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Original scientific paper

THE SOCIO-ECONOMIC PERFORMANCE OF THE HUNGARIAN NUTS3 REGIONS BETWEEN 2010-2020

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Abstract

The aim of the study is to analyse the changes in the socio-economic performance of Hungarian regions in the previous decade. The first part of the paper deals with the epistemological and methodological questions of the analysis of temporal change of spatial differences of various individual and composite socio-economic indicators. In the second part the empirical analysis will be conducted at the county level (NUTS 3 level, 20 spatial units), including a wide range of economic, social and demographic variables. The analysis is concerned with processes over an eleven-year period, 2010-2020. Our methodology combines the analysis of individual indicators with the use of complex aggregated indicators composed of several indicators. Some of the counties show higher level of socio-economic performance with more developed infrastructure, higher quality of education and stronger economic base. However, the picture is not entirely uniform, there are small, moderately positive and negative movements compared to the national average.

Keywords: regional inequalities, regional convergence, Hungary, NUTS3, socio-economic performance

INTRODUCTION

From the very beginning, one of the main priorities and objectives of regional policy – in all countries and on all continents – has been to reduce the significant regional development disparities and promote the catching-up of lagging regions. Both economic theory and ideology play a role in justifying this objective. The economic theoretical rationale is that inequality implies or shows inefficiency, and that the existence of less developed regions indicates unfulfilled development potential. Ideology may invoke the principle of equity and distributive justice. The latter aspect is not enforceable at world level. EU cohesion policy is the most striking example of its supra-national application.

The results of the various regional policy interventions aimed at economic rebalancing are mixed. Among the studies assessing the effectiveness of cohesion policy, there are examples

of all three types of effects: successful, namely a reduction in regional development disparities; however, there are also analyses that show neutral or even negative effects (i. e. increasing regional differences) (Molle, 2007; Mohl &Hagen, 2010; Mohl, 2016; Dall'Erba & Fang, 2017; Becker et al., 2018; Berkowitz et al., 2020, Szabó et al., 2021). Thus, there are successful examples of regional rebalancing of development, as well as failures. Deep-rooted demographic and institutional factors are the main reasons for failure.

The contradictory results both encourage researchers to conduct further empirical analysis of the issue and suggest that local contextual and historical circumstances are likely to play a major role. One of the aims of our analysis is therefore to highligt the changing, fluctuating nature of regional development disparities by analysing Hungary as a case study. In order to support our empirical, descriptive approach, the first part of the paper examines epistemological and methodological issues and potential problems concerning the study of regional development disparities, which are mostly overlooked in mainstream research. It is not a comprehensive survey; rather, it prepares and justifies the approach of the second section of the paper, where we analyse the current situation and changes in the previous decade of Hungarian regional socio-economic performance, at the county (NUTS 3) level with a composite indicator. In the period under study, there was no major structural break, no shock to the economy as a whole, in contrast to the economic recession of 2008-2009. The impact of the economic downturn due to COVID-19 and the large increase in energy prices was visible after the period, the effects of which will require a separate analysis.

METHODOLOGICAL BACKGROUND

Historical-descriptive approach and convergence hypothesis approach to the analysis of spatial differences

The elimination of regional disparities of socio-economic phenomena or, in a milder and more common form, their reduction to an acceptable level, is often seen as a desirable goal for economic and social policy. Acceptable level is defined on a political and ideological basis, as there is no objective yardstick. Socio-economic phenomena with regional inequalities can be very diverse and different: income, consumption, housing, unemployment, employment, labour skills, entrepreneurial activity, energy consumption, education level, and so on. Composite indicators, such as Human Development Index may also be the subject of the study. For the sake of simplicity, we will mostly use the example of the study of spatial

differences in income and GDP, but the issues involved generally affect all other temporal spatial studies to some extent.

This type of work was greatly stimulated by Williamson's research in 1965 on national development and regional inequality. From the 1990's to the present, three factors have contributed decisively to the growing popularity of research on the temporal evolution of spatial differences of any socio-economic phenomenon: firstly, the ideological background, the imperative of reducing inequalities; secondly, the easy availability of data sets on internationally comparable socio-economic indicators; and thirdly, the intention to measure the effectiveness of regional development policy, the efficiency of the use of different regional development funds, monitoring various social, educational, cultural programs. The impact of the European Union's cohesion policy is a popular research topic for the EU as a whole as well as for member states (except for the smallest states, Malta, Luxembourg). Some form of regional economic development programmes, which are similar to cohesion policy, exist in almost every country. Large and unequally developed countries, such as China, India, Indonesia, Brazil have conducted substantial research on their regional disparities.

The aim of a part of these papers is to provide a pure historical description and explanation of temporal processes with the help of historical, demographic, institutional, regional policy, technological or other concrete factors. This aim can be supplemented by some lessons, which are important from a theoretical or regional/economic policy point of view, and impact analysis of regional programmes can also complement these studies. These analyses may use single or multiple indicators and may employ sophisticated analytical tools to describe complex relationships between variables.

The other, larger part of the research on regional inequalities has a more ambitious aim: the 'testing' of various theoretical approaches to the temporal evolution of spatial differences. The most popular among these approaches is the 'convergence hypothesis' proposed by neoclassical regional economic growth theory. According to the convergence hypothesis, less developed spatial units will develop faster than more developed spatial units; therefore spatial differences are diminishing (as demonstrated, for instance, by Kotosz and Lengyel (2018)). Sources of convergence can be intra-regional factors or they can be based on inter-regional flows. Less developed regions have relatively less capital and/or lower level of technological development. This, on the one hand, offers a higher rate of return on capital which attracts external investment, and on the other hand, facilitates a technological leap forward, causing an increase in capital and productivity and consequently faster economic growth (Rácz, 2014). This sounds plausible, but in reality it is not always observable, as less developed

regions may develop more slowly than more developed regions due to a number of other factors that can impact economic growth. The epistemological status of the second approach differs from the first one. We will explain in section 1.3 why we consider the first approach appropriate and the second approach problematic.

The spatial units of analysis

Spatial units here is a general term, indicating that in the theories of regional economics and regional economic growth the size of the spatial units or regions is typically not specified. Its magnitude in terms of, say, population number or geographical size can be of any size. Therefore, the 'convergence hypothesis' can be tested for any geographical scale, from the global to the minimum size of the territory which cannot be specified exactly. On the other hand, the level or scale of spatial division can also vary. For example, in the case of an analysis of regional differences within the European Union, the following territorial subdivisions are theoretically possible: country, NUTS1 (megaregions), NUTS2 (regions), NUTS3 (counties), LAU1 (micro-regions), and LAU2 (municipalities). The number of practical options is smaller due to data availability limitations; namely, several indicators are not available even on NUTS3 level. Other papers exclude 'special' regions, for example, city-regions, islands or oil mining regions. These exclusions can be justified with historical reasons; however, this practice makes it difficult to compare results.

The temporal extension (the starting and ending points of a time period) of the investigation depends mainly on the accessibility of temporally comparable data sets. There is of course no natural starting point, zoning system or spatial extent of analysis. As in all other territorial inquiries, the modifiable areal unit problem (MAUP) must be reckoned with (Openshaw, 1984; Dusek, 2004). The final results can be modified due to a change of one element of these three factors, with the other two factors unchanged.

Abstract theories of regional economics (for an overview see Bodnár et al,. 2022) often do not specify the level of spatial aggregation which they consider relevant. This can be problematic as the spatial variations in different phenomena can be interpreted differently at various levels of aggregation (Finta & Dombi, 2021). At a granular spatial level, for example, where settlements or parts of settlements are the relevant observational units, socio-demographic differences among the population can be huge and the spatial distribution of some natural resources can be highly concentrated at the same time.

A typical methodological problem of spatial analysis within a country is that large cities often form a separate metropolitan region, isolated from their surrounding agglomeration and

wider area. This generates different structures and levels of development both as a result of commuting and the spatial division of labour between towns and rural areas.

In the case of very small spatial units (settlements, micro-regions with a small number of settlements), the daily commuting of people can significantly modify the data which are expressed in proportion to the number of inhabitants. This is the main reason why per capita types of indicators are not always appropriate. The difference of regions where the employed work and where they live is the most notable in the case of city regions and the neighbouring regions, such as, for instance, Prague and Central Bohemian Region, Budapest and Pest county, Inner London and Outer London, Jakarta and West Java, and it can be highly significant in the case of small countries such as Luxembourg.

The importance of the spatial delimitation effect on regional inequality indicators is clearly visible in the context of urban regions. However, this derives to a significant extent from a more general issue, the zoning system effect. It has long been argued that inequality indicators are sensitive to the zoning system, i.e. the way in which a country draws its internal boundaries (Parr, 1976). A further implication of this issue is that comparisons of regional inequality indicators between countries are limited due to this problem. Since in most studies, researchers do not create their own special zoning system but adopt a ready-made zoning system determined by the sources of data, these issues are mostly hidden in the analysis.

The calculation of spatial inequality indices also raises a methodological issue that does not arise for natural observational units which have the same size, namely, the dilemma of weighting or not weighting the elements. Regional units are not naturally given units; their size varies geographically and in many other respects, among which the number of inhabitants is the most important from a socio-economic point of view. A recent review of the issue (Gluschenko, 2017) argues for using only unweighted indicators. In our view, the two options are an intrinsic feature of spatial analysis, and arguments can be made for and against both.

Problems of the convergence approach

In the literature on intercountry convergence, questions such as this can be encountered: ‘Will relatively poor economies remain poor for many generations? Will the rich countries in year 2100 be the same that are relatively rich today? Is the degree of income inequality across economies increasing or decreasing over time?’ (Sala-i-Martin, 1996, 1019). ‘Is it always the case that poor countries or regions tend to grow faster than rich ones: are there automatic forces that lead to convergence over time in the levels of per capita income and product?’ (Barro & Sala-i-Martin, 1992, 223). These types of questions can also be found in regional

analyses of convergence. These questions are important from a historical point of view. It is historically variable whether in a particular country or groups of countries in a specific time-period with a particular zoning system, the differences in data were decreasing, increasing or unchanging.

The literature on spatial income disparities contributed to our historical knowledge to a significant extent. However, its contribution to theoretical knowledge is questionable. If the categorical difference between theory and history is not registered, it leads to confusion about the domain and task of both theoretical and historical types of research. This confusion can be well observed in many papers on the temporal change of regional income inequalities. There are two main ways to investigate the spatial economy: the empirical, historical description of concrete, real places, and the abstract, theoretical models and theories of spatial economy. On one hand, people are interested in concrete historical events, on the other hand, the human mind is able to abstract from the complexity of the real world, build imaginary constructs, and by seeking theoretical explanations, it creates theories. Neither of these two approaches are superior to the other. Competent historical research uses theories for the explanation of real phenomena and theoretical papers use examples from empirical writings to illustrate theory.

The contradictory results of the different studies alone disprove the convergence hypothesis. For example, in country-level studies of India, based on per capita income, none of the results dominate, with mixed results supporting or refuting convergence. An overview (Banerjee & Kuri, 2015) of the studies shows that 2 studies found absolute convergence, 7 studies found absolute divergence, and 6 studies found absolute divergence but conditional convergence. These different results do not refute each other but the approach itself: the historical part is valid, but the testing part is unjustified and pointless. The long tradition of research on the subject has led to a number of meta-analytical survey studies. The lesson from the meta-analysis of meta-analysis is that spatial disparities can decrease and increase, they fluctuate, and there is no law or set of rules to describe their evolution.

The results concerning convergence or divergence describe in a perfect manner the concrete historical patterns of regional inequalities in the applied zoning system, but there is no epistemological basis to generalise the results. Using various tests of inferential statistics should be avoided, since probability theory is applicable only if the examined events can be classified in a class of events. Regional income data have a unique characteristic; they are not homogeneous members of an identifiable class with known parameters in the distribution of values. They are uncertain, but not random, in the sense of probability theory. They are not one actualisation of repeatable ‘random samples’ derived from a larger population, but a part

of spatial economic history. Papers using regional income data describe the concrete ex post development of regional income disparities. The application of the word ‘sample’ to the group of countries and regional units is unjustifiable and misleading, nor is the use of various statistical tests justified despite its widespread practice.

SOCIO-ECONOMIC PERFORMANCE OF THE HUNGARIAN NUTS3 REGIONS

A general review of spatial disparities in Hungary

In the spatial distribution of the various socio-economic phenomena in Hungary the following spatial factors play a significant role:

- east-west location;
- distance from Budapest;
- distance from the county seat;
- size of the settlement;
- transport-geographical location.

These factors have had a stable influence on socio-economic spatial disparities over the past 100 years (Győri & Mikle, 2017; Kincses & Tóth, 2020; Zsibók & Páger, 2021; Kocziszky & Szendi, 2021; Egri, 2023). Generally, the indicators have better values for regions with western position, closer to Budapest, closer to county’s capita, with the increasing size of settlement and near the main transportation arteries. Each of these factors has a historical time span, so it has not become significant in recent years but was an important factor more than 100 years ago too, therefore the possibility of dynamic (longitudinal) measurement must be established (Harcsa, 2015). Due to the data availability, we examined NUTS3 spatial aggregation level, which matches the more than 1000-year-old Hungarian counties. Of course, county borders have changed over history, most drastically as result of the Treaty of Trianon in 1920, which cut many counties in two along the new state border. However, apart from this interference, the magnitude and number of the counties is essentially constant. On the county level mostly the effect of the east-west location is visible, the size of the settlement only for Budapest, as the dominant and most developed settlement.

The European Union has always aimed to achieve successful European integration, to reduce disparities in development and to help lagging regions catch up. Plenty of studies show that the disparities within the countries are stable, persistent and difficult to influence (see Sávai et al., 2022). The concentration of factors providing competitive advantage has

changed, and the importance of knowledge, the creation of a knowledge economy, a knowledge region, the ability to use information and innovation has increased. The reasons for this can be found in the expanding market, rapidly changing needs and hence the short market life of products, as well as the increasing demand for quality. The ability to gain a competitive advantage depends on the level of development of the country. Obviously, where the biggest problems are in building infrastructure, running social services or introducing basic utilities in large peripheral areas, there is less focus on creating a knowledge-based society and an innovative milieu. Regional policy actions to reduce regional disparities have varied from one period to another. The 'traditional' and the 'new' dimensions co-exist and are increasingly difficult to delineate (Table 1).

Table 1 Changing framework of regional differences

	Traditional	**Mixed**	**New**
Temporality	1950s to 1970s	1971-1996	1996-
Features	➢ The importance of industry ➢ Strong central governance ➢ Centralised infrastructure development	➢ The effects of industrial decline ➢ Strengthening the services sector ➢ The crisis of industrialised areas ➢ The emergence of foreign capital ➢ Legalisation of businesses ➢ The appreciation of social factors	➢ Dominance of the services sector ➢ Globalisation and, in parallel, the effects of EU accession (information society, technology, innovation, competition in knowledge-intensive industries) ➢ Appreciation of local specificities ➢ European outlook, identity awareness ➢ Focus on research and development
Regional differences	Regional differences existed, but they were not the basis for decisions	National regional development concept identifies differences in the settlement network with territorial differences Intensive differentiation	Deepening disparities Strong focus on solutions (concepts, strategies flourish)

Source: own editing

Of course, these mechanisms of action change from time to time, so that what was “new” becomes “traditional”, and the new ones are replaced by other effects. It is not possible to clearly distinguish between these influences, since there are traditional spatial forces that have to be dealt with today, despite the fact that the ‘new’ spatial processes also have a significant influence on the development of areas and cities. In many cases, the focus of development has already been on cities, primarily for business development. Today, an increasing proportion of the world's population is concentrated in large cities, mainly due to a wider range of job opportunities.

The convergence of the development of counties can be related to the dominance of economic sectors in the period under study (Nemes Nagy, 1990a). While in the 1960s the country's economy was characterised by the predominance of industry, in the 1970s the steady development of backyard farms and the strengthening of agriculture were significant. Investment decisions by the central government contributed significantly to this one-dimensional development. Then, from the 1980s onwards, this 'simplicity' seemed to break down and no clear sectoral determinants could be established, as no major investments or site developments were made. These processes have also led to uneven development.

The period since the fall of socialism, and especially the decade after the turn of the millennium, has been characterised by marked differences in the socio-economic spatial structure of the country. The transformation of the economic structure, privatisation and the inflow of foreign capital have significantly widened the gap, with a significant share of the latter being concentrated in the northwestern part of Hungary and Central Hungary since 1990 (two-thirds of all investment in the latter region), thus reinforcing the existing disadvantages in the eastern parts of the country. There are a number of reasons for this: existing economic infrastructure, educational opportunities, or urban policies. The intensity of investment is further catalysed by competition for foreign and domestic capital. There are a few positive 'counter-examples': Mercedes in Kecskemét, Bosch's expansion in the Miskolc and Eger areas, or the Lego factory in Nyíregyháza. The mentioned cities are county seats in Eastern Hungary.

Within the urban regions, we should highlight the Budapest agglomeration, which has a significant economic concentration, and the Vienna-Budapest axis, which has been developing intensively over the last decade and has become a dynamic region, mainly due to the dynamic development of the automotive industry. The regions of Western and Central Transdanubia attract the highest share of foreign capital (excluding Central Hungary). Aggregated data have shown a downward trend since the turn of the millennium for Central Transdanubia, but an interesting phenomenon is the jump in the data for Northern Great Plain from 2013 to 2014. The reason for the uneven development of the Hungarian economy lies in its different economic structure. The transition to a market economy has been a huge challenge for the whole country, including the unilateral industrialisation actors – iron and steel, or the coal basin of the northeastern county, Borsod – and the predominantly agricultural areas have found it particularly difficult to adapt to the situation, which has also left its mark on the spatial structure (Honvári, 2008; Filep et al., 2010; Rechnitzer, 2016; Vida, 2022).

In most parts of Europe, regional development in the late 1950s was based on the growth pole strategy (Egyed & Póla, 2020). According to this strategy, the development instruments are concentrated at a limited number of locations (poles), and over time, 'spill over' from the centre and have a development impact on the whole region, including the periphery. This was accepted and relied upon by the majority of the profession for a long time, but by the 1980s confidence in the theory had been shaken. The long term 'positive' impact of the poles is highly uncertain, while the current ‘backwash effect’ is clearly visible, which is eroding the periphery in favour of the centre, depriving it of resources that could be developed 'later'. This is basically the same approach imported from the West that has guided regional development in Hungary until the 1980s. This logic is strongly reflected, for example, in the National Concept for the Development of the Urban Network (1971).

The difference in position and dependency between the county seat and the county was reinforced by the fact that for roughly a quarter of a century the seat was the exclusive beneficiary of the redistribution of regional development funds. This was determined by the county apparatus as one of the key players in the planning process. All the county seats have grown dynamically, improving their infrastructure and multiplying their housing stock. Industry relocation was the engine of development, attracting people with the job opportunities and free housing that came with it. The volume of commuting also grew enormously, with the number of daily commuters exceeding 10,000 in every county town by the 1980s. This favourable resource position for the seat had quite contingent consequences for the intellectual life of the city, depending heavily on the local climate created by the county administration. The most important aspect of territorial subordination was the relationship between the capital and the countryside (Filep, 2014; Rácz & Egyed, 2022).

METHODS

Spatial inequality is most often measured along two axes: economic and social characteristics, as presented by several Hungarian studies (Dövényi & Tolnai, 1993; Faluvégi & Komjáthy, 1995; Nemes Nagy, 1998b; Major & Nemes Nagy, 1999; Kertesi & Ábrahám, 1996; Kovács, 2002; Nagy, 2002; Nemes Nagy, 2003; Beluszky & Sikos, 2007; Nagy, 2007). The effects of the two determinants are interrelated and cannot be separated. In line with these previous studies, we selected 15 commonly used, general economic and social indicators that are easy to interpret and which relate to different aspects of development:

– Activity rate (%)

- Unemployment rate (%)
- Employment rate (%)
- Average gross earnings (HUF)
- Vacancy rate (%)
- Registered job seekers as a percentage of the active population (%)
- Number of registered business organisations per 1,000 economically active population
- Investment per economically active population (thousand HUF)
- GDP per capita (thousand HUF)
- Foreign direct investment per active population (net debt stock, million HUF)
- R&D expenditure as a percentage of GDP (%)
- Value of industrial production per economically active resident by establishment (thousand HUF)
- Number of inhabitants per 100 dwellings
- Number of doctors per 10,000 inhabitants
- Number of students in higher education per thousand inhabitants

As with all other multi-indicator analyses, the question is why these indicators were chosen and not others, and why they are weighhted equally and not differently. We do not consider it a sufficient justification that others have chosen similar indicators, but consider them as the most important indicators independently of others. The aggregation of these indicators requires their transformation into a common unit of measurement, for which range normalisation is used. Normalisation is used to scale the data of an attribute so that it falls in a smaller range, such as -1.0 to 1.0 or 0.0 to 1.0. It is generally useful for classification algorithms.

$$X'_{range\ norm} = \frac{X - Xmin}{Xmax - Xmin} \tag{1}$$

The methodology consists of the following steps:

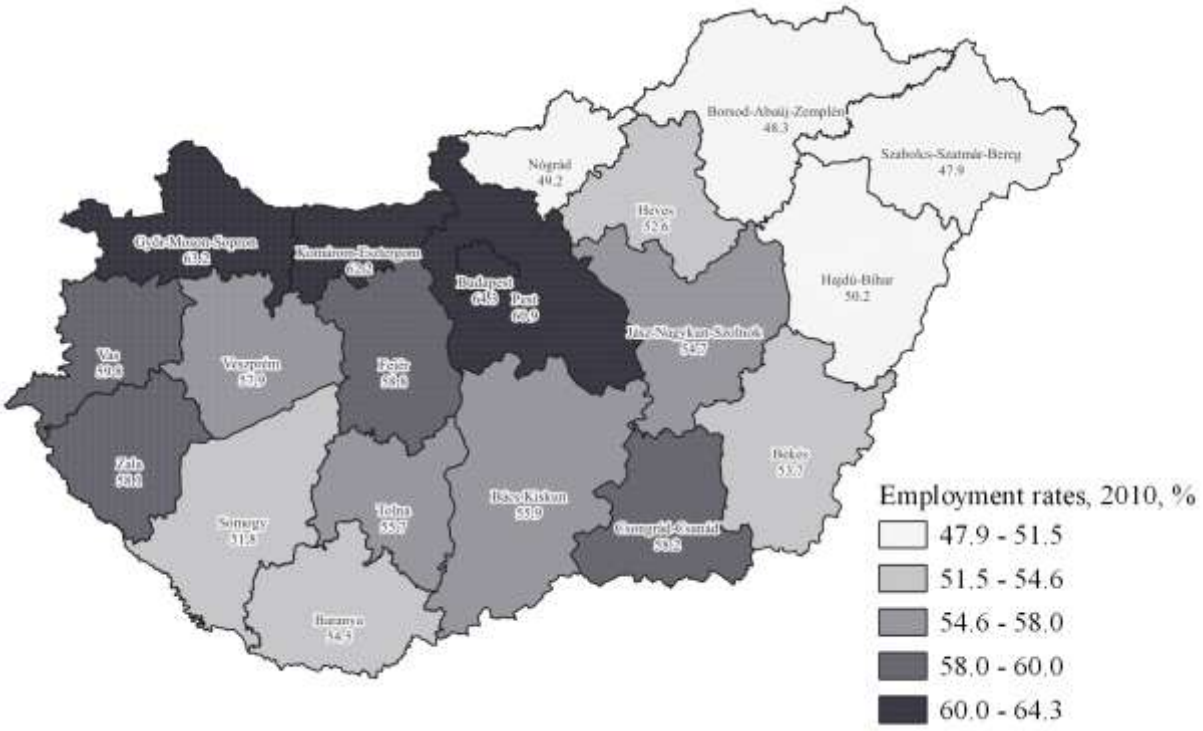
- normalisation
- addition of normalised values (maximum possible value is 15)
- average of normalised values (for each year separately)
- comparison with the average (for each year separately).

RESULTS AND DISCUSSIONANALYSIS

First of all, the indicators that play the most prominent role in territorial disparities are highlighted. According to HCSO (Hungarian Central Statistical Office), Hungary's employment rate (from 15 to 64 years) was approximately 57% in 2010 and has generally been increasing since then. As of 2021, the employment rate in Hungary was estimated to be around 73.1%. However, it is possible that employment rates have developed differently across the Hungarian NUTS3 regions, depending on the specific conditions and factors affecting each region (Figures 1 and 2). Employment rates started to rise in most counties after 2010 and have stagnated since 2018. Only Budapest, Pest, Tolna and Somogy show a slight increase.

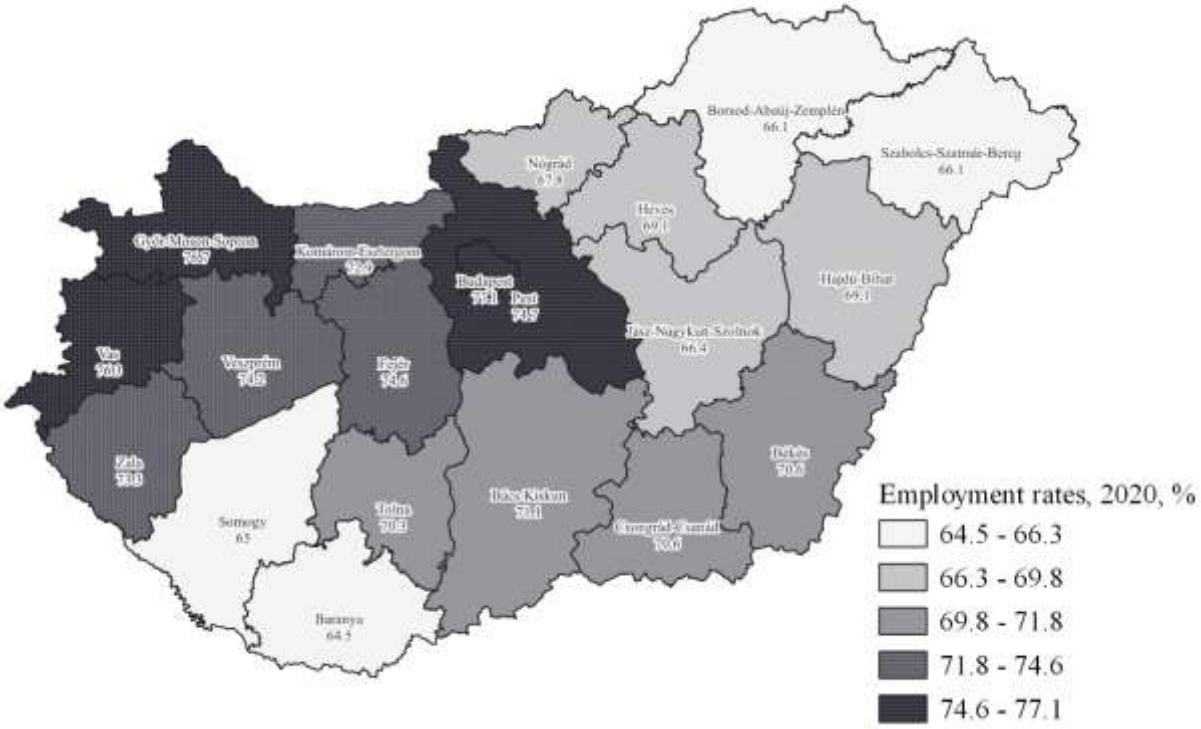
In Hungary, the GDP per capita varies significantly between different counties (Figure 3), depending on a variety of factors such as the local economy, the skill levels of the population, and the job opportunities. The most obvious difference is in the assessment of the position of Pest county (a large part of the county is the agglomeration of the capital Budapest).

Figure 1 Employment rates in counties (NUTS3) of Hungary (2010)



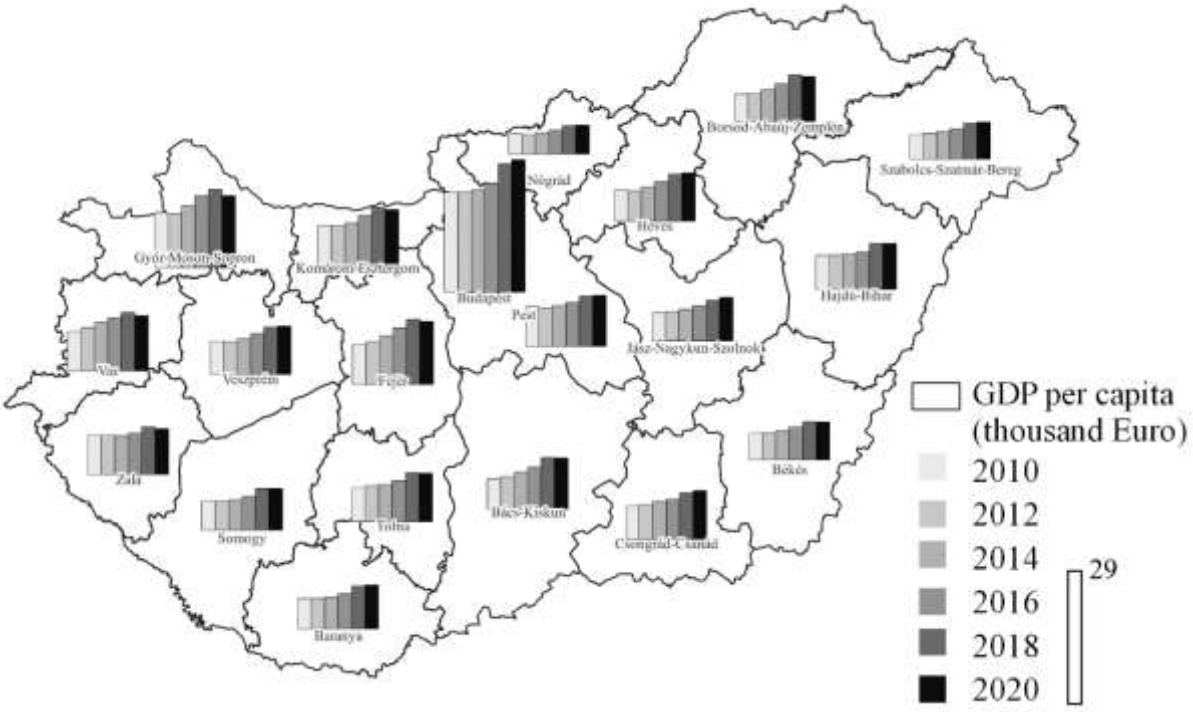
Source: own editing based on HCSO data

Figure 2 Employment rates in counties (NUTS3) of Hungary (2020)



Source: own editing based on HCSO data

Figure 3 Trends in GDP per capita by county (2010-2020, %)



Source: own editing based on HCSO data (each year deflated at the average exchange rate of the current year)

The northeastern and southwestern parts of Hungary have lost their relative position since 2010, while the middle regions of the country and the northwestern counties gained in relative position of GDP per capita. The second difference is related to the eastern counties, Borsod-Abaúj-Zemplén, Szabolcs-Szatmár-Bereg, Békés and Hajdú-Bihar. All of them rank low in GDP per capita rankings.

In ten years, Bács-Kiskun and Borsod-Abaúj-Zemplén counties have managed to catch-up. The former jumped up 8 places in the county ranking, the latter 4, making Bács-Kiskun the 6th most developed county and Borsod-Abaúj-Zemplén the 12th. It can be seen that Borsod-Abaúj-Zemplén county started from a particularly unfavourable position during the crisis.

The most important catalyst for the catching-up of Bács-Kiskun county was the construction of the Mercedes factory in the county seat, Kecskemét and the ramp-up of its production, as well as the development of the automotive supply network (Józsa, 2019; Lux, 2019). Among the industrial companies, it is worth mentioning Knorr-Bremse, and fact that the headquarters of the fast-growing Duna Aszfalt, a road construction specialist is located here deserves special mention too. There is no single large factory in Borsod-Abaúj-Zemplén county worth highlighting, but Mol Petrochemicals, BorsodChem, Bosch and Jabil have also added a great deal of value to the county's development.

The strengthening of the research and development (R&D) and innovation activities is essential for the transition of the domestic economy to an advanced, knowledge- and innovation-driven growth model. It expected, R&D performance is not the only problem of Hungarian regional development performance, but it is worth highlighting. The transition from an investment-led to a knowledge- and innovation-led growth model requires a further increase in R&D expenditure and R&D personnel.

However, the R&D and innovation ecosystem depends not only on resource and staffing conditions, but also on expanding and developing the innovation capacity of enterprises, their ability to adopt the latest technologies and their ability to develop new technologies, and thus the economy-wide diffusion of digitalisation and automation.

Hungary's R&D expenditure as a share of GDP was 1.5 per cent in 2019 (based on OECD[1]), even lower than the 2020 national target of 1.8 percent. R&D expenditure as a share of GDP in Hungary increased from 1.1 percent in 2009 to 1.5 percent in 2019, but this growth slowed down in 2019 (1.6 in 2020). R&D spending in Hungary is the fifth behind the average

[1] OECD (October 16, 2023). Gross domestic expenditure on research and development (GERD) as a percentage of GDP in Hungary from 2000 to 2021 [Graph]. In Statista. Retrieved: December 13, 2023, from https://www.statista.com/statistics/420965/gross-domestic-expenditure-on-research-and-development-gdp-hungary/

of EU Member States (2.3) (Eurostat, 2020[2]). The GERD is above the V3 average, and between 2009 and 2019 Hungary moved closer to the EU's GERD level. However, the dynamically increasing EU average has not been approached by our region.

In R&D, the national trend is that the number of researchers is growing fastest in companies (ahead of research institutes and higher education), so that in general most R&D activity is also concentrated in large companies. Another national trend is that most researchers are working in technical fields, mainly in automation, robotics, chemistry and biotechnology (see Szeged – Csongrád-Csanád county, Debrecen – Hajdú-Bihar county and Budapest).

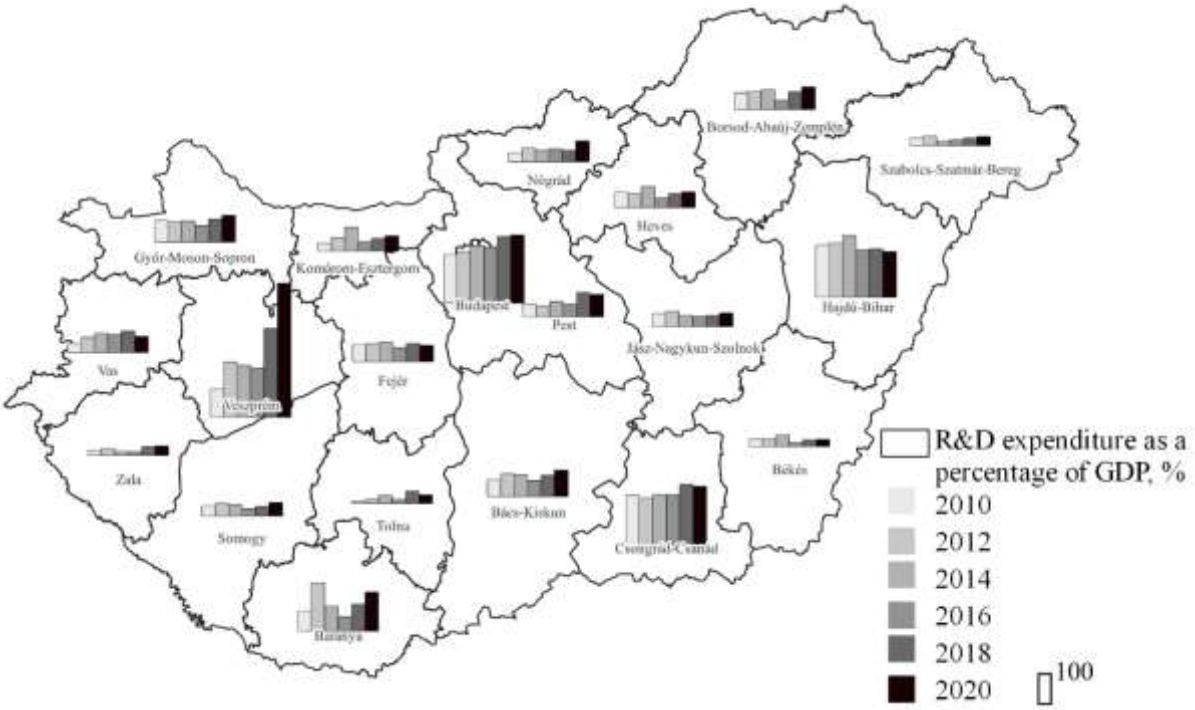
Veszprém county shows an outstanding increase in performance in this area (Figure 4). Six out of 10 researchers work in Budapest, the next largest city with the highest number of researchers is Veszprém. There are several reasons for this; there have been a number of investments for the European Capital of Culture title and under the Modern Cities programme. Infrastructure developments have led to increased labour mobility and the University of Pannonia has a major role as a regional research and development centre, with a significant impact on the economic operators in the North-Western Hungary region, and its extensive links with the business sector are expanding, which is reflected in the growing number of R&D companies in the industrial environment. Veszprém is increasingly striving to play a role of innovator, as evidenced by the growing intensity of R&D activities of the backbone companies in automation, automotive and electronics R&D. The Modern Cities Programme will soon deliver a new market-oriented innovation training centre for vocational education and training (Rákosi, 2023).

Complex index of economic development

The change in the development index calculated separately for each year (see methodology) shows different results for the Hungarian counties (Figures 5 and 6). Among the worst performing counties are Nógrád, Borsod-Abaúj-Zemplén, Szabolcs-Szatmár-Bereg and Somogy. These regions have been searching for their “path” since the fall of socialism. So far they have been less able to adapt to macroeconomic changes. By contrast, Budapest, Csongrád-Csanád and the counties of the North-Western Hungary have shown an increase in economic and labour market development; they have all gained an advantage in industries (robotics, automation, automotive, pharmaceutical technology) and have built up their infrastructure accordingly.

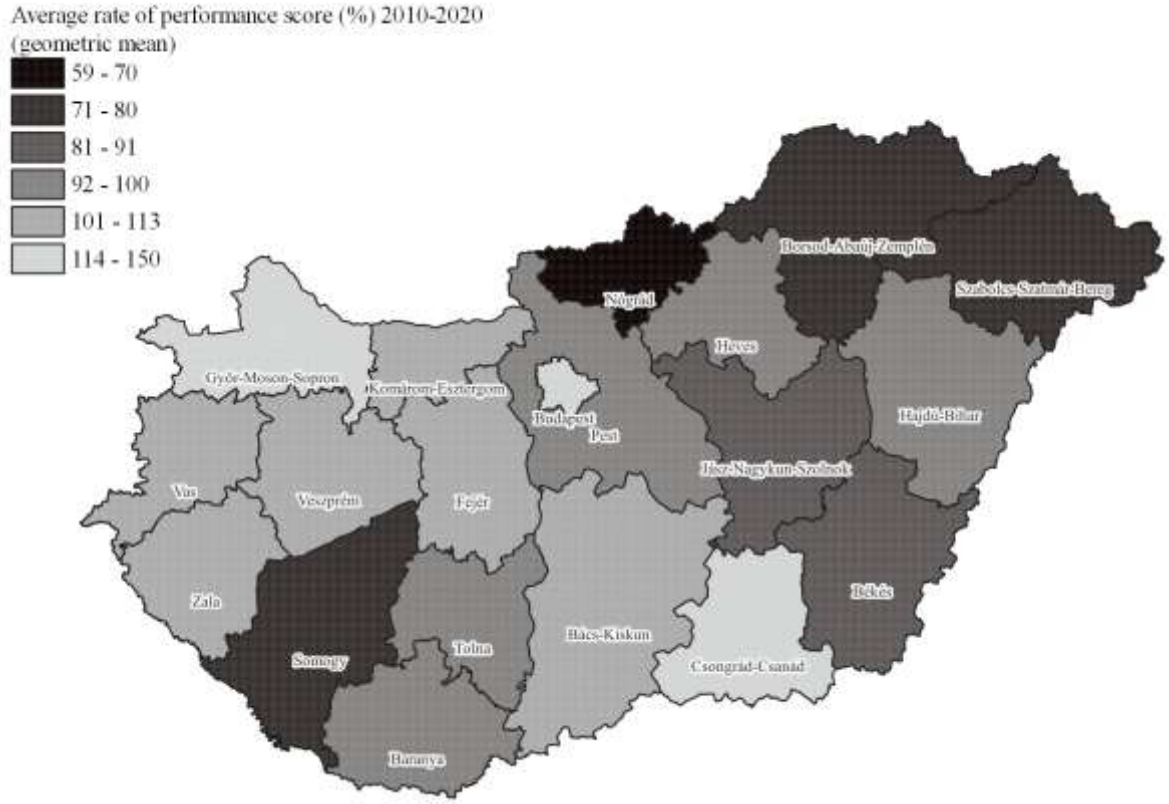
[2] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20211129-2

Figure 4 R&D expenditure as a percentage of GDP in the counties (2010-2020, %)



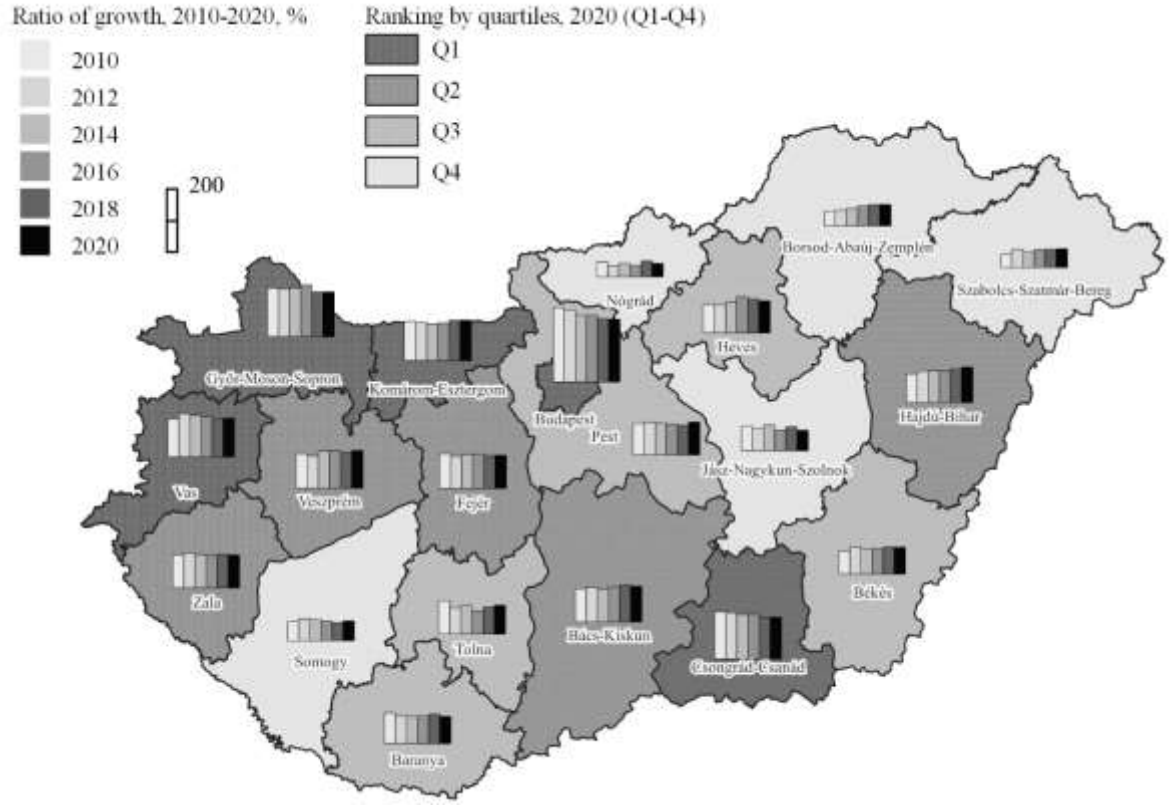
Source: own editing based on HCSO data

Figure 5 The average rate of performance score between 2010 and 2020 (%)



Source: own editing

Figure 6 The average ratio of growth based on 2020 quantile (%)



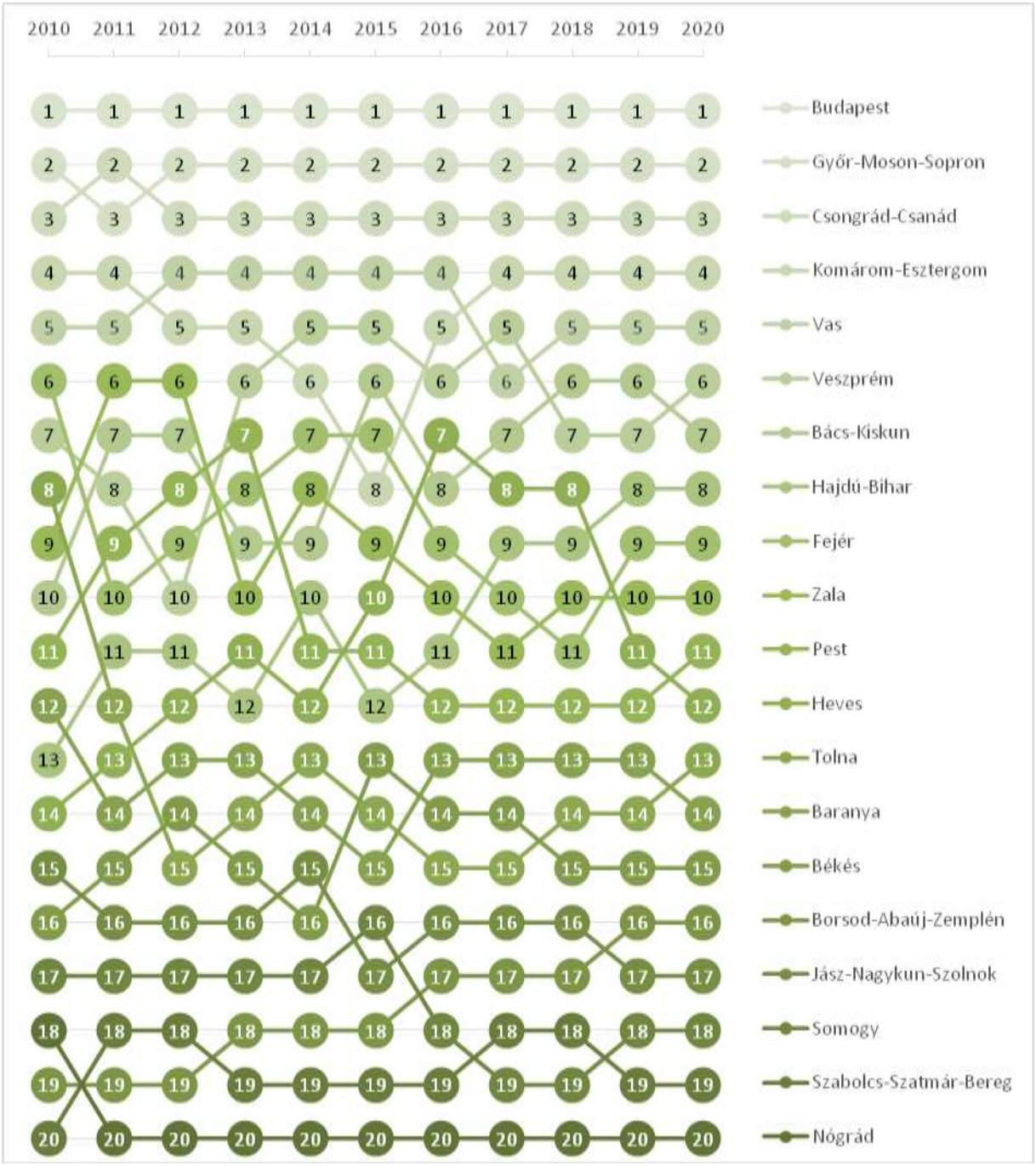
Source: own editing

The rate of growth of the economically well-performing counties was decreasing (Budapest, Csongrád-Csanád, Győr-Moson-Sopron, Vas). Counties in the second and third quartile showed some growth (Hajdú-Bihar, Veszprém) or stagnation (e.g. Zala). However, there are regions with absolute "declining" performance (observations of the last quartile), which have shown an economic growth over the last 10 years (e.g. Borsod-Abaúj-Zemplén). For some counties, the economic-labour market performance has been hectical (e.g. Tolna, Nógrád, Jász-Nagykun-Szolnok).

There have been no major movements in the first quartile in a decade. Budapest remained the leader over the period, far outperforming other counties in most indicators. The counties of Győr-Moson-Sopron and Csongrád-Csanád also remained almost unchanged in 2nd and 3rd position in the ranking, with the position being reversed only in 2010 and 2011. However, the two counties are competitive in different areas: while Csongrád-Csanád county is the best performer in research and development, higher education, health (in terms of the number of doctors per thousand inhabitants, it has the best performance in the country in several years, mainly due to the medical education of the University of Szeged), while Győr-Moson-Sopron has a stronger performance in labour market indicators, such as unemployment rate, and in

investment. Komárom-Esztergom and Vas counties have moved within the first band over the 11 years, generally to a 4th or 5th position, with the exception of 2014 and 2015 due to Komárom-Esztergom county slipping out of the range in those years and Vas county slipping out of the first quartile in 2017 and ending up 6th in the competitiveness ranking (Figure 7).

Figure 7 Changes in ranking between counties between 2010 and 2020



Source: own editing

The second quartile saw much more varied movements. The two counties of Central Transdanubia, i.e. Veszprém and Fejér, moved within the quartile (6th to 10th) almost throughout the period, with Veszprém only moving up into the first quartile in 2014, 2015 and 2017, ranking 5th in all three years, while Fejér only slipped down into the third quartile in one year (2018). Zala county also slipped out of the second quartile in 2017 in only one year, but this was also a one-off occurrence over the time interval. Bács-Kiskun county was within the second quartile throughout the period. In Hajdú-Bihar county, an evolving trend can be observed with minor fluctuations, ranking in the third band throughout the whole period between 2010 and 2013, but only twice between 2014 and 2020 and five times in the second quartile.

In the third quartile, there were more shifts. Pest county was ranked in the third quartile in 2011, 2012 and 2013, moving up in those three years, and down four positions from 2013 to 2014, from 7th to 11th. Heves county also moved regularly in that range, except in 2016, 2017 and 2018 (once in 7th and twice in 8th). Tolna county, after its outstanding 9th ranking in 2010, has performed much worse in terms of competitiveness over the period. Baranya county has always been in the third range (12th-15th). Békés county was among the worst performers in the third quartile and in one year, 2014; it did not even move into the third range.

In the fourth quartile, there were no major differences; the positions of all four counties (Borsod-Abaúj-Zemplén, Somogy, Szabolcs-Szatmár-Bereg and Nógrád) were unchanged in this ranking zone, but Jász-Nagykun-Szolnok county could only move up once, and even then only by one place to 15th. The development of Borsod-Abaúj-Zemplén county was a positive surprise, as it moved up from 20th place in 2010 to 16th in 2020.

To illustrate their overall performance between 2010 and 2020, a table was created where the ranking was based on the sum of the counties' rankings over the 11 years (Table 2). The fewer points the counties have achieved, the higher they rank in the ranking. The result is not much different from their ranking after their 2020 performance.

Comparing Figures 8 and 9 shows that the counties have approached the capital city in terms of competitiveness, since in 2010 Budapest exceeded the average performance of the counties by 130%, by that time in 2020 it was “only” 95% better. Among the developing ones, the development of Borsod-Abaúj-Zemplén county is the most outstanding, its result of 45.36% compared to the average has swelled to 66.47% in 10 years, which means that it is only 33.53% behind the average performance of the counties. Nógrád county stagnated,

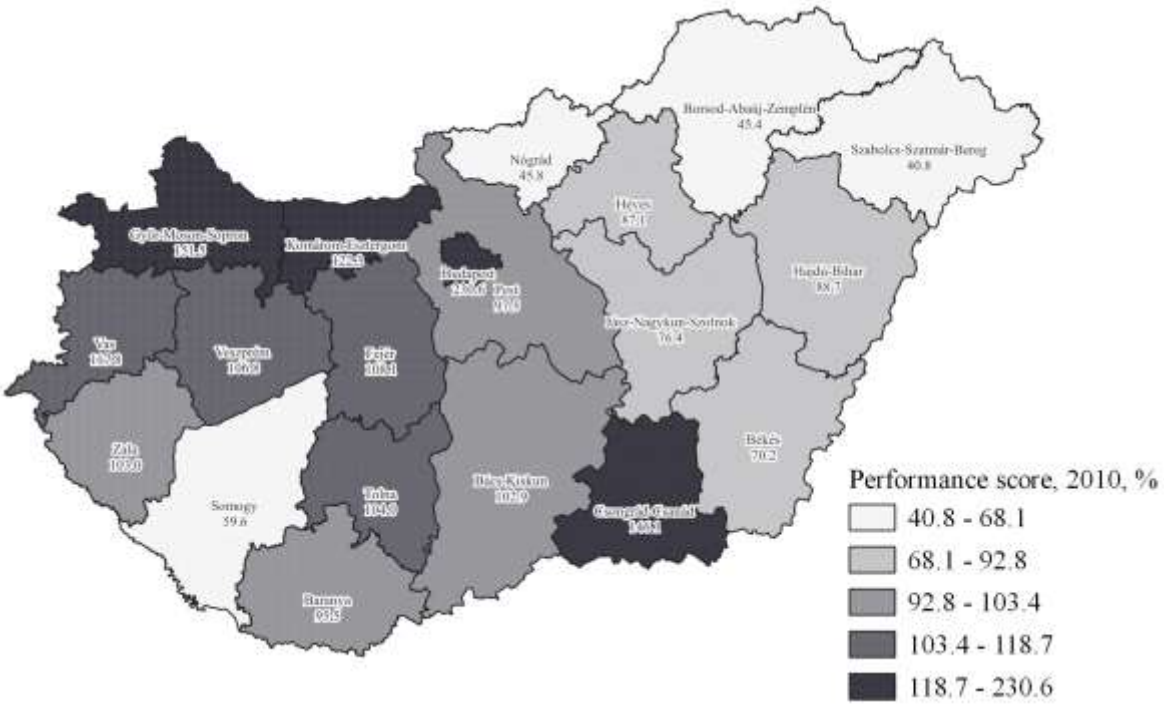
during the period it was unable to approach the competitiveness performance of the other areas.

Table 2 Scores based on the rankings

Ranking	County	Score
1.	Budapest	11
2.	Győr-Moson-Sopron	23
3.	Csongrád-Csanád	32
4.	Vas	51
5.	Komárom-Esztergom	53
6.	Veszprém	72
7.	Bács-Kiskun	82
8.	Fejér	95
9.	Zala	99
10.	Hajdú-Bihar	114
11.	Pest	116
12.	Heves	118
13.	Tolna	147
14.	Baranya	147
15.	Békés	162
16.	Jász-Nagykun-Szolnok	177
17.	Somogy	193
18.	Borsod-Abaúj-Zemplén	194
19.	Szabolcs-Szatmár-Bereg	206
20.	Nógrád	218

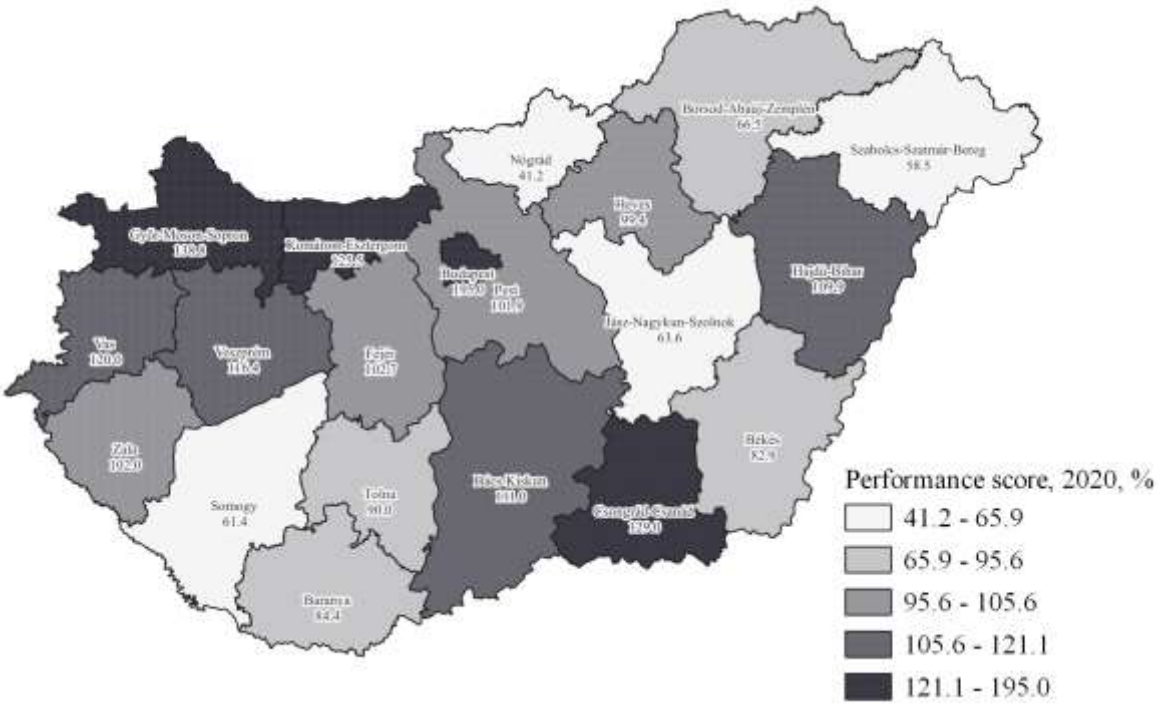
Source: own editing

Figure 8 The performance score for 2010



Source: own editing

Figure 9 The performance score for 2020



Source: own editing

CONCLUSION

The basic factors proposed in the European Union's sixth periodical report on improving regional performance can be considered as components of regional growth, namely research and development, small and medium-sized enterprises, foreign direct investment, infrastructure and human capital, as well as institutions and social capital. In our analysis, it was confirmed that the performance of the counties of Western Hungary is stronger than that of the counties of Eastern Hungary, since the value of the performance index was higher than that of the western counties. Over the examined period, some counties developed faster compared to each other, but there were counties whose performance declined. In terms of faster developing counties, Hajdú-Bihar county can be singled out, as it improved three positions during the 11-year period, as well as Borsod-Abaúj-Zemplén county among counties that show a higher than average development; improving four positions during the examined period. Among the counties with declining performance, Tolna county should be highlighted, which lost four places in the ranking during the examined period. Based on the research results, Budapest ranked first throughout the decade and can be considered the most competitive county.

Among the deep-rooted regional divisions and inequalities, the two most striking elements have not changed over the past 25 years, namely the significant gap between the capital and the countryside and the favourable position of the North-West. At the sub-regional level and at the level of municipalities, there have been more shifts.

The growth paths of the counties, due to the global, macro and local traumas that have occurred from time to time, have felt the shocks more than the national path of specific GDP output. Due to the complexity of the methodology (and the loss of information due to aggregation), it is difficult to measure these inequality 'shocks', with changes occurring at different rates and indicators (in some cases with a significant lag). It appears that GDP per capita has been high in recent decades in regions with export-oriented sectors (machinery, automotive).

Overall, there were only minor shifts in the performance of the counties in positive and negative directions, and the regional differences that emerged during the previous decades are very stable. The results clearly show that territorial economic and social disparities are very slowly changing structures, shaped to a large extent by long term economic and social history and cultural habits.

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