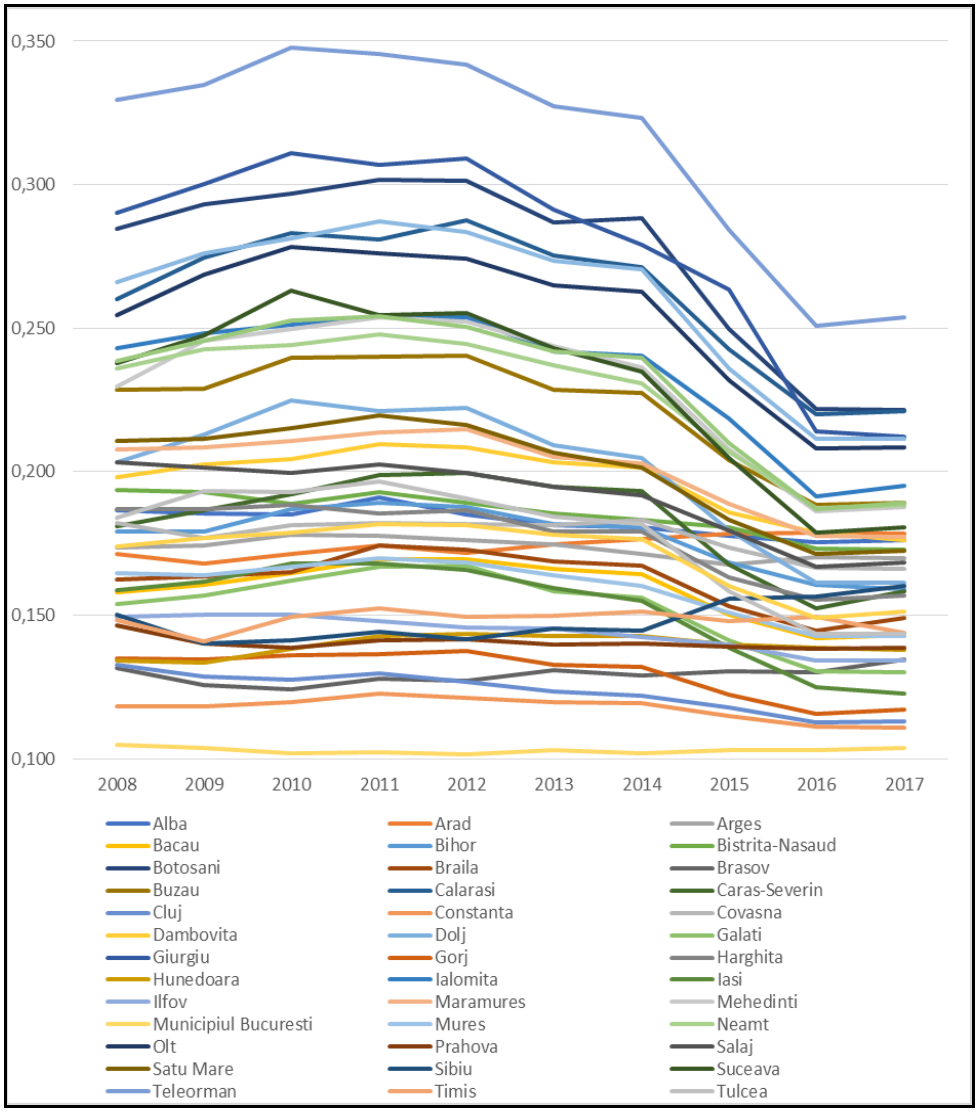

*Source: own processing*

This finding is confirmed by county level results (Figure 3), again with the exception of Bucharest Municipality and Ilfov County.

Comparing the evolution of Herfindahl specialization index by counties during the 2008-2017 period (Figure 3) we find strong increase in absolute specialization in Teleorman, Giurgiu, Botosani, Calarasi and Vaslui, some of the least developed Romanian counties. They are also the counties having the highest level of specialization. At the other end of the distribution, the lowest specialization is to be found in Bucharest, followed by Constanta and Cluj. These results are confirming the inverse relationship between

specialization and regional development discussed in Traistaru and Pauna (2003) and Andrei et al. (2007).

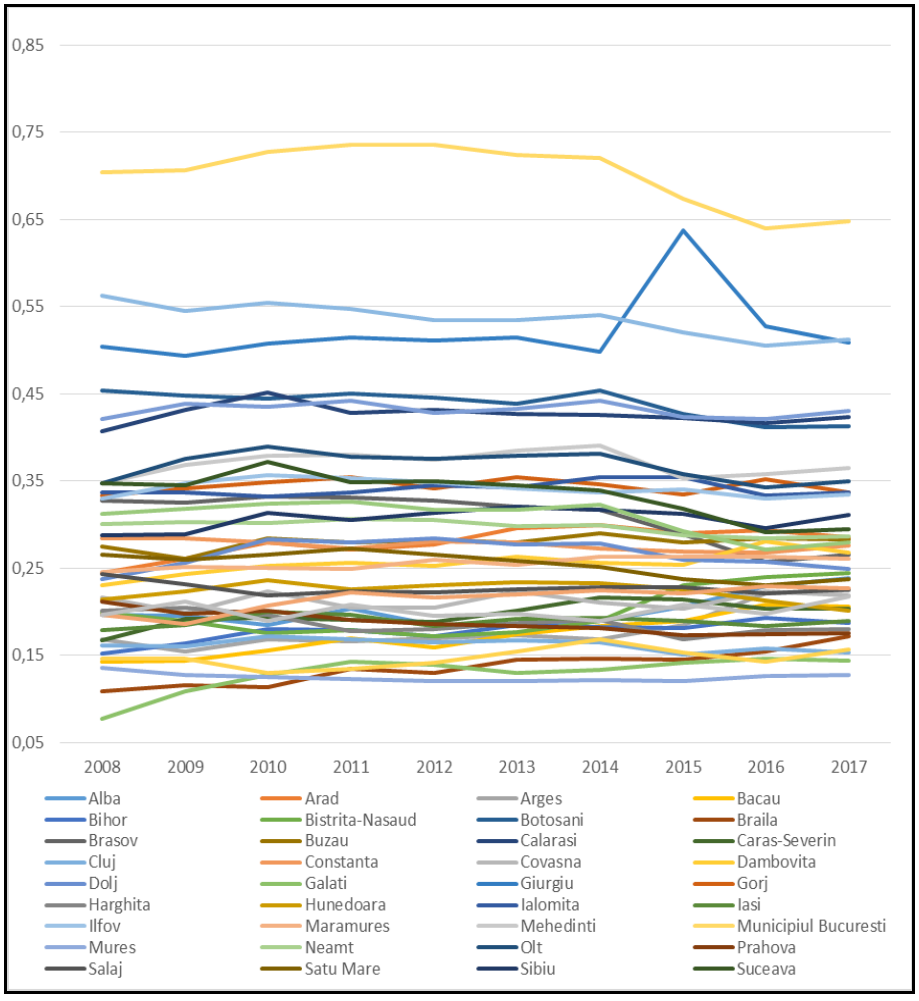
***Figure 3. Herfindahl specialization index by counties, 2008-2017***




*Source: own processing*

The Krugman dissimilarity index at county level (Figure 4) shows that during the 2008-2017 period the sectoral structure of Bucharest Municipality was the farthest from the national one (supporting previous findings based on Gross Value Added in Neagu, O. and Neagu, M.I., 2016), although the gap is narrowing since 2014. Teleorman and Giurgiu are also highly dissimilar to the overall economy. At the other end of the distribution, Mures, Galati and Braila display the strongest closeness to the structure of the national economy.

***Figure 4. Krugman dissimilarity index by counties, 2008-2017***



Changes in the level of dissimilarity between the counties' specialization and the structure of the national economy as a whole (as indicated by the Krugman index) seem to be insignificant during the 2008-2017 period (Figure 4). There are nevertheless a few exceptions, such as increases in dissimilarity in Giurgiu (2015), Galati (2009-2011), Bucharest (2010-2013), as well as decreases in Teleorman (2009, 2012, 2016), Olt and Suceava (2016), etc. The 2009-2010 depression doesn't seem to have had a uniform and significant impact on the similarities between the regional and the national sectoral structures.

## Conclusions, limits and directions for future research

Given the current interest for a better understanding of the regional development in Romania and the role played by economic specialization in this process, our research aimed to outline the intensity and dynamics of specialization at county and regional level. In order identify the regional specialization profiles, we applied a specific statistical methodology using simple location quotients and synthetic specialization indexes. We have analysed the most relevant aspects regarding the evolution of the specialization of the regional economies in Romania in order to identify the dominant economic sectors with potential for leading future development and how they can be used in establishing the regional growth policies. An appropriate regional policy should capitalise on local strengths, including smart specialization strategies that allow a better use of the specific resources available to each region.

As a general conclusion, regional specialization is relatively low in Romania and seems to negatively correlate with economic growth. Our results suggest that manufacturing has been leading the economic growth for most counties during the recovery from the 2009-2010 depression and still continues to do so, while agriculture, after increasing its share during the crisis, is on a downward path since 2014. We found significant spatial polarisation of location quotients, which is an indication of differences in counties' specialization level, as well as inequalities in the concentration of industries. Applying a specific typology of regional specialization for the period 2008-2017, we also found which sectors are competitive, emerging, at risk or in decline in each region. The time span addressed by our analysis was long enough to include the 2009-2010 depression and the subsequent recovery, capturing the changes in regional specialization related to the economic cycle. The 2009-2010 crisis temporarily put its mark on regional specialization, as there has been a significant rise in absolute specialization of all Romanian regions, except for Bucharest-Ilfov Region, during this period.

Static and dynamic location quotients used in this paper are important because they indicate both activities that already concentrate a large part of the regional work force and growing sectors that hold a promise for future regional development. They can

identify potential sources of economic growth in the region, such as competitive advantages that support productivity growth, comparative advantages (smaller costs), and regions' strengths compared to other regions.

Although indicative of regional specialization patterns and emerging trends, specialization indicators are but a first step on the path of understanding regional variations in economic activity and rise subsequent questions on the factors which generate the differences and the appropriate strategies for exploiting comparative advantages revealed by large location quotients. Further research is needed to check the robustness of our findings and to deepen the understanding of the changes in regional specialization. Increased integration within EU (through trade and FDIs) is expected to bring more structural changes in the Romanian economy, which will most probably influence regional specialization, opening new avenues for future research in this area.

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## ANNEXES

### Annex 1. Static location quotients by economic sector and regions

### Agriculture, forestry and fishing

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 0,103 | 0,103 | 0,104 | 0,104 | 0,105 | 0,104 | 0,104 | 0,102 | 0,096 | 0,097 |
| Centru | 0,839 | 0,846 | 0,829 | 0,830 | 0,825 | 0,820 | 0,822 | 0,815 | 0,808 | 0,807 |
| Nord-Est | 1,423 | 1,413 | 1,424 | 1,423 | 1,417 | 1,436 | 1,444 | 1,463 | 1,494 | 1,489 |
| Nord-Vest | 1,110 | 1,095 | 1,083 | 1,088 | 1,085 | 1,080 | 1,070 | 1,066 | 1,069 | 1,066 |
| Sud-Est | 1,117 | 1,126 | 1,136 | 1,156 | 1,151 | 1,156 | 1,168 | 1,179 | 1,208 | 1,209 |
| Sud-Muntenia | 1,284 | 1,278 | 1,273 | 1,275 | 1,278 | 1,285 | 1,291 | 1,311 | 1,335 | 1,334 |
| Sud-Vest Oltenia | 1,369 | 1,367 | 1,381 | 1,373 | 1,375 | 1,393 | 1,406 | 1,431 | 1,476 | 1,476 |
| Vest | 0,854 | 0,856 | 0,860 | 0,855 | 0,856 | 0,852 | 0,845 | 0,839 | 0,845 | 0,855 |

### Manufacturing

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 0,695 | 0,718 | 0,681 | 0,657 | 0,654 | 0,635 | 0,632 | 0,611 | 0,569 | 0,562 |
| Centru | 1,323 | 1,328 | 1,345 | 1,352 | 1,365 | 1,369 | 1,353 | 1,348 | 1,337 | 1,360 |
| Nord-Est | 0,827 | 0,818 | 0,801 | 0,810 | 0,812 | 0,811 | 0,794 | 0,814 | 0,843 | 0,840 |
| Nord-Vest | 1,150 | 1,166 | 1,181 | 1,184 | 1,179 | 1,184 | 1,201 | 1,205 | 1,196 | 1,198 |
| Sud-Est | 0,945 | 0,916 | 0,900 | 0,886 | 0,878 | 0,881 | 0,878 | 0,864 | 0,863 | 0,866 |
| Sud-Muntenia | 1,057 | 1,053 | 1,063 | 1,061 | 1,061 | 1,065 | 1,066 | 1,082 | 1,124 | 1,122 |
| Sud-Vest Oltenia | 0,817 | 0,788 | 0,774 | 0,772 | 0,768 | 0,754 | 0,743 | 0,774 | 0,808 | 0,827 |
| Vest | 1,280 | 1,298 | 1,354 | 1,381 | 1,376 | 1,395 | 1,426 | 1,393 | 1,387 | 1,356 |

### Mining and quarrying

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 0,235 | 0,273 | 0,348 | 0,390 | 0,467 | 0,461 | 0,510 | 0,593 | 0,530 | 0,530 |
| Centru | 0,791 | 0,860 | 0,933 | 0,975 | 1,010 | 1,062 | 1,115 | 1,090 | 1,081 | 1,142 |
| Nord-Est | 0,533 | 0,495 | 0,498 | 0,520 | 0,483 | 0,481 | 0,485 | 0,531 | 0,550 | 0,531 |
| Nord-Vest | 0,443 | 0,457 | 0,444 | 0,424 | 0,465 | 0,488 | 0,494 | 0,531 | 0,618 | 0,629 |
| Sud-Est | 0,559 | 0,545 | 0,540 | 0,524 | 0,546 | 0,524 | 0,538 | 0,555 | 0,568 | 0,611 |
| Sud-Muntenia | 1,530 | 1,436 | 1,408 | 1,319 | 1,256 | 1,291 | 1,283 | 1,235 | 1,274 | 1,346 |
| Sud-Vest Oltenia | 2,764 | 2,790 | 2,843 | 2,944 | 2,898 | 2,932 | 2,845 | 2,804 | 2,842 | 2,773 |
| Vest | 1,870 | 1,885 | 1,688 | 1,615 | 1,556 | 1,450 | 1,399 | 1,315 | 1,250 | 1,106 |

### Electricity, gas, steam and air conditioning

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 1,085 | 1,126 | 1,147 | 1,155 | 1,129 | 1,203 | 1,188 | 1,235 | 1,203 | 1,144 |
| Centru | 0,879 | 0,881 | 0,851 | 0,807 | 0,792 | 0,781 | 0,789 | 0,811 | 0,826 | 0,881 |
| Nord-Est | 0,822 | 0,795 | 0,725 | 0,691 | 0,653 | 0,486 | 0,466 | 0,474 | 0,644 | 0,656 |
| Nord-Vest | 0,657 | 0,666 | 0,649 | 0,652 | 0,652 | 0,672 | 0,683 | 0,656 | 0,668 | 0,716 |
| Sud-Est | 1,122 | 1,182 | 1,238 | 1,243 | 1,273 | 1,336 | 1,260 | 1,265 | 1,229 | 1,229 |
| Sud-Muntenia | 0,837 | 0,761 | 0,778 | 0,745 | 0,729 | 0,720 | 0,706 | 0,718 | 0,739 | 0,738 |
| Sud-Vest Oltenia | 1,764 | 1,750 | 1,728 | 1,876 | 2,003 | 2,057 | 2,221 | 2,114 | 1,968 | 1,921 |
| Vest | 1,061 | 1,080 | 1,150 | 1,128 | 1,105 | 1,108 | 1,088 | 1,100 | 1,026 | 1,017 |

## Construction

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 1,614 | 1,685 | 1,700 | 1,675 | 1,660 | 1,607 | 1,574 | 1,501 | 1,425 | 1,416 |
| Centru | 0,913 | 0,892 | 0,898 | 0,903 | 0,900 | 0,885 | 0,895 | 0,890 | 0,890 | 0,894 |
| Nord-Est | 0,832 | 0,811 | 0,807 | 0,830 | 0,818 | 0,840 | 0,850 | 0,877 | 0,894 | 0,908 |
| Nord-Vest | 0,861 | 0,861 | 0,846 | 0,844 | 0,869 | 0,897 | 0,904 | 0,915 | 0,906 | 0,905 |
| Sud-Est | 1,050 | 1,072 | 1,094 | 1,090 | 1,096 | 1,104 | 1,102 | 1,119 | 1,136 | 1,113 |
| Sud-Muntenia | 0,833 | 0,813 | 0,806 | 0,815 | 0,820 | 0,824 | 0,829 | 0,839 | 0,852 | 0,855 |
| Sud-Vest Oltenia | 0,941 | 0,935 | 0,961 | 0,938 | 0,933 | 0,956 | 0,972 | 0,996 | 1,033 | 1,028 |
| Vest | 0,858 | 0,829 | 0,784 | 0,791 | 0,804 | 0,772 | 0,757 | 0,742 | 0,728 | 0,744 |

## Wholesale and retail trade

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 1,433 | 1,435 | 1,400 | 1,397 | 1,399 | 1,357 | 1,349 | 1,322 | 1,283 | 1,299 |
| Centru | 1,054 | 1,048 | 1,051 | 1,056 | 1,039 | 1,039 | 1,040 | 1,023 | 1,002 | 0,993 |
| Nord-Est | 0,857 | 0,868 | 0,874 | 0,875 | 0,874 | 0,890 | 0,894 | 0,912 | 0,926 | 0,922 |
| Nord-Vest | 0,972 | 0,956 | 0,964 | 0,965 | 0,957 | 0,949 | 0,946 | 0,944 | 0,944 | 0,939 |
| Sud-Est | 0,929 | 0,925 | 0,937 | 0,944 | 0,951 | 0,949 | 0,952 | 0,961 | 0,976 | 0,977 |
| Sud-Muntenia | 0,835 | 0,847 | 0,859 | 0,848 | 0,850 | 0,870 | 0,866 | 0,866 | 0,876 | 0,873 |
| Sud-Vest Oltenia | 0,809 | 0,820 | 0,820 | 0,824 | 0,840 | 0,848 | 0,864 | 0,884 | 0,889 | 0,886 |
| Vest | 1,045 | 1,042 | 1,040 | 1,029 | 1,041 | 1,040 | 1,027 | 1,014 | 1,003 | 1,008 |

## Accommodation and food service activities

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 1,312 | 1,425 | 1,346 | 1,412 | 1,449 | 1,421 | 1,389 | 1,386 | 1,319 | 1,281 |
| Centru | 1,359 | 1,333 | 1,350 | 1,356 | 1,356 | 1,321 | 1,318 | 1,306 | 1,262 | 1,235 |
| Nord-Est | 0,792 | 0,739 | 0,771 | 0,753 | 0,781 | 0,737 | 0,799 | 0,779 | 0,821 | 0,842 |
| Nord-Vest | 0,883 | 0,952 | 0,943 | 0,960 | 0,964 | 0,968 | 0,938 | 0,965 | 0,965 | 0,993 |
| Sud-Est | 1,109 | 1,089 | 1,068 | 1,021 | 0,989 | 1,059 | 1,054 | 1,072 | 1,052 | 1,079 |
| Sud-Muntenia | 0,797 | 0,666 | 0,730 | 0,730 | 0,710 | 0,670 | 0,693 | 0,660 | 0,722 | 0,710 |
| Sud-Vest Oltenia | 0,711 | 0,715 | 0,733 | 0,703 | 0,721 | 0,764 | 0,762 | 0,772 | 0,825 | 0,828 |
| Vest | 1,004 | 1,068 | 1,047 | 1,020 | 0,970 | 1,015 | 0,986 | 0,975 | 0,907 | 0,918 |

## Public administration and defence; social insurance from the public system, administrative and support service activities

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 2,080 | 1,935 | 1,972 | 2,037 | 2,133 | 2,071 | 1,985 | 1,987 | 2,021 | 2,040 |
| Centru | 0,786 | 0,867 | 0,922 | 0,875 | 0,859 | 0,918 | 0,943 | 0,849 | 0,848 | 0,838 |
| Nord-Est | 0,741 | 0,748 | 0,721 | 0,702 | 0,698 | 0,720 | 0,735 | 0,751 | 0,706 | 0,711 |
| Nord-Vest | 0,646 | 0,683 | 0,694 | 0,679 | 0,686 | 0,683 | 0,704 | 0,726 | 0,716 | 0,706 |
| Sud-Est | 0,952 | 0,943 | 0,947 | 0,909 | 0,904 | 0,873 | 0,889 | 0,903 | 0,886 | 0,897 |
| Sud-Muntenia | 0,887 | 0,918 | 0,894 | 0,892 | 0,874 | 0,881 | 0,881 | 0,895 | 0,849 | 0,844 |
| Sud-Vest Oltenia | 0,935 | 0,940 | 0,927 | 0,946 | 0,895 | 0,876 | 0,827 | 0,803 | 0,798 | 0,789 |
| Vest | 0,797 | 0,836 | 0,784 | 0,807 | 0,785 | 0,789 | 0,848 | 0,846 | 0,827 | 0,819 |

## Financial intermediation and insurance, real estate transactions

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 2,666 | 2,647 | 3,433 | 3,399 | 3,106 | 3,335 | 3,361 | 2,700 | 2,598 | 2,715 |
| Centru | 0,791 | 0,813 | 0,646 | 0,651 | 0,719 | 0,646 | 0,638 | 0,709 | 0,683 | 0,649 |
| Nord-Est | 0,650 | 0,648 | 0,524 | 0,510 | 0,592 | 0,541 | 0,555 | 0,650 | 0,624 | 0,609 |
| Nord-Vest | 0,805 | 0,776 | 0,654 | 0,652 | 0,695 | 0,648 | 0,654 | 0,715 | 0,734 | 0,755 |
| Sud-Est | 0,737 | 0,754 | 0,635 | 0,638 | 0,694 | 0,654 | 0,611 | 0,687 | 0,674 | 0,681 |
| Sud-Muntenia | 0,622 | 0,626 | 0,486 | 0,491 | 0,533 | 0,487 | 0,511 | 0,601 | 0,575 | 0,598 |
| Sud-Vest Oltenia | 0,610 | 0,639 | 0,539 | 0,552 | 0,605 | 0,587 | 0,536 | 0,624 | 0,672 | 0,646 |
| Vest | 0,792 | 0,813 | 0,647 | 0,651 | 0,691 | 0,635 | 0,604 | 0,897 | 0,891 | 0,718 |

## Health and social care

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 0,981 | 1,006 | 1,021 | 1,088 | 1,093 | 1,097 | 1,113 | 1,107 | 1,041 | 1,011 |
| Centru | 0,976 | 0,980 | 0,995 | 0,996 | 0,998 | 0,992 | 1,006 | 0,996 | 1,012 | 1,010 |
| Nord-Est | 1,116 | 1,122 | 1,122 | 1,096 | 1,095 | 1,103 | 1,113 | 1,131 | 1,156 | 1,162 |
| Nord-Vest | 1,047 | 1,026 | 1,004 | 0,981 | 0,983 | 0,977 | 0,962 | 0,952 | 0,963 | 0,957 |
| Sud-Est | 0,982 | 0,988 | 0,967 | 0,970 | 0,957 | 0,951 | 0,933 | 0,951 | 0,952 | 0,957 |
| Sud-Muntenia | 0,885 | 0,877 | 0,886 | 0,877 | 0,880 | 0,888 | 0,885 | 0,880 | 0,881 | 0,884 |
| Sud-Vest Oltenia | 0,970 | 0,958 | 0,937 | 0,935 | 0,938 | 0,952 | 0,955 | 0,955 | 0,992 | 1,012 |
| Vest | 1,038 | 1,031 | 1,056 | 1,036 | 1,036 | 1,010 | 0,998 | 0,988 | 0,979 | 1,004 |

## Education

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Bucuresti - Ilfov | 0,961 | 0,926 | 0,920 | 0,928 | 0,974 | 0,905 | 0,852 | 0,861 | 0,835 | 0,832 |
| Centru | 1,095 | 1,083 | 1,075 | 1,060 | 1,063 | 1,052 | 1,048 | 1,032 | 1,024 | 1,022 |
| Nord-Est | 1,172 | 1,158 | 1,159 | 1,175 | 1,172 | 1,192 | 1,214 | 1,246 | 1,272 | 1,263 |
| Nord-Vest | 1,064 | 1,074 | 1,067 | 1,065 | 1,050 | 1,066 | 1,072 | 1,055 | 1,046 | 1,041 |
| Sud-Est | 0,910 | 0,933 | 0,939 | 0,945 | 0,929 | 0,947 | 0,946 | 0,943 | 0,973 | 0,988 |
| Sud-Muntenia | 0,868 | 0,876 | 0,871 | 0,862 | 0,852 | 0,863 | 0,871 | 0,878 | 0,879 | 0,882 |
| Sud-Vest Oltenia | 0,946 | 0,967 | 0,980 | 0,986 | 0,976 | 1,010 | 1,038 | 1,041 | 1,052 | 1,026 |
| Vest | 0,953 | 0,962 | 0,975 | 0,962 | 0,958 | 0,953 | 0,963 | 0,948 | 0,954 | 0,980 |

## Annex 2. Herfindahl specialization index

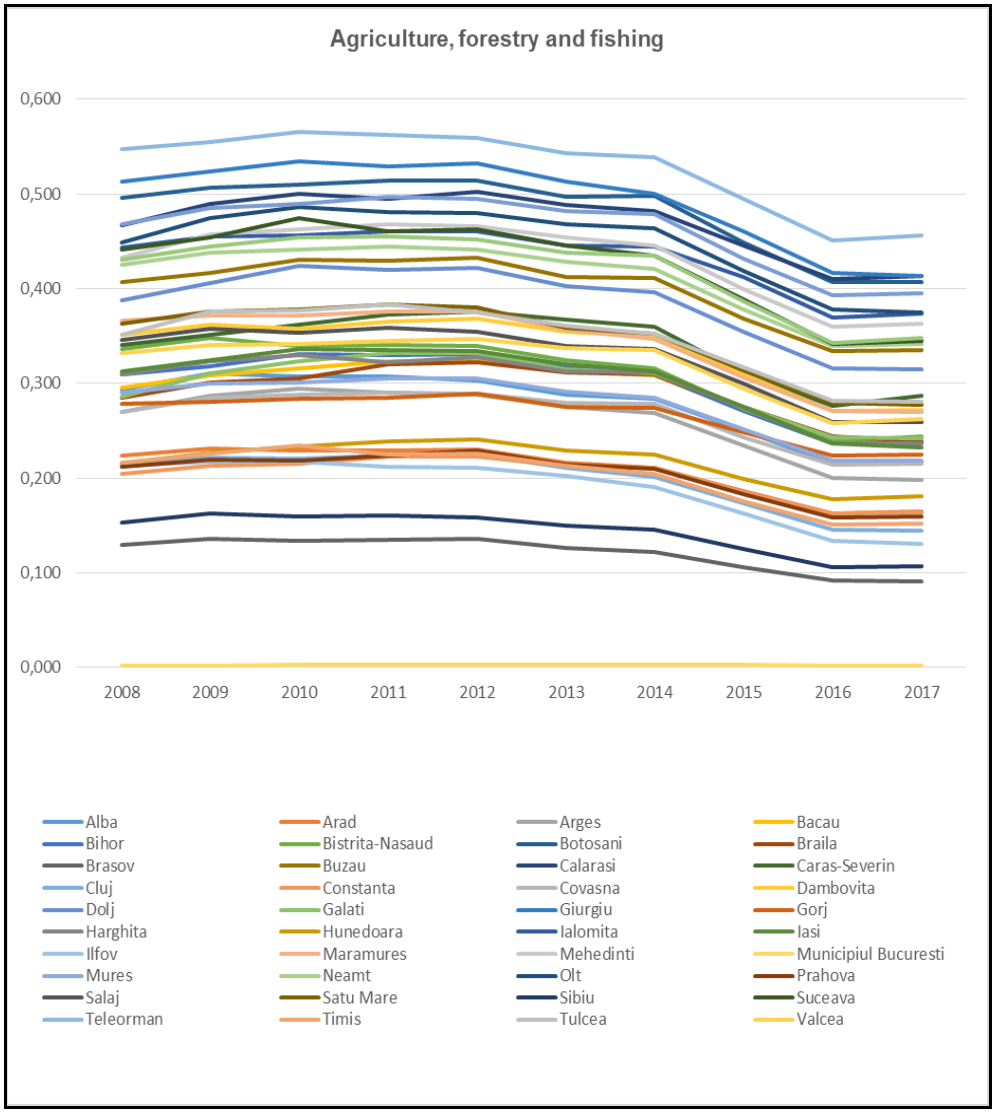
| | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** |
|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL | 0,149 | 0,150 | 0,152 | 0,153 | 0,153 | 0,148 | 0,146 | 0,137 | 0,129 | 0,129 |
| Counties | | | | | | | | | | |
| Alba | 0,186 | 0,186 | 0,185 | 0,191 | 0,185 | 0,181 | 0,181 | 0,178 | 0,176 | 0,176 |
| Arad | 0,171 | 0,168 | 0,172 | 0,174 | 0,172 | 0,175 | 0,176 | 0,178 | 0,179 | 0,178 |
| Arges | 0,174 | 0,174 | 0,178 | 0,178 | 0,176 | 0,175 | 0,171 | 0,168 | 0,170 | 0,170 |
| Bacau | 0,158 | 0,160 | 0,165 | 0,170 | 0,169 | 0,166 | 0,164 | 0,150 | 0,142 | 0,143 |
| Bihor | 0,179 | 0,179 | 0,187 | 0,189 | 0,188 | 0,182 | 0,181 | 0,168 | 0,160 | 0,159 |
| Bistrita-Nasaud | 0,194 | 0,193 | 0,189 | 0,193 | 0,189 | 0,186 | 0,183 | 0,181 | 0,173 | 0,173 |
| Botosani | 0,285 | 0,293 | 0,297 | 0,302 | 0,301 | 0,287 | 0,288 | 0,250 | 0,222 | 0,222 |
| Braila | 0,163 | 0,164 | 0,165 | 0,174 | 0,173 | 0,169 | 0,167 | 0,153 | 0,145 | 0,149 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Brasov | 0,132 | 0,126 | 0,124 | 0,128 | 0,127 | 0,131 | 0,129 | 0,130 | 0,130 | 0,135 |
| Buzau | 0,228 | 0,229 | 0,240 | 0,240 | 0,241 | 0,229 | 0,227 | 0,204 | 0,189 | 0,189 |
| Calarasi | 0,260 | 0,275 | 0,283 | 0,281 | 0,288 | 0,275 | 0,271 | 0,243 | 0,220 | 0,221 |
| Caras-Severin | 0,181 | 0,187 | 0,192 | 0,199 | 0,200 | 0,195 | 0,193 | 0,167 | 0,152 | 0,158 |
| Cluj | 0,133 | 0,129 | 0,127 | 0,130 | 0,127 | 0,124 | 0,122 | 0,118 | 0,113 | 0,113 |
| Constanta | 0,118 | 0,118 | 0,120 | 0,123 | 0,121 | 0,120 | 0,120 | 0,115 | 0,111 | 0,111 |
| Covasna | 0,182 | 0,177 | 0,181 | 0,182 | 0,182 | 0,181 | 0,183 | 0,174 | 0,167 | 0,166 |
| Dambovita | 0,198 | 0,202 | 0,205 | 0,210 | 0,209 | 0,203 | 0,201 | 0,186 | 0,179 | 0,176 |
| Dolj | 0,203 | 0,213 | 0,225 | 0,221 | 0,222 | 0,209 | 0,205 | 0,179 | 0,161 | 0,161 |
| Galati | 0,154 | 0,157 | 0,162 | 0,167 | 0,167 | 0,159 | 0,156 | 0,141 | 0,131 | 0,130 |
| Giurgiu | 0,290 | 0,300 | 0,311 | 0,307 | 0,309 | 0,291 | 0,279 | 0,263 | 0,214 | 0,212 |
| Gorj | 0,135 | 0,135 | 0,136 | 0,136 | 0,137 | 0,133 | 0,132 | 0,122 | 0,116 | 0,117 |
| Harghita | 0,187 | 0,187 | 0,189 | 0,185 | 0,187 | 0,179 | 0,179 | 0,163 | 0,156 | 0,157 |
| Hunedoara | 0,134 | 0,134 | 0,138 | 0,143 | 0,144 | 0,143 | 0,143 | 0,140 | 0,139 | 0,138 |
| Ialomita | 0,243 | 0,248 | 0,251 | 0,254 | 0,254 | 0,242 | 0,241 | 0,218 | 0,192 | 0,195 |
| Iasi | 0,159 | 0,162 | 0,168 | 0,168 | 0,166 | 0,160 | 0,155 | 0,139 | 0,125 | 0,123 |
| Ilfov | 0,149 | 0,150 | 0,150 | 0,148 | 0,146 | 0,145 | 0,142 | 0,140 | 0,134 | 0,134 |
| Maramures | 0,208 | 0,209 | 0,211 | 0,214 | 0,215 | 0,205 | 0,203 | 0,189 | 0,178 | 0,177 |
| Mehedinti | 0,230 | 0,245 | 0,250 | 0,254 | 0,252 | 0,244 | 0,236 | 0,208 | 0,186 | 0,188 |
| Municipiul Bucuresti | 0,105 | 0,104 | 0,102 | 0,102 | 0,102 | 0,103 | 0,102 | 0,103 | 0,103 | 0,104 |
| Mures | 0,165 | 0,164 | 0,167 | 0,170 | 0,169 | 0,164 | 0,160 | 0,151 | 0,143 | 0,143 |
| Neamt | 0,236 | 0,243 | 0,244 | 0,248 | 0,244 | 0,237 | 0,231 | 0,207 | 0,187 | 0,188 |
| Olt | 0,255 | 0,269 | 0,278 | 0,276 | 0,274 | 0,265 | 0,263 | 0,232 | 0,208 | 0,209 |
| Prahova | 0,146 | 0,140 | 0,139 | 0,141 | 0,142 | 0,140 | 0,140 | 0,139 | 0,138 | 0,139 |
| Salaj | 0,203 | 0,201 | 0,199 | 0,203 | 0,200 | 0,195 | 0,192 | 0,179 | 0,167 | 0,168 |
| Satu Mare | 0,211 | 0,212 | 0,215 | 0,220 | 0,216 | 0,206 | 0,201 | 0,183 | 0,171 | 0,172 |
| Sibiu | 0,150 | 0,140 | 0,141 | 0,144 | 0,142 | 0,145 | 0,145 | 0,156 | 0,156 | 0,160 |
| Suceava | 0,238 | 0,248 | 0,263 | 0,254 | 0,255 | 0,243 | 0,235 | 0,205 | 0,179 | 0,181 |
| Teleorman | 0,329 | 0,335 | 0,348 | 0,346 | 0,342 | 0,327 | 0,323 | 0,284 | 0,251 | 0,254 |
| Timis | 0,148 | 0,141 | 0,149 | 0,152 | 0,149 | 0,150 | 0,151 | 0,148 | 0,149 | 0,144 |
| Tulcea | 0,184 | 0,193 | 0,193 | 0,197 | 0,190 | 0,184 | 0,182 | 0,158 | 0,144 | 0,143 |
| Valcea | 0,174 | 0,177 | 0,179 | 0,182 | 0,181 | 0,178 | 0,177 | 0,160 | 0,149 | 0,151 |
| Vaslui | 0,266 | 0,276 | 0,281 | 0,287 | 0,283 | 0,274 | 0,271 | 0,236 | 0,211 | 0,211 |
| Vrancea | 0,239 | 0,246 | 0,253 | 0,254 | 0,250 | 0,242 | 0,240 | 0,210 | 0,187 | 0,189 |
| Regions | | | | | | | | | | |
| Bucuresti - Ilfov | 0,103 | 0,102 | 0,100 | 0,100 | 0,099 | 0,101 | 0,100 | 0,102 | 0,102 | 0,102 |
| Centru | 0,155 | 0,151 | 0,151 | 0,154 | 0,152 | 0,151 | 0,150 | 0,147 | 0,145 | 0,147 |
| Nord-Est | 0,206 | 0,213 | 0,220 | 0,221 | 0,220 | 0,211 | 0,207 | 0,182 | 0,163 | 0,162 |
| Nord-Vest | 0,174 | 0,173 | 0,174 | 0,177 | 0,175 | 0,169 | 0,166 | 0,156 | 0,147 | 0,147 |
| Sud-Est | 0,161 | 0,165 | 0,169 | 0,173 | 0,172 | 0,165 | 0,164 | 0,148 | 0,137 | 0,138 |
| Sud-Muntenia | 0,192 | 0,195 | 0,199 | 0,200 | 0,201 | 0,193 | 0,190 | 0,174 | 0,163 | 0,163 |
| Sud-Vest Oltenia | 0,194 | 0,200 | 0,207 | 0,207 | 0,207 | 0,198 | 0,196 | 0,174 | 0,157 | 0,158 |
| Vest | 0,151 | 0,148 | 0,154 | 0,157 | 0,156 | 0,156 | 0,156 | 0,152 | 0,151 | 0,149 |

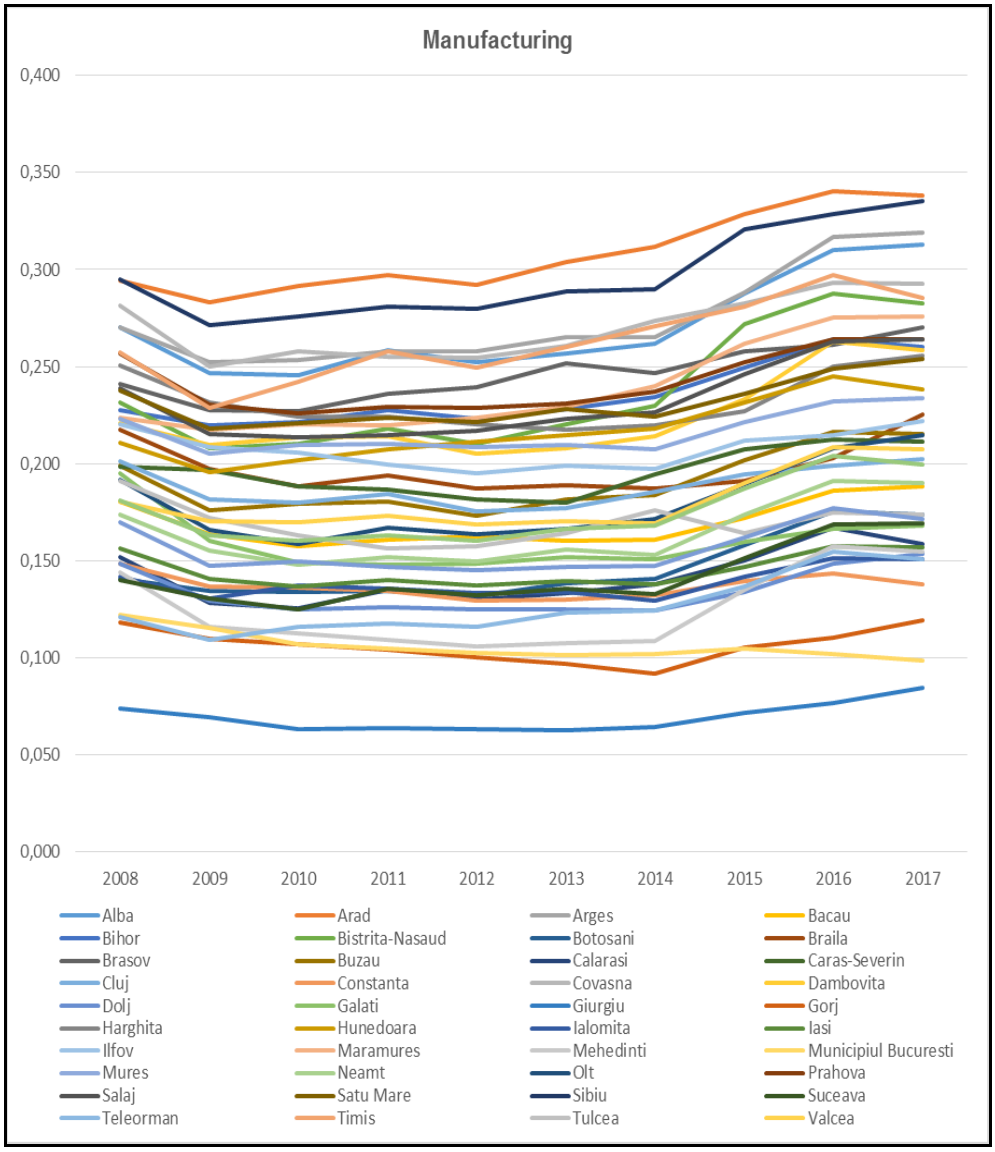
## Annex 3. Krugman dissimilarity index

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Counties | | | | | | | | | | |
| Alba | 0,196 | 0,195 | 0,185 | 0,203 | 0,185 | 0,186 | 0,189 | 0,206 | 0,229 | 0,239 |
| Arad | 0,245 | 0,261 | 0,279 | 0,271 | 0,277 | 0,296 | 0,300 | 0,290 | 0,294 | 0,285 |
| Arges | 0,168 | 0,155 | 0,168 | 0,166 | 0,170 | 0,173 | 0,169 | 0,185 | 0,221 | 0,225 |
| Bacau | 0,143 | 0,144 | 0,156 | 0,170 | 0,159 | 0,174 | 0,184 | 0,189 | 0,208 | 0,206 |
| Bihor | 0,152 | 0,164 | 0,180 | 0,179 | 0,172 | 0,185 | 0,183 | 0,181 | 0,193 | 0,187 |
| Bistrita-Nasaud | 0,199 | 0,189 | 0,175 | 0,179 | 0,172 | 0,177 | 0,190 | 0,230 | 0,240 | 0,244 |
| Botosani | 0,454 | 0,448 | 0,444 | 0,450 | 0,446 | 0,439 | 0,454 | 0,427 | 0,412 | 0,413 |
| Braila | 0,109 | 0,116 | 0,114 | 0,135 | 0,130 | 0,145 | 0,146 | 0,145 | 0,154 | 0,172 |
| Brasov | 0,328 | 0,325 | 0,332 | 0,331 | 0,328 | 0,320 | 0,317 | 0,289 | 0,257 | 0,265 |
| Buzau | 0,275 | 0,261 | 0,284 | 0,280 | 0,282 | 0,279 | 0,290 | 0,280 | 0,284 | 0,283 |
| Calarasi | 0,407 | 0,432 | 0,451 | 0,428 | 0,432 | 0,427 | 0,426 | 0,422 | 0,417 | 0,424 |
| Caras-Severin | 0,167 | 0,192 | 0,193 | 0,191 | 0,188 | 0,201 | 0,216 | 0,214 | 0,203 | 0,204 |
| Cluj | 0,161 | 0,160 | 0,172 | 0,169 | 0,165 | 0,167 | 0,165 | 0,151 | 0,158 | 0,153 |
| Constanta | 0,284 | 0,284 | 0,280 | 0,272 | 0,281 | 0,279 | 0,272 | 0,269 | 0,268 | 0,276 |
| Covasna | 0,216 | 0,199 | 0,223 | 0,205 | 0,205 | 0,223 | 0,211 | 0,204 | 0,223 | 0,219 |
| Dambovita | 0,230 | 0,243 | 0,253 | 0,256 | 0,253 | 0,263 | 0,256 | 0,254 | 0,281 | 0,268 |
| Dolj | 0,238 | 0,256 | 0,283 | 0,280 | 0,284 | 0,277 | 0,278 | 0,260 | 0,257 | 0,249 |
| Galati | 0,077 | 0,109 | 0,127 | 0,143 | 0,139 | 0,130 | 0,133 | 0,142 | 0,146 | 0,144 |
| Giurgiu | 0,504 | 0,494 | 0,508 | 0,515 | 0,511 | 0,515 | 0,498 | 0,638 | 0,527 | 0,509 |
| Gorj | 0,333 | 0,341 | 0,349 | 0,355 | 0,342 | 0,354 | 0,346 | 0,335 | 0,352 | 0,337 |
| Harghita | 0,201 | 0,205 | 0,197 | 0,178 | 0,180 | 0,187 | 0,191 | 0,169 | 0,179 | 0,180 |
| Hunedoara | 0,214 | 0,223 | 0,236 | 0,226 | 0,231 | 0,234 | 0,233 | 0,226 | 0,213 | 0,201 |
| Ialomita | 0,337 | 0,337 | 0,332 | 0,337 | 0,345 | 0,343 | 0,355 | 0,355 | 0,333 | 0,337 |
| Iasi | 0,179 | 0,185 | 0,200 | 0,197 | 0,184 | 0,192 | 0,193 | 0,189 | 0,184 | 0,190 |
| Ilfov | 0,330 | 0,348 | 0,357 | 0,353 | 0,349 | 0,342 | 0,337 | 0,340 | 0,330 | 0,335 |
| Maramures | 0,246 | 0,251 | 0,250 | 0,249 | 0,260 | 0,254 | 0,263 | 0,263 | 0,263 | 0,261 |
| Mehedinti | 0,348 | 0,369 | 0,379 | 0,380 | 0,374 | 0,385 | 0,391 | 0,353 | 0,358 | 0,365 |
| Municipiul Bucuresti | 0,704 | 0,706 | 0,727 | 0,736 | 0,736 | 0,724 | 0,720 | 0,674 | 0,640 | 0,648 |
| Mures | 0,136 | 0,127 | 0,125 | 0,123 | 0,121 | 0,120 | 0,122 | 0,121 | 0,126 | 0,127 |
| Neamt | 0,301 | 0,303 | 0,302 | 0,307 | 0,305 | 0,298 | 0,300 | 0,288 | 0,284 | 0,287 |
| Olt | 0,347 | 0,375 | 0,390 | 0,378 | 0,375 | 0,379 | 0,381 | 0,358 | 0,343 | 0,350 |
| Prahova | 0,212 | 0,198 | 0,201 | 0,191 | 0,186 | 0,184 | 0,181 | 0,173 | 0,174 | 0,175 |
| Salaj | 0,243 | 0,232 | 0,219 | 0,223 | 0,222 | 0,226 | 0,228 | 0,228 | 0,221 | 0,226 |
| Satu Mare | 0,265 | 0,260 | 0,265 | 0,273 | 0,266 | 0,259 | 0,251 | 0,237 | 0,231 | 0,238 |
| Sibiu | 0,288 | 0,289 | 0,313 | 0,305 | 0,313 | 0,321 | 0,317 | 0,312 | 0,296 | 0,311 |
| Suceava | 0,348 | 0,345 | 0,372 | 0,349 | 0,350 | 0,345 | 0,339 | 0,318 | 0,291 | 0,295 |
| Teleorman | 0,563 | 0,545 | 0,555 | 0,547 | 0,535 | 0,534 | 0,540 | 0,520 | 0,505 | 0,512 |
| Timis | 0,197 | 0,186 | 0,207 | 0,222 | 0,216 | 0,220 | 0,225 | 0,221 | 0,229 | 0,227 |
| Tulcea | 0,196 | 0,212 | 0,189 | 0,208 | 0,195 | 0,198 | 0,189 | 0,208 | 0,198 | 0,218 |
| Valcea | 0,146 | 0,146 | 0,130 | 0,134 | 0,142 | 0,154 | 0,168 | 0,153 | 0,143 | 0,157 |
| Vaslui | 0,421 | 0,439 | 0,435 | 0,442 | 0,428 | 0,433 | 0,442 | 0,424 | 0,421 | 0,431 |
| Vrancea | 0,312 | 0,318 | 0,324 | 0,326 | 0,317 | 0,317 | 0,323 | 0,293 | 0,271 | 0,280 |
| Regions | | | | | | | | | | |
| Bucuresti - Ilfov | 0,631 | 0,634 | 0,652 | 0,662 | 0,657 | 0,650 | 0,646 | 0,603 | 0,576 | 0,580 |
| Centru | 0,169 | 0,159 | 0,164 | 0,169 | 0,169 | 0,171 | 0,167 | 0,165 | 0,159 | 0,168 |
| Nord-Est | 0,261 | 0,264 | 0,274 | 0,272 | 0,268 | 0,269 | 0,272 | 0,257 | 0,245 | 0,243 |
| Nord-Vest | 0,129 | 0,123 | 0,119 | 0,124 | 0,120 | 0,120 | 0,122 | 0,122 | 0,121 | 0,120 |
| Sud-Est | 0,104 | 0,114 | 0,117 | 0,127 | 0,127 | 0,130 | 0,134 | 0,135 | 0,138 | 0,136 |
| Sud-Muntenia | 0,188 | 0,186 | 0,187 | 0,187 | 0,190 | 0,189 | 0,189 | 0,187 | 0,199 | 0,198 |
| Sud-Vest Oltenia | 0,250 | 0,255 | 0,263 | 0,263 | 0,265 | 0,264 | 0,269 | 0,250 | 0,245 | 0,240 |
| Vest | 0,145 | 0,144 | 0,163 | 0,167 | 0,166 | 0,174 | 0,178 | 0,168 | 0,167 | 0,157 |

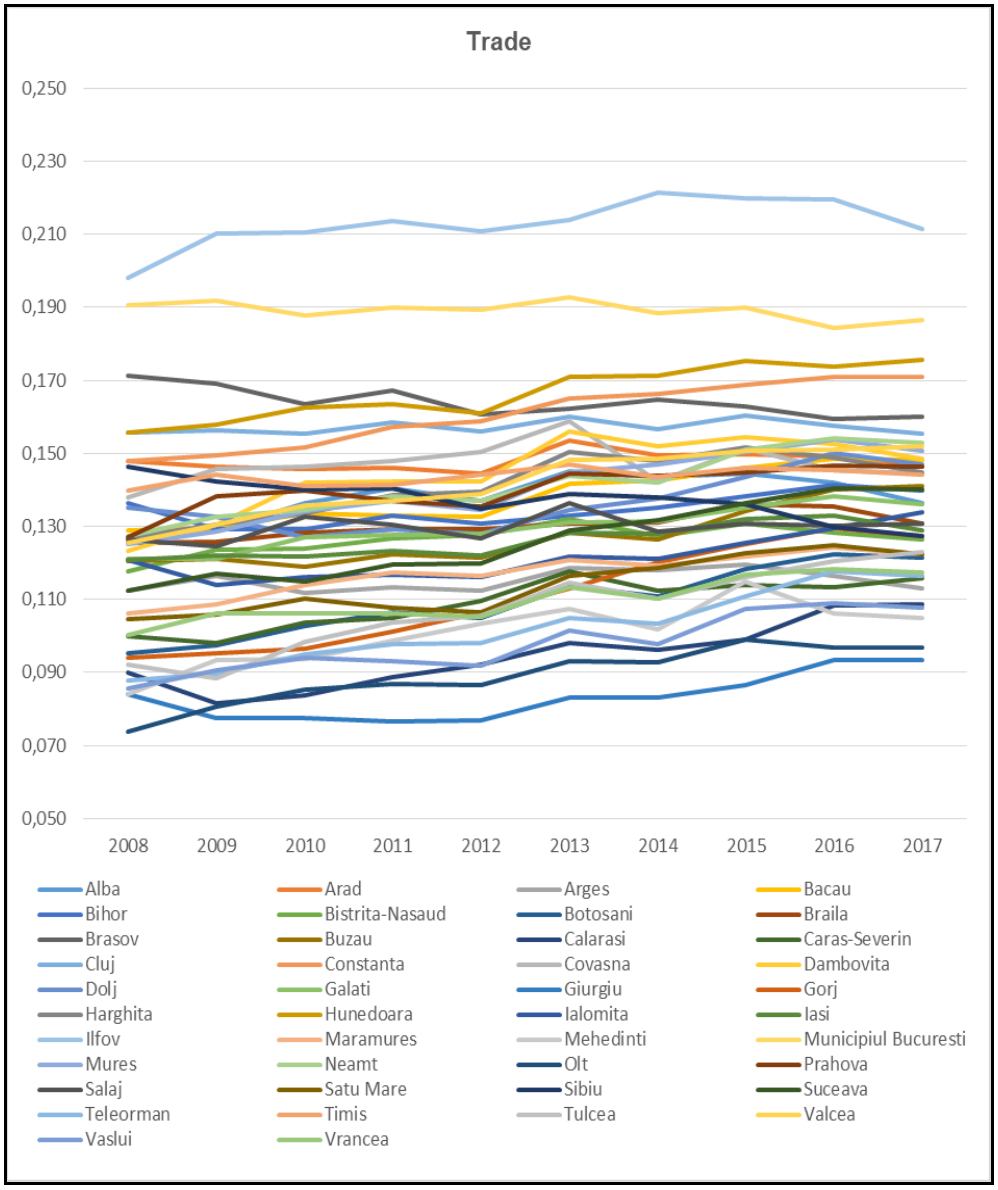
## Annex 4. Specialization coefficients for the main economic sectors




*Source: own processing*




Source: own processing




*Source: own processing*