Geographical context of the revealed competitiveness of urbanised areas in Hungary excluding the Budapest agglomeration

György Vida[A]*, Gábor Dudás[B]

Abstract

The processes of economic globalization have transformed socio-economic spatial functioning of the territories. These trends caused international competition between countries, regions, and settlements. According to this, nowadays, the examination of competitiveness has become an important research question in economic geography. The aim of our study is to examine the scale-dependent processes of revealed competitiveness of agglomerations, agglomerating areas, and settlement groups in Hungary excluding the Budapest agglomeration. The study was based on quantitative research methods using an empirical database and mathematical statistical methods. Firstly, we conducted a Principal Component Analysis (PCA) of revealed competitiveness in different geographical scales and afterwards, we utilized the method of Spatial Autocorrelation on a settlement level. Our findings showed that there are significant spatial differences among the performance of the Hungarian urbanised areas. The east-west dichotomy considering competitiveness despite the European Unions' developmental funds is still present between Agglomerations, Agglomerating areas, and Settlement groups in Hungary. Moreover, according to our calculations, intra-regional polarization and scale mechanism are in connection with revealed competitiveness and it is justified by spatial autocorrelation.

Keywords: Revealed competitiveness, Scale, Agglomerations, Agglomerating areas, Settlement groups, Hungary

Introduction

In the global economy of the 21st century, the economic competition between regions and settlements is intensifying across borders. The companies have realized that in the current economic division of labour their competitive advantage derives from spatial concentration. Therefore, nowadays the national economy level is re-evaluating and the significance of the local level - especially the cities and their agglomerations – is increasing along with the need for their competitiveness analyses (Dicken, 2015; Wood, Roberts, 2011). Due to the hierarchic spatial structure of the international economy and the precise definition of agglomerations, the role of geography is emerging in the competitiveness research of certain areas.

Competitiveness and its measurement issues have a comprehensive literature basis and are a continuously researched area on an international level. These studies include country comparisons (Bartha, Szita, 2015; IMD, 2014; WEF, 2015), NUTS 2 and NUTS 3 (No-

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[A] Junior lecturer, Department of Economic and Social Geography, University of Szeged, Szeged, Hungary; Address: H-6722 Szeged, Egyetem utca 2. Phone: +36 62 344176; email: vidagyorgy.vida@gmail.com

[B] Research fellow, Institute for Regional Studies, Centre for Economic and Regional Studies, Hungarian Academy of Sciences, Békéscsaba, Hungary; Address: H-5600 Békéscsaba, Szabó Dezső utca 42. Phone/fax: +36 66 441801; email: dudasgabor5@gmail.com

* Corresponding author: György Vida, e-mail: vidagyorgy.vida@gmail.com, phone: +36 62 344176

menclature of Territorial Units for Statistics according to the European Union classification) level analyses (EC, 2014; Enyedi, 2009; Klamár, 2016; Madzevic, et al., 2013; Lengyel, Rechnitzer, 2013a; Zenka, et al., 2014), as well as LAU1 and LAU2 (Local Administrative Units according to the European Union classification) level analyses (Csomós, 2015; Lengyel, Szakálné Kanó, 2012). The common point of the former analyses is that they applied available and measurable indicators as well as mathematical methods, which enabled to make rankings between the analysed regions. In addition, the selected indicators were aggregated into groups or factors and thus complex competitive analyses were carried out.

Nevertheless, we have to note that in the existing studies in several cases the geographical scale was determined by the aggregation level of the available data. Although, for example, the extent of an agglomeration is sometimes beyond LAU2 or NUTS3 scale, while in other cases they are smaller than these territorial units (Lengyel, Rechnitzer, 2013b). This outlines that in mainstream analyses comparison between scales and the problem of variable territorial units causing different spatial patterns do not receive sufficient attention.

Whereas, primarily it is reasonable to compare areas with similar economic size, therefore, our analysis is focusing on urban areas in Hungary excluding the Budapest agglomeration (26 per cent of the Hungarian population, more than 2,5 million people lives there, according to 2011 Census), and we expect to outline more significant differences between these areas.

According to the above, the aim of the paper is to examine the scale-dependent processes of revealed competitiveness of urban areas in Hungary excluding the Budapest agglomeration. Based on the issues raised in the previous paragraphs, the research seeks to answer two main questions. On the one hand, how do the revealed competitiveness values of urban settlement groups, agglomerating areas, and agglomerations vary relative to each other in Hungary? On the other hand, how do administrative boundaries and different effects on settlement level modify the revealed competitiveness of urban areas? To answer these research questions we basically applied mathematical and statistical methods and our calculations were carried out for three different geographical scales.

In the first half of the study, the interdisciplinary interpretations of the concept of competitiveness will be discussed, as well as the determining role of geographical scale and its conceptual issues. After the literature review, we present the applied methods and define our study area in Hungary. In the second half of the study, the revealed competitiveness of the re-

gions will be analysed using Principal Component Analysis. Thereafter, the results are presented on different scales to reveal the nexus of the applied methods and the geographical delimitation and how these affect the revealed competitiveness of the analysed areas. Then, to identify settlement polarization within settlement groups - except the Budapest agglomeration – we applied spatial autocorrelation, the local Gi* statistics invented by Getis and Ord on a settlement level. Finally, the findings and conclusions are presented at the end of the paper.

Theoretical framework of regional competitiveness

Regional competitiveness along with economic convergence and polarization is permanently in focus of researchers and policy makers, moreover, the regional policy of the European Union also builds on it. A number of studies deal with this topic (Annoni, Dijkstra, 2013; Annoni, Kozovska, 2010), however, we think it is important to clarify the widely used notion of competitiveness and shortly present the social debate around it.

The discourse, in general, is defined by neoliberal corporate strategy economics and evolutionary theory connected to city competitiveness and success concepts (Benedek, Moldovan, 2015; Porter, 2003), and several studies discuss it in details (Camagni, 2002; Huggins, et al., 2013; Lengyel, 2004). In this train of thoughts mostly the standard definition of competitiveness (EC, 1999; EC, 2014) is used, which is also adopted by the European Competitiveness Report. The essence of this concept is that "*competitiveness is understood to mean a sustained rise in the standards of living of a nation or region and as a low level of involuntary unemployment, as possible.*" (EC, 2008). Building on this concept, several models have been constituted to interpret regional competitiveness and to analyse the factors affecting it (Huggins, et al., 2013; Porter, et al., 2008). Such an interpretation frameworks are, for example, the European Regional Competitiveness Index (Annoni, et al., 2017; Annoni, Dijkstra, 2013; Annoni, Kozovska, 2010), the UK Competitiveness Index (Huggins, Thomson, 2016), or the Pyramid Model by Lengyel (2004, 2016), which all are based on global competitiveness rankings (IMD, 2014; WEF, 2015). These models have in common that the revealed competitiveness of the regions and areas are associated with the inhabitants' household incomes, labour productivity, and employment rate. However, it can be concluded that in the view of economics and regional science the neoliberal approach to economic development is in the nucleus of regional success and basically, this could be associated with GDP, the con-

centration of explicit and implicit knowledge, labour productivity, and income levels.

Over time, these above-mentioned interpretations have to face with several critics (Hudson, Hadjimichalis, 2014; Nagy, et al., 2012) and amendments even within the field of economics and from social geography as well, which divides also the research society (Bristow, 2010). It can be also concluded that economic agglomeration and concentration raises many social problems. Such issues can be, inter alia, metropolitan (power) conflicts (Boros, et al., 2010), public safety, evolving segregation in the developed regions (Marcinczak, et al., 2015), or the problem of deviance and deprivation (Szirmai, 2015). Furthermore, competitiveness analysis and actions based on economic growth raises not only social problems but serious environmental concerns (Alexander, 2012; Boros, Nagy, 2014; Dombi, Málovics, 2015; Newman, Jennings, 2008). Additionally, they also highlight the statistical and methodological problems of competitiveness studies (Kotosz, 2016; Nagy, Koós, 2014; Stiglitz, et al. 2009). Consequently, it is difficult to find such factors, which can be used to map a regions' competitiveness and success effectively and undisputedly. The Stiglitz-Sen-Fitoussi report is a comprehensive publication focusing on this issue (Stiglitz, et al., 2009).

Overall, in scientific life, there is a serious theoretical and practical discourse about the interpretation and measurement process of competitiveness. Our point of view is that alternative approaches have a significant role in the interpretation and modelling of the concept since in order to allocate the developmental funds more precisely, it is advisable to determine and map the relative position of the areas more accurately. However, critics of the alternative economic approach should be treated cautiously. Despite, it criticizes the mainstream models but does not provide pragmatic answers, since it would go against the concepts' transformation and complex way of thinking. In addition, alternative well-being indexes do not show significant differences from mainstream competitiveness indicators, rather they only complement them (Nagy, Koós, 2014). Summing up, we built on the pyramid model of Lengyel (2004, 2016), as in our view this makes not only possible to measure the regions' outputs, but to structure the factors affecting it (Lengyel, 2004; Lukovics, 2009). Our research is based on the basic categories, which we relate to revealed competitiveness, and the logical framework of the model is intrinsically aligned with the ***inputs → outputs → outcomes*** economic development logic (Huggins, et al., 2013; Lengyel, 2016). In our study, taking notice of the literature critics, we aligned to the unified European competitiveness concept and seek to reveal the relations between scale and competitiveness.

Geography, scale and delimitation effects in regional revealed competitiveness

In addition to the conceptual and measurement approaches of competitiveness, the interlocking of different regional competitiveness processes linked to different territorial levels are very important, and this highlights the role of geography. It can be stated that in addition to the difficulties in the selection of the suitable indicators, often the applied methods and the scale also affect the results (Boros, Pál, 2011; Egedy, 2012; Kotosz, 2016). The research of Shin and Agnew (2011) pointed out that in the case of using the same indicators, the global correlation and regression analysis may show different results in space than spatial autocorrelation and the geographically weighted regression analysis. The reasons for this discrepancy can be found in the complex factors explaining socio-economic phenomenon's – beyond the already mentioned approaches – and also in spatial differences associated with the problem of scale. Another challenge is the assessment of the Modifiable Areal Unit Problem issue in social and economic analysis (Dusek, 2004; Dusek, Kotosz, 2016; Fotheringham, Wong, 1991; Openshaw, 1984; Tagashira, Okabe, 2002), as the same phenomenon due to different geographical delimitations shows diverse spatial patterns. Accordingly, in addition to objective external territorial disposition criteria, other social factors should be taken into account. So, the whole territorial disposition and scale issue strongly react upon the assessment of regional competitiveness, therefore, in our study, we want to focus on the geographic point of view of this issue.

In human geography and in regional science nodal regions – a city and its agglomeration - have a key role (Lengyel, Rechnitzer, 2004). However, the spatial extent of these areas differ from administrative boundaries in several cases, therefore, there is a great need for mathematical models to be able to delimitate the agglomerations of the cities. Thus, the delimitation of real agglomerations or functional urban areas has not only internationally notable literature but also in Hungary (Antikainen, 2005; Pénzes, 2016). Accordingly, our study was based on the territorial units (agglomerations, agglomerating areas, and settlements groups) delimitated by the Hungarian Central Statistical Office using the 2011 Census data (Fig. 1) (Tóth, 2014). Although we have to note, that there are other delimitation approaches, for example, based on local labour system which is one dimension of functional urban areas (Pénzes, et al., 2014, 2015). In certain cases, delimitation based on real commuting and labour market processes may outline the regional catchment areas of regional centres more effectively (Pálóczi, et al., 2016; Pénzes, et al., 2014, 2015). Nevertheless, these
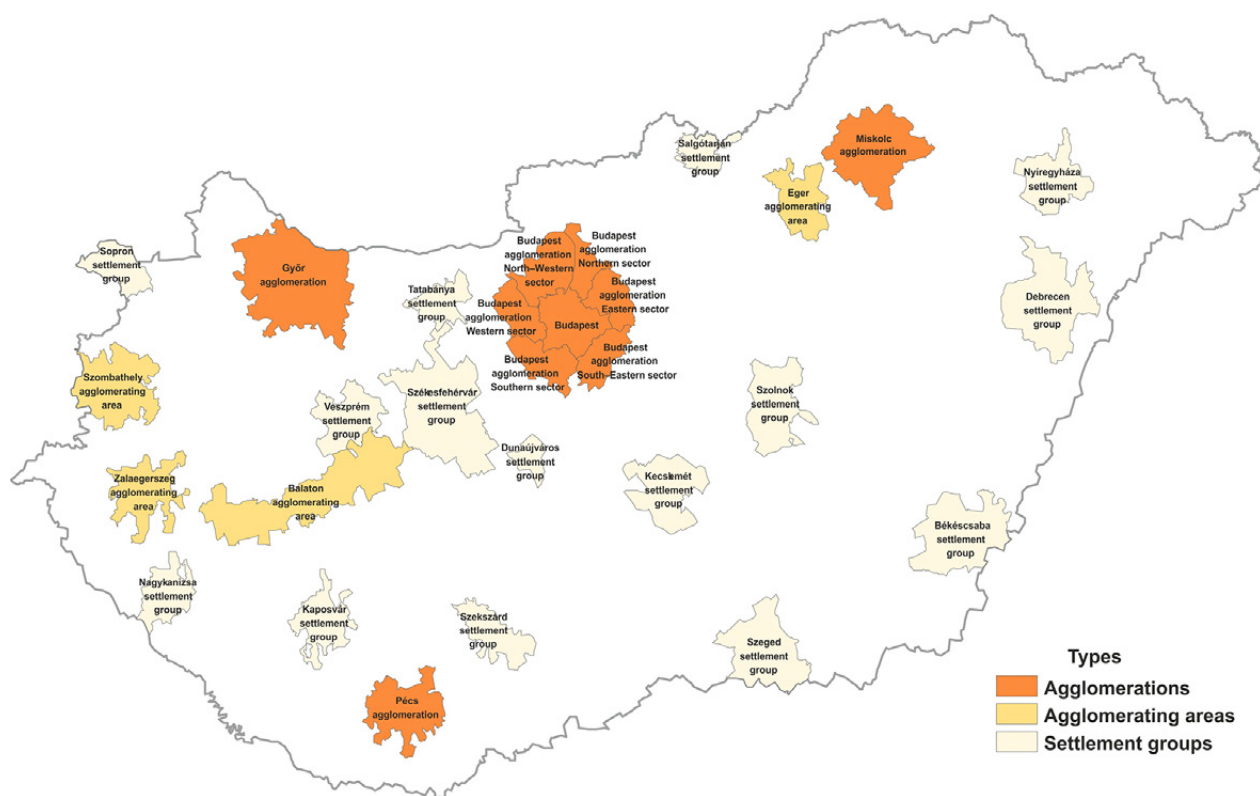
Figure 1. Settlement groups, agglomerations, and agglomerating areas in Hungary after 2011
Source: https://www.ksh.hu/regional_atlas_agglomerations, modified by the authors

delimitations are difficult to utilise in regional competitiveness analyses as the borders change more dynamically than in the case of micro-regions or delimitations related to them. Therefore, we think that the local labour system is an important approach to delimitate functional urban areas, however, we utilised the micro-region delimitation of the CSO, since it is based on such infrastructural indexes which fit our nodal region concept (Lengyel, Rechnitzer, 2004) and the administrative boundaries in Hungary.

The difference between the three urbanised areas delimited by the CSO is based on relations between the centre and the agglomeration. In relation to settlement groups, agglomerating areas and agglomerations assume tighter economic, social, and demographic relations between settlements in space (Tóth, 2014). In our study, during the selection of the sample areas previous academic literature considerations were taken into account (Schuchmann, Váradi, 2015; Szilágyi, 2014; Szirmai, Ferencz, 2015), thus the Budapest agglomeration and the Balaton agglomerating area was not included in the study. The reason for doing so is that we can experience certain economic competition between agglomerations and settlement groups of Hungary, but as the Budapest agglomeration is significantly greater than the others, thus we assume that more powerful rivalry is between the rests of the urban areas. In the case of the Balaton agglomeration, the main reason not to include it in the

study was, that it is an artificially created agglomeration and its settlements do not constitute a real agglomeration, rather they have more tourism-oriented importance in Hungary.

Methodology

In our study, the revealed competitiveness of Hungarian urban areas was analysed and its scale related processes. To answer the research question raised in the introductory part we basically applied mathematical and statistical methods and our calculations were carried out for three different geographical scales (urban areas without Budapest, LAU1, and LAU2 level). In the course of our study, primarily, we have created specific indicators which made it able to represent revealed competitiveness on different scales. Then, a Principal Component Analysis (PCA) was made and along the resulting factor values the selected study areas were differentiated. In addition, our analysis was supplemented by Spatial Autocorrelation, thus we were able to study the geographical characteristics of revealed competitiveness and compare it with the geographical scope of urbanised areas. The data for the quantitative analysis was gathered from the database of the Hungarian Central Statistical Office [1] and the National Spatial Development and Planning Information System [2], for different territorial levels. For the computerized investigation (mathematical and statistical calculations,

mapping, charting), we used SPSS 23 and the ArcMap 10.3. Geographic Information System (GIS).

Based on the Pyramid model of Lengyel (2004) and the theoretical background of the basic categories, in our analyses we utilised the collected data based on previous methodological researches (Lukovics, 2009; Lukovics, Kovács, 2011; Szakálné Kanó, 2008), thus, we created three specific indicators, which served as the input variables for the PCA analysis:

- Personal income per capita (2007, 2013)
- The number of taxpayers per 100 inhabitants (2007, 2013)
- The ratio of registered jobseekers from the working-age population (2007, 2013)

When creating the principal component of the revealed competitiveness, we paid special attention to the precise enforcement of the statistical rules (Dusek, Kotosz, 2016) and that the data utilised by the dimension reduction method should be available for the same year and for all three territorial levels. So, we strived for that the KMO and Barlett's score would be above 0,500, the eigenvalue above 1, and the principal component would explain at least 70 percent of the variance of the variables. In order to represent some temporal dynamics related to the European Union 2007-2013 funding period the Principal Component of revealed competitiveness was computed for the years of 2007 and 2013 but only for the highest scale (agglomerations, agglomerating areas, settlement groups level) due to statistical limitations (Dusek, Kotosz, 2016; Lukovics, Kovács, 2011). Accordingly, our principal component has the following features on the three examined scale:

- In agglomerations, agglomerating areas, and settlement groups level based on 2007 data with 21 item number the KMO value is 0,687 the principal component contains explained variance of 80,878 and the eigenvalue is 2,426;
- In agglomerations, agglomerating areas, and settlement groups level based on 2013 data with 21 item number the KMO value is 0,618, the principal component contains explained variance of 71,905 and the eigenvalue is 2,157;
- In LAU1 level based on 2013 data with item number 175 the KMO value is 0,738, the principal component contains explained variance of 81,238 and the eigenvalue is 2,437;
- In municipality level based on 2013 data with 3152 item number the KMO value is 0,695, the principal component contains explained variance of 76,049 and the eigenvalue is 2,281.

To ensure comparability, we defined 4 categories at each scale as follows: territorial units above 1 factor value were considered as strong competitiveness, between zero and 1 factor value above-average, between zero and -1 below average, while under -1 were considered as weak competitiveness. In addition, principal components of different scales were mapped using GIS by projecting the layers at each other to visualize the differences arising from different geographical delimitations. Moreover, the calculation of the factor values can answer the question that what kind of municipal differences prevail between the borders of agglomerations, agglomerating areas, and settlement groups - mostly interpreted as regions. Additionally, in order to outline the polarization between geographical scales and highlight the territorial differences behind urban areas, we utilized the method of Spatial Autocorrelation on a settlement level. In the study, the local Gi* statistics by Getis-Ord (Getis, Ord, 1992) was utilized by using the principal component factor values.

After discussing the methodology, we think it is important to note few limitations of the study. It is important to point out that due to the specific geographic delimitations, only 21 urbanised areas are included in the study, which counts as a low number in mathematical statistical analyses, however, the item number of the LAU1 and LAU2 level is adequate. In addition, another limitation was that some data is only accessible at regional or county level, thus they are not available at lower levels, which made it difficult to select the most appropriate indicators for our research. In conclusion, however, we can state, that the mathematical apparatus used in the study is broad, and we strained after to picture the revealed competitiveness of settlement groups more precisely.

Revealed competitiveness of Hungarian agglomerations, agglomerating, areas and settlement groups

In the course of measuring regional revealed competitiveness, it is important to compare areas with similar economic potential to each other. First, groups of revealed competition and its differences were determined. Based on the Pyramid model of Lengyel (2004) the principal component representing the basic categories clearly differentiated the studied areas. By mapping these separate groups, the spatial configuration of the group members can be revealed, and also the dynamics were highlighted between 2007 and 2013 in Figure 2.

According to our calculations, urban areas with strong revealed competitiveness have high income and labour productivity and the employment level is positive as well. Geographically, these areas are located mostly near the capital and in the north-western
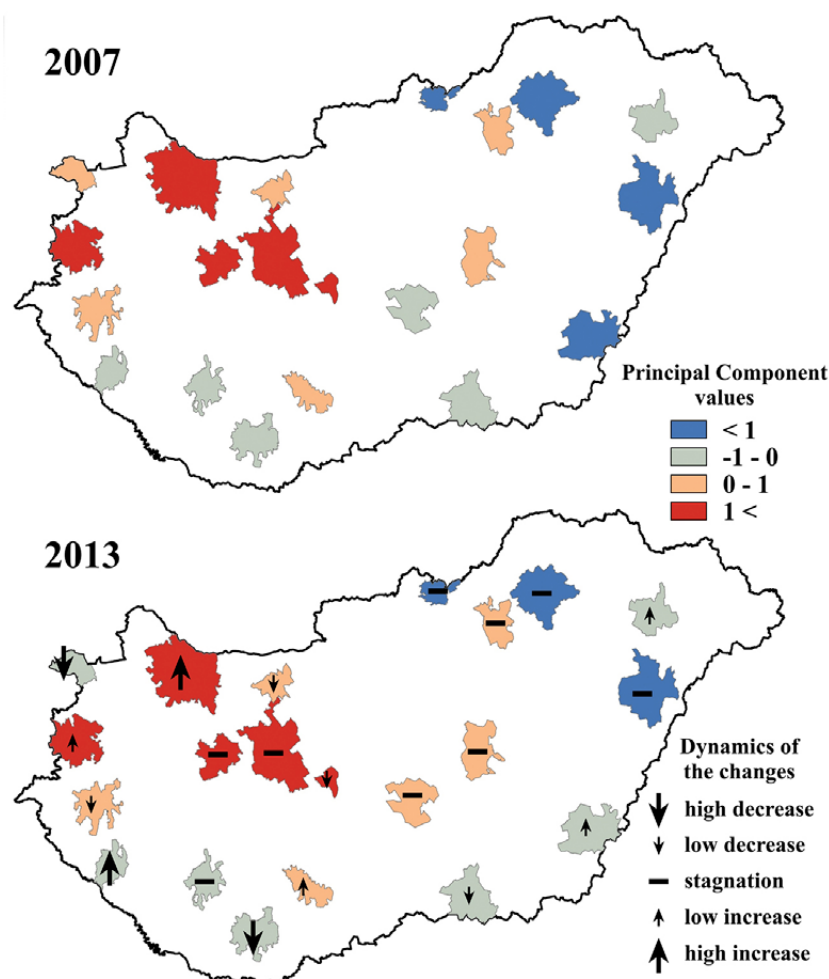
Figure 2. Types of urban areas (excluding Budapest) by principal component
values of revealed competitiveness and the dynamics of changes between 2007
and 2013
Source: https://www.ksh.hu/, https://www.teir.hu/, own calculations

region of Hungary near the Austrian border. In this group, areas with export-oriented industries dominate (Szakálné Kanó, Vas, 2013), while the university education role and the tourist attractiveness is secondary. In addition, advantageous traffic conditions, proximity of outlets, existence of production centres (Veszprém settlement group), and export-oriented automotive industries (Győr agglomeration) are present in this group. Based on the standard deviation values of the factor values we can state that basically, this group is steadily competitive.

For urban areas with above average revealed competitiveness, positive factor values are typical and they do not show outstanding differences. This group is almost at the same distance from the groups with strong and below average competitiveness, which points out that the degree of spatial differences seems to be stable. The spatial location of these areas shows similarity with the former category since they are either at an available distance from the capital or are close to Austria, which may highlight their integration of into

global networks. It can be also stated that the Kecskemét settlement group is in this group, but due to the effects of the recently realized major automotive industry investments, in the future, it could move to the group with strong competitiveness.

For urban areas with below average revealed competitiveness, negative factor values are typical and they do not show outstanding differences. This group is very heterogeneous, but the distance from the capital city is well outlined. Geographically, areas near the southern borders of Hungary, typical university cities as Pécs and Szeged, and the Nyíregyháza settlement group are included in this group. The results show that areas building on knowledge capital are significantly lagged behind export-oriented manufacturing centers. Moreover, the Sopron settlement group is also included in this group, which highlights that not all North-Transdanubian areas have an outstanding performance. In addition to advantageous geographical location the closeness of main transport corridors (e.g. highways) and infrastructural accessibility matters as well.

Areas with weak competitiveness are close to spatial peripheries (Alpek, et al., 2016) (Debrecen settlement group) or are the depressed areas of former socialist industrial cities such as the Miskolc or the Salgótarján settlement group. There are also major differences within this group with less competition among group members. Moreover, the results also outline, that despite the infrastructural investments, the geographical accessibility is unfavourable and the economic and social problems stemming from the post-socialist period needs to be addressed.

The dynamics of revealed competitiveness show that between 2007 and 2013 there was no significant spatial rearrangement, however, some minor changes in the directions were highlighted. Comparing the minimum and maximum factor values it was outlined that urbanised areas diverge compared to 2007. This may be because the Győr agglomeration produced significant improvement, while the least competitive areas in 2007 stagnate in 2013. Our results also show that the Győr agglomeration and the Nagykanizsa settlement group in relation to themselves show significant improvement, while the Pécs agglomeration and the Sopron settlement group declined notably. Between 2007 and 2013 the Békéscsaba, Nyíregyháza, and Szekszárd settlement group and the Szombathely ag-glomerating area slightly improved, the Dunaújváros, Szeged, and Tatabánya settlement group and the Zalaegerszeg agglomerating area slightly declined while the other areas stagnated considering revealed competitiveness.

In our point of view, during the analysis of revealed competitiveness of areas not only the real output has an important role, but the applied geographical framework has significant effect on the interpretation of the results. Accordingly, we analysed revealed competitiveness on LAU1 administrative level (Fig. 3), since, due to the availability of the data, urban areas are interpreted in this framework by most of the Hungarian researchers (Lengyel, Szakálné Kanó, 2012; Lukovics, Kovács, 2011).

Our study provides a kind of evidence for the determinate role of scale since more urbanised areas got into a better category with higher factor values than in the case of the NUTS3 level. Thus, for example, the Debrecen or the Sopron settlement group on the LAU1 level were classified in the above average competitiveness category. Although it is important to note that while in the case of Debrecen better values are caused by the narrowing down of the study area until then the Sopron area was expanded and this resulted in better values. This may be due to macro processes,
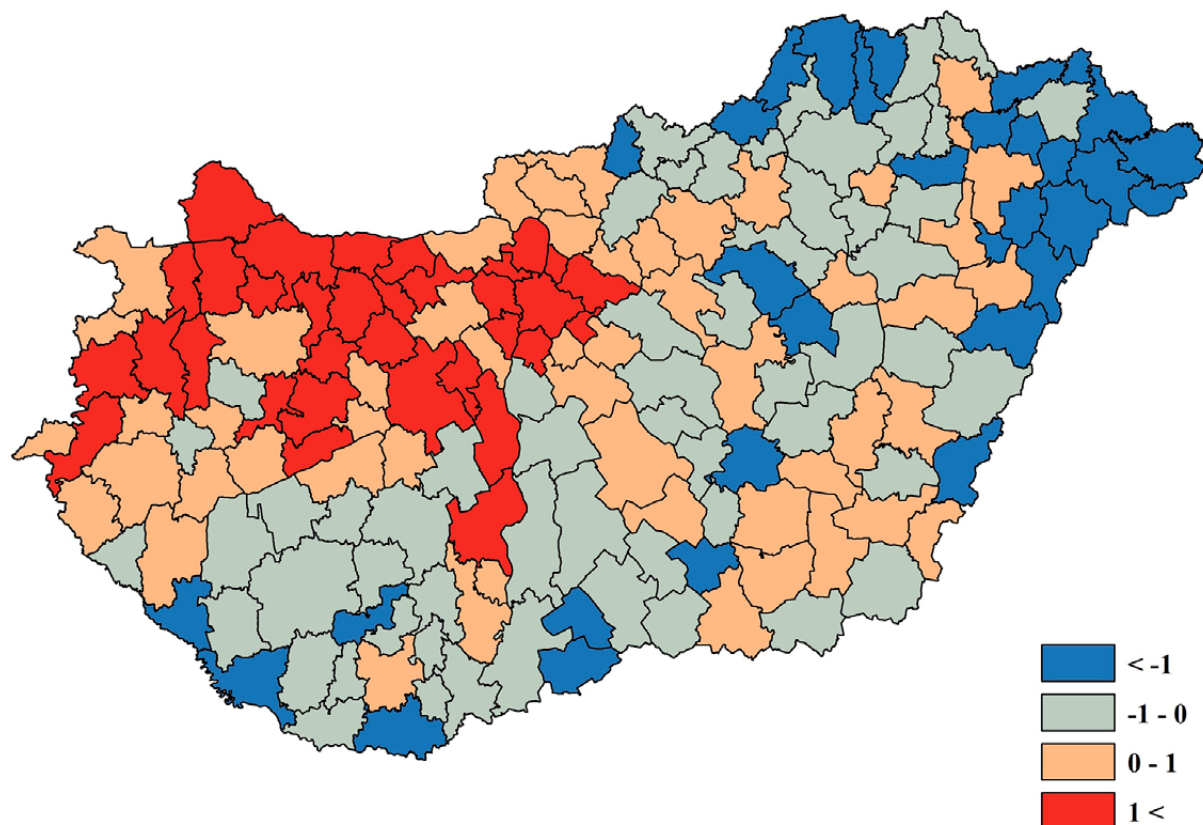
Figure 3. Types of LAU1 level units by principal component values of revealed competitiveness
Source: https://www.ksh.hu/, https://www.teir.hu/, own calculations

since the east-west and developed-underdeveloped dichotomy may affect locality in this way.

At LAU1 administrative level, the economic space forming role of the Hungarian highway improvements is much more outlined. In addition, against the general approaches, we can determine areas of weaker competitiveness at the northern part of Transdanubia as well. It is also highlighted that at the northeastern part of Hungary contiguous external lagging areas are present, which is not typical at the southern part of Transdanubia to such an extent. This suggests, that this area is the most uncompetitive part of Hungary, which particularly affects the performance of these settlement groups.

Overall, it can be stated that according to our results significant differentiating factors in competitiveness values may be the distance from Budapest, proximity to the Austrian border, accessibility of highways, and the existence of export-oriented manufacturing centres. The differences between the groups are durable, however, the competition within the groups is sharp. Evidence for the importance of administrative delimitation is the fact that some cities and its agglomerations got into different factor group, and this was caused either by the decline or the increase of the size of the delimitated areas. This intends to support that economic processes are related to scale, and more attention should be paid on this in later studies.

Scale determinants of polarisation in the revealed competitiveness in Hungarian urbanised areas

During the measurement of competitiveness, highlighting of spatial differences within a region remains mostly in the background, but this could increase the complexity of the topic. In our point of view, an index-number of success could be utilized that explains, that to what extent the central city can affect its agglomeration. For example, the decrease in unemployment can affect local incomes and indirectly the well-being of the whole area. However, if there are significant differences between the centre and its agglomeration that could cause tension. Therefore, in a competitive urban area, the spatial balance of economic interactions can be assumed. In order to highlight real polarisation, it is advisable to calculate factor values on a settlement scale (LAU2 level) as well as presenting it with spatial autocorrelation to reveal local territorial differences (Fig. 4-5.).

Considering the settlement level delimitation, the relativeness of the positive economic space forming role of the Hungarian highway investments are outlined since for example, the Budapest-Kecskemét-Szeged axis includes several small peripheral islands, which are hidden on higher scale. Actually, it may indicate the stronger economic polarization of these ar-
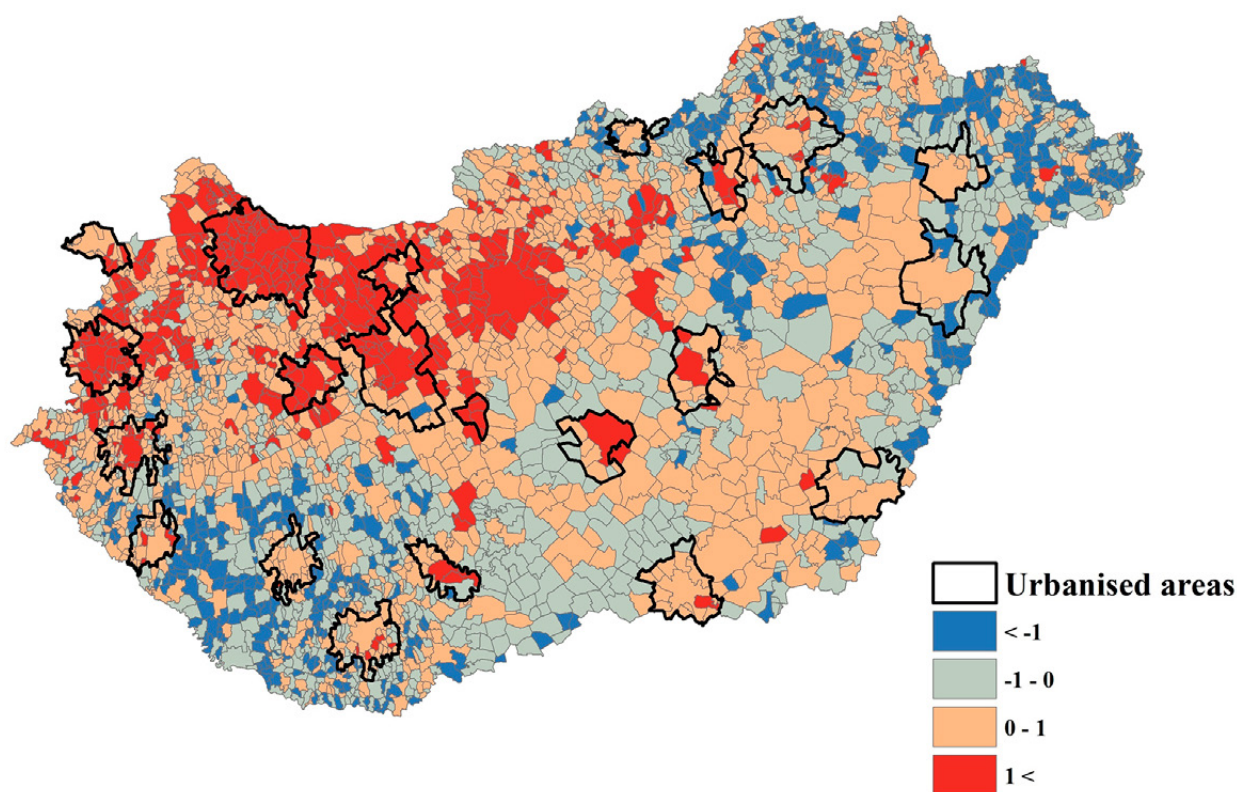
Figure 4. Types of municipalities by principal componentvalues of revealed competitiveness
*Source: https://www.ksh.hu/, https://www.teir.hu/, own calculations*

eas. On a settlement scale, the influencing role of the proximity of the capital on competitiveness is not so powerful, as in higher scale. If we compare the figures, we can discover significant differences within the LAU1 administrative level as well. This suggests, that nationally the economic performance of the central cities and the attracted settlements are separated. Although, it is advisable to note the distorting effects of the specific indicators at the low populated settlements. Nevertheless, we can find small villages with good factor values, but this is mostly due to that, low population numbers have a positive impact on specific values. Implicitly, in addition to the change of scale, the examined item number also contributes to a much more diverse spatial pattern, therefore, to determine the spatial dependence of spatial disparities the use of Getis-Ord global and local spatial autocorrelation indicator could be justified. The results of the general Getis-Ord analysis is a given z-score of 2.49 and a less than 5 percent likelihood that this high-clustered pattern could be the result of random chance in addition to a 0,01 p-value. This proves that there is a positive spatial autocorrelation, thus geographical neighbourhood has relevance in the processes. The high-high and low-low values are located contiguously in Hungary, however, if we analyse the local values precise

geographical differences were outlined within urban areas (Fig. 5).

In the spatial autocorrelation of the factor values, the impact of both national trends and local characteristics can be observed, which can contribute to the competitiveness of regions. Settlement groups at the north-western part of Hungary have positive values, which suggests that the interactions between the centre and the attracted settlements are adequate. The centre (e.g. Győr, Székesfehérvár, Veszprém) has a positive impact on the attracted settlements, the employment is also above national average. Of course, the picture is overshadowed by the fact that at the western border the cross-border economic processes have also an impact on local employment.

Urban areas with above and under average revealed competitiveness show mixed picture, but the spatial autocorrelation of the homogeneous high values are not typical for the whole region. Thus, average values or differences between the centre and its agglomeration (e.g. Kaposvár and Szeged settlement group, Pécs agglomeration) turn up. In addition to the economic differences, an explanation could be also the settlement system of Hungary since the small village area represents a large part of the country, which is in competitive disadvantage in global competition.
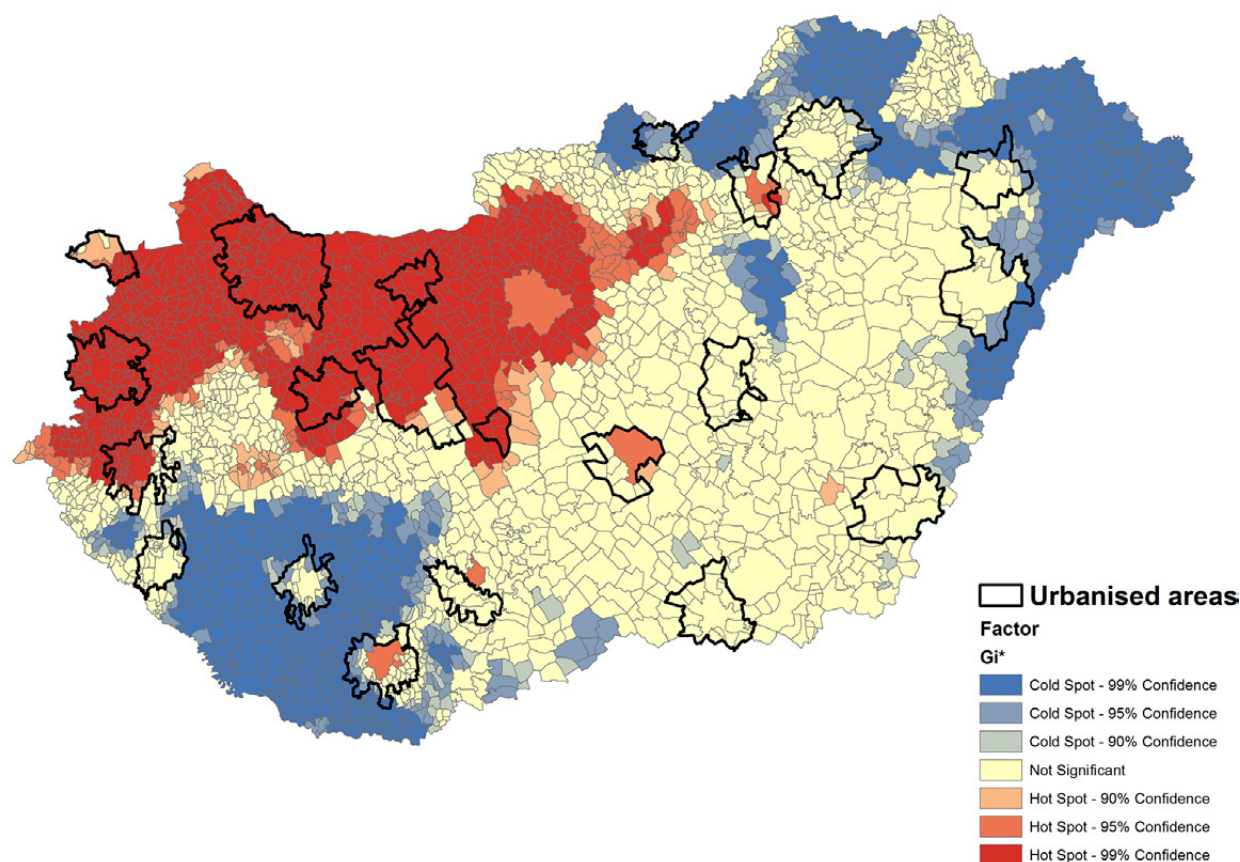
Figure 5. The local Getis-Ord territorial autocorrelation of the principal component value of revealed competitiveness
Source: https://www.ksh.hu/, https://www.teir.hu/, own calculations

Urbanised areas with weak revealed competitiveness do not show high values and the discrepancy between the centre and the attracted settlements is outlined. In this case, the central city (e.g. Debrecen, Miskolc) could not have a substantive effect on the surrounding settlements, thus it could not integrate the hinterlands' workforce into the local economy, which may also be the sign of some kind of spatial economic performance.

In conclusion, our results on the settlement scale considering economic terms, over-estimate the delimitation processes and instead of the macro analyses, put emphasis on relations within agglomerations. The local similarities also highlight that in the case of the complex crisis regions, the centre settlement of the urbanised area outperforms its agglomeration, but differences within the region are greater.

Conclusions

Since the process of globalization has transformed the spatial functioning of the economy, it has facilitated competition between regions across borders. It is not different in the European Union or in Hungary, either. It can be concluded that interpretation and measurement of the concept of competitiveness are constantly at the forefront of academic researchers and policy makers, although the analyses are diversified and contradictory. In this discourse, we put emphasis on geographical scale and effect of the delimitation in these processes. In our study, we highlighted the role of macro and local geographical factors in revealed competitiveness, which was examined along two questions.

In response to our research questions, we can state, that based on our calculation the east-west dichotomy considering competitiveness despite the European Unions' developmental funds is still present between Agglomerations, Agglomerating areas, and Settlement groups. The export-oriented manufacturing centres are more competitive than university regions, moreover, the permanently lagging regions are mainly concentrated in the eastern part of Hungary. The key issue, in this case, will be the adequate development of peripheral areas as well as the re-integration of the former industry into the global economic networks.

According to our results, the selection of the research framework or the geographical scale has a significant role in the measurement of the revealed competitiveness of regions. Our study also points out indirectly, that in the allocation of the funds scale could be very important as for example (Tésits, Alpek, 2014), the EU subsidies should not be allocated on NUTS2 level, however, this requires further anal-ysis. In future, it would be advisable to examine the factors affecting revealed competitiveness and its diversity on different scales. In addition, the differentiated analysis of the results may highlight the spatial phenomenon of the Simpson-paradox (Dusek, Kotosz, 2016), since due to different delimitation the correlation and regression between indicators may be positive on the one scale while negative on the other scale (Openshaw, Taylor, 1979; Tagashira, Okabe, 2002).

According to our calculations, intra-regional polarisation is in connection with revealed competitiveness. Local spatial autocorrelation indicates, that where the regions' revealed competitiveness is stronger, there the central city has positive effect on its agglomeration. Nevertheless, where problems arise, there the spatial polarisation is more significant within nodal regions.

Overall, in the future, it would be advisable to extend the notion of competitiveness like well-being works (Berki, Halász, 2015) and its analysis by incorporating environmental, political representation and spatial factors into statistical analyses. It would be also advisable to study the suburbanization effect in competitiveness inside urbanised areas, or the eminence of urbanized areas in revealed competitiveness comparing the surrounding counties average. Furthermore, the geographical scale could be taken into further consideration by incorporating the delimitation of functional urban areas and the analysis of its competitiveness. Based on the results, however, it can be concluded that it is important to emphasize the complexity of the interpretation of the processes. Thus, it is necessary to identify the shortcomings and the limitations of the research methodology and in addition, it should be refined and supplemented by empirical research.

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