STUDIES

The Small Towns conundrum: What do we do about them?

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Small Towns have long been seen as an important element in Europe's urban structure, currently around 24.2% of the European population live in them. Despite this, we know relatively little about them and there is insufficient recognition of the role they have as important providers of services, employment, housing, etc. Moreover, there is a tendency to view them as a homogenous category. However, this paper argues what is required is a more disaggregated understanding of them in order to develop policy approaches relevant to their situations and to genuinely include them in approaches that seek to enhance economic, social and territorial cohesion. Drawing on research from the ESPON TOWN project, I will try to throw some light on the issues around small and medium-sized towns (SMSTs) and what to do about them if they are to continue to thrive.

Keywords: Small Towns, European, policy, cohesion

Introduction

It is widely accepted that we live in what might be termed the 'urban age' in which globally the majority of people live in urban areas (although see Brenner–Schmid 2014 for a dissenting voice). Perhaps understandably there has been a tendency to focus on 'big cities', albeit somewhat attenuated more recently by a growing recognition of the role of what are termed 'second-tier cities' (see Cardoso–Meijers 2016). Nevertheless, the vast majority of contemporary research and policy development has concentrated on large cities and metropolitan regions (i.e. 'big' or 'global' places) within the context of globalising forces and international competition. The problem with this focus is that it fails to differentiate among the different types of 'urban areas' in which people live and work and the relationships between them. In other words the 'rich mosaic' that constitutes the 'urban structure' has been neglected. This is somewhat ironic in relation to Europe given that it has long been asserted that small towns are a key element, both historically and in the modern-era, of Europe's urban structure – they are considered to be an important part of the continent's urban fabric. As a result, what are termed 'small towns' have largely been neglected (cf. McCann 2004, Bell–Jayne 2009, who articulate the case for a greater

understanding of the role and significance of small places). The ESPON TOWN project[1], on which much of this article draws, sought to remedy this deficiency and to explore and explicate the role and position of small towns and develop policy options to address their, varied, situations and contexts.

In this article I begin by briefly discussing the methodological issues related to defining 'what a small town is' before setting out some of the basic information about where people in Europe live and the position and number of small towns within this framework and the different 'types' of small town according to their regional location. It is important to emphasise that the focus is on small towns, although often we find a somewhat confusing use of terminology as there is frequent reference to SMSTs, perhaps reflecting the different definitions of what constitutes a small town and a medium-sized town in different European countries. However, the focus here is on small towns with a population between 5,000 and 50,000. The article then considers the possibilities to address the situation of small towns and illustrates the possible policy approaches that might be adopted using a place-based approach (Barca 2009).

What is a Small Town?

In the ESPON TOWN project the basic parameters for the research were set by the ESPON research specification which required the project to focus on ESPON TOWN project, on small towns with populations between 5,000 and 50,000 across Europe. This was deliberately intended to address the imbalance in terms of research and policy noted above. Nevertheless, this did not resolve the issue of what constitutes a town/place; what follows draws on the arguments developed by Servillo et al. (2017) and Servillo et al (2014a, Ch. 2). In the TOWN project, we drew on three key methods of defining a town: the morphological approach, the functional approach, and the administrative approach. It is important to note that taken in isolation none of these three approaches resolves the definitional problem of what is a town. In essence we adopted a 'territorialist approach' that enveloped the three approaches identified above, although it should be noted that this was a 'compromise' because we recognised that there was no 'perfect' way of defining 'what constitutes a small town'. Within this framework, we focussed on a morphological approach building on work carried out by DG Regio (2011) and Dijkstra–Poelman (2012) which allowed the project to develop a relatively uniform interpretation of urban settlements across the EU territory and surmount different national interpretative criteria. Using this approach we created an initial definition of small towns as having the following characteristics:

[1] https://www.espon.eu/programme/projects/espon-2013/applied-research/town-%E2%80%93-small-and-medium-sized-towns

- Polygons with a total density (average density of all cells included) between 300 and 1,500 inhabitants/km^2 and a population between 5,000 and 50,000 inhabitants;
- Polygons with a total density of more than 1,500 inhabitants/km^2 but a total population of less than 50,000;
- Polygons with a total population of more than 50,000 but a total density of less than 1,500 inhabitants/km^2. (Servillo et al. 2014b, p. 18.)

Building on this basic morphological approach, which allowed us to produce a cartographical presentation of small towns across Europe, we then deepened our understanding of what is a small town through the investigation of their functional roles within their wider regional context and their socio-economic characteristics. So while the multifarious national administrative definitions of what, according to national traditions, was defined as a town were not ignored, they were subordinate to both morphological and functional definitions.

Where do people in Europe live – the role of small towns

While it is estimated that approximately 70% of the European population live in cities (see CEC 2011, p. 14.) what is often not recognised is that a majority of this 'urban population', around 56% (CEC 2011, p. 1.) are actually to be found living in what are described as SMSTs. Thus, we produced the following table that illustrates the numbers and percentages of people living in different types of settlements based on our morphological classification. This clearly indicates the complex nature of Europe's population distribution. For instance around 21% of Europe's population live in small towns defined as places having populations between 5,000 and 50,000. What is also worth pointing out is that just over 16% of Europe's population live in places with populations under 5,000.

Using this information, the map (from Servillo et al. 2014a, p. 9.) below illustrates the distribution of small towns across the European space. What is notable is that within an area that runs from the South East of England across the Benelux countries and West of Germany to Northern Italy there is a great number of such places what is often termed 'The Pentagon' that is traditionally associated with a concentration of urban and economic centres. So somewhat ironically it is also shown to contain the highest number and density of small towns in Europe. The map also identifies other concentrations in the industrial belt of South-Eastern Germany and Poland and along the length of the Western Mediterranean arc from Spain to Italy. What it also shows, relatively speaking, is the paucity of small towns in the interior of France, north-eastern Spain, the Alpine arc, and the eastern side of the Pentagon area. In many ways this should come as no surprise as these areas have been losing population for a long period of time. Many of these latter, mainly rural areas, such as the French Massif Central, have experienced population decline

over a lengthy period caused by high levels of out-migration, particularly of young people, and low levels of in-migration linked to long-term economic decline. Of course some of the decline in these areas has been accentuated by more recent changes linked to trends in the global, European, national and regional economy.

Distribution of population between classes of cities/towns according to TOWN typology 2, 2011

Class	Delimitation criteria	Count	Average population	Average km²	Average density	Total population in this class	*As % of ESPON space**
HDUC	Population > 50,000 Population density > 1,500 inh./km²	850	275,476.1	92.3	2,927.10	234,154,670	46.3
Large SMST	Population > 50,000 Population density < 1,500 inh./km²	100	132,331.4	101.8	1,299.60	13,233,142	2.6
Medium SMST	25,000 < Population < 50,000 Population density > 300 inh./km²	966	35,162.9	19.7	2,060.59	33,967,357	6.7
Small SMST	5,000 < Population < 25,000 Population density > 300 inh./km²	7,348	10,241.5	7.6	1,470.09	75,254,510	14.9
VST	Population < 5,000 Population density > 300 inh./km²	69,043	1,193.1	1.7	699.30	82,376,586	16.3

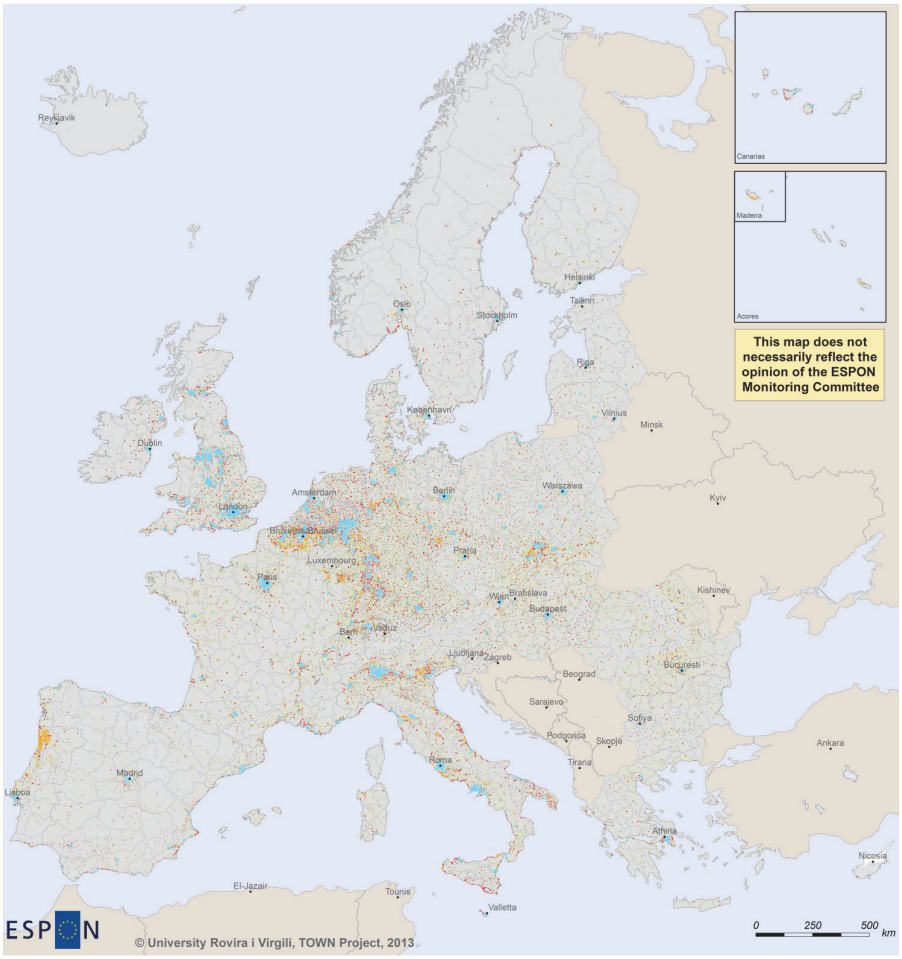
* Including EU27 + Iceland, Norway, Lichtenstein, Switzerland.

Note: Here and in the following figure, HDUC – high density urban clusters; SMST – small and medium-sized towns; VST – very small towns; inh. – inhabitants.

Source: Servillo et al. (2014a, p. 8.).

What the map below does not tell us is anything about the functional role of these small towns. Nor does it tell us anything about how their regional location and how this influences them as the TOWN research indicates that regional location matters and is a significant, albeit not unqualified, determinant of their socio-economic situation. This is precisely what the project sets out to investigate in a number (31) of carefully selected case studies in 10 countries across Europe.

Distribution of small towns across Europe based on TOWN typology 2



Small Towns and their context

One of the key findings of the TOWN project was that regional context matters, and along with national context, is an important determinant of the situation of small towns in terms of 'where they are today' and their 'possible futures', albeit not to the extent that it excludes the development of distinct locally driven responses and development (i.e. endogenous) to their situation. Given this it is therefore important to differentiate, at a general level, a 'typology of regions'. Thus based on work carried out by the European Commission and the Organisation for Economic Co-operation and Development (Dijkstra–Ruiz 2010; Dijkstra–Poelman 2012; OECD 2010, 2012), we developed a three-fold regional typology that needs some internal differentiation:

1. Small towns in metropolitan regions, which can be subdivided into:
   - Thriving metropolitan regions
   - Declining metropolitan regions
2. Small towns in remote/rural or peripheral regions
3. Small towns in intermediate regions, which can be subdivided into:
   - Those close metropolitan/urban regions
   - Those close to rural/peripheral regions

The above regional context shapes the situation of small towns and may create both opportunities but also create problems for them and set limits on possible development trajectories. A few examples will serve to illustrate this.

So for instance while a small town in a thriving metropolitan region potentially has greater possibilities for development than those in declining metropolitan regions, their proximity to a successful metropolitan core can create new issues. This proximity may bring with it certain 'risks'. If we take the case of a small town in the metropolitan region of Prague we see that in the agglomerated town Brandýs nad Labem – Stará Boleslav we find an example of the impacts of suburbanisation and decentralisation in metropolitan areas along with the offer of good services and a 'high quality of life'. This small town experienced rapid population growth post-2000 after experiencing a long period of decline and stagnation. However, there are high levels of daily commuting to Prague related to having good transport links to the city. The problem is that the town is in danger of becoming a 'dormitory town', with many residents working, shopping and using leisure facilities in Prague. Theresult has been a decline in the quality of private services in the city and of community life. A somewhat similar story is recounted by Kaufmann–Meili (2019) in their study of SMSTs in the Zurich metropolitan area. They found that "Our comparison reveals that the economic development and the economic specialization of SMSTs are largely exogenous to local policy-making." (Kaufmann–Meili 2019, p. 36.). While not strictly comparable to the focus of this paper as they include medium-sized towns, their research revealed that the distance and connectivity to Zurich shaped their function and the type of development that took place in these towns, which is similar to results in the TOWN Czech Republic case study (ESPON 2013a). Thus,

those closer to and with good connectivity to Zurich were able to develop knowledge intensive business or financial service sector industries while those further away developed into residential towns. The only local factor able to influence local development was land-use policy. Overall, they described such places as 'like leaves in the wind' in terms of their ability to shape their own development trajectories. This illustrates how even 'successful' small towns in thriving metropolitan regions are not without their problems and that the function of a small town in its regional context shapes its development. In some cases, this means that such small towns have relatively limited opportunities to 'shape their own destinies'.

The Polish small town of Łosice located in a peripheral area of the Mazovia region close to the Polish-Belarusian border, provides an example of a small town in a 'peripheral rural area'. Its local economy is predominantly structured around agriculture, it has poor connectivity, an aging demographic structure related to the outmigration of young people, lacks large firms that could stabilise the labour market, suffers from a shortage of available jobs and unemployment. Its peripheral location and poor connectivity also means it is considered unattractive to outside investors. Moreover, its post-1989 development, economic structure and its location create significant problems for future development. This is exacerbated by the failure of local government to develop a coherent and strategic local development policy. The Polish TOWN case study (ESPON 2013d) described the approach as one of "…»plugging holes« and sweeping problems under the carpet, handling difficulties as they arise." (p. 52.). The future development possibilities for the town appear to be restricted by its location, economic and demographic structure and lack of local capacity to react proactively and creatively to its problems and develop a long-term vision and strategy for its future development.

Nevertheless, one should not assume that all small towns in such locations/situations cannot succeed. The Cypriot small town of Athienou, a Cyprus TOWN case study (ESPON 2013b), provides a counter example. It is a small rural town located in a relatively remote area, has a long history and has a mainly agricultural based economy. Moreover, it is situated in the United Nations 'buffer zone' between North and South Cyprus created in the aftermath of the Turkish invasion of the island. This all means is that it has been further isolated due to the effects of the division of the island in 1974. Additionally, as a result of the division of the island it lost access to the main area from which its agricultural products (wheat and barley) were produced (the population lost access to 65% of their land). In addition, it also lost a direct connection with the capital of Cyprus (Nicosia) and thus found itself in a much more isolated position than prior to the invasion. All of this would suggest that the town faced a bleak future. However, despite a decline in population, employment growth has been surprisingly high. The TOWN Cypriot case (ESPON 2013b) study explained this by reference to the strong entrepreneurial spirit present in the town and its local 'milieu'. In part this comes from the local council's activi-

ties in relation to promoting and developing the cultural and social sector. Also it has a well-established cultural, social and athletic associations, a social welfare committee that runs relevant programmes and has built public home for the elderly. In addition, the town formed an agricultural cooperative to support its farmers as long ago as 1916. All of this emphasises a long history of cooperation and sharing within the population and along with the presence of a rich civic culture this constitutes a positive 'milieu'. So despite its problems the town has 'successfully reinvented itself' by developing its agricultural and agroindustry sectors based on livestock and cereal production. Most of the investment required to develop these sectors was locally generated and thus there is minimal dependence on outside investors. Moreover, the vast majority of employment (90%) created by these developments has been taken by local people, so the benefits of development have largely remained within the town.

The problem with success stories like this is that they are difficult to replicate because they are so deeply embedded in a rich historically created and maintained milieu. Although research on Danish small towns in rural areas (Fertner et al. 2015) suggests some small towns can resist decline by reinventing themselves through a process of what they term 'residential urbanism'. Taken together this does suggest that there are a number of pathways of development that small towns in rural/peripheral regions can take but much depends upon the presence of a rich and embedded civic culture, social capital and a spirit of cooperative endeavour that enables local people to create a viable future for the town.

The French small town of Vendôme is an example of a place in an intermediate region close to a major metropolitan region – Paris. It is located in a predominantly rural area and as the TOWN French case study (ESPON 2013c) notes traditionally the local economy was reliant on the agricultural sector but post-WWII, due to its relative proximity to Paris, manufacturing industry began to develop particularly as several multi-national companies decided to locate facilities there. However, later decisions by these companies to relocate created problems for the town. What really changed things for the town in the early 1990s was the construction of the TGV line between Paris and Bordeaux on which Vendôme was located. This now means that the town has a direct connection to Paris that takes around 40 minutes. As a result, many families have relocated from the Paris metropolitan region to the Vendôme area where they have access to cheaper housing and a rural location which offers a better quality of life. In addition, there is considerable daily commuting from the town to Paris. All of this creates dilemmas for the future development of the town. The municipality is uncertain over its future development – is it a 'suburb' of Paris or part of its parent region? In part this may be related to the influx of newcomers who have relocated from the Paris region and who have no sense of identity with the town or the region. The danger is that in the future it will increasingly be-

come a 'dormitory town' which has potential negative impacts on both the local economy and local society.

The above vinaigrettes give a sense of how a range of factors such as regional location, connectivity and 'civil society' can influence a small town's development. While we have stated regional location is an important factor structuring potential avenues of development and associated opportunities, these vinaigrettes also illustrate that both endogenous (e.g. a rich civic culture, tradition of cooperation) and exogenous (decisions about the routes of transport infrastructure, firms investment decisions) factors can present new opportunities for and threats to their future development. What they also suggest is that it is difficult to come up with overarching prescriptions for small towns even within a broadly similar regional context and that even small towns in apparently unpromising locations can be successful. In the next section we turn to the issue of what can potentially be done about the development of small towns.

Small Towns – what can we do – the place-based approach

Since the publication of the Green Paper on Territorial Cohesion (CEC 2008), subtitled Turning territorial diversity into strength, and the Barca Report (Barca 2009) there has been an overwhelming emphasis on the endogenous development of places, with appropriate exogenous support, known as the 'place-based approach'.

It is important to note that within the EU the place-based approach sits within a wider framework created by EU Cohesion Policy that entails the articulation of spatial planning with the notion of territorial development and the place-based approach within the EU. This is related to the development of an approach known as territorial development. The wider policy context has constructed an overarching policy narrative that seeks to simultaneously accomplish 'polycentric development' in combination with 'territorial balance and harmonious development'. In effect, this means the achievement of territorial, economic and social cohesion across the European space (see CEC 2008, 2010; ESDP 1999). There are two essential problems here, first the relationship between territorial, economic and social cohesion remains unclear to say the least. Second, the hegemonic discourse within the EU is a version of neo-liberalism that is primarily concerned to develop Europe's competitiveness (see Olesen 2014) particularly in the current period of economic crisis and fiscal austerity that prevails across Europe. This means that inevitably there is an overwhelming emphasis on economic cohesion in the sense of seeking to improve the economic performance of places (cities and towns) across Europe.

The Barca Report (2009) which sets out and justifies a place-based approach argued that it should be aimed at what are referred to as 'meaningful places of intervention' (i.e. not limited by administrative boundaries and borders; see Barca 2009, p. 93.). Moreover, the areas selected for such interventions should have a coherent

functional geography. This in turn raises issues/problems related to the development of effective working and coordination relations across administrative boundaries in order to overcome the dissonance between territorial focus and administrative entities. Something that has proved difficult in the past and still appears to be a serious obstacle to the development of a place-based approach in many parts of Europe. Nevertheless, it is important to note that a precondition for the successful development of a place-based approach, according to the Barca Report, is institutional change:

> The intervention needed to tackle these problems should take the form of the provision of integrated bundles of public goods and services aimed at triggering institutional change, improving the well-being of people and the productivity of businesses and promoting innovation. The goods and services concerned need to be tailored to places by eliciting and aggregating local preferences and knowledge and by taking account of linkages with other places. (Barca 2009, p. 11.)

However, in many ways what the Green Paper and the Barca Report (Barca 2009) did was to rationalise and justify an approach that had already been evolving in many places around Europe where cities and towns had realised they needed to develop their endogenous potential (i.e. forms of territorial capital), address their weaknesses/problems and utilise external support from regional, national and, where available, European funding programmes. More forward looking places had also taken on the board the need to develop sustainable forms of economic development that reconciled competitiveness and social cohesion. Moreover, some also recognised the need that this should be accompanied by institutional change.

In the remainder of this section we will examine a few examples of 'successful' and 'unsuccessful' attempts at developing and implementing a place-based approach to small town development. This will help illustrate the dilemmas they face.

The Czech town of Písek offers an example of a town that has managed to overcome a potentially difficult situation and revive its fortunes. It is an 'isolated' small town in a peripheral rural area of southern Bohemia situated between three relatively distant large cities. This situation allows it to retain a degree of autonomy it perhaps would not otherwise have were it located within the 'zone of influence' of one of these cities.

The TOWN Czech Republic case study (ESPON 2013a) notes that at the beginning of the 1990s the town faced a number of economic challenges that raised questions over its future development. In addition to industry based on the machinery and electronics sectors, the main employer was the textile industry. However, in the post-socialist period when the national economy underwent a rapid transformation towards a more market-based system the textile company was unable to compete under new market conditions. Moreover, the town was also an important army base which was downsized due to a reduction in the size of the army and relocation of

the remaining troops. As a result of these developments, the town experienced high levels of unemployment.

Despite these problems Písek was able to develop into a town with a stable population, growing economy and low unemployment. One of the ways in which it did this was by being one of the first Czechs towns to create an industrial zone and attract investment from the automotive and electronic industries. In addition to these relatively labour intensive industries, it has sought to encourage the development/location of firms in the knowledge intensive sector by constructing a new technology park focused on ITC. It has also sought to develop tourism along with cultural festivals and other culture-related institutions such as museums, galleries, and other cultural and tourist-oriented facilities. It is also developing higher education facilities to support these developments. Thus, it has sought to develop a diverse economy.

The successful (re)development of Písek has been led by the municipality which sets ambitious development goals and was active in many fields. Moreover, the town attempted to balance support for business and competitiveness with support for social cohesion. It was able to do this by using both its own internal resources (e.g. land and other property transferred from the state in the early 1990s) and combining these with resources from national policies and programmes, participation in cross-border cooperation and the Structural Funds of the EU. This development process has been structured by a strategic plan first created in 2001 and updated regularly to address the town weaknesses. In addition, the town has attempted to create an 'entrepreneurial culture' to fuel future developments. Moreover, it works well with other municipalities in the sub-region and the national government and has the capacity to utilise EU resources in a targeted manner to support its strategic plan.

While the municipality has developed the town's economic competitiveness and position compared to other cities, it has also focussed on enhancing the quality of life of its citizens. It has done this by developing its social services and housing and improving education, public spaces and other facilities used by citizens. Thus, it has balanced external competitiveness and internal social cohesion and in this sense represents an example of good practice. Nevertheless, it has not been a continuous 'success story' as many of the new jobs created were for employees with lower qualifications rather than for those who has been university educated. Thus, it is now facing the loss of its elite, well-educated inhabitants, which may have implications for its future development.

The Italian small town of Alba, rather like the Cypriot town of Athienou referred to earlier, offers a positive example of how a place can create its own pathway of development based on the exploitation of its resources. The TOWN Italian case study (ESPON 2013f) points out that Alba is located in a hilly region of the Province of Piedmont, however, due to its 'poor connectivity' it is considered to be re-

mote/isolated in terms of the rest of the region. Nevertheless, this does not seem to have affected its development. Despite this isolation it has developed its own unique (high quality) brand that has achieved a global presence. In particular, it has strengths in the agri-food sector and high quality tourism that is based on a mix of high quality local foods and wine (gastronomy), the high quality natural landscape, heritage and culture. They have been brought together into a coherent tourist offer aimed at high-value added tourism. In addition, it also has established several large scale manufacturing plants that serve a global market and a large number of small and medium-sized enterprises. In other words, it has a diverse economy that is strong and performing well. The town also has a well-educated workforce that has aided innovation in response to changing external circumstances and most of the benefits of development have been retained locally in the form of reinvest in the development of existing facilities and/or new opportunities and accrued to local people. Moreover, the Italian TOWN case study (ESPON 2013f) suggests that the local authority has not been the leading actor in these developments and that they have been driven by actors in the private sector and civil society. Rather like the example of Athienou, the 'local milieu' appears to have been the 'generative source' of development. To achieve this, it has built on well-established reciprocal local networks (e.g. social capital, 'knowledge exchange', and trust) and an associated strong sense of 'local identity' created over a long period of time, perhaps also a reflection of the 'isolated/remote' position it occupies.

However, the town's future is not without its potential problems. In terms of the manufacturing sector, the positive developments identified run the risk of 'delocalisation' as the relevant large-scale manufacturing firms consider relocating plants to other locations with access to cheaper labour, in response to global competition. The danger is that if this were to occur then the town would find itself reliant on tourism and the residential economy. Whether or not this is sufficient to sustain the local economy in the future is an open question. One final point should be made about both Alba and Athienou is that both represent 'outliers' in the TOWN research. In part this is because of the apparent lack of leadership by the public sector which stands in stark contrast to other small towns. In addition, it should be noted that both Alba and Athienou were 'outward looking' and sought to build and maintain links with other places. Finally, while such cases represent good examples of 'success stories', we need to bear in mind that it would be very difficult to replicate/transfer the factors that underlie their success (social relations, mix/articulation of territorial capital, and modes of 'mobilisation' of those assets) elsewhere because they are 'deeply embedded' in the local social structure and reflect a very particular 'history'.

These two towns are examples of how place-based approaches can be developed to address the problems small towns face. However, the majority of small towns in our TOWN research were unable to replicate the relatively successful development

trajectory of these two towns. The Welsh small town of Tredegar represents an example of a former industrial small town that has been unable to prosper in the wake of the decline of its industrial economy. It is agglomerated within a wider sub-region dominated by larger cities (Cardiff and Newport), albeit it is located on the periphery of the south-east Welsh 'capital region'. The town is located in the municipality of Blaenau Gwent which is the most deprived district in Wales. It is also located within the West Wales and the Valleys region which since 2000 has been in receipt of the highest rate of EU Structural Funds (Objective 1 and subsequent programmes). It has also been in receipt of funds from programmes launched by the Welsh government such as the Communities First initiative and UK national government programmes such as the Enterprise Zone policy.

The TOWN UK case study (ESPON 2013e) notes that Tredegar has a long industrial history and had ironworks from the early 1800s and it has long been associated with coal mining. However, it has experienced de-industrialisation over the past 30-40 years. One of the town's current problems is that is has a high proportion of working age adults with either few or no qualifications, in 2011 just over 38% of working age adults in Tredegar had no qualifications. This doubtless contributes to the fact that in 2011 it had very low employment with only 51% of the working age population in some form of employment. This has made it very difficult for the town to adapt to a 'post-industrial economy'.

While the Blaenau Gwent municipality has a number of initiatives to improve the situation of Tredegar and other similar towns in its area, these initiatives were not 'joined-up' and in effect there was no overall strategy to address the problems that Tredegar and other similar towns in the local authority area faced. In an attempt to address the problems, using EU Structural Funds, a major redevelopment has taken place on a former steel works site in the adjacent town of Ebbw Vale. The steel works closed in the early 1980s having once been a major employer in the area (in the 1960s it employed around 14,500 people and was a major source of employment for people from Tredegar). This site is now known as 'The Works', it includes a range of facilities including housing, a community centre, educational facilities, and a hospital. It is hoped that this will provide the sort of workforce that will attract new (high quality) investment and perhaps begin to address the identified lack of an entrepreneurial culture and attitudes to work prevalent not just in Tredegar but in the wider area. However, this will be a long-term process and it is likely to take at least a decade before any clear results emerge.

In the meantime, there is a hope that a tourist economy can be developed based on the area's industrial and social heritage. In addition, a great deal of emphasis was placed on the building of a racing circuit known as the 'Circuit of Wales' which would have had associated high-tech motor vehicle research and development facilities. It was hoped this would attract large numbers of tourists and provide employment for local people. However, the proposed investment was never forthcoming.

Moreover, the area lacks an adequate tourist infrastructure to provide for large numbers of tourists meant it would have been difficult to cater for visitors and this same deficiency makes it difficult to support heritage-based tourism. What this illustrates is that the ambitious but unrealistic plans that many municipalities have for their development are difficult to realise without a clear 'vision', strategy and the 'capacity to act' by creating and deploying appropriate policies in an integrated and planned manner.

Across Europe, small former industrial towns such as Tredegar appear to have entered into a long-term 'spiral of decline'; experience suggests that it is extremely difficult to break out of such a spiral. What is also apparent in towns like Tredegar is the relative weakness of the private sector and that they lack organisations which can adequately formulate and articulate their interests. Moreover, they lack the sort of civic culture we identified earlier in places like Alba and Athienou that could initiate development. This means the onus lies with local government to take this process forward and in many, if not a majority of, small towns they lack the capacity to do this even with external support.

Conclusions

What we can say in general about the factors influencing the development/decline of small towns is that regional context matters but is not necessarily determinate. The regional context may set certain parameters but this does not mean that they are insurmountable obstacles. What needs to be in place is appropriate support from higher level (EU, national and regional) authorities. It is most certainly helpful if these higher level authorities recognise the need to support small towns and have explicit policies/programmes to do so, although from the European down to the regional level such explicit policies rarely exist. Nevertheless, there are resources available to small towns that they can draw on provided they can access and deploy those available at the different levels; this requires that towns have the ability to engage in what are often complex multi-level governance structures. However, this requires a proviso, there are not limitless funds available and they will need to be directed towards supporting the development of certain small towns. Thus, within a region it will be necessary to identify a 'settlement hierarchy' based on the functional roles of towns (e.g. related to employment, housing, the provision of public and private services and connectivity) and their ability to support daily life in surrounding places. Depending on regional location, the types of support will vary, thus for instance small towns in rural/peripheral regions will need different types/levels of support to those located in thriving metropolitan regions.

Assuming that the above framework exists much then depends on the 'capacity to act' of small towns. This requires them to develop appropriate institutional structures and processes to work across boundaries both internally (i.e. across traditional local government departmental divides) and externally (i.e. across administrative

boundaries) to develop new forms of territorial governance. They will also need to find new ways to engage with local stakeholders from the private and civil society sectors to ensure they are fully engaged in decision-making and development processes. This will be required if the town is to develop a long-term 'vision' of what the town wants to become and its relationships with other places in the region/sub-region. However, any such 'vision' should be realistic, for instance not every place can aspire to be a centre of knowledge-based development. This will also entail the deployment of a spatial planning approach that is needed to realise this 'vision' by helping to identify the strengths (in terms of existing forms of territorial capital) and deficiencies that need to be addressed and developing a long-term strategy for the town that is supported by all stakeholders and can be revised in the light of experience. Following on, there will be a need to develop appropriate 'policy bundles', based on the short-, medium- and long-term goals of the town. Leadership is also essential but it is important that thus does not rely upon a single individual or group of individuals. In some cases it may come from traditional political leaders but in other cases as the TOWN case studies illustrated it may arise from within civil society and take a more collective form.

As already noted not all small towns can be a focus for development and their will inevitably be 'winners' and 'losers'. Moreover, some towns will simply find it impossible to break out of their deeply embedded path dependency. However, such places cannot simply be abandoned if notions of economic, social and territorial cohesion are taken seriously. These places will still require support to ensure daily life can continue, that residents have access to the necessary services (e.g. health, education, housing, employment), can experience the same quality of life as citizens living in more prosperous towns and have opportunities to achieve social mobility.

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The most important city development initiatives of Hungary*

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Recently, Hungary's urban development issues have been gaining increasing attention, while directions and institutional frameworks of regional politics are in a constant change. In this context, the study discusses the contents and connotations that can be linked to the territorial concept of major Hungarian cities; it also examines the changes in the position of these cities in the urban system. Major cities have a key role in territorial development as they facilitate spatial processes, and hence it is crucial to identify the weight and directions these centres with complex functions represent in development concepts. The formation or even restructuring of spatial processes require time. Since the democratic transition in 1989–1990, different development directions were assigned to major cities in short cycles. Cities have failed to adapt to these ever-changing objectives.

The first part of this study presents the layers of the concept of major cities and characterize such categories as regional centre, city, county seat, and city with county rights. The second part tries to locate these centres, exploring changes in their developmental emphases, and also identifies pathways in the frequently changing territorial politics of the post-transition period.

Introduction

Since 1990, major cities and their hinterlands have been embracing various concepts and directions for achieving development, thereby significantly contributing towards the contents of territorial politics and developmental concepts. Since then, these centres have evolved from being regional administrative centres (1990–1994), to main- and sub-centres of development regions (1998–2005), and eventually to growth poles (2005–2008). Meanwhile, they were also subject to a discontinued

* This work relies on this study: Rechnitzer (2019).

attempt of administrative decentralization (2006–2010), and, later, they became centres of development, independent of the counties (2012–2016). Today, the focus of these centres has shifted to territorial development. As stated earlier, besides numerous generic development goals, unique and specific developmental concepts have been designed for major cities over the past 30 years. These centre- and region-specific ideas and concepts were well-coordinated by several cities, which led to dynamic development. However, other cities were less successful in this synchronization, and hence their situation did not improve significantly.

The development of major cities in the urban network as counter-poles to Budapest was not a successful process both before and after the transition. The capital is considered unique and has a paramount position owing to its size; economic concentration; role in the settlement network, the Hungarian culture, or public thinking; and weight. Although there were several attempts toward decentralization at a territorial level, Hungary continues to have a centralized structure. Due to centralized administration and national development and the strong centralization of the various state functions, major cities have failed to offset the 'capital myth', despite the creation of many regional organisations.

Dimensions of the Metropolitan System

The importance of cities can be determined by two factors that are built upon one another and define one another's institutions, entirely or partially. These factors are the population and the role of a city. So the more people live in a settlement, the more versatile the market spaces are, so we can count on more functions and the presence of organizations and institutions that embody them. The population size determines the role of a city's and its institutions, and vice-versa. In other words, the institutions and organisations of a city attract inhabitants and increase the concentration of population (Lengyel–Rechnitzer 2009). These two concepts form a unified system and both stand as the outcome of the development process that has been taking place since centuries in the metropolitan world.

In regional economics, the centers are settlements that can organise, supply, and direct market areas of various sizes and spreads. However, lacking in various functions, they are subordinate to other market supply areas. These central places emerge from the intersection of internal networks. The resources – products, materials, personnel, skills, innovations, and information – free flow in space and intersect each others' paths formed and organised by geographical factors, historical processes, and/or social behaviour.

The network nodes, as central places (predominantly multifunctional), which become dense spatially, concentrate economic, community organising roles and institutions and, correspondingly, attract producers, consumers, and inhabitants.

Big cities stand out from among such central places as they possess stronger concentraction skills; market attraction (unlike their surroundings); a unique economic, social, and human capital, and a robust infrastructure (Rechnitzer 1987).

The definition of cities can be based on its population. It is, generally, accepted that the aforementioned function of population concentration can generate mutual effects and facilitate synergy when the population size is around or above 100,000 persons. These synergies, in part, create new processes, institutions, and market-consumer matrixes. The interplay of roles and institutions embodying them also spreads in space, forming different catchment areas. After all, the spatial market for functions, including their attractiveness, is diverse, both in size (e.g. population size) and in scope. (e.g. number and orientation of settlements).

The functions of a city, therefore, hold space-forming power, and the larger the centre, the more widespread is the influence of these functions. These dimensions can capture one portion of a country or a sum of its parts. It can also spread abroad to a border country, other countries' functions, or institutions of certain regions.

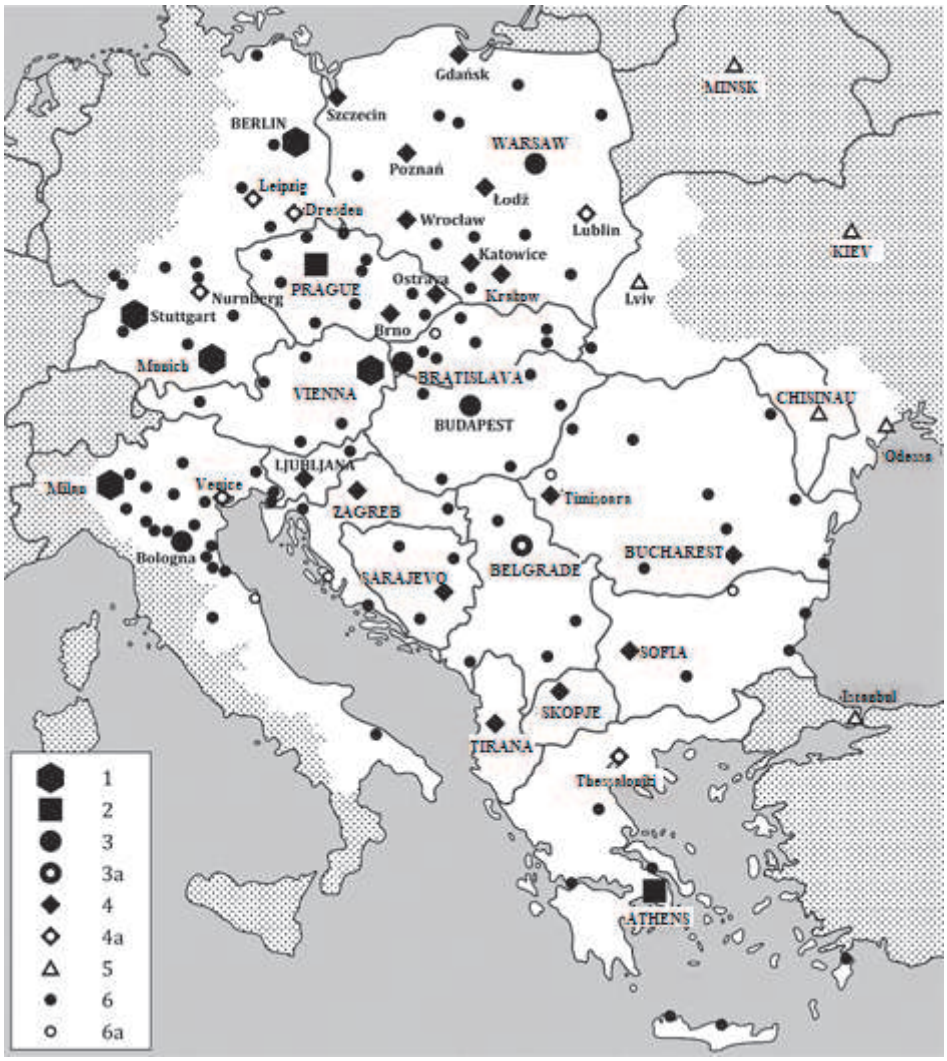
The capital cities of several central and eastern European countries have different population concentration. The percentage of inhabitants in the ten largest cities account for between 10% and 20% of the total population of the country, that is, the administrative divisions of these capital cities are found to be proportional.

Studies on European city development have typologised the networks of big cities. Based on the research, we can classify mega centres into the following four categories (Figure 1): global nodes (MEGA1[1]), 'the European engines' (MEGA2), strong and multifunctional metropolis (MEGA3), and potentially-weak big cities (MEGA4). The basis for the arrangement of the above categories is the varying degrees of competitiveness held by the institutions and organisations possessing global, continental, or perhaps only macro-regional significance. These studies consider the cities to be well-supplied with resources, and an emphasis is given to the cities' human capital, institution levels, the density of internal connections, and their geographic position. MEGA cities include capitals and cities, macro-regional centers that have an impact on the European spatial structure and macro-regional dimension (Figure 1) (Rechnitzer 2007, Egri 2014, Faragó 2014).

[1] MEGA: Metropolitan European Growth Area.

Figure 1

Functional urban districts of national / international importance
Central Eastern Europe, 2006



Note: 1 – MEGA1: global nodes; 2 – MEGA2: Europe's engines; 3 – MEGA3: strong and multifunctional metropolis; 3a – MEGA3 candidates; 4 – MEGA4: potentially poor cities; 4a – MEGA4 candidates; 5 – Uncategorized MEGA; 6 – International/National Functional Urban Areas; 6a – International/National Functional Urban Areas.

Source: Ricz–Salamin (2010, p. 43.) based on own editing.

Smaller cities[2], which have a national significance[3], are also considered at par with megacities (Faragó 2007, Lux 2012). In the centres of Western Europe, the influence of such concentrated functions stretches beyond a nation's borders (e.g. international institutions serve as interregional network nodes when they benefit other neighbouring regions, thereby establishing connections with two or more countries, etc.). These functions are likely to play special economic roles (e.g. large companies' headquarters, university, and R&D centres), attract companies with cross-border market presence, and establish collaboration with big cities in formal and informal networks (e.g. importers). Beneath this level, we find regionally significant (big) cities whose influence is – relevant – defined by some principle – based on area; they engage in pre-defined (institutional) formal and (regional) informal roles[4] and allow the establishment of institutional networks.

In Hungary, we consider cities with populations greater than 50,000[5] big cities, while settlements with more than 100,000 inhabitants are considered regional big cities or regional centres.

Big cities perfrom their functions in different sized spaces. Thus, different-sized, centre-focused catchment areas, which can be characterized by various principles, have been created. Given the number, size, economic activity, renewing ability, and economic and organisational skills of their markets, it can be states that the roles of these cities are continuously developing; additionally, these areas – facilitating a multitude of functions – cover different regions that change periodically (Nagy-Molnár–Lendvay 2018). The size and spread of catchment areas effect the density of big cities, the way these cities interact, or the division of the functions they share.

The attributes of the settlement network, its complexity, subdivisions, the size of hubs (cities) and their interrelation also influence the spatial extent of the various functions (Figure 2). In regions where, owing to historic, geographical, economic, or political reasons, a big city is a determining factor, although the small centres (with smaller populations) take up functions, the concentration of roles and organisational institutions is localized to one centre. Meanwhile, in regions with several large competing cities, regional roles are shared and, in some cases, parallel roles exist. An overlap in the spatial structure is observed in such regions, which often leads to the improper evaluation of a city's true territorial impact; in some cases, it leads to either an external intervention (of a political nature) into the maintenance of institutes or the expansion thereof.

[2] In International literature, cities with a population size of 300,000 – 500,000 inhabitants are considered large cities, while cities comprising between 100,000 and 300,000 inhabitants are considered small cities (Lux 2012).

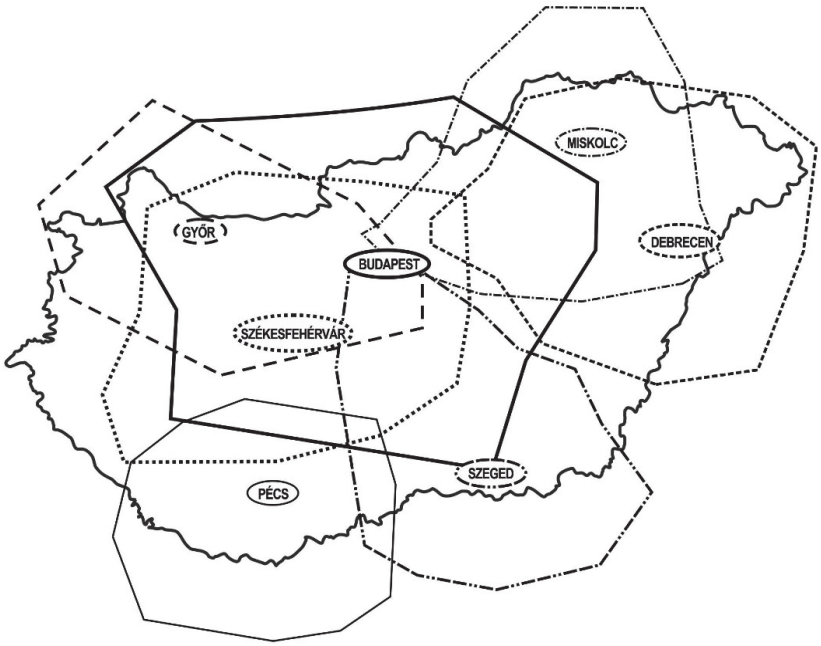
[3] Hungary does not have a MEGA4 level, as the population does not exceed 200,000 (Debrecen) in the largest case, and hence the country has smaller cities (MEGA3) and regional centres after the capital (Faragó 2008).

[4] According to the Hungarian scientific literature, there are regional centres with incomplete roles (Csomós 2009).

[5] A city with more than 50,000 inhabitants is considered a city with county rights by Act LXV of 1990; it means that such cities can define territorial tasks to be carried out under their authority. The county law is governed by Act LXIII of 1994. The law also applied to townships of the county with less than 50,000 inhabitants, which further eroded the metropolitan system. There are currently 23 cities with county rights.

Figure 2

Availability of Hungarian big cities within 1.5 hours by car



Source: Salamin et al. (2008, p. 22.).

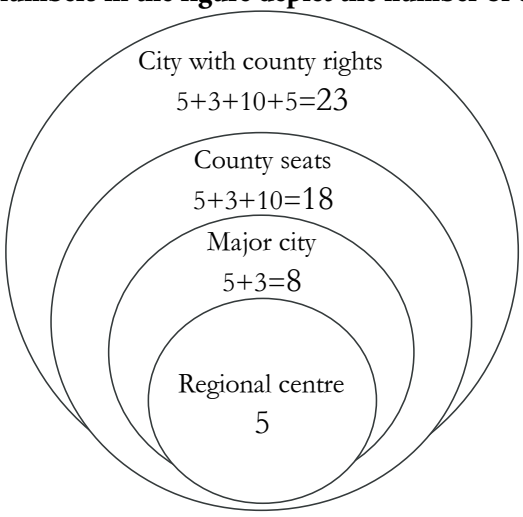
The national, territorial, and other developmental documents determine regional centres. They highlight one or two centres as headquarters. The most populated city, the one that plays the maximum number of roles, or possesses the maximum number of institutions does not always win; rather, the winner is determined by several factors including historic value, location, and political structures.

The seat of the given and nationally interpreted territorial level (province, region, county) thus accepts administrative and management roles and institutions, serving as their centers. Market participants, depending on their interests and values, either accept this designation of a regional center or not, choosing the settlement where they find the most favorable conditions for their operation. The stronger the dependence of economic agents on the political system and its institutions, the more determined is the orientation of economic units towards the designated regional center, whereas the opposite is observed in the emergence of dual or multiple centers with territorial separation and division of administrative and management functions.

The next level or degree of a city's spatial-organisational role is associated with the formation of the functional urban area (FUA)[6]. This role is concerned with facilitating an integration between a city and its surroundings; precisely, a more organised, institutionalised form of internal cooperation takes place when towns, spatially influenced by big cities, create (with cooperation) the conditions for joint operations, plans, and development. This is characteristic of hierarchical urban agglomeration, wherein the networks focus on the central city and internal cooperation is minimal. Additionally, this case represents horizontal big-city regions, wherein sub-centers are formed, the attracted settlements also interact and enforce their functions (Enyedi 2012). The network is interconnected, which may comprise transportation networks; common institutions with a regional impact; or planning, development, and management systems. This connection leads to resource-savings and allows the formulation of new spatial organization, management and governance solutions (Somlyódyné Pfeil 2008, 2014, Faragó 2008). Big cities simultaneously generate, initiate, and participate in these new connections; when playing these roles, these cities either give place to countless other roles or, in the interest of organising the latter, draw in new, external resources. The *Hungarian metropolitan system* is modelled here in Figure 3.

Figure 3

Model of the Hungarian metropolitan system
(the numbers in the figure depict the number of cities)



[6] In 2007, the Leipzig Charter adopted by the European Union Ministers for Regional Development set out the basic principles for a European polycentric urban network. As a result, the principles and directions of the National Settlement Network Development Concept started during the same period. The work revealed many results on the characteristics and development directions of the Hungarian settlement network. This aspect and the FUA delineation and its tasks have been presented in detail. It is regrettable that the concept has not been developed and its political acceptance has not taken place.

The metropolitan 'core' is represented by regional centres, which, according to experts, consist of five centres concentrating significant population and economic power (Debrecen, Győr, Pécs, Miskolc, Szeged). These, functioning as county seats and having county powers, are home to institutions with a large regional (multi-county and sometimes cross border) impact. The next metropolitan 'shell' is made up of large cities with little or no regional role, but with outstanding populations and functions (Kecskemét, Nyíregyháza, Székesfehérvár). These are also county seats and cities with county rights. The third 'shell' of our metropolitan system is represented by cities serving as county seats (in our case another 10 + 1 cities where Budapest is the capital and also a county seat, but as stated we do not take this into account). These centres, which concentrate significant population and economic power, have roles that affect a larger area (one or more counties), with middle-level administrative responsibilities and county competences. The final metropolitan layer comprises towns that have county rights (five more cities). Each of these are equal in that they all wield certain city functions with regional influence (perform special roles), not submitting to the public administration, that is, the county. However, they do not have institutions that can enable them to provide public functions at an intermediate level.

The metropolitan structure of the city network is a *not closed* – permanently fixed formation. Big cities can 'move' or can 'migrate' between the functions of each 'shell'. A city can expand its roles and, consequently, institutions. Additionally, the population of a city can increase or decrease and its spatial impact can expand or contract. The constant motion of the latter and the development that comes with it displays *the Metropolitan System* or the system of big cities.

Metropolitan trajectories in development concepts and in practice (1990–2016)

New cities with county rights, crisis resolution (1990–1996)

The transformation of the public administration system was among the first developments to take place, by the order of Act LXV of 1990 on local governments, which is also called the *first municipal law*. An important element of this law was to create or rather restore the institutions of cities with county rights. Towns with a population size exceeding 50,000 persons were qualified for county rights and functions. Subsequently, these towns move out of county councils' area of influence, gaining independence, equal roles, and economic rights. Besides the aforementioned major cities that also act as counties (Debrecen, Győr, Kecskemét, Nyíregyháza, Miskolc, Pécs, Szeged, and Székesfehérvár), the county seats (Békéscsaba, Eger, Kaposvár, Salgótarján, Szolnok, Szombathely, Tatabánya, Veszprém, and Zalaegerszeg) also qualified for county rights. Moreover, many secondary centres in multiple

counties have become autonomous, creating the conditions for competition between cities, which will become increasingly important in the future. With the constitutional amendment of the *first municipal law in 1994* led to the removal of the minimum population requirement of 50,000. Additionally, *independent initiatives* supported the transformation of simple towns into county cities (Szekszárd immediately seized the moment; additionally, in 2006, Budapest's biggest agglomeration settlement, Érd, also successfully gained this title). Today a total of *23 towns hold the 'city with county rights title'*.

The competences are not broader in their case than in an average city, but they could operate in the same rank as the counties, independently of the county government. Among the rights-wielding cities, however, there were large differences in city functions and institution facilities. Additionally, in the years following the change in regime, the economic bases of these cities kept changing.

The regime change led to an economic crash in Hungary, the decline having started at the beginning of the 1980s. Meanwhile, the elements of the *market economy* formed gradually (independent entrepreneurs, formation of state-run businesses, multi-level banking system, commercial rights insurance, and the presence of foreign working capital, among others). Their interaction with the *various economic participants* and their *centres* took different forms and had diverse effects. Moreover, market changeover as well as the rapid change of ownership (privatization) was seen in branches where international economic relationships were diverse. However, for units involved in eastern markets or specialized in domestic production, the transformations and/or adjustments were much slower and harder, or perhaps, never occurred. All this was mirrored in *the territorial fabric*. Economic centres that had companies with a strong market position experienced a much faster and less painful transformation.

Conversely, in industrial centres that had a dense presence of traditional branches of industry (mining, metallurgy, chemical industry), the sector crisis broadened to a territory crisis. As a result, the growing problem of unemployment, functional organisation issues, and maintenance problems had to be dealt with in the centres and in their areas of effect (Alpek–Tésits–Hoványi 2018).

Another attribute of this temporary period is that *foreign investors* desired to invest in businesses in the cities, county seats, and larger industrial centres in the western part of the country. This can be attributed to the quick access to resources, the presence of skilled workforce, and a seemingly more favourable environment to build economic and business infrastructure (headquarters and service provider companies) in these regions. The new democratic government correctly recognized this phenomenon because it provided economic development support for the renewal of the western region's industrial centres' economic mechanisms or for building infrastructure that serves to support those mechanisms.

Some of the regionally organized *republic trustees,* while overseeing the legality of the operation of municipalities, called for the actual establishment of the regional

level, but the majority insisted on their official duties. At this time, they nurtured poor connections between the counties and big cities, as the latter performed authoritative functions. Conflicts broke out between *counties and county seats* regarding the share of wealth and institutional roles; besides, there were disagreements on the means to fund operations. The conflicts were natural; as the participants were not familiar with the new council system formed at that time. Gradually, the laws were formed and were full of loopholes, these laws were misinterpreted. Besides, the illusion of autonomy and the disillusionment that followed thereafter permeated the public administrations; this is because of a surge in the number of jobs and the lack of financial support. The public pressure continued to grow, while *regional cooperation fell apart,* and the connection between the city and the countryside, as well as between council units (settlements), loosened.

In 1994, the new government dissolved the quasi-regional administration and the legality supervision model and *strengthened the counties*. In the case of the latter, decision-making was not vested in the hands of the county administration, but the council legality supervision existed at a county level.

A direct county-level election institution was established, which started the politicisation of the county self-government. Cities with county rights were once again omitted from the counties, which functioned as an intermediate territorial level, thus perpetuating disagreements between counties and cities with county rights. The county council continued its institution maintenance roles, and though the sources needed for its operation grew slightly, they were insufficient to support county-wide development.

The spatial development act, institutional Congress, and preparation (1996–2004)

Act XXI of 1996 laid down the foundations for the *new Hungarian regional 'policy',* which led to the second phase of the transition. The Act defined *the goal of spatial development,* according to which the following must be ensured in every part of the country: the establishment of a social market economy, the conditions for sustainable development, the spatial spread of innovation, the reduction of disparities between the capital city and rural areas, a harmonious development of the spatial structure, and the safeguarding and strengthening of the regional identity. The Act established a *unified institutional system for regional development*. It drew up tasks at national, regional, county and micro regional levels, designated the decision-making bodies of regional development and named the decision-makers (parliament, government, county development council, micro regions, local governments, economic sector, and employee representatives). The law defined the tools of regional development (Regional Development Fund, then Earmarked Appropriation for 1996–1999, Earmarked Appropriation for Rural Development 1999–2002) and even its

resources, and later a separate regulation was drawn up concerning the principles of distribution among territorial units. The *Regional Development Act* assigns *decentralized* resources to the county development councils, which are organized on the principle of partnership. The county development councils had to prepare *development strategies* and *programmes* that were built upon those strategies, thus forming the basis for using the state's resources. In its first draft, the Act entrusted the counties with the creation of regional levels, tasking the various regions with only the planning and statistical roles.

After the law was passed, the year still being 1996, the *National Spatial Development Concept* (NSDC, 1998) started to unfold, which was approved by the parliament in March 1998. The NSDC passed in 1998 determined the future *directions of spatial development;* specified the goals and guidelines of spatial policy; defined the priorities of development along with the areas of intervention and the types thereof. Furthermore, it defined the principles of operation for the instrument and institutional system. The aforementioned concept, in relation to some of its branches, even points out directions of development and, in the end, summarizes spatial-political measures for joining the European Union.

The decision-makers selected for spatial development were in a state of confusion. The selection of the decision-makers was not backed by sufficient analyses (the representation of cities holding county rights was not set, with subregions representing a large ratio), the financial difficulties surrounding the initial operations caused tension, and the lack of professional personnel led to uncertainties in the execution of the organisational frameworks.

In October 1999, the Spatial Development Act was renewed (Act XCII. of 1999). The first reason behind the amendment was *to strengthen the regional level* (the earlier regional initiatives were affirmed by the act, and, in this way, seven planning and statistical regions were delimited). Second, it was important *to validate the legality checks;* eventually, finally, the amendment, based on the already changed set of political values, transformed the representation of the spatial development players within the institutional system. The most controversial points of the forward-looking amendment were about *partnership*. In the regional and county development councils mentioned earlier, chambers of commerce and employees received advocacy functions, while micro regions got full legal representation. This newly passed amendment restrained the advocacy role of the chamber of commerce and employees organization, allowing them only the right to counsel. In other areas, however, government representation through the full membership of ministries and some decentralized bodies increased and the situation of cities with county rights was favourably resolved. However, at the same time, the practical distribution of ministerial representation took place according to party politics (in place of ministry appointment, parties designated local representatives), and no direct contact was established with the authorities.

Additionally, in this period, the *Regional Development Councils* (RDC) were reorganised, based on the territorial delimitation of the 1998 NSDC; regional programmes were also developed on the basis of the previously adopted development strategy.

In the *Regional Development Agencies* (RDA)[7], the operative arm of the regional development councils, specialists worked on programming and materializing developments (personnel headcount during this period fluctuated from 5 to 22, regionally). The *selection of the centres of the planning-statistical regions* generated controversy. The RDC and the institution operating the RDA were not always headquartered in the same settlement. Cities with county rights begun to fight for these headquarters. These battles were about gaining regional centre status, as planning-statistical regions could even become political regions in the future. In each of the seven regions, different organisational strategies were implemented for the establishment of the regional development institutions.

Cities with county rights also began building *their planning* apparatuses, in preparation for joining the European Union. Although they had the right to participate in the elaboration of the regional development plans, their willingness to collaborate was varied. There were county seats wherein regional and county city developers had worthwhile connections, and thus the interests of the big city appeared in the plans. Conversely, we found that Act XCII of 1999 prescribed conciliation forums for regions and cities with county rights, but these were more formal than substantive.

EU resources, new programming period, regionalization initiatives and planning activity (2004–2010)

Receiving encouragement from the European Union, Hungary consented to having only one *regional development operative Programme (Regional Operative Programme – ROP)* in the First National Development Plan (NDP) (2004–2006). When designing the program, regional government bodies, as well as the regions themselves, were weak, ineffective advocates. From the NDP 1's *five operative Programmes*, the *regional Programme* was built on the residual principle; some of the goals of this programme were *tourism* (121 winning projects), *road reconstruction* (77 winning projects), *improvement of kindergartens and schools* (120 winning projects), and *training and employment* (112 winning projects). Between 2004 and 2006, a sum of 107.14 billion HUF was at the ROP's disposal. By June 19, 2006, a total of 2,233 grant applications were filed, of which 521 were approved; these changes drove the decision to financially support the programme. The 521 winning grants received a total of 106.37 billion HUF in support.

In 2005, the Parliament adopted the National Regional Development Concept (NRDC 2005) (Parliamentary Resolution 97/2005. (XII.25.)). The 2005 NRDC is a

[7] The RDAs were also headquartered in the regional centres, except for Western Transdanubia, where the agency was headquartered in Sopron, while the Regional Development Council in Győr.

modern, long-term document comprising the *new directions* of the European spatial policy. It precisely documents both Hungarian and central European regional processes. The 2005 NRDC determines long-term strategic goals, which from the perspective of our topic, are listed below:

- The strengthening of *regional competition* across the entire country as well as within regions and other territories;
- *Sustainable* regional improvement and heritage protection;
- The reinforcement of connections *beyond the border* in the Carpathian Basin;
- Central Europe's more organized integration into the European spatial structure;
- Promotion of a *decentralized development policy*.

Concerning the vision and overall goal implementation in the mid-term, by 2013, the *spatial goals* from the country's and our topic's perspective are as follows:

- *To create* a competitive *Budapest metropolis*;
- To strengthen regions' dynamic *poles of competitiveness* for improving the city network's contact system.

The concept urged that the *reorganization of the regional public administration* must be initiated. The first initiative comprised the formation of state administrative operations in the regional institution form (2005–2007). During the mid-level realignment and renewal, political units were not formed since this would have affected the municipal law and the Constitution, requiring a two-thirds parliamentary majority to make any changes to either. The decentralized state administrative bodies with county jurisdiction in development regions were organised; this implies that, by the start of 2007, eight regional organisations with different centres were established.

The second initiative aimed at broadening metropolitan functions between 2007 and 2013; it was known as *'the Pole Programme*[8]*'* (2005–2007). The 2005 NRDC named Debrecen, Győr, Miskolc, Pécs, and Szeged as the development poles, and added Székesfehérvár and Veszprém as partner poles. At the beginning of the decade, much emphasis was put on the 'formula' of knowledge-based society (in European development policy) and on its role in sustainable economic growth and the reduction of spatial disparities (Lengyel 2007). These drove the government to work on a Hungarian development/competitiveness pole programme. Its policies as follows:

- It must possess region-forming institutions and factors, and its connections must reach across the border
- It must have knowledge-intensive economic bases; high research, development, and investment potential; multi-functional university education; and research bases,
- It must focus on widespread *municipal development*,

[8] Official Name: Competitive Poles.

- It must have a definite and structured *town agglomeration*,
- It must ensure that the weight of the centre is definitive in *the region's economic, social, and institutional* relationships,
- It must be able to provide a broad range of quality *business, economic, and cultural services* to the region.

The planners thought of five major centres and one pair of partner centres and determined desirable development goals and directions for the big cities, focusing on *large-scale scientific capacities*.

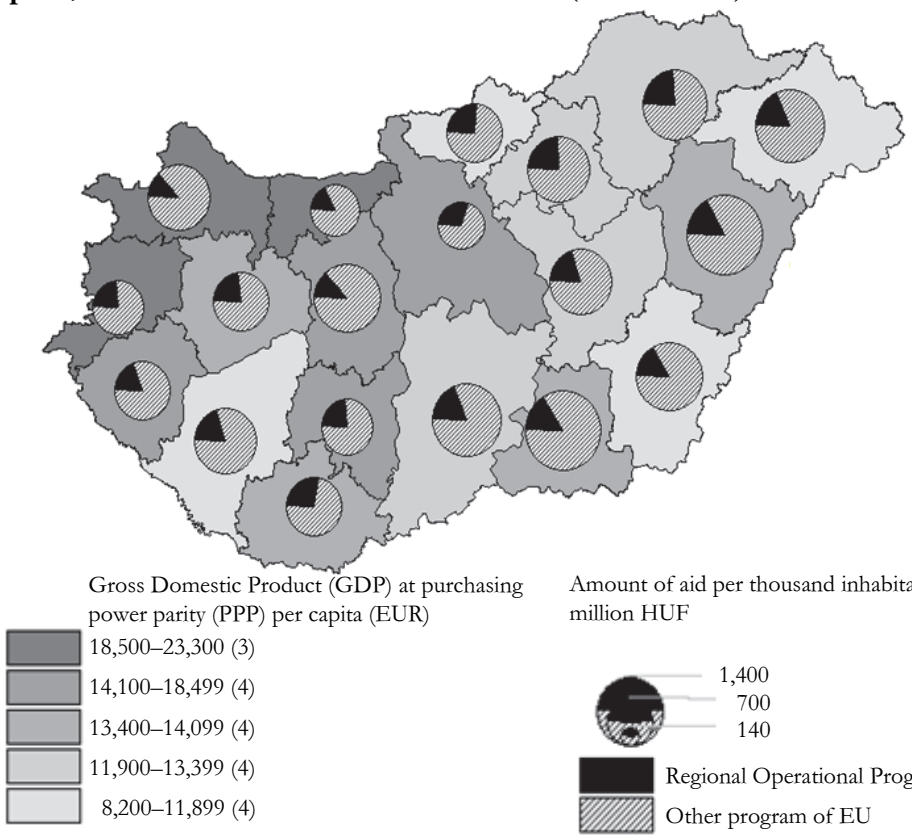
The directions of the growth pole concepts are as follows. In *Debrecen,* building upon the pharmaceutical industry and agricultural innovations, the concepts targeted the 'industrialisation of knowledge'. They saw *Győr,* with its auto-industrial, mechanical production, and renewable energy research, as an 'auto-polis'. *Miskolc* was envisioned to grow into a 'technopolis', facilitating developments pertaining to nanotechnology, the chemical industry, mechatronics, and renewable and alternative energy research. They determined that *Pécs,* being built upon the health, cultural, and environmental industries and their research, would be considered 'a healthcare hub'. In *Szeged,* they dreamed of a 'bio-polis' that would concentrate on healthcare, environmental industry, and agricultural biotechnological research. Concerning *Veszprém-Székesfehérvár,* it was considered a hub for mechatronic, logistical, and environment industrial research. Each of these new centres emerged from planning possible directions of development. (Doktor 2010). Each potential centre prepared its own *pole programme concept,* which not only gave the foundation for reviewing research and development resources but also provided opportunity for cities with county rights to come up with and work through their *integrated municipal development strategies* (IMDS), since many elements reappeared in the renewal concepts associated with either metropolitan development or higher education. Sadly, the pole programme was reduced to regional, metropolitan innovative group development (cluster development), and eventually disappeared from the scene. As an initiative, the elements of municipal development were given emphasis, within the IMDS. However, the metropolitan city councils and the Hungarian regional/town development institution systems as well as the public *were unprepared* for such expansive city-system development. Additionally, there was no monetary and European support.

From 2007-2008, the work in the cities with county right continued to ensure the formulation of IMDS for the requisition of European and other connected national sources between 2007 and 2013. The development concepts were put together in a pre-determined system, the regulations for which were provided by the central planning authorities. Though the system was pre-determined, a considerable freedom of movement was given to the city. We do not intend to analyse the plans. However, it must be said that, in multiple cities, that plans *very thoroughly* improved the conditions for receiving EU funds at the municipal level, and succeeded in gen-

erating and co-financing developments that contributed to the development of quality urban spaces and conditions.

Figure 4

PPS-based GDP per capita (EUR) (2015) and the total amount of EU sources per 1,000 inhabitants between 2007 and 2013 (million HUF) for the counties



Source: http://terkepter.palyazat.gov.hu/, Data downloaded: 2014. 02. 15., GDP data downloaded: http://ec.europa.eu 2017. 05. 12.

It would be a far more picturesque diagram (Figure 4) if we add the GDP and the EU support data to it as well. Based on the data, we can, in part, surmise that *more intense source usage occurred* in those regions that, based on the regional inequality test, can be judged underdeveloped. It must be confirmed whether the 'classical convergence' or '*absolute convergence*' (Egri–Tánczos 2018) happened *in part* only. This is because while Hajdú-Bihar, Csongrád, or Bács-Kiskun counties all had higher support intensity, Borsod, Heves, Nógrád, and Tolna counties' support intensity was very low. A '*one-sided*' *convergence* is easily seen if we again look at Hajdú-Bihar county, which exhibits a lower GDP and support levels (Figure 4). In comparison,

Somogy county's economic strength is not significant; its support intensity does not compensate for its economic weakness (though note must be taken that the city that applied for the 'Pécs: Europe's Culture Capital' award received considerable resources for preparing and extrapolating its strategies and programmes).

Towards a New Regional Policy

The seven-year planning period of the European Union and the four-year Hungarian electoral cycle are overlapping, so the realization of the EU development and support objectives *goes beyond* the shorter electoral cycles.

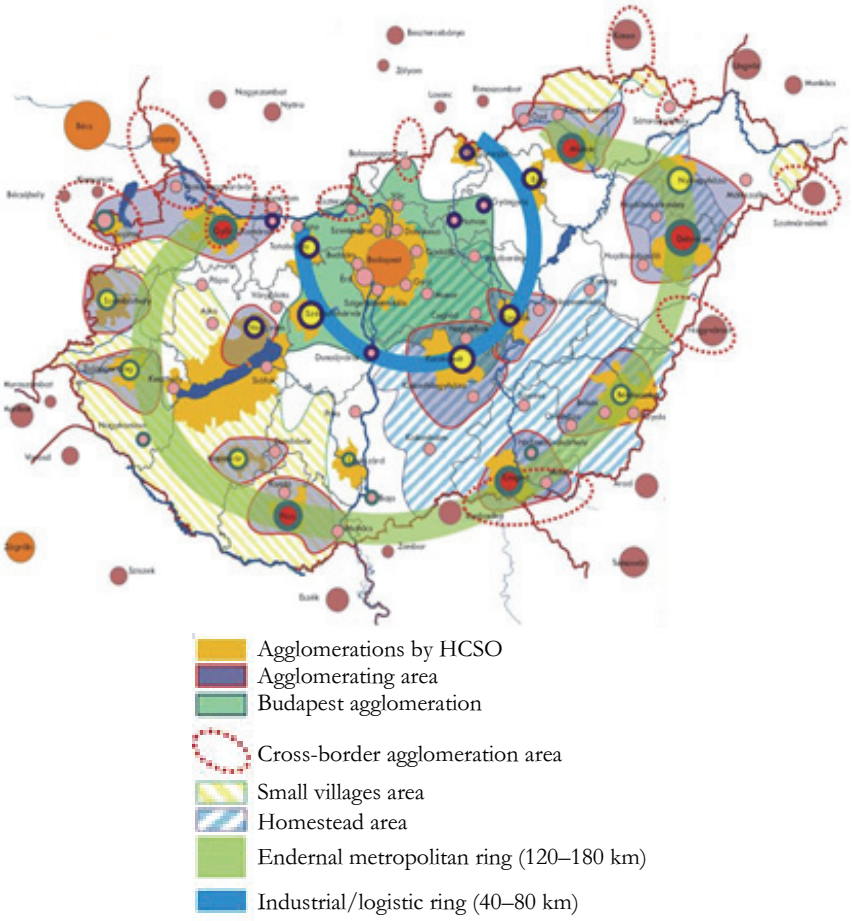
The result of this was that the execution of previously discussed and accepted developmental ideas could only be altered in accordance with the ideas of those in power and only with many *regime-changing corrections*. Starting in 2010, certain circles, in profession-related arguments, rushed the formation of new regional/spatial policies. Perhaps these affected the creation of the *National Planning Office* (NPO) (2012–2014), which will continue with its efforts to achieve the goals of the NDP covering the period between 2014 and 2020.

Along with the NPO, as a central institution, many similar legal rulings emerged during this time, which served to improve the scenario effectively or poorly. The most significant ruling was that the regional developmental and organisational tasks (Act CXCVIII of 2011) were turned over to the *county councils*; the next most significant ruling was associated with the *Regional Development Act's* amendment (Act CCXVI of 2013), in which the transformation of the previous institution's regime took place. This resulted in the *reorganization of the territorial institutional system for regional development*, eliminating the previously well-functioning, highly experienced regional development agencies (Józsa 2016).

The current National Development and Spatial Development Concept (adopted by parliamentary resolution 1/2014 (I.3.)), which is relevant to our topic, has identified the development directions up to 2030, including all factors affecting the major cities and county cities examined at national level. The general principles of the concept are as follows: *economic development* that creates value and provides job opportunities, demographic change, *healthy and progressive society,* and sustainable use of our natural resources, *preservation of our core values and conservation of our environment*, and *sustainable spatial structure* that is based on the regional potential. Thus, concerning the spatial structure, the new desirable structural model of the settlement network emerged (Figure 5).

Figure 5

Possible direction of the settlement network: The internal and external city rings



Source: OFTK (2014, p. 187.).

The concept of the municipal system can be classified *into two large units*. It refers to an *outer metropolitan ring*, in which the regional centres (several major cities with countywide functions: Debrecen, Győr, Miskolc, Pécs, and Szeged as potential internationally significant big cities) are nodes and *space-forming focal points*. The capital's counterpoints appear in more shaded, descriptive dimensions. On the one hand, these big cities have to fulfil high-level tasks in the fields of services, culture, education, and public administration. In addition, the performance of these cities can be enhanced in terms of R&D functions, cooperation with regional economic stake-

holders, and cultural and creative industries (OFTK 2014, p. 184.).[9] Furthermore, these cities, with the support of settlement agglomeration processes that stretch beyond the country's borders, became centres for the gate regions of the country, which partly aimed at the Hungarian-populated areas and partly aimed at the novel, large-regional (together beyond national borders and connecting with the European regional structure) economic, social, and cultural cooperation networks. The third tie is that *the intermediate regions' county seats* are connected to this outer ring of metropolises. Though these intermediate county seats do not possess more county-widespread functions, they concentrate on regional-organising institutions; they also focus on economic and innovation potential. The concept does not focus on in this aspect; in other words, it does not reveal that county seats' functions or institutions establish *connections*, add to the roles of the metropolises, and establish a robust relationship with them (e.g. delivery networks for economic bodies, business and financial service centres, healthcare-related hubs, educational hubs, and cultural cooperation).

The concept also drew up an *inner city ring*, which in reality *can be found 40 to 100 kilometers from the capital;* it groups other metropolises and cities with county rights. It treats *Székesfehérvár* as an important economic, logistics and historical centre with spatial planning effects in the central part of Transdanubia. The concept does not emphasize the city of *Kecskemét*, while in the recent period (from 2014) this historical centre of the Great Hungarian Plain has acquired a strong regional organizing role, mainly due to the strengthening of its industrial potential and the establishment of related service roles. The inner ring also contains county seats and centres with characteristic economic and other functions (education, culture) that have their own distinctive character in the large area around the capital.

The *developmental directions* of the two rings are also defined. Different emphases are used. In the first case, the emphasis was on *joining the international metropolitan network* by developing[10] knowledge, research and development, innovation, and economic potentials. Meanwhile, in the inner ring, the emphasis was on improving the *relationship system,* or perhaps reliving the capital (reception of economic units, bypassing and connecting transport networks) by renewing and expanding the already present potential (economy, education, research and development).

During the course of 2014, the cities with county rights gathered and arranged their IMDS, which are still governed by Government Decree 314/2012 (XI.8.).

The pre-defined content requirements of the strategies were as follows: setting medium-term development goals, necessary interventions for implementation, elaborating an anti-segregation program, systematizing the strategy's external and internal context, and recording the implementation tools and their follow-up.

[9] The latter is the silent smuggling back of growth poles. It is interesting to see that these more complex functions include the placement of some resident institutions in these regional centres. These ideas were formulated (2014), such as the move of the Ministry of Agriculture to Debrecen, the shift of rural development to Kecskemét, or the shift of the Ministry of Defence to Székesfehérvár. However, these ideas did not materialize – only the Prime Minister's Secretary of State for Agriculture and Rural Development moved to Kecskemét (2015).

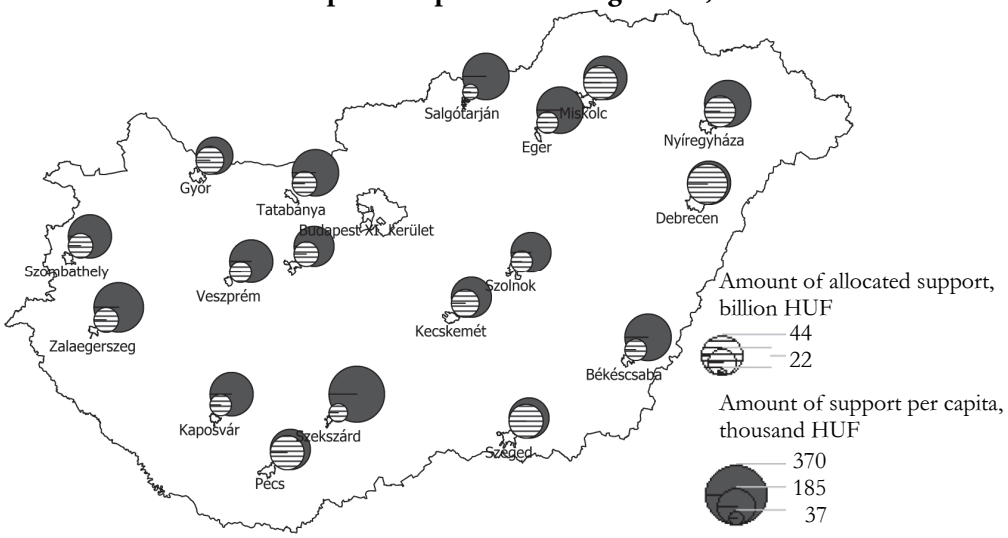
[10] Here, the points made in the pole programme clearly come back.

The IMDS-es and the Integrated Regional Programmes (IRP) that built upon the IMDS made up the base for the March 2015 publicized *Modern Cities Programme (MCP); its* frame included 23 cities with county rights having signed an investment agreement to the tune of 3.4 billion HUF. At the expense of the 2014–2020 European Union support system's Territorial and Settlement Development Operational Programme (TOP) and the support of the national foundations (in 2017 152 billion HUF and 150 billion HUF in 2018), Integrated Transportation Developmental Operative Programme (ITDOP), the above programme was ensured, but the towns used their own income for the programme's implementation. It is possible that the funds for the implemented developments were provided by the private sector (Fekete 2017, 2019).

The Territorial and Settlement Development Operational Programme's (TOP) sixth priority provided the needed initial support for the county-rights cities' development, the size and value of which (1562/2015. (VIII. 12. Gov. order, then amended to 1562/2016. (X.13) Gov. Order on excess commitment) *is shown in Figure 6*.

Figure 6

Planned support of cities with county rights from the Territorial and Settlement Development Operational Programme, 2014–2020



Note: Érd is located in the Central Hungary region, the government provided 14.3 billion HUF for the city from the Competitive Central Hungary Operational Programme.

Source: Fekete 2017, p. 101 based on own editing.

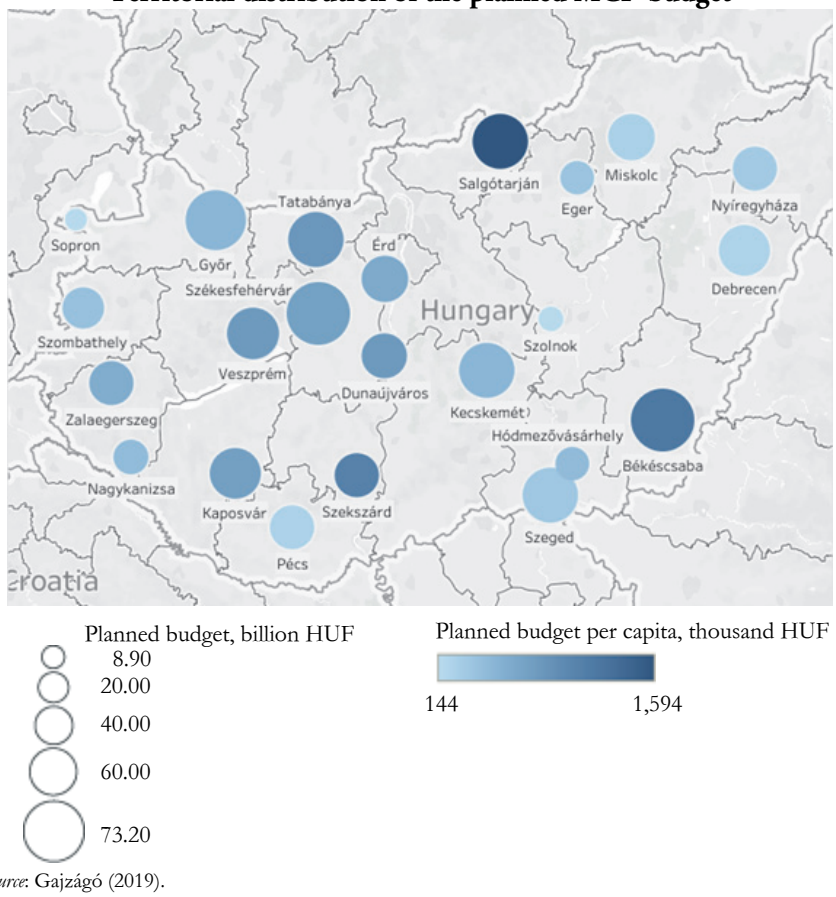
According to the data, the regional centres received 39.3% of the funds and their combined share with the big cities was 56.1%. The remaining county-rights' cities gained 43.9%; in their case, however, the amendment for greater sums of support (close to 20% more) took place from 2015 to 2016. Based on the final sums, *the per capita amount* with the population of metropolitan areas (set at 1.9 million HUF) totalled to 224,000 HUF per person. The *smallest* specific support was won by Győr

(167,000 HUF/person) and Nagykanizsa (168,000 HUF/person), while the inhabitants of Szekszárd (365,000 HUF/person) and Zalaegerszeg (289,000 HUF/person) received maximum support since they had the *largest* measures of specific support. We have not seen any examples over the last 100 years of large-scale municipal developmental Programmes under the regional policy. Thus, with interest and confidence, we look towards the implementation of the MCP.

The Hungarian Government started its MCP in 2015 – the plan for implementation being fixed in the period of 2019–2022. However, it harmonizes with basic principles laid down for the municipal development strategies. According to the MCP, a modern city is any Hungarian city that is part of the expressway road network, whose every region-organising function represents high quality. It is also considered to have appropriate public transportation networks, which guarantee space and opportunity for new economic investors and possess special local factors (Gajzágó 2019). Founded upon these elements, the developments affect 23 cities.

Figure 7

Territorial distribution of the planned MCP-budget



Source: Gajzágó (2019).

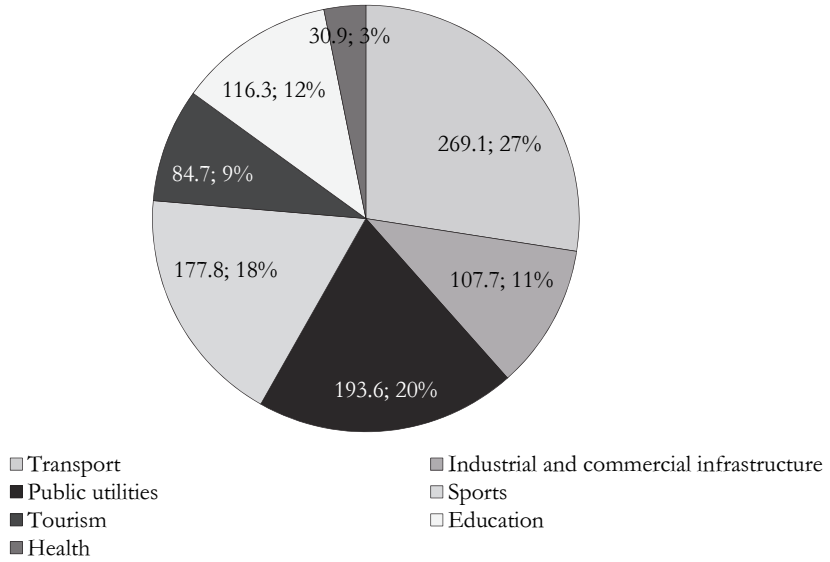
The MCP's budget has not been fully clarified either. However, it can be approximated to be around 3.4 to 3.5 billion HUF, with the following territorial breakdown (Figure 7).

The number of people living in one of the 23 cities has been estimated to be near two million. This is not negligible, and hence it is also necessary to focus on their development. The MCP ensures a conceptual and financial *framework* that counterweights the EU support (since the ROP and the Rural Developmental Programme first target the small countryside towns, the cities with county rights' sources could only manage about 18 to 20% in total). The state wants to finance nearly 60% of the MCP budget from EU sources. If this all comes to pass, then Hungary's EU funds for cities with county rights, per capita, would be outstanding, and the winners of this season would very clearly be these cities.

Beyond the territorial distribution, it is also important to determine which sectors the MCP should support (Figure 8).

Figure 8

Planned MCP-budget by sectors (billion HUF)



Source: Gajzágó (2019).

Close to 27% of the budget targets *transport development,* which appears, in the Programme, first in the form of express way and railway development. By contrast, health care receives the least funding; only 3% was allocated to improve this area (presumably due to earlier hospital developments). Besides, considerable investments are planned for sports, industrial, infrastructural, and public works areas (Gajzágó 2019).

In our opinion, the MCP can significantly contribute towards municipal development; it is worth noting that, among the questions of regional development, the city network has a prominent place; this can be attributed to the formation of the Hungarian big cities. Though we do not know whether an impact assessment was conducted, we think this could significantly influence the developmental trajectory of the 23 cities with county rights.

Conclusions and lessons

Over nearly the past 100 years, big cities and their various forms – the county seats, cities with municipality rights, regional centres, and cities with county rights – have represented *the regional development hubs*. We can consider 1950s and 1960s an exception, when the socialists viewed the *new industrial cities* as excellent centres for political power. They neglected traditional metropolitan circles as *quasi symbols* of the previous regime (citizenship and public administration centres), and thus these centres enjoyed less attention and support (typical of this era, that county seats have been transferred to industrial or other cities, to demonstrate the neglect of civil values and their representatives!)

The more intense developmental support began in the 1970s for these centres, which were formed in the 1950s but were not legalized, on the basis of the *settlement classification system*. The developmental support arranged the towns in groups, based on their city's network development. In this case, the examined cities held the *upper three categories* (high priority (5 cities), high-end centre (7 cities), and partial high-end centre (11 cities)). Though they built their developments into the settlement network's system, owing to the political and economic weights, along with the local/regional elites' ever-growing influence, *their renewal was increasingly detectable from the 1970s.*

From this point onwards, the term 'counter-pole' appeared in national-level developments, which essentially sought to demonstrate that major cities and their hinterlands, as counterpoints, reduce the economic, political and social weight of the capital and become (large) regional organizing centres. The planners saw, in the network of appointed planning and economic district centres, the high priority centres (5); they considered them from the perspective of connectivity; however, they also saw that the political actors shaping the regional processes are also part of the counter-pole's quasi network.

After the *change of regime*, big cities became prominent in development concepts and regional policy. Various development directions have been defined for these centres and their hinterlands. First, they appeared as regional administrational centres (1990–1994), then as main and sub-centres of development regions (1998–2005), and finally as the growth-generating poles (2005–2008). All the while, they became the victims of an aborted administration decentralization attempt (2006–

2010), then they became development centres, independent of the county (2012–2016). Again, in today's world, they have become the focus of priority development (2015–present). It is clear to see that the big cities and their hinterlands planned to implement many of the aforementioned general and yet uniquely special developmental ideas – or they were the sufferers, recipients, or beneficiaries of such ideas.

It is possible to trace back the metropolises' and its circles' continually changing, *short-lived* function supply and its changes back to *attitudes of decentralization* that had not rooted themselves in Hungarian political culture. *In municipal development*, it is possible to have short, *booming periods,* which can transform entirely or partially the city structure, modify institutional bases, expand infrastructural networks, and smooth regional relations. These can influence the speed of municipal development, but only temporarily and with small shocks.

The courses of *municipal development* and the regional structure junctions, metropolises, and their circles are determined by the size, make-up, and internal connections of the *regional capital* (Rechnitzer 2016). The development policy can form the regional capital factors, though this only can succeed if the *centres possess their independent strategies* together with *their own developmental sources.* For this, the *independence* of metropolises and their circles (as internal entities) and the cooperation formed by their participants and communities is needed.

It proved impossible to form the *counter-pole* system in the city network. The *capital's* size, concentration of population, institutional system, economic control roles, settlement system, the role filled in the minds of Hungarians, and the unique international judgment are only related to Budapest. All of the above-mentioned things are enhanced by the Hungarian political institution system's centrality – it is controlled from one centre in a top-down fashion. Although there have been several attempts, *the regional-level decentralization* was not implemented here at home. Following not only the centralized public administration and national development, but also *the centralization of the different state functions,* big cities formed and integrated many regional functions, yet these were not able to counterbalance the 'capital myth'. They could not become real "counterpoints" with their own room for manoeuvre. This is partly because of the structure of power, partially due to the institutional capacities, and also as a result of the division of intellectual resources. All of this does not mean that the metropolitan circle's potential is weak, that life in the city has a low quality, but rather the opposite. In these centres, the highlighted criteria are exceptional; they surpass the national average. However, the big cities themselves do not have the autonomy that could, in many cases, act as a substitute or complement to the "world of capital cities".

The *Modern Cities Programme* seems to be a grandiose development. As we said, it could jump-start the metropolises and their surroundings, as well as significantly renew and multiply cities' and regions' functions. We hope that the development goals of today serve *the future and not the daily or short-term interests.* Additionally, if con-

crete *decentralization can be added* to all this, perhaps this would create the conditions for the Hungarian regional structure junctions to pass on their *developmental momentum*, making them catalysts for real regional development.

Acknowledgements

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Creative cities in Central and Eastern Europe – Examining the position of Győr from the creative and cultural aspects of this macro-region

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The European Union is paying increasing more attention to the creative sector, acknowledging the economic significance of the sphere and appreciating the social benefits of creative and cultural activities. Its latest innovation is the Cultural and Creative Cities Monitor (CCCM), which shows the creative vibrancy of 168 European cities, thus enabling a comparison and ranking in terms of different creative and cultural aspects. Győr has been included in this platform's list besides Budapest, Pécs, and Szeged. In this study the creative position of Győr, in relation to similar mid-sized Central and Eastern European cities is examined, thus estimating the creative potential of Győr. The analysis enables us to observe the elements and indicators of a creative city that are used to measure and show creativity. Exploring the city's strengths and weaknesses provides guidance as the CCCM annually renews its evaluation and changes the ranking. With conscious initiatives Győr may become more creative, both internationally and locally. Based on the CCCM scores Győr has numerous strengths: favourable geographic location, adequate amount of cultural offerings, strong economic potential, cultural vibrancy, and a high level of participation in cultural life. However, the city has weak features too, that require strengthening. The aim is for the cities to become more creative, but this requires analysis from the creative and cultural aspects. We offer an analysis that focuses on Hungarian cities, on our macro-region and on the creative and cultural elements of these cities.

Keywords:
creative cities, culture, urban development, Győr, Central and Eastern Europe, ranking

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Introduction

Győr, the creative city: is this the future, a vision, or present-day reality? How can the creativity of a city be measured? What elements should be altered by the decision makers of a city if the goal is to enhance creativity? After all, what does a creative city mean? What indicators express a city's level of creativity?

Researchers, international organisations and European Union institutions have been looking for answers to these questions for over two decades. Since the 1970s, people have recognized that answers should be given to the urban problems of declining industrial centres, and as a result, urban researchers tried to add culture as a new element to their analysis. Meanwhile political transition, economic and social transformation have taken place and the conditions of urbanisation changed fundamentally (Konecka-Szydłowska et al. 2018).

Subsequently, more elements for examination were added: creativity and later creative economy. In the 1990's Western-European and North American cities, renewed by cultural development, have already been discussing these concepts; and by the turn of the century, the role of a new social class, the creative class in urban development has already been written about (Czirfusz 2013, Florida 2002). In the last decade, creative individuals came into focus as well, with regard to their embedding in the urban environment, the openness of the city, the exploration of their ways to connect to the city's economic policy, and the supporting policies to alleviate their labour market dependency. These are in addition to shaping the creative vision in the minds of youths to exploit creativity as a potential skill (Tokatli 2011, Pratt 2008, 2011, Allen–Hollingworth 2013).

From the above-mentioned elements and mosaics, the ideal picture of a creative city can be constructed, that is, a city where the presence of the creative class is strongly felt, where the city's policy offers artistic training, a supportive environment and cultural investment and development, and where economic enterprises are linked to the creative sector.

At the same time the independent creative city conglomerate formed from different elements is worth structuring, as different tools and aspects are needed to enhance their growth. This embodies 1) a culture-centred interpretation, which generally means that the creative and cultural activities in a city are focused on those that stimulate the emotional and spiritual well-being of the inhabitants and 2) an economy-centred interpretation, where the support and enhancement of creative enterprises in the local economy is the goal (Szemző–Tönkő 2015). This is how we can depict the pillars of a creative city: the pillars being cultural life, vibrancy, a creative economy, and its supporting background, environment, the goodwill coming from the city, and a supportive policy. This structure is followed by the CCCM platform, brought to life by the European Commission with the intent of measuring

and showing the creative colour and abilities of European cities. The pillars provide guidance when examining creativity.

There are many studies that rank cities, regions. They use variations of indicators. There are aspects related to these indicators, such as economic accounts, demography, labour market, education, health, agriculture, business, tourism, science and technology, transport, digital economy and society, poverty, crime, social connections, social exclusion, governance, environment (Sungur–Zararci 2018). Numerous studies have addressed the role of cities in the Hungarian economy (Csomós 2015) as well as economic development, the role of big companies and the importance of the local budget on economic economic sustainability (Czakó et al. 2019, Enyedi 2000, Hegedűs et al. 2018, Rechnitzer 2004, Fekete–Rechnitzer 2019, Fekete 2018a, Lentner–Kolosi 2019, Lentner 2019, Reisinger et al. 2017).

Our study fills this gap and follows the CCCM's aspects and structure and examines Győr's creative aspect using CCCM data. Besides listing the strengths and weaknesses of its creative elements we subject Győr to an international comparison, ranking it with other similar-sized cities from the Central-Eastern European's macro-region to determine which creative elements the city is strong at and which ones need enhancement.

Creative city concept

The 'creative city' as a concept is based on two factors. It builds, first of all on a culture that nourishes the spirit and creates communities, and secondly on creativity that helps in searching for new answers, directions, solutions, and new 'colours', (i.e. new content). If the society builds on culture and creativity it can generate a high degree of economic value and social welfare. Consequently, in these days culture and creativity have increasingly become the focus of European decision-making (or at least they get more attention). Such elements come to the fore to promote cultural diversity, protect cultural heritage, and support cultural and creative industries, with the clear objective of creating workplaces and enhancing economic growth (European Commission 2018).

Then, the exploitation of culture and creativity as potential resources gets to urban context, as the relevant source of successful and competitive cities and regions. Regionalization is increasing, which is one of the most spectacular processes of the economy: the increase of the economic role of regions and cities (Lengyel–Szakálné Kanó 2012). Regional or local resources have also become important due to the conscious development of cities and regions. The most important capital-elements of territorial capital are fixed capital, human capital, social capital, natural capital, cultural capital, relational capital, and infrastructural capital (Kovács–Bodnár 2017, Czakó 2015).

Several creative city models have been created, but the most dominant of them is the model of Florida, which fundamentally influences contemporary cultural policies. The Florida model follows a city and regional development concept that is based on the definitions of work, space, and creativity, emphasising the contribution of cultural services and creative experts to the urban and regional identity and liveability, as well as responding to the need for creativity of successful and globally competitive post-industrial cities and regions (Byrne 2012).

Although the notion of creative city has been mentioned in the 1980s, however the concept became constant later, in the 1990s and 2000s. Originally cultural policies were tools that attempted to stop the decline of post-industrial cities, and after the recession of the 1970s, the interest increased in the role of culture in economic growth (Bianchini 1993). 'The Creative City', written by Landry, outlines a culture-centric theory, where a creative city is defined as a city in which primary sources and value-fund are the cultural resources that replace coal, steel, and gold. Meanwhile, Florida sees a creative city as a city that is able to attract a highly qualified workforce and creative professionals. The two trends have a basic similarity: the cultural values of cities attract talented people and knowledge-based workers, otherwise called the 'creative class' (Landry 2000, Florida 2005). Moreover, it has to be highlighted that a creative city uses creativity as a key element in issues concerning society, environment, and the economy. The creative city concept is popular in local governments; it is related to the framework of a knowledge economy, and within it, the definitions of innovation, growth, enterprise, and competition (Galloway–Dunlop 2007).

However, the ways by which cities realise the creative city concept vary in practice. In the concept adaptation, several cities only reach the step of developing 'catchy' slogans, through which they try to position and define themselves. In these cases, a comprehensive urban development concept that builds on cultural and creative resources is usually missing. Many cities have constructed creative city strategies that are predominantly economy-oriented and contain interventions that focus on economic development ideas. For example, large Dutch cities such as Amsterdam, Rotterdam, Hague, and Utrecht targeted the direct support of creative enterprises and the development of a creative business environment, while the soft factors of creative cities – culture, the social aspects, and tolerance – took a back seat (Kooijman–Romein 2007). Meanwhile, there are cities that identify themselves as absolute creative cities. A study from 2010 lists 60 self-professed creative cities (Karvounis 2010). There are cities generally considered less creative, although they have defined themselves as being so, like Sudbury in Canada, Milwaukee in the United States, Huddersfield in the United Kingdom, and Darwin in Australia. Moreover, the number of scientific works increased in the topic of creative city. Specifically, the number of citations associated with the term 'creative city' was moderate from 1990 until 2005 at below 200 per year. From 2005 on this number

increased significantly, with citations per year growing above 800 starting from 2010 (Scott 2014).

The creative city concept offers cities an appealing vision, sending a message that creativity is a key element for achieving urban development objectives. For local economic development is an emphatic question that has been evaluated differently from time to time, which requires conscious intervention, which effectively unites the local resources. Creativity helps in this progress (Nagy-Molnár–Lendvay 2018). Nevertheless, cities have always been centres of creativity (Andersson 2011). Today, urban creativity is built into a new cognitive and cultural system of available social-economic relations. Urban policies on creativity also speed up gentrification processes that result in the exclusion of lower-income families from the downtown areas. Although the creative city theory puts great emphasis on diversity, tolerance, and political support, in reality only some gestures are taken in the direction of social inclusion and even less in the direction of fairer income redistribution. Based on discourses about creative cities, cities often launch incorrect programmes in the hope that these investments, as magnets, will attract creative people and lead to the growth of urban welfare. However, several examples proved that investments have been much higher than the expected increment because the decision makers placed too much hope on models like the one of the Guggenheim Museum in Bilbao (Scott 2014).

Cultural and Creative Cities Monitor

The European Union is initiating more and more intensive steps towards the creative and cultural sphere because it has realised that creative industries and cultural and creative services have become the most dynamically growing sector. With respect to innovation, growth and job creation it provides incentives for a new economic environment characterised by the development of information and communication technology, the necessity of digitalisation and diversification, the raison d'etre derived from the higher added value, knowledge-intensive activities and automation possibilities – as these demand the support of creativity and creative talent. From the European Capital of Culture (ECoC) initiative, through the Creative Europe Programme to the Creative Lenses/Trans Europe Halles programme,[1] there are several initiatives that have helped the creative and cultural sphere to evolve.[2]

The newest platform that helps achieve the above-mentioned goals is the CCCM, which concentrates on European cities and examines their creative abilities

[1] Trans Europe Halles is a European network of cultural centres initiated by European citizens and artists. It excels in revitalising European industrial buildings that are home to artistic and cultural activities. Until 2016 it has held together 90 multidisciplinary art centres and other cultural organisations in Europe (creative-lenses.eu/page/trans-europe-halles).

[2] European Commission (2017): Information – Cultural and Creative Cities Monitor, Brussels.

and character. Beside 27 EU member states it also includes cities from Norway and Switzerland, monitoring 168 cities. The CCCM list involves cities that have either been ECoC, have been awarded the United Nations Educational, Scientific and Cultural Organization (UNESCO) title 'Creative City', or hosted at least two international festivals. CCCM provides pointers based on 29 indicators, one main index, three sub-indices and nine dimensions as the structure of its analytical method. Basically, it is an interactive online platform that is also a database; it evaluates cities on a point system in terms of various dimensions. The main index and sub-indices are point values that help compare the listed European cities in terms of their creative strength. Furthermore the cities are divided into groups according to their size in order to make more relevant comparisons. Finally, in its own publication it provides some analysis. In 2017, its first document was published, and it is committed to updating the data of the platform every second year thereafter.[3]

Looking at the CCCM methodology we can say that two of the nine dimensions evaluated using the 29 indicators merge into the sub-index of cultural vibrancy; three indices form the sub-index of creative economy; and the supportive environment sub-index is compiled from four other dimensions. The index category is the final indicator made from the sub-indices, and basically it quantifies the creative aspects of the examined cities into points, with a maximum of 100 points. The index value is generated by the three sub-indices with different weights. The cultural vibrancy and creative economy sub-indices are weighed 40% each and the supportive environment sub-index is weighed 20% when defining the final value. The indicators of the dimensions are from different sources. Besides Trip Advisor; Eurostat; Flash Eurobarometer 366; the ETER project; institutes that rank universities such as QS, Shanghai, Leiden, or the Times; the DG Region can also serve as a source.[4]

We believe that the above set of indicators do not satisfy the complete, detailed, and nuanced expression of the quality of creative cities. The set of indicators considered to be an obstacle, a bound track, and the variables defined by the professional apparatus behind the databases do not always meet the requirements in certain contexts (e.g. creative city). The advantage of databases is that we can access the same data of different cities for comparison purposes (and this is one of the reasons that such general indicators are created, as they can be collected in a standardised way from cities all over Europe and the world, for example at the Eurostat Urban Audit system).

This means that the data-pool does not fall under rules carved in stone. When it comes to analysing the creative nature of cities, there is room for forming unique, local indicators. The question is (which we have already asked in the introduction) what makes a city creative? For answering this we have to ask another question:

[3] https://europapont.blog.hu/2017/10/09/cultural _and _creative_cities_monitor

[4] European Commission: The Cultural and Creative Cities Monitor, 2017 Edition, Luxembourg, Publications Office of the European Union, 2018.

who are the entities who can truly respond to this question? We believe that each city has to address its own creative people. It has to find the right way of communicating with its 'creative class' (the creatives) and allow them to formulate their own vision, their own creative city, through their own 'creative spectacles', and what they should look out for when defining the creative nature of their city. It is them who are capable of describing the creative nature of their city and with their unique perception feel its creative energies or identify the problematic areas that may have gaps. The result, possibly, is that in the databases (besides the quantitative data) there will be qualitative variables, segments, and elements from the perspective of those who are in direct contact with the city, know the city personally, and are interested in the city's creative sphere.

Positions of creative cities in our macro-region with special regard to the city of Győr

Based on the data of CCCM we completed a quantitative analysis to obtain qualitative conclusions about the creative tinge of Győr, the strength of its creative elements and its potentials, which if uncovered can lead us to the path of transforming Győr into the cultural and creative city it can possibly be. The research project of CCCM also aims to determine the strengths and weaknesses of the chosen 168 European cities, thus making them comparable and placing the best ones at the top of the rankings for others to learn from.

Győr – as a creative city – can be ranked using CCCM's indices, allowing a deeper analysis than the one just based on CCCM's point system. This way it is possible to make comparisons within the macro-region and against other cities in terms of different dimensions, which can provide various answers to our questions. Moreover, we do not contrast Győr with all the 167 cities, as the creative and cultural values of cities are defined more in historical traces. Furthermore, the city's size is a fundamental factor, as the urban environment of large cities and the adequacy of the cultural consumer base are among the criteria for evaluating a creative economy. Hence, we choose cities from Central Eastern Europe with a population between 100,000 and 250,000, the so-called category M[5] cities, from the 168 cities identified by CCCM. The demarcation of Central Eastern Europe has an important role in the comparative analysis as this macro-region holds significant differences compared with Western European countries. The change of regimes that happened around the same time in this region meant that both political and economic changes occurred within a few decades, namely, the renewal of economic structure (the last two and half decades), the EU accessions and the influx of EU funds (starting a little bit more than a decade ago). The business environment of the 'delicate' industries of

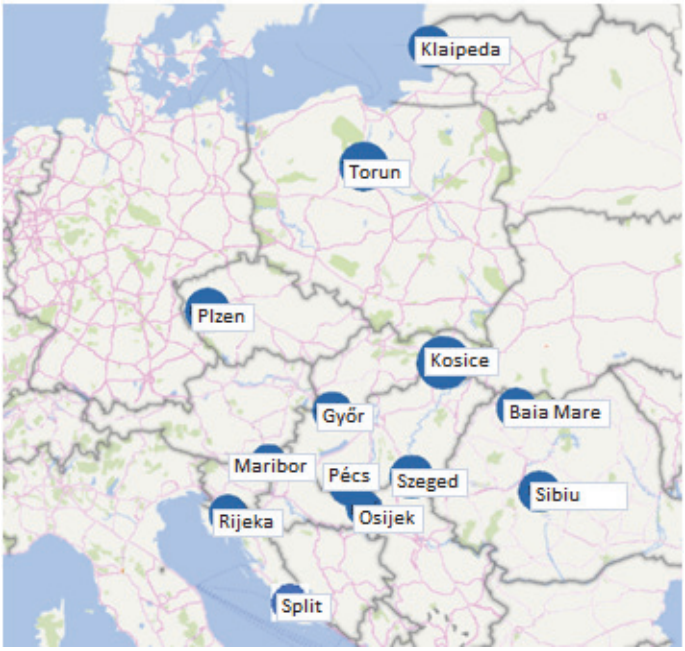
[5] Medium-sized cities.

the creative and cultural economy and the social environment necessary for creative mentality, creative freedom, openness and tolerance are very young in the said region, compared with that of the Western capitalist countries, where the cultural consumer society and the economic structural importance of the tertiary sector have long been present. As a result, it can be misleading to compare the creative potential of a Western, let us say a French city with a Central Eastern European city using similar criteria because their starting points and conditions on the difficult road to becoming a creative city are totally different.[6]

Figure 1 illustrates the geographical position and size of the examined cities. Kosice and Torun are the larger cities with a population of over 200,000; Maribor and Osijek are smaller cities with 100,000 inhabitants, and Győr, Pécs, Szeged, Baia Mare, Sibiu, Klaipeda, Plzen, Rijeka, and Split are similar medium-sized cities.

Figure 1

Middle-sized Central Eastern European cities monitored by CCCM, 2017



The above cities are compared based on the creative index and sub-indices defined by CCCM, and the ranking is done with the help of Pareto-diagrams.

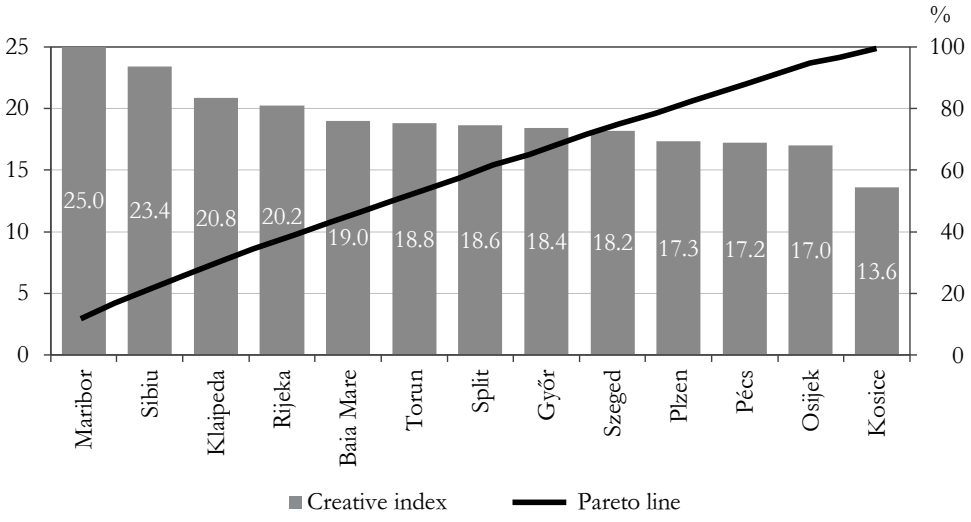
Figure 2 shows the points of the total credit index and ranks the cities according to these points. Based on the figure we can conclude that the creative colour and energy of these cities are roughly the same, and Győr occupies a position in the

[6] However, it would be useful to reveal the greatness of the creative 'barrage' between the West and the East, but this is not the topic of this paper.

middle. It is ranked above the Hungarian cities Szeged and Pécs, which appear to be less creative based on the CCCM analysis system. Maribor is the most creative city and leads with 25 points, while Sibiu has good scores, too. It is important to note when looking at the result of these two cities that both have had the title of ECoC: Maribor in 2012 and Sibiu in 2007. Although Plzen, Pécs, and Kosice have also owned this title before, they are currently at the bottom of the list in this context. In Klaipeda, Split, and Plzen one can find the so called creative hub, which is where creative people gather, but the importance of this factor is not reflected in the rankings. On the Figure, from the Pareto line touching Győr we can intersect the point that cumulates the rate compared with the total result of points, and we can state that 60% of the points are owned by the cities ahead of Győr. With regard to Győr being middle-ranked (the eighth out of the 13 cities), this 60% can be considered positive, as the cities ahead of Győr do not exceed Győr remarkably with regard to their creative index. Thus, it is not an advantage that cannot be matched, and with little improvement it is possible to move up in the ranking.

Figure 2

The ranking based on the creative index of CCCM, 2017



Source: Own compilation based on CCCM data.

In the following section we look at the composites of the main index, as the points of the sub-indices offer a possibility for deeper analysis.

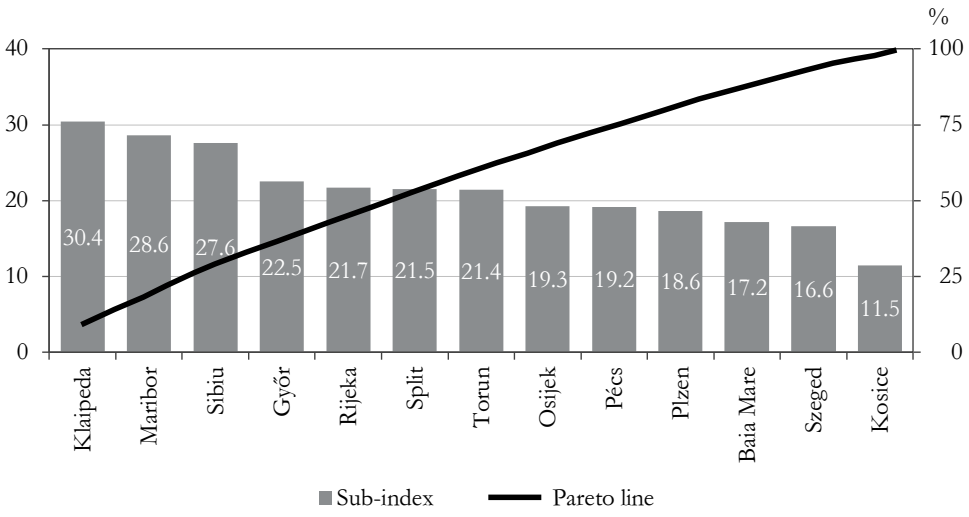
Figure 3, based on the 'cultural vibrancy' sub-index, shows a different ranking.[7] The index consists of the cultural venues and institutions (their quality) with their

[7] We can state that the cumulative index can show the strength of the relations, but some cities can be stronger in some of the creative elements whilst being lower in rank in the main index list.

corresponding attendance and the appeal of the cultural event. CCCM describes the essence of these two pillars in its 2017 edition, stating that the cultural vibrancy of a city is significantly defined by the places and institutions that can be filled with cultural content that is imposing and appealing to the inhabitants and conveys creative energy. Participating in the cultural life of a city means meeting new people who enhance one's mood and quality of life. The level of this type of participation also characterises a city's capacity to attract local, national, and international crowd to its cultural events.

Figure 3

The ranking based on the CCCM sub-index of 'cultural vibrancy', 2017



Source: Own compilation based on CCCM data.

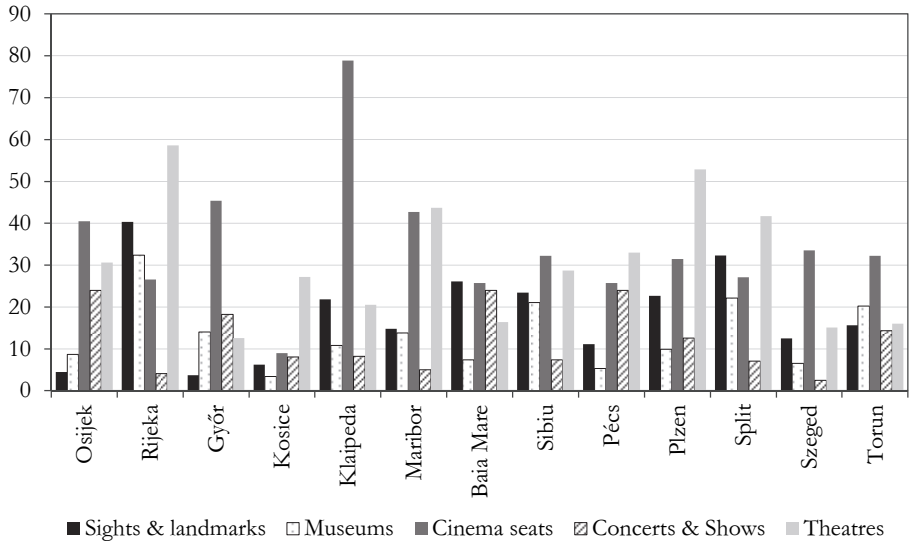
With regard to cultural vibrancy Győr has moved up significantly in the rankings. Right after the leaders on the list (Klaipeda, Maribor, and Sibiu), we find Győr. Klaipeda leads this list, and Maribor is considered more vibrant than Sibiu. The first five cities up to Rijeka take 50% of the total points based on the Pareto line. This means that there are bigger and more significant differences between the cities with regard to the indicator, and that the first five cities on the list are hugely ahead, compared with the other cities in the same macro-region.[8] Pécs and Szeged change places in this ranking compared with their places in the main index ranking. Pécs overtakes Szeged, while Szeged is significantly behind. Only Kosice is ranked worse, being once again ranked the lowest.

[8] While cultural life in the leading cities is very vibrant, further down the list it is quite stale. It is advisable for cities with lower points to learn from those ahead of them in the ranking. Cultural vibrancy in a city also affects many other processes. A grey, dull city can lag behind in terms of other aspects as well.

The sub-indices pointing toward 'cultural vibrancy' are formed from the aggregated values of the two pillars, and these pillars have further building blocks. One of the pillars is cultural venues and institutions. The elements that are looked at are the presence of sights, museums, cinema places, concerts, events, theatre, and their function in cultural offerings. Figure 4 illustrates the points for the existing elements of the cultural offerings in a given city.

Figure 4

The building blocks of the 'cultural vibrancy' sub-index: Cultural venues and institutions, 2017

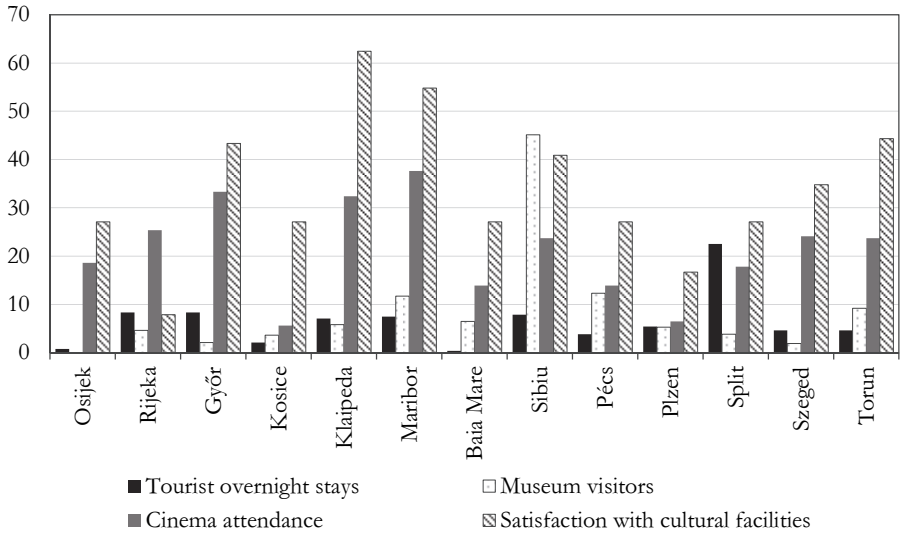


Source: Own compilation based on CCCM data.

In this figure, the cities are in other order and do not reflect the earlier ranking. From the figure we can say that when looking at the building blocks of cultural offerings the cities show a more varied picture. Concerning sights, Klaipeda, Maribor, Baia Mare, Sibiu, Plzen, and Split score much higher than the rest of the cities. The ranking for the Hungarian towns is in the order of Szeged, Pécs, and Győr. When evaluating the museums, Győr has relatively high points; Sibiu, Split, and Torun have very high points as well. Meanwhile, Rijeka leads due to its high-quality, thematic, and historic museums. Cinema places are not lacking in either of the cities, Klaipeda having outstanding ratings. Regarding concerts and events, Osijek, Baia Mare, and Pécs are the leaders, and Győr ranks right after these cities. With regard to theatres, Croatia leads again, and the theatres of Plzen and Maribor also have high scores.

Figure 5

The building blocks of the 'cultural vibrancy' sub-index: Cultural participation and the appeal of cultural events, 2017



Source: Own compilation based on data from CCCM.

The second set of elements that measure the cultural vibrancy of the examined cities is the appeal of cultural participation and cultural events. Based on Figure 5, we can see that this attribute is revealed through such aspects as the volume of guest nights, number of visits to the cinemas and museums, and the satisfaction of the inhabitants with the cultural offerings. [9]

Regarding the first indicator (the grading of the volume of guest nights) Split, the second biggest city in Croatia, is ahead of the other cities. We have to note that the city is a transport hub and an important holiday destination due to its seaside. Putting the emphasis on Győr we can say that with regard to the other cities it has a good position, on the same level as Rijeka. Klaipeda, Maribor, and Sibiu have high points. Pécs, Plzen, Szeged, and Torun have moderate results, and Kosice, Baie Mare, and Osijek are at the bottom of the list. The number of museum visits is significant in Sibiu only; most probably relating to the Brukenthal Museum, which houses the richest fine art collection in Romania. Regarding this indicator, among the Hungarian cities only Pécs exceeds most of them. Visits to the cinema also show a varied picture, and the up-to-date offer of films has a more significant role than

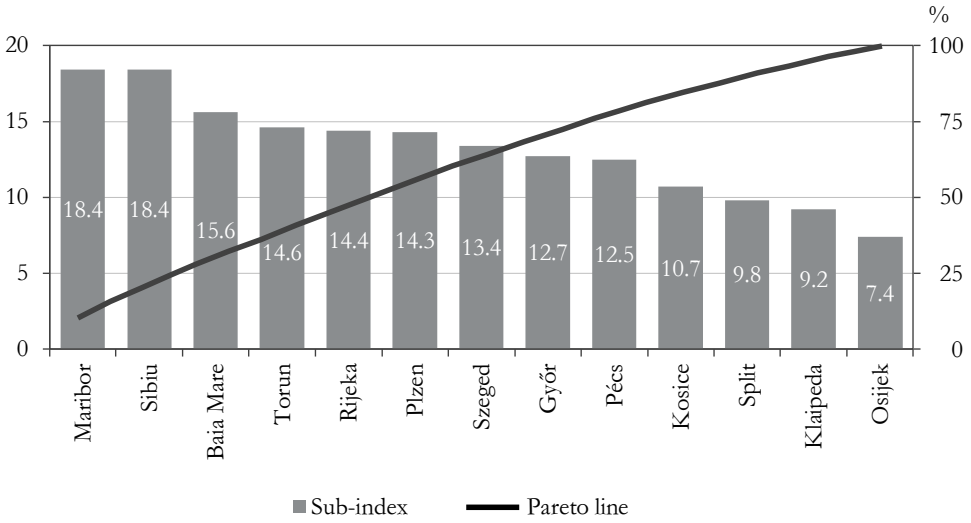
[9] The sources of the indicators are the Eurostat and within that the Urban Audit data system. Data on the satisfaction of the inhabitants concerning the cultural offerings are from the 'Flash Eurobarometer 366' (2013) survey, coordinated by the European Commission.

the cultural role of the actual city.[10] Satisfaction with the cultural offerings is highest in Klaipeda, and Maribor, Győr, Sibiu, Torun, and Szeged are in the second group. Third in ranking are Osijek, Kosice, Baia Mare, Pécs, and Split. The inhabitants of Rijeka and Plzen are not satisfied with their city's cultural potential.

When we talk about a creative city, we must also talk about its creative sector and its weight in the economic structure. The CCCM monitoring has also a sub-index on the analysis of the city's creative economy, with dimensions such as creative and knowledge-based workplaces, intellectual capital and innovation, and generation of new workplaces in the creative sector. The CCCM itself states that creative, knowledge-based workers play an important role in the growth of the economy and the development of innovations. The indicator also embraces areas such as art, culture, entertainment, media and communication, and creative services like advertising and fashion. The dimension of intellectual capital and innovation explores to what extent the given city helps the development of innovation, how the cultural and creative sector is capable of adapting to the digital revolution, and whether the attitude of consumers using new technology and information-communication technology have any impact on the participants of the creative sector. The dimension of new workplaces in the creative sector examines how the cities capitalize on creative ideas and innovation to establish new workplaces and start new enterprises in the creative sector.

Figure 6

Ranking based on the CCCM's 'creative economy' sub-index, 2017



Source: Own compilation based on CCCM data.

[10] For this question it might be worth examining the art cinemas in these cities.

Figure 6 depicts the ranking generated by the points received for the sub-index 'creative economy' in the examined cities. Regarding this index we can see a significant change in the ranking compared with that of the 'cultural vibrancy' sub-index. First, we can see that Maribor and Sibiu have held onto their elite ranking, indicating that it is not only cultural vibrancy that is present in these cities but also a strong creative economy. However, Klaipeda has fallen to the bottom of the list, ahead of only Osijek. Baia Mare, Torun, Rijeka, and Plzen are the ones in the lead, while the Hungarian cities take their positions one after the other. Szeged, Győr, and Pécs have nearly the same number of points, with Pécs getting the least. Kosice, too, does well in this respect, compared with its points in the main index and the first sub-index. Split, Klaipeda, and Osijek are at the bottom of the list. Cities with rankings ahead of Győr take 60% of the total points; while the remaining cities, including Győr, share the remaining 40% of the points. This means that they are not only behind in the ranking but also that their positions are obtained at a lower value. The cities ranked further down the list have a lot to work on developing their creative economy.

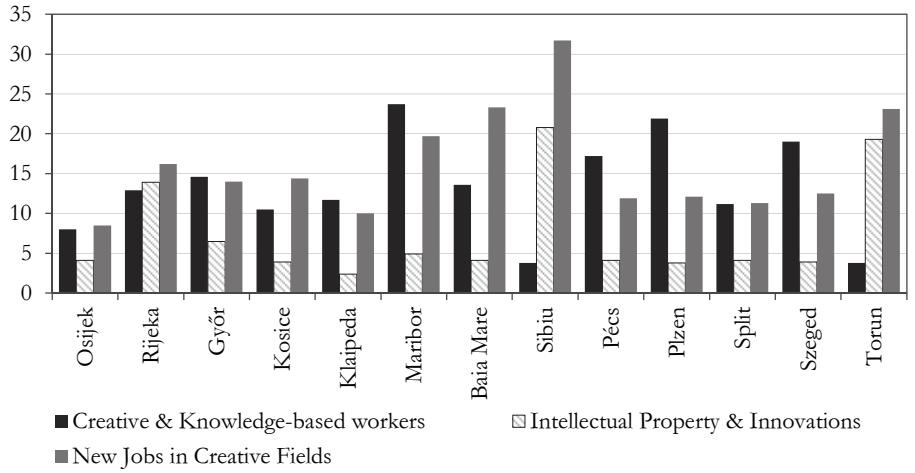
Based on Figure 7 we can examine the fundamental factors, the details of the sub-index, and the building blocks behind the ranking generated by the points received for the 'creative economy' sub-index. A detailed analysis reveals the specific elements of a creative economy and the indicators with which these are measured.[11] The previously introduced dimensions (building blocks of the 'creative economy' sub-index) are creative and knowledge-based workers, intellectual capital and innovation, and the establishment of workplaces in the creative fields. Creative and knowledge-based workers are taken into account by CCCM from creative areas like the arts, culture, entertainment, media and communication, and other creative areas.[12] In this respect, Maribor is in the lead, exceeding the points of the other cities. Plzen is close behind. The Hungarian cities also have good rankings: first Szeged, then Pécs, and finally, Győr. Consequently, we can state that in the examined macro-region the Hungarian cities do have creative workers. Rijeka, Kosice, Klaipeda, Baia Mare, and Split are very close to each other based on this indicator. Osijek, Sibiu, and Torun lag behind the others. Concerning intellectual capital and innovation, Sibiu, Torun, and Rijeka are the leaders. Next to them all the other cities are roughly on the same level. However, Győr has more significant values compared with the other cities. Looking at the components of this indicator we note that it takes into account the number of registered patents from the information and communication sector and registered community designs submitted to the Office for Harmonisation in the internal market.

[11] Note that the figure showing the points of the building blocks of the sub-index does not reflect the ranking based on the 'creative economy' sub-index; instead, the cities are in alphabetical order. Moreover, besides the CCCM criteria that describe the creative economy, we can also take into account other indicators when examining the given cities' creative economy.

[12] Data are from the Eurostat Urban Audit and Regional Statistics database and do not represent absolute data but the points received.

Figure 7

Building blocks of the 'creative economy' sub-index, 2017

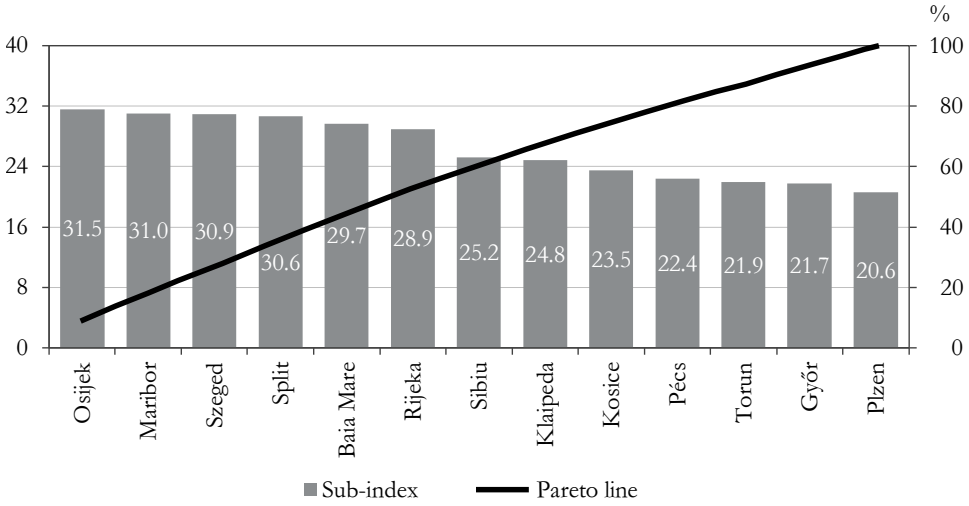


Source: Own compilation based on CCCM data.

'New jobs' is an indicator in the creative areas. In the previously listed creative activity areas it reflects the number of people employed by enterprises that have been set up in the reference year. Based on this indicator Sibiu and Baia Mare are in the lead. Torun is ranked high, and Maribor also has high values. However, after these cities the results for the remaining cities are moderate and similar in the figure.

Figure 8

Ranking based on the CCCM's 'enabling environment' sub-index, 2017

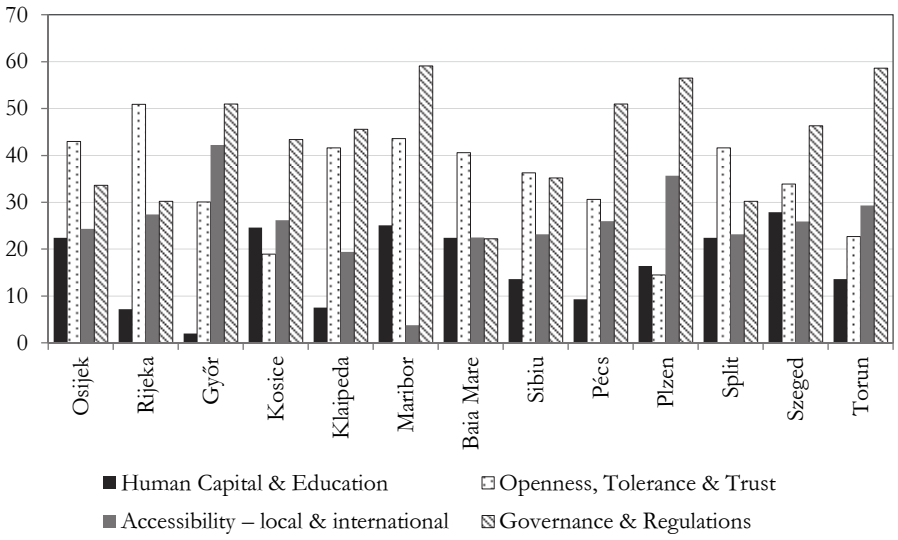


Source: Own compilation based on CCCM data.

The 'enabling environment' sub-index relates to the tangible and visible tools and capital of cities that attract creative people to the city and inspire cultural and creative performance and activity. The ranking in Figure 8 shows yet another reordering. Győr has fallen back based on this indicator. Szeged and Pécs are ahead of Győr, with Szeged gaining significant advantage by taking third place in the ranking, with much higher points than the other two Hungarian cities. Maribor is the only city that has kept its good position with respect to this third sub-index. This is consistent with Maribor being regarded as the most creative city based on the main index. While Kosice has been ranked low so far, its supportive environment towards the creative sphere is considered more favourable. With regard to the sub-index 'enabling environment', Osijek is first in the ranking based on internal indicators (which we do not introduce here) and has very high points for openness towards foreigners, their integration, and the number of inhabitants born abroad. The field is more balanced with regard to this sub-index, as there are only small differences in the ranking between the cities.

Figure 9

The building blocks of the 'enabling environment' sub-index, 2017



Source: Own compilation based on CCCM data.

In Figure 9 we can see that the building blocks of the sub-index 'enabling environment' are human capital and education, openness, tolerance and trust, accessibility, and government and regulations. Looking at Győr, we believe that it has low points based on the human capital and education indicators. Győr has the lowest

number of points among the cities examined as it is perceived to lack[13] training in arts and humanities, and the number of its graduates in the field of information-communication technologies does not come near the numbers of the other cities. Győr's openness is average in this macro-region but its accessibility is excellent. Győr also has high points in local government. Only Maribor, Plzen, and Torun are ahead of Győr. Pécs has the same number of points as Győr for government and Szeged has a little bit less.

Finally, based on the points we can issue the 'creative certificate' for Győr, which highlights the less effective areas and the good and not so good elements of the city's creative potential. The best aspect of the city is its accessibility, being positioned in the intersection point of three capital cities. Good transportation conditions provide significant potential, as the creative partners can create synergies through frequent interactions facilitated by the proximity. The other two strengths of the city in the examined context are the integration of foreigners and the quality of the local government. However, according to the numbers of the internal indicators (which are not detailed in this paper) the integration of foreigners in Győr is average in relation to the other cities. The criterion on the quality of the government and regulations is more nuanced. Here, the regulatory system is also evaluated. Besides the ideal impartiality and anti-corruption characteristics, it is also rated in terms of its quality, mechanism, and policies towards the creative sphere, where Győr has high points. Győr also has good points for 'satisfaction with the cultural offerings' and 'tolerance towards foreigners'. Meanwhile, cultural vibrancy, cultural participation and attractiveness are the moderate features of Győr. It could benefit from having more international students in higher education and modernising existing and establishing new cultural venues and institutions. Concerning the creative economy, the city must plan and envisage setting up new workplaces, as well as renewing and rethinking its theatres and museums.

Finally, the elements below are the weakest features of the city, which need strengthening. Table 1 summarises these factors.

[13] In the 1700's, the university-level legal and teacher training in Győr's higher education programmes dominantly focused on the technical and engineering field. The Technical College, founded in 1969, only started to widen its educational and research landscape in the 1990's: teaching at the Faculty of Law was resumed, the Faculty of Economics was founded, and the Engineering Trainings became more varied. Training in the music and healthcare fields was also launched in this decade, and in the beginning of the 2000's, the college became a university. As a result of recent restructuring, the Apáczai Faculty, which deals with teacher training, training in tourism, and catering, has also become part of the university as the Faculty of Agrarian Sciences in Mosonmagyaróvár. In 2018, the Faculty of Arts was founded, which later can be a significant base for art, design, and creative training with an economic focus. This way, Győr can make up for the deficiencies identified by CCCM. The launch of training in the field of humanities is not among the medium-term plans.

Table 1

Elements where Győr has the least number of points

Sights
Community designs
Tourist guest nights
Intellectual capital and innovation
Workplaces in the media and communication sector
New enterprises in the media and communication sector
Population born abroad
Graduates in the field of Information and Communications Technology (ICT)
Trust
Visitors of museums
ICT-patent registrations
Human capital and education
Graduates in the field of arts and humanities

Factors where Győr has the least points can be considered areas of 'hiatus', but we have to treat this term with caution with regard to the elements listed in the above table. The quality and magnitude of these features can be evaluated subjectively and can also be evaluated in relation to the city's policies, strategies, and traditions. The indicator 'population born abroad' is debatable, as it is normal that certain cultures do not learn always from one another; communities do not merge, and isolation is oftentimes more typical for cities. Thus, 'population born abroad' cannot be listed among the city's creative energies because without interaction it is only the normal everyday life that characterises the members of this group. The low number of point for 'sights' may be due to the use of Trip Advisor as a source, which does not fully consider the available sights and values of each city. Győr should introduce its sights in detail on this platform. Concerning 'tourist guest nights', we believe that Győr is aware that tourists dominantly visit the city for one day, but the fact that Győr has doubled its number of tourist guest nights in the past decade is indisputable. Thus, the city needs to find and communicate a strategy to convince tourists that Győr is worth visiting for more than a day. In the field of media and communication it is the investment of private capital that counts the most, and the local government has little influence in this respect. The ICT sector is not a strategic direction for the diversification of Győr's economic structure; thus, it is irrelevant even though CCCM considers the sector, the patents, and the graduates in this field to be

a creative element.[14] In relation to the visitors of museums, it is noteworthy that the local historical museum of Győr was closed for renovation when the survey was conducted, which clearly had a negative effect on the number of visitors.[15] Finally, with regard to human capital, education and art training, we can say that Győr and its university are committed to set up the Art Faculty as the eighth faculty of the university, which can address the said areas.

Partly as an answer to CCCM critics and partly in relation to the tender to win the title of ECoC 2023 the city has developed, and its general assembly unanimously accepted the Creative Strategy of Győr.[16] The strategy and the ECoC tender anticipate several measures that will significantly improve Győr's position in the CCCM and inspire the city to better use and develop its creative energy.

Conclusion

A conclusion can be drawn that Győr as a creative city is considered middle-ranking in relevant international comparisons. In Central and Eastern Europe, the city of Győr may take as examples the pioneering cities in the examined aspects. Specifically, Maribor, Sibiu, and Klaipeda are considered the best ones with regard to the sub-indices of creative index (main index) and cultural vibrancy. Moreover, it must be noted that Maribor and Sibiu were European Capitals of Culture, which must have contributed to their rankings. Furthermore, Baia Mare has an outstanding creative economy, and the supportive environment towards the creative sphere is also significant in the cities of Osijek and Szeged. It is clear that interest in the creative sphere and supportive policies has intensified in Europe as a whole, becoming strategic issues as the economy evolves with the increasing significance of a knowledge-based economy that builds on creativity, innovation, and activities with higher added value. Moreover, there is growing demand for cultural products, it is socially accepted to protect arts in an institutional framework, the cultural budgets of the cities show an increasing trend, and the visions and missions of cities to make culture prosper in urban circles have been drawn up in cultural strategies. The last step has been the European Commission's establishment of the CCCM. Whit this system, compara-

[14] We have to emphasise that in terms of development and cooperation, IT training appears promising and can later contribute and enhance the expansion of information-communication opportunities in Győr. The cooperation between Széchenyi István University, Egyetem and Huawei Technologies, Hungary has started in 2016, which aims to setup a Huawei academy and laboratory in the next five years to develop a university training programme in the telecommunication and information-communication fields, with a budget of HUF 100 million.

[15] In addition, trends indicate that instead of permanent exhibitions, periodic ones attract more visitors. An exhibition in a gallery is capable of continuous renewal. It can follow trends and be flexible and modern, while permanent exhibitions of the local museums are rather 'dusty' and are not forced to renew and take initiatives. Museums very seldom attract cultural consumers, especially the small and medium-sized city museums or international and national non-prestigious museums.

[16] The international panel of experts announced on 14 December 2018 the support of the proposal of Veszprém among the proposals of the cities from Hungary (ed.).

tive analyses can be carried out among cities, and the internal components of the creative elements of cities can also be examined more carefully. Thus, it can be understood what factors constitute a creative city.

Győr has all the potential to become a truly creative city and the ECoC. On the basis of the CCCM scores Győr has numerous strengths. Its favourable geographic location can trigger synergy in additional dimensions; it has an adequate amount of cultural offers; and the cultural vibrancy and participation in the cultural life of the city is increasing, which may follow from the strong economic potential of the city and the strengthening of the population's purchasing power. The city plans to set up new cultural venues and institutions.[17] The university in the city of Győr aims to increase the number of its foreign students, and the launch of the faculty of arts will be realised in the near future. The city, as a supportive environment, is generating beneficial processes towards the creative sphere. Győr's intention to become a ECoC also demonstrates that the city is committed to culture. The description of Győr as an industrial city started to change. The new image of 'Győr, the creative city' is on the horizon. These processes have been supported by examinations based on the concept of territorial capital (Czakó–Dőry 2016, Rechnitzer 2016), as it has been established that cultural capital plays an increasingly important role in urban and business development.

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[17]The Hungarian Government and the city of Győr concluded the agreement in connection with the Győr elements of the Modern Cities Program in 2017. Among the government investments aimed at the development of cities with county rights, more developments have been allocated to those of Győr, relating to the cultural sphere. In the future, the building of the National Theatre of Győr will be renovated and a new conference and exhibition centre will be established in the city. Moreover, a new concert hall will be built for the Győr Philharmonic Orchestra. In the framework of the program, a Digital Development Centre will be realised at Széchenyi István University, where digitalisation and the industry 4.0 concept will be the focus (Fekete 2018b).

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Population, diversity, and restaurants: trends in the geography of cuisine variety in the Netherlands

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Over the past two decades, research in regional science has paid considerable attention to the benefits of urban density and proximity, even though there has been tremendous progress within the same period in technologies that ease the friction of distance (e.g. mobile communication, high-speed internet). Many scholars argue that in spite of falling transportation costs for tradable goods and the proliferation of information and communication technology cities will always have a vital edge in facilitating face-to-face communication. We argue that even if this is the case, there still remains a host of benefits that have come to rely less on urban density and this will have implications for the future of cities. In the current study we focus on one particular type of benefit associated with urban size and density – namely, the availability of a specialized array of urban amenities. More precisely, we use regional data on the distribution of restaurants in the Netherlands, and differentiate them according to their cuisine type. We explore how the presence of cuisine variety relates to population density and diversity, and whether these relationships vary across different city sizes. We find that the explanatory power of population density and diversity diminishes over time, especially in smaller cities. We argue that these trends support the hypothesis that a reduction of spatial information frictions reduces the need for urban density, as benefits associated with larger cities – such as cuisine variety – can be increasingly found in smaller cities.

Keywords:
agglomeration,
economies of consumption,
local product variety,
restaurants,
information technology,
Netherlands

Introduction

For some time now, the academic debate over the foundations and benefits of agglomerations has been dominated by the notion of transportation costs. New economic geography models tend to explain agglomeration as a consequence of transportation costs of goods, increasing returns in production, and 'love of variety' among consumers (Krugman 1991). Other theories stress the increasing importance of passenger transportation costs compared to those of goods transport, and the importance of local knowledge spill-overs that require face-to-face contact (Glaeser et al. 1992, Jacobs 1969, Marshall 1890). Although the costs of exchanging information over space have fallen at rapid rates over the last 20 years – largely on account of the rise of (high-speed) internet and mobile communication technologies – the implications of this trend for the future of cities have been scarcely explored to date.

While face-to-face contact may still be the most efficient way to exchange certain types of knowledge, it seems that changes in information exchange costs cannot occur without having some effect on the spatial structure of the economy. Several early studies indicate that communication technologies such as the internet would at best contribute to the 'death of distance', and not so much to the 'death of cities'– meaning that there is an *urban bias* inherent in the benefits of these technologies (Kolko 2000, Leamer–Storper 2001, Panayides–Kern 2005, Sinai–Waldfogel 2004). A recent study by Anenberg and Kung (2015) convincingly shows that the rise of mobile internet has reduced *spatial information frictions* in the market for food truck lunches and led to an increase in local variety, thereby again complementing rather than substituting for urban benefits. Notwithstanding these studies we argue in the current study that the rise of the internet and mobile communication *does* substitute for the city by 1) making urban density less critical for efficient information exchange and 2) providing alternatives for diverse local populations.

Thus, the aim of this study is to illustrate the implications of reduced spatial information frictions on the benefits of agglomeration. We limit our approach by explicitly taking the perspective of people (i.e. consumers and workers) rather than that of firms, and by focusing on the *local variety effects* of agglomeration. We take the perspective of people because this is an understudied viewpoint in the abundant body of agglomeration literature; although this lacuna was identified over 15 years ago (Clark et al. 2002, Glaeser et al. 2001, Tabuchi–Yoshida 2000), extensive research on this topic is emerging only slowly. We choose to focus on *variety effects* because these are the most obvious urban benefits for people (Glaeser et al. 2001), and a large proportion of the research on the consumer effects of agglomeration has focused on these outcomes (e.g. Berry–Waldfogel 2010, Lee 2010, Schiff 2015, Tabuchi–Yoshida 2000, Waldfogel 2008). We operationalize the concept of local product variety with the variety of restaurant cuisines. Restaurants are typical local goods, and cuisine variety has always served as a prime example of the consumer benefits of agglomeration (Glaeser et al. 2001, Tabuchi–Yoshida 2000).

This study mainly serves to explore whether trends in the distribution of restaurant variety over the last 20 years *support* the hypothesis that a continuing reduction of spatial information frictions changes the effects of agglomeration and diversity on local product variety. We carefully address potential sources of bias and, to some extent, correct them by using the panel dimension of our data to control for the time-invariant characteristics of municipalities. The identification of specific mechanisms is left to future research.

This paper proceeds as follows. In Section 2 we review the basics of urban benefits for consumers and introduce the manner in which reducing spatial information frictions may render population density and local diversity less important vis-à-vis local product variety. We also present three hypotheses that we later test. Section 3 provides a brief history of restaurant cuisine variety in the Netherlands, and the associated institutional factors. Section 4 describes the data and methods used herein. Section 5 presents our analytical results – in which we test our three hypotheses – and Section 6 concludes.

Agglomeration theory and spatial information frictions

Agglomeration benefits for people: local variety

Over the previous century, the bulk of the literature has argued that cities are well-suited for production but not so much for consumption, given the presence of congestion, pollution, and crime (Glaeser et al. 2001). One of the first papers to pay empirical attention to the consumption benefits of cities argues as follows.

> *There are not only the agglomeration diseconomies, but also agglomeration economies, which are called economies of variety, on the consumption side. Consumers can choose more suitable goods and services from a larger variety in larger cities. They can also enjoy the "city lights" effects there. In addition, agglomeration economies also play a role in job search. Since there are diverse job types and numerous workers with various skills and knowledge in larger cities, jobs and workers tend to match more easily there (Tabuchi–Yoshida 2000, p. 71).*

Next to variety-, city lights- (or architectural beauty-), and labour market-matching effects, other researchers propose that sharing the fixed costs of local (public) goods as well as the general ease of interaction and idea transmission are among the benefits that cities offer (Glaeser et al. 2001).

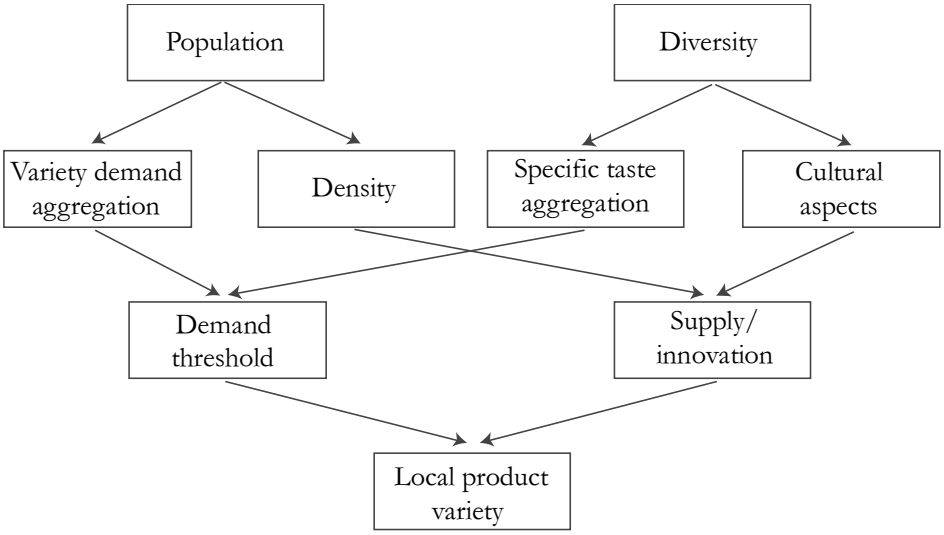
As previously mentioned, we focus on the variety effect of agglomeration. The literature explains the relationship between agglomeration and local product variety in different manners. According to central place theory and new economic geography, larger cities can foster more varieties due to the local aggregation of demand (Christaller 1966, Krugman 1991). Other theories stress the importance of diversity (especially ethnic diversity) in fostering a large variety of products (Jacobs 1969). According to this line of reasoning, it is not sheer city size but rather the demographic, social, and economic composition of cities that leads to more varieties.

We propose a conceptual model in which both population (density) and diversity affect local product variety through demand and supply effects. The demand effect of agglomeration is based on the notion that people have a 'love of variety'. Larger cities in this case aggregate the love of variety of many people and thus, are able to sustain a greater variety (Krugman 1991, Lee 2010). Agglomeration affects the supply side of urban product variety mainly by providing the density needed for quick interaction, face-to-face knowledge exchange, and the presence of different suppliers and other facilities that rely on some form of increasing returns (Glaeser et al. 2001). A large number of restaurants in larger cities may also induce competition on the basis of product characteristics rather than price, thereby increasing variety.

The demand effect of diversity is simple: when a cluster of people with the same taste reaches a certain threshold, product variety within a city increases. This relationship has been empirically confirmed for various products, including newspapers (George–Waldfogel 2003), radio stations (Waldfogel 1999), and restaurants (Schiff 2015). The supply effect of diversity relates to skills and cultural aspects. The supply of ethnic cuisine skills, for instance, is crucially dependent on the presence of specifically skilled cooks (Mazzolari–Neumark 2012). Next to that, a diverse socioeconomic environment is often argued to be conducive to innovation, because new combinations are more easily derived from different sets of ideas, values, and experiences (Feldman–Audretsch 1999, Jacobs 1969). Figure 1 provides a graphic overview of the aforementioned relationships. This figure ignores any possible reverse causality running from local product variety to population and diversity.

Figure 1

Conceptual framework: Population, diversity, and local product variety



Mechanisms and hypotheses

The forces that shape local product variety exist mainly because of transportation costs – or, more broadly, spatial transaction costs. The mechanism of demand aggregation works only for goods that are cheaper if they are produced around the corner rather than at a distance. In the same manner, density can lead to a better exchange of knowledge only if ideas can be transferred more efficiently across short distances – for instance, through face-to-face contact. It is important to note that transport costs have been continually evolving over time. Glaeser and Kohlhase (2004) show that the transportation costs of goods declined by 90% over the 20th century, and they argue that this phenomenon has changed the importance of fixed-infrastructure transportation. They contrast this trend with the remaining importance of the costs of moving people. By focusing on these passenger transportation costs, we argue that the increasing (and increasingly mobile) availability of information reduces uncertainty regarding destinations, and that it reduces the need to be at a particular location for certain activities. We present three hypotheses that we test later, in Section 4.

Reducing uncertainty about destinations

By reducing the uncertainty about destinations mobile communication technologies affect the costs of moving people and things from one place to another. Anenberg and Kung (2015) use the example of food trucks that provide up-to-date information on where they are located, thereby reducing for customers uncertainty about their whereabouts. This argument can be extended to things other than locational uncertainty: for example if the internet can give ubiquitous information on the quality of certain local products, people may be willing to travel longer distances.[1] If this is the case, the need for comparison shopping may diminish, thus reducing the need for clustering. In the case of restaurants, online review systems have indeed been shown to affect customers' purchasing decisions (Anderson–Magruder 2011), and the penetration rate of these websites is a strong predictor of (changes in) cuisine variety (De Vos–Meijers 2019). Overall, by increasing the willingness to travel for restaurants and reducing the need to cluster, we argue that urban density may have become less important with regard to local product variety. Therefore, our first hypothesis is as follows:

Hypothesis 1: Population density has become a less important determinant of restaurant variety in all cities.

[1] This relates to the idea that people have fixed travel time budgets, and that lower (generalized) transportation costs are generally offset by more travel (Fleischer–Tir 2016, Van Wee et al. 2006).

The question of whether this *uncertainty-reducing* mechanism has an urban bias leads to an ambiguous answer. With reference to Tobler's first law of geography,[2] we may assume that uncertainty about locations increases with distance. The uncertainty-reducing mechanism may thus affect more gravely the costs associated with travelling further. This means that at the neighbourhood level, communication technologies substitute for density to a lesser extent than is the case at higher spatial scales (e.g. city or metropolitan area). However, there is more asymmetry to this relationship if information is more easily and more abundantly transmitted from dense places (Panayides–Kern 2005). Indeed, even today, the coverage of glass-fibre internet and high-speed 4G mobile internet network is often, but not always, more extensive in urban areas than in rural areas. Therefore, communication technologies are likely a stronger substitute for urban density in lower-density places than in the densest locales.

Our second hypothesis is as follows:

Hypothesis 2: The importance of population density in explaining cuisine variety has decreased more quickly in smaller cities.

Reducing the need to be somewhere in particular

Another striking feature of the proliferation of mobile communication and interaction possibilities is that the need to be at a particular location to perform certain activities has decreased. Shopping for groceries or clothing can be done online, many job interviews today take place via Skype, and coffee shops are flooded with freelancers that no longer need an office. Although working from home has not completely supplanted the office, it has no doubt had consequences regarding traffic congestion. Many early studies stress that face-to-face contact will never be fully replaced by online communication, but we can safely assume that FaceTime and, perhaps in the near future, virtual reality conversations will substitute for face-to-face contact to a greater degree than fax or email.

Not only has the rise of information and communication technology meant that the people's *activities* are less bounded by the need to be in a certain location: the *influences of external factors on people* are also less bounded by space. The internet is a pool of knowledge about science, technology, culture, and the like. The serendipitous nature of diverse cities that, according to many scholars, remains so vital to innovation and technological advancement (Duranton–Puga 2001, Florida 2002, Glaeser et al. 1992, Jacobs 1969) is arguably even more noticeable on the internet. We go so far as to argue that technologies such as the internet have reduced the relative importance of local diversity for innovation and variety of local products by substituting local knowledge spill-overs. A point to be made here is that local diver-

[2] 'Everything is related to everything else, but near things are more related than distant things' (Tobler 1970, p. 236).

sity may also have become relatively less important given the increased global ease of travelling, which allows tourists to exert more demand for exotic varieties in tourist cities. Relating this *relaxation of spatial constraints* mechanism to cuisine variety in the Netherlands, we offer our final hypothesis:

Hypothesis 3: Local ethnic diversity has become relatively less important in determining restaurant variety.

History and institutional environment

Cities and the birth of restaurants

Historically, restaurants constitute an urban phenomenon. One of the first accounts to describe a restaurant (which is here defined as an eating house with a menu from which a customer can choose food items) comes from a historical observation of the Chinese city of Hangchow in the 13th century, which at the time was the largest city in the world (Kiefer 2002). Although subject to some discussion over which exact *établissement* was the originator, the first European restaurant was founded in Paris just before the French Revolution of 1789, around 1765 (Gault–Millau 1969, Spang, 2000). The French Revolution resulted in many jobless cooks that were previously employed by the aristocracy. As these cooks opened restaurants or were employed by other entrepreneurs, the restaurant industry developed rapidly in the late 18th-century Paris. The restaurant concept then dissipated to other European capitals, such as Brussels (Colliers 1993) and later, around 1850, also to the Dutch capital of Amsterdam. At that time, Amsterdam was recovering from a tumultuous first half-century, but incomes were on the rise again, and the *nouveaux riches*, in contrast to the old nobility, did not have objections to being seen eating in public.

The roles of trade, decolonization, and work migration

In the Netherlands, the emergence of cuisine variety was also something particularly urban (De Vos–Meijers 2019). In Rotterdam, the first Chinese restaurants opened around 1920, and in 1928 the first Chinese restaurant aimed at Dutch customers, 'Kong Hing', opened its doors in Amsterdam (Sanders 2008). During this time, Chinese sailors used to stay at predominantly Chinese-owned boarding houses while awaiting future employment, but the economic recession in the 1930s meant a decrease in demand for sailors. Meanwhile, boarding housekeepers were looking for ways to make their venture more profitable in times of economic downturn, and the first Chinese restaurants emerged from these boarding houses. By 1945, there were about 30 Chinese restaurants; fostered by an increasing demand for Asian food by colonists returning from Indonesia, this number grew to 225 by 1965. Many of these restaurants branded themselves as Chinese–Indonesian (Rijkschroeff 1998).

The decolonization process also resulted in the presence of Surinam restaurants in the Netherlands. Migration from Surinam to the Netherlands spiked in the years before Surinam's independence in 1975, and also four years later when it was announced that the lenient immigration policy for Surinam citizens would shortly be discontinued (Lucassen–Lucassen 2011). Immigrants from Surinam migrated for various reasons, including education, work, and the Surinam political environment. As people from Surinam clustered in large cities such as Amsterdam and Rotterdam, most Surinam restaurants are there. The Surinam cuisine is a mix of Creole, Chinese, and Indonesian cuisine, and so in the largest cities, the traditional blurring between Chinese and Indonesian cuisines goes one step further to Surinam cuisine.

Besides the trade- and colonialism-engendered Chinese–Indonesian and Surinam cuisines, there are several other widespread *migration-induced* ethnic cuisines in the Netherlands. Italian and Greek restaurants quickly gained footholds in Dutch cities during the 1960s and 1970s, when many Dutch companies employed migrant workers from the Mediterranean area. Nicolaas, Sprangers and Witvliet (2001) show that between 1965 and 1979, 44% of migrant workers returned to their respective home countries; however, 77% of Greek and Italian immigrants returned home during this period (i.e. 4,700 of 6,100, and 18,600 of 24,100, respectively). Still, these groups have made a lasting impact on the variety of cuisines offered in Dutch cities: even to this day, Italian and Greek restaurants can be found in virtually every small- and medium-sized city, alongside restaurants that serve Dutch, French, and Chinese food.

Other cuisines that can be traced back to large waves of work-related migration include those of Turkey and Morocco. Arguably, these cuisine types relate more closely to immigrant clusters than the Italian and Greek ones. Additionally, whereas the migration waves of Italian and Greek workers were followed by waves of remigration, migrant workers from Morocco and Turkey were more inclined to bring their families to the Netherlands. Between 1965 and 1979, a net total of 95,700 Turks and 61,100 Moroccans migrated to the Netherlands, and after 1974, almost one-half of these migrants arrived for family reunion reasons (Nicolaas et al. 2001).

Other peculiarities

We highlight two other specificities that have influenced the cuisine landscape in the Netherlands. First, the limitations of Dutch cuisine have led to many crossovers with other cuisines, most notably that of France. While during the 1960s all these ethnic cuisines were making their way to the Netherlands, the classical Dutch restaurant cuisine was, according to some, losing its quality, given the advent of stock powder, canned and deep-frozen vegetables, and ready-made products. In response to this downward trend, in 1967 19 Dutch restaurateurs started the Alliance Gastronomique Néerlandaise (AGN), which sought to bring craftsmanship back to restaurant kitchens, establish supply lines with French food producers, and ultimate-

ly promote culinary culture in the Netherlands (Klosse 1989). The fact that Dutch culinary culture was traditionally very modest meant that Dutch restaurants often already had to resort to the more pronounced Belgian and French ways of cooking. The AGN's efforts led to a further blurring of the lines among these national cuisines, at least in the Dutch context; therefore, it is not surprising that our data source does not distinguish between the two, and uses one category that includes both cuisines (i.e. 'Dutch–French').

Second, the geography of restaurant variety in the Netherlands is not shaped exclusively by the market. Since the 1980s, the Dutch government has put in place limits to the number of foreign-owned Chinese restaurants in Dutch municipalities (Koopman 2002).[3] Nowadays, migrants from outside the European Union (EU), United States, or Japan that want to open a restaurant need to show that their product has a 'genuine merit' for the Dutch economy (De Lange 2016). This means that the extent of cuisine variety is limited to some degree, and so we may expect that cuisines that relate to the EU, Japan, and the United States have a distribution different from those of other 'exotic' cuisines. Finally, there are several globalization-related cuisines in the Netherlands, including those of Argentina, India, Mexico, Thailand, and Vietnam (De Vos–Meijers 2019).

Data and methods

Data and descriptive statistics

The data used in this paper consist of a panel of Dutch municipalities from 1996 to 2011, and stem from the ABF Vastgoedmonitor. This source distinguishes 20 cuisine types, including a general *international* category and an 'other' category. Following Schiff (2015), we enrich this dataset with several municipality-level control variables. From Netherlands Statistics (CBS) we obtain information on local diversity, defined by the share of Western and non-Western foreigners. Here, 'Western foreigners' are defined as persons of whom at least one parent is born outside of the Netherlands, in either Europe (excluding Turkey), North America, Oceania, Indonesia, or Japan; 'non-Western foreigners', on the other hand, are people with at least one foreign-born parent from any other country. Our measure of diversity thus distinguishes Western and non-Western foreigners, but it does not address the extent to which specific ethnicities are concentrated. This measurement error may lead to the underestimation of the true effect of diversity. We also include household size, household income, and the shares of young (below 15 years) and old (65+

[3] Since only three small municipalities lacked a Chinese restaurant for a short period (i.e. Ouder–Amstel in 2006, Rozendaal in 2007, and Ouderkerk between 2007 and 2009), we do not expect this to influence our results.

years) people.[4] Furthermore, we use data from the ABF Vastgoedmonitor database regarding the number of hotel beds.

Table 1 shows the summary statistics of our data, aggregated over our study period. Municipalities had on average five cuisines, 28 restaurants, and 38,847 people each. Average household income slightly exceeded €30,000, and the average household contained 2.5 individuals. Furthermore, the average percentages of young, old, non-Western foreign people and Western foreign people were 14, 31, 5, and 7, respectively, and each municipality had on average 463 hotel beds.

Table 1

Summary statistics regarding cuisines in municipalities

Variables	(1)	(2)	(3)	(4)
	mean	sd	min	max
Number of cuisines	5.466	3.614	0	20
Number of restaurants	28.34	64.78	0	1,249
Population	38,847	59,628	3,413	779,808
Population density (per ha)	7.776	9.358	0.535	60.46
Share 'non-Western' foreign	0.0466	0.0450	0.00412	0.367
Share 'Western' foreign	0.0738	0.0438	0.00787	0.519
Number of hotel beds	462.9	1,957	0	46,189
Avg. household size	2.506	0.504	2	4
Avg. household income	30.71	5.408	18	59
Share old people	0.143	0.0289	0.0597	0.269
Share young people	0.305	0.0297	0.216	0.522
Year	2,004	4.610	1,996	2,011

Note: Number of observations: 6,640 and number of municipalities 394.

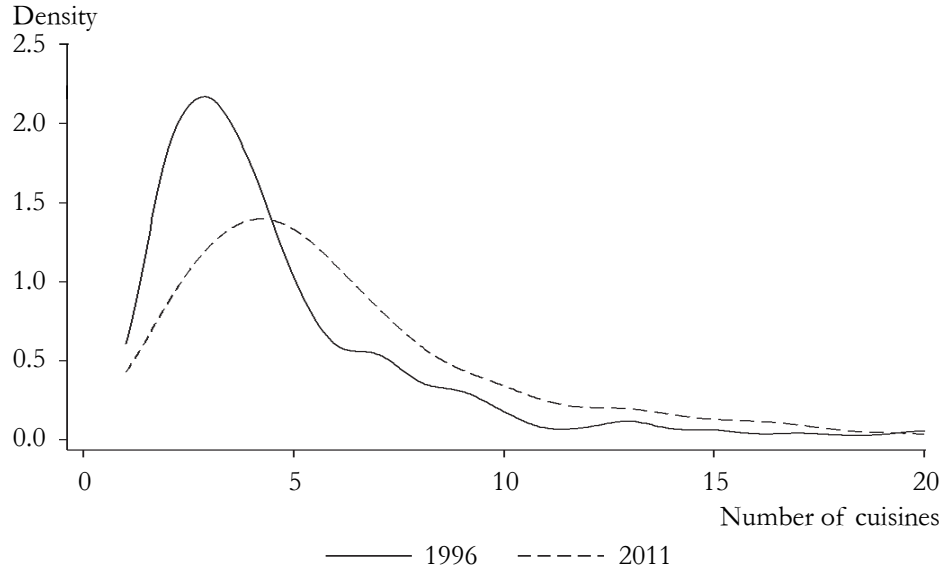
Figure 2 shows the distribution of the number of cuisines across the municipalities for the years 1996 and 2011. The emerging pattern suggests that between 1996 and 2011, the average municipal-level variety of cuisines increased; additionally, cuisine variety became somewhat more equally distributed across municipalities of different sizes.

Figure 3 shows the geographic distribution of cuisine variety over municipalities. This map shows clearly that cuisine variety increased nationally between 1996 and 2011.

[4] Household income data were missing for the years 1997, 2010, and 2011, in which case we use the income level of the nearest preceding year. We omit the small municipalities of Rozendaal, Schiermonnikoog, and Vlieland, because for confidentiality reasons, income information for the years 2006–2011 was not available.

Figure 2

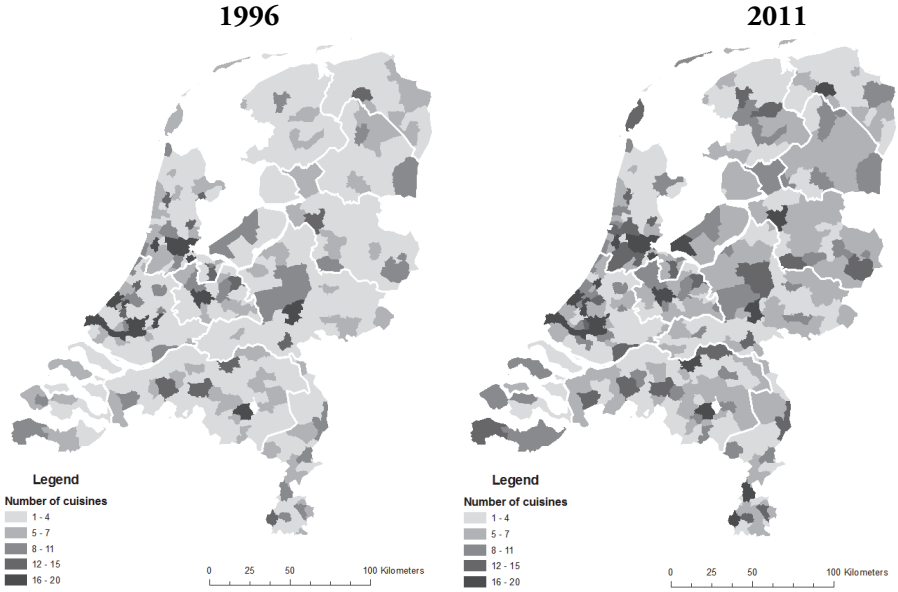
Distribution of the number of cuisines



Note: This density function is estimated using a Gaussian kernel and a rule-of-thumb bandwidth (Silverman 1986).

Figure 3

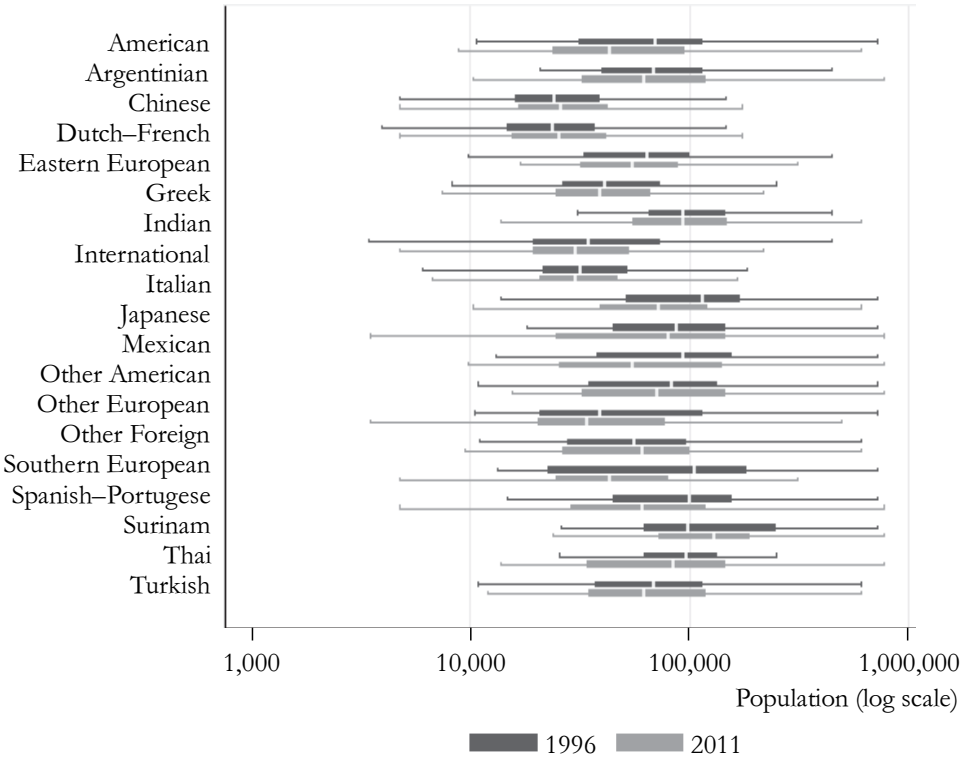
Maps of cuisine variety in the Netherlands in 1996 (l) and 2011 (r)*



* (l) – minimum; (r) – maximum.

Figure 4

Box plots of population in select municipalities for each cuisine type, in 1996 and 2011



Note: Outside values are excluded. The whiskers represent the minimum (l) and maximum (r) of the distributions (excluding. outliers), the boxes represent the areas between the first and third quartile of the distributions, and the white vertical lines in the middle of the boxes represent the median of each distribution.

Figure 4 features box plots that represent the distribution of population across choice cities – cities in which at least one restaurant with the cuisines in question is present – for each cuisine type, for the years 1996 and 2011. In this figure, several differences among cuisine types emerge. First, there are several varieties that show more or less the same distribution of choice cities in 1996 and 2011. These varieties include the Chinese, Dutch–French, Greek, Italian, Other Foreign, and Turkish varieties. Unsurprisingly, with the exception of the category Other Foreign, these are the varieties that have been around the longest in the Netherlands. Second, there are several cuisine types that seem to have become more regional, in the sense that in 2011 the distribution of choice cities contained smaller cities than the one of 1996. These cuisine types include the American, Argentinian, Indian, Japanese, Mexican, Other American, Other European, Southern European, Spanish–

Portuguese, and Thai varieties; these cuisine types are all more or less 'exotic'. Finally, the Eastern European, International, Other Asian, and Surinam cuisine types have become either more centred in medium-sized cities, or more urban. Overall this box plot shows that changes in the variety of cuisines may, for the most part, be explained by exotic rather than 'mature' varieties, and that net changes in cuisine variety may include the advent of new varieties and, simultaneously, the disappearance of other varieties.

Methodology

In analysing the relationship between agglomeration and urban benefits, it is of key importance to consider sources of bias. Omitting variables that, in our case, simultaneously affect cuisine variety and municipal population may lead to biased estimates (Angrist–Pischke 2008). Therefore, we employ a correlated random-effects approach (on which we elaborate below) that controls for all *time-invariant* characteristics of cities. However, there may still be *time-varying* municipal characteristics that correlate with both population and restaurant variety. Therefore, in our regression models, we control for several important time-varying city characteristics.

Reverse causality is another issue that may lead to bias. This would be the case if cuisine variety were an important pull factor for people. One way of addressing this issue is to use historical instruments for population, in a two-stage least squares regression. Using the 150-year lag for population essentially rules out the possibility of reverse causality. Schiff (2015) employs such an approach in his analysis of the relationship between population and cuisine variety. His instrumental variable estimates are similar to his ordinary least squares estimates, and so there seems to be little reverse causality. Furthermore, research on the pull factors of cities corroborates that consumer amenities – including cuisine variety – are minor pull factors compared to business factors (Chen–Rosenthal 2008). Therefore, in the current study, we focus on controlling for omitted time-invariant variables, and we do not control for reverse causality.

We use a log–log specification, as is customary in this literature stream. Our empirical model closely resembles those of Schiff (2015) and Berry and Waldfogel (2010); however, our data allow us to employ panel-data techniques, and this approach is quite unique in the literature. The standard approach would be to use municipality fixed effects, and while doing so would lead to unbiased estimates, this method can be very inefficient, especially with data that show limited variability. We therefore use the more flexible correlated random effects (CRE) method (Bell–Jones 2014). This is essentially a random-effects model (i.e. includes a specific error term for each otherwise fixed effect) combined with covariates that represent the panel-level mean. As such, this method is asymptotically identical to the fixed-effects approach, and even preferable for small samples (Dieleman–Templin 2014). Furthermore, it relates to the classic approach of Mundlak (1978), in that it allows

one to test whether there is correlation between unobserved heterogeneity and the model covariates. The CRE model nonetheless has several limitations—in particular, regarding the assumptions concerning the unobserved (random) effect (Wooldridge 2002). Therefore, we will test the sensitivity of our results by estimating a fixed-effects model—a model which does not include between effects, but which relies on less-stringent assumptions, allowing for correlations between the unobserved effect and the dependent variable.

We include random effects at the municipality level. This leads to the following specification:

$$V_{mt} = \alpha + \beta(P_{mt} - \bar{P}_m) + \gamma(X_{mt} - \bar{X}_m) + \delta\bar{P}_m + \kappa\bar{X}_m + \theta_t + \omega_{mt} \quad (1)$$

where V_{mt} is the logarithm of cuisine variety in municipality m in year t, P is the logarithm of municipal population density, X is a vector of municipal control variables, θ_t are year-specific parameters, and $\omega_{mt} = \eta_m + \epsilon_{mt}$. The 'within' coefficients (β and γ) measure the effect of changes in the independent variable on changes in V, whereas coefficients δ and κ measure the extent to which the 'between' coefficients differ from the within coefficients. Furthermore, it should be noted that since the denominator of population density (area) varies only between municipalities (i.e. not over time), the interpretation of the within coefficient β differs slightly from that of the between coefficient δ: β should be interpreted as the estimated change in cuisine variety due to a change in population over time, and δ should be interpreted as the extent to which the (cross-sectional) effect of population density differs from the effect of population changes.

To test hypotheses 1 and 3 – which concern the existence of trends in the population and diversity effect, respectively – we examine changes in the effect of population, the share of immigrants, and the number of hotel beds on cuisine variety by allowing the coefficients to vary over time. To test hypothesis 2 – which concerns the differential trends between higher-density and lower-density places – we interact the population–time interaction with a dummy variable that indicates whether or not the municipal population density exceeds the median density.

Results

Table 2 presents the regression results. In column (1), we estimate the basic CRE model without year interactions, including the panel-level mean of all covariates. The results show that the 'within' effect – which stems from year-to-year variability within municipalities – of population density is characterized by an elasticity of 0.366, which means that a 10% population increase leads to 3.66% more cuisine variety. This is comparable to Schiff's (2015) lower-bound estimate of the elasticity between population and cuisine variety. The other 'within' coefficients are consistently not significantly different from 0. Among the included parameters for 'mean covariates' – which represent the difference between 'within' and 'between' effects –

average household size, income, share of non-Western foreigners, and number of hotel beds all significantly differ from zero. For these variables, the between effects differ significantly from the within effects. This is due, for example, to unobserved cross-sectional differences between municipalities that correlate with these variables.

We proceed to test hypotheses 1 and 3 – that is, to investigate trends in the effects of population density and diversity on product variety. In column (2), we include time-period dummy interactions for the effects of population density, the share of non-Western foreigners, and the share of Western foreigners. We also control for time-period interactions with the effect of the number of hotel beds, to account for changes in the importance of tourism. The results show that the effect of population density decreased from 0.406 to 0.356 (–12%) between the 1996–2001 and 2007–2011 periods, although the standard errors are large. The effect of the share of non-Western foreigners also decreased. In the 1996–2001 period, the estimated coefficient equals 0.972; this implies a 0.98% increase in cuisine variety for every one-percentage-point increase in the share of foreigners.[5] The estimated coefficient for the 2007–2011 period equals 0.944, and corresponds to a 0.95% marginal effect. Therefore, according to this model, the decrease in the effect of the presence of non-Western foreigners on product variety is extremely small. Estimates of the effects of the share of Western foreigners do not differ significantly from zero, and the number of hotel beds shows a small but significant ($p = 0.1$) effect only for the final period (i.e. doubling the number of hotel beds leads to a 2.42% increase in cuisine variety). From this latter result we may conclude that while tourism may be gaining importance in determining cuisine variety, its effect is extremely small. With the exception of the share of non-Western foreigners, all parameters for 'mean covariates' that were significant in the previous regression are now significant.

In the final regression model, we tackle hypothesis 2; here, we investigate whether the relationship between population density and cuisine variety has decreased more quickly in lower-density areas (i.e. municipalities with a population density lower than the annual median). Indeed, the decrease in importance of population density seems to have been graver for below-median-density municipalities: the elasticity estimate went from 0.461 in 1996–2001 to 0.342 in 2007–2011 (–26%), whereas for above-median-density municipalities during the same period, it went from 0.381 to 0.325 (–15%). Interestingly, population density initially seems to have affected product variety more in lower-density cities, but during our study period, the effect converged across cities of different sizes, even as there is also a general downward trend.

[5] In our data, shares range from 0 to 1. Considering that the dependent variable is presented in log form, we convert the coefficient value into a marginal effect of a one-percentage-point increase by using the formula $\exp(\beta*0.01)–1$, where β represents the coefficient value.

Table 2

Regression results. Dependent variable: Number of cuisines (log)

Variables	(1)		(2)		(3)	
Population density (log)	0.366*	(0.206)				
*1996–2001			0.406**	(0.202)		
*2001–2006			0.379*	(0.202)		
*2007–2011			0.356*	(0.203)		
Pop. density (log) *1(Pop. Density < P50)						
*1996–2001					0.461**	(0.202)
*2002–2006					0.406**	(0.206)
*2007–2011					0.342	(0.211)
Pop. density (log) *1(Pop. Density > P50)						
*1996–2001					0.381*	(0.201)
*2002–2006					0.352*	(0.201)
*2007–2011					0.325	(0.203)
Share 'non-Western' foreign	0.365	(0.343)				
*1996–2001			0.972**	(0.481)	0.970**	(0.471)
*2001–2006			0.948**	(0.419)	0.943**	(0.412)
*2007–2011			0.944**	(0.407)	0.931**	(0.399)
Share 'Western' foreign	0.629	(0.532)				
*1996–2001			0.729	(0.579)	0.749	(0.579)
*2001–2006			0.824	(0.598)	0.819	(0.598)
*2007–2011			0.920	(0.629)	0.881	(0.628)
Number of hotel beds (log)	0.0186	(0.0121)				
*1996–2001			0.0130	(0.0125)	0.0140	(0.0124)
*2001–2006			0.0183	(0.0123)	0.0189	(0.0122)
*2007–2011			0.0242*	(0.0135)	0.0241*	(0.0134)
Avg. household size (log)	–0.0525	(0.0445)	–0.0369	(0.0441)	–0.0291	(0.0435)
Avg. household income (log)	–0.00222	(0.187)	0.0463	(0.192)	0.0292	(0.191)
Share old people	0.638	(0.432)	0.711	(0.439)	0.823*	(0.430)
Share young people	–0.332	(0.476)	–0.377	(0.477)	–0.258	(0.468)
Between effects						
Population density (log)	–0.255	(0.206)	–0.271	(0.203)	–0.240	(0.202)
Share 'non-Western' foreign	0.985**	(0.460)	0.393	(0.589)	0.404	(0.580)
Share 'Western' foreign	–0.429	(0.565)	–0.615	(0.621)	–0.587	(0.620)
Number of hotel beds (log)	0.153***	(0.0191)	0.153***	(0.0188)	0.153***	(0.0186)
Avg. household size (log)	–0.435**	(0.185)	–0.450**	(0.184)	–0.517***	(0.188)
Avg. household income (log)	–0.599**	(0.288)	–0.648**	(0.291)	–0.623**	(0.291)
Share old people	–0.0321	(0.702)	–0.121	(0.699)	–0.255	(0.698)
Share young people	1.089	(0.744)	1.131	(0.743)	1.060	(0.734)
Constant	0.851**	(0.339)	0.871***	(0.338)	0.848**	(0.339)
Year dummies	Yes		Yes		Yes	
Municipality random effects	Yes		Yes		Yes	
Observations	5,940		5,940		5,940	
R-squared	0.629		0.630		0.629	
Number of municipalities	394		394		394	

Note: Cluster-robust standard errors in parentheses, next to coefficient estimates. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 3 in the Appendix shows that these results are robust to a model specification with fixed effects, instead of (correlated) random effects.

Conclusion

Review of hypotheses

Our first hypothesis was that between 1996 and 2011, population density became less important in determining local product variety. Our results show that, overall, the elasticity of cuisine variety with respect to population density decreased by 12%. It remains to be investigated whether it is indeed the progress in (mobile) communication technologies that underpins this trend. Even more pressing is the question of the extent to which this result implies that accessibility is increasingly substituting for urban density as the spatial extent of agglomeration externalities increases. This topic is outside the scope of the current study, and we leave it for future research.

Our second hypothesis concerns the existence of an urban bias in the decreasing importance of population density. Our results show clearly that the elasticity between population density and cuisine variety was considerably greater in below-median-density municipalities; however the convergence of this elasticity between low- and high-density municipalities suggests that lower-density areas have indeed become able to sustain more variety with less density, while higher-density areas have experienced a more modest decrease in the importance of density. This finding aligns with those of earlier research, and implies again that communication technologies contribute more to the 'death of distance' than to the 'death of cities' (Kolko 2000). The overall decreasing importance of density does, however, imply that cities will not stay the same if the demand for density will indeed also decrease.

Our final hypothesis relates to the effect of local diversity on local product variety. We conjectured that this effect should have become less important in explaining product variety, as the internet has become an increasingly fruitful substitute for knowledge spill-overs and innovation. According to our estimates in Table 2 column (2), this seems hardly the case, as the effect of the concentration of non-Western foreigners has remained relatively stable over time. Meanwhile, the effect of local tourism – proxied by the number of hotel beds in a municipality – has become somewhat more important. It does not, however, entirely compensate for the decreasing importance of ethnic diversity, which suggests that ethnic diversity as a driver of local product variety (through innovation) may have been replaced by better communication technologies. Given the absence of a significant decrease, this hypothesis remains unconfirmed.

Directions for future research

The findings of this study give rise to several questions. First, the outlined trends indicate only a decline in the importance of urban density for variety; we can by no means establish that this is caused by advancing information and communication technologies. To identify the causal effect of such technologies, one strategy would be to find a credible source of random variation in the supply of communication technologies over space. Anenberg and Kung (2015) suggest, for instance, that the introduction of 3G-capable base stations may exhibit such random variation. Another approach would be to analyse the relation between information technology usage and cuisine variety. De Vos and Meijers (2019) do this by examining the effect of review website penetration rates on cuisine variety, conditional on historical variety.

Second, the future of cities depends not only on the cuisine variety effects that relate to urban density: on the contrary, this is only a tiny part of the puzzle of why people choose to live in cities (Chen–Rosenthal 2008). Further research may additionally examine whether urban density has become less important for labour market-matching externalities. Considering the increased possibilities for telecommuting and online job searches, this does not seem extremely farfetched (De Vos et al. 2018). In this case, the main challenge would again be to establish a causal relationship between communication technologies and the declining importance of urban density.

Third, while cities are beneficial for people, they are also associated with pollution, congestion, and crime (Glaeser et al. 2016). The interaction of information and communication technologies with these so-called agglomeration diseconomies is an understudied theme. While their effects on pollution may be limited, recent research suggests that the internet and mobile phones have lured criminals away from city streets (Edlund–Machado 2019). We may also expect some effects with regard to congestion, as many of today's navigation apps make it possible for one to choose the fastest route given current traffic conditions, and new cars are increasingly equipped with software that provides real-time routing and parking information.

Finally, over the last 20 years, a lot more has changed than just communication technologies. One of the other potential drivers is of course globalization (i.e. increased ease of travelling, EU integration, visa arrangements, etc.). We already alluded to one way in which globalization may substitute for local population, through demand exerted by tourists. In a similar fashion, outbound tourism may substitute for local knowledge spill-overs. This issue relates to the literature on city networks that suggests that as a driver of urban economic performance and the supply of functions, embeddedness in global networks is gaining importance relative to city size (Burger–Meijers 2016, Capello 2000, Johansson–Quigley 2004).

APPENDIX

Table 3

Fixed-effects models

Variables	(1)		(2)		(3)	
Population density (log)	0.365*	(0.206)				
*1996–2001			0.403**	(0.203)		
*2001–2006			0.376*	(0.202)		
*2007–2011			0.353*	(0.204)		
Pop. density (log) *1(Pop. Density < P50)						
*1996–2001					0.482**	(0.205)
*2002–2006					0.427**	(0.209)
*2007–2011					0.364*	(0.214)
Pop. density (log) *1(Pop. Density > P50)						
*1996–2001					0.378*	(0.201)
*2002–2006					0.349*	(0.201)
*2007–2011					0.323	(0.203)
Share 'non-Western' foreign	0.346	(0.343)				
*1996–2001			0.953**	(0.479)	0.955**	(0.469)
*2001–2006			0.928**	(0.418)	0.928**	(0.411)
*2007–2011			0.926**	(0.406)	0.916**	(0.398)
Share 'Western' foreign	0.632	(0.532)				
*1996–2001			0.739	(0.578)	0.764	(0.579)
*2001–2006			0.835	(0.598)	0.834	(0.599)
*2007–2011			0.931	(0.629)	0.895	(0.628)
Number of hotel beds (log)	0.0185	(0.0121)				
*1996–2001			0.0130	(0.0125)	0.0142	(0.0124)
*2001–2006			0.0182	(0.0123)	0.0189	(0.0121)
*2007–2011			0.0233*	(0.0135)	0.0235*	(0.0134)
Avg. household size (log)	-0.0541	(0.0445)	-0.0384	(0.0441)	-0.0301	(0.0435)
Avg. household income (log)	0.00352	(0.187)	0.0506	(0.192)	0.0378	(0.191)
Share old people	0.627	(0.432)	0.695	(0.439)	0.818*	(0.431)
Share young people	-0.316	(0.476)	-0.359	(0.477)	-0.234	(0.468)
Constant	0.308	(0.338)	0.200	(0.344)	0.156	(0.343)
Year and municipality FE	Yes		Yes		Yes	
Observations	5,940		5,940		5,940	
R-squared	0.249		0.257		0.262	

Note: Cluster-robust standard errors in parentheses, next to coefficient estimates. * p < 0.1; ** p < 0.05; *** p < 0.01.

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Spatial econometrics: transport infrastructure development and real estate values in Budapest

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Over the last few decades, the M4 metro line has been the largest transport infrastructure project in Budapest. Despite the size and importance of the project, there has been no evaluation of its economic impacts in the scientific literature. This paper addresses this gap and expands the scientific discourse on spatial econometrics, cohesion policy, and sustainable urban development by exploring the impact of the new metro line on real estate prices.

To assess the economic effect of the M4 project on the value of nearby properties, the authors use counterfactual impact evaluation along with a measurement of the utility increase in the change in property prices. The research database has been provided by the National Tax and Customs Administration.

Sustainable and useful public infrastructure developments will have a positive effect on the value of nearby properties. It is reasonable to assume that easier access to downtown areas can be an added value; however, the increased traffic, crowds, or noise may outweigh these positive impacts. In case of M4, the authors find no significant effects of the stations on the Pest side.

Only the new stations that were not connected directly to existing underground lines exert a positive effect on nearby real estate properties. It is worth using this information when making decisions on further transport development in Budapest.

This paper presents original research on the economic effects of the M4 transport project. It determines the factors that increase or decrease the economic effects of the stations. As has been shown, several stations have failed to generate additional economic value. This information is highly useful for the planning of future transport infrastructure projects.

Keywords:
public infrastructures, urban transportation analysis, sustainability

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Introduction

The cohesion policy of the European Union strengthens economic, social, and territorial cohesion within the Union, and aims to reduce regional disparities. Realistic regional convergence also requires the elimination of obstacles such as the development level of basic transport infrastructure. This objective is frequently fulfilled through the development of urban public transport systems and facilities (Guzik et al. 2017, Bodnár–Csomós 2018, Konecka-Szydłowska et al. 2018).

In addition to their undoubted effects on mobility (Varga et al. 2016, Kiss–Szalkai 2018), these interventions can alter the spatial distribution of urban property values. Studies suggest that economic impacts can vary significantly depending on the type of interventions, the locations and geographical areas served, pre-existing market conditions, and other policy and planning factors. The impact of urban infrastructural developments has been studied in other countries with special attention paid to underground projects. Research on sustainability and market value has received considerable attention in recent years, which has led to a rapidly evolving body of research. The literature presents several methodologies from the domain of spatial econometrics for the measurement of real estate values (Ibeasa et al. 2012).

In 2014, a new metro line was opened in Budapest. The project was co-financed by European development funds. The new line is seen as a milestone for the Hungarian capital; however, its economic impacts have not been investigated in detail. This paper addresses this research gap and expands the scientific discourse of spatial econometrics and cohesion policy by examining the impact of the new metro on real estate prices. The new metro line also intended to steer the surface, non-line infrastructure public transport traffic underground[1]. Increasing accessibility of remote parts of the city and decreasing the pollution from urban transport are particularly important aspects in the sustainable development of Budapest. This paper presents a method to monetise these effects by measuring the change in real estate prices.

Conceptual background

The efficiency of public spending has always been an important issue, and in the current economic and financial climate, the questions of what and how the scarce resources available are used, and the impact of this spending are of particular significance. The issues of whether the use of public funds is justified, which areas require development, and where the best result can be ensured (value for money principle) (Nyikos 2011, 2013) are extremely important. Greater welfare can be achieved by increasing the gross domestic product (GDP) components and increasing state or corporate capital is one type of investment intervention in infrastructure. The objec-

[1] See the official website of Metro4 (http://www.metro4.hu/en/what-will-metro4-be-like)

tive of the cohesion policy is to enhance regional economic performance (Nyikos 2013, p. 164), particularly with respect to GDP, employment, productivity, investments, and the foreign trade equilibrium. Within the policy framework, significant amounts of public funds are utilised to support the necessary infrastructure and to stimulate private investment, which could significantly speed up the convergence process. Realistic convergence requires the elimination of growth obstacles such as the development level of basic infrastructure and the need to increase mobility. Thus, one of the efficient channels of the medium- and long-term sustainable impacts of EU cohesion policy is the funding of broadly interpreted public infrastructural investments (Nyikos 2013). The European Union's structural and cohesion funds play a major role in the funding of Hungarian economic agents (Egri–Kőszegi 2018).

The effect of infrastructure investment could be multidirectional and, in several cases, controversial (Horkay et al. 2006). Transportation infrastructure is known to affect the value of real estate property due to changes in accessibility. The impact of transportation facilities is also highly localised, and the capitalisation of accessibility may lead to spillover effects (Dorantes et al. 2011).

Public mass transit systems can alter the spatial distribution of urban property values. The magnitude of this effect is likely to be highly parcel-specific, and changes in real estate values may occur both prior to and after a transit system's construction. In the US, access to the transit system and the implementation schedule of metro line construction were found to be significant determinants of parcel transaction prices (Lerman et al. 1978). In other cases, the literature on the impact of transit on land values reports mixed results concerning the economic benefits of accessibility to subway stations, specifically in the context of commercial properties (Kim–Zhan 2005). A Korean study suggests the discrimination impact of transit on land values by location, in a built-up urban area as a possible explanation for the mixed results. A Scandinavian study argues that the distance to the city centre and the proximity of metro stations constitute two of the factors that significantly affect the market price of dwellings. This means that the positive and negative effects of the recently constructed metro line have capitalised the market value of property in the vicinity and in feeder transport areas (Laakso 1992). A Spanish case study indicated that better accessibility to MetroSur stations (Madrid) had a positive impact on real estate values, and that this effect was marked in cases in which a house was put up for sale. The results also revealed the presence of submarkets, well defined by geographic boundaries and transport fares, which implied that the economic benefits differed across municipalities (Dorantes et al. 2011). The results of a Portuguese study (Martínez–Viegas 2009) and a Polish study (Bazyl 2009) also suggest that the proximity to one or two metro lines leads to significant changes in property values. However, an important factor is that, as in the case of the Jubilee Line Extension and the Madrid MetroSur, positive economic benefits occurred most frequently

around the stations where enforceable land use plans and complementary policies has already been in place to increase urban densities and encourage mixed land uses, alongside restricted car access and good pedestrian access to stations (Mejia-Dorantes–Lucas 2014).

The literature presents several methodologies for the measurement of real estate values. Hedonic multiple linear regression models, spatial autoregressive hedonic models, spatial autoregressive hedonic in the error term models and spatial Durbin hedonic models are used to estimate housing price variations in metropolitan areas as a result of changing environmental and accessibility conditions (Ibeasa et al. 2012).

Research suggests that economic impacts can vary significantly depending on the type of interventions, the locations and geographical areas served, pre-existing market conditions, and other policy and planning factors. However, another issue for evaluation is the extent to which the different studies that are available are comparable in terms of their methodologies, which makes the synthesis of research findings across different case studies extremely difficult (Mejia-Dorantes–Lucas 2014).

The relationship between sustainability and market value has also received considerable attention. Most studies that investigate the relationship between sustainability and value have been categorised into the following themes to allow critical analysis and examine the applicability of the theory or research for valuation practice:

- discussion and analysis of stakeholders' perceptions and sentiments;
- normative studies that suggest the relationship 'should' be present;
- case studies used to demonstrate normative theory; and
- quantitative studies to quantify the effect of sustainability (Warren-Myers 2012).

Methodology

Measuring the utility of large transport infrastructural projects is a challenge in cohesion policy. The standard tools are cost-benefit analysis and passenger counting, however these techniques often fail to measure the real value-added of these types of projects[2].

The main challenge is to construct a solid counterfactual analysis exploring what would have happened if there were a lack of investment. Our idea was to borrow a widely used technique of counterfactual impact evaluation from human development and SME development evaluations. This method (Khandker et al. 2010) was

[2] Statistical methods are designed to answer large sample-based research questions. Large infrastructural projects often fail to build a well-based counterfactual situation (i.e. what would have happened without the development). Our approach attempts to combine the evaluation of territorially focused infrastructure development with large sample statistical hypothesis testing and counterfactual impact evaluation.

combined with Lucas' (1988) concept of measuring the utility increase using the change in property prices. According to this research methodology, useful public infrastructural developments have a positive effect on the value of nearby properties. It is reasonable to assume that easier access to downtown areas can be a value-added, but the increased traffic, crowds, or noise may outweigh these positive impacts. To explore the economic impacts of the M4 project, this research uses the following methodological steps.

The **research database** has been provided by the National Tax and Customs Administration. The initial dataset contained the location data of properties sold in the capital. These data were used to estimate one of the research variables: the **distance** of dwellings from the metro stations. However, two difficulties arose. First, due to data protection requirements, the records of the dataset included ZIP codes, city, and street names without house numbers. Second, the addresses were provided in a semi-structured format (free text fields) that contained many abbreviations and typos to be unified in some degree. In the absence of house numbers, it was necessary to apply a simplification to ensure adequate granularity. To manage these, a list of ZIP codes and unique addresses was created, excluding undefinable cases. To address the second challenge, street midpoints were used for distance measurement. For addresses concerning more than one ZIP code, ZIP code level midpoints were calculated to improve accuracy. This approach may result in some inaccuracies; it has been assumed that such approximations can fit the purpose of the research[3]. To obtain accurate distance measurement, it was necessary to convert addresses to geo-coordinates. The list of street midpoints was used for geocoding via the HERE Geocoder API using a Python script. This step provided X and Y coordinates for all street midpoints to enable distance measurement. The calculation of distances was based on Euclidean distances (Jóna 2018) between stations and street midpoints[4]. The Haversine formula was used to provide distance variables in metres (van Brummelen 2013). Going one step further, the shortest distance between metro stations and street midpoints was defined.

We choose to use a double propensity score matching (for the propensity score matching technique, see Rosenbaum–Rubin 1983) technique **to evaluate the utility** of the M4 metro line development in Budapest through the change in property values. We created a 'treated' group, from sold properties close to the metro stations (we estimated a walking distance of seven minutes from the new metro stations as the treated area, which is approximately 580 m)[5], and created a 'control' group on which the new metro stations had no effect (more than 15 minutes' walking distance from any of the newly built metro stations, which is approximately 1,250 m).

[3] Due to data protection measure, imposed by the National Tax Authority, we could not obtain more accurate geopoints.

[4] As we used a large sample, the possible errors have been eliminated through aggregation.

[5] According to the Cohesion Policy regulation.

We compared the change in the property prices before and after the investment. The main challenge here is that properties are rarely sold twice (before and after the investment); we first created pairs of properties with very similar characteristics in the treatment and control groups, sold before and after the investment. This was done using a one-to-one nearest neighbour propensity score matching.

To find the average treatment effect on the treatment group, we analysed the results of three models:

1. a one-to one nearest neighbour matching without the per square metre starting property prices;
2. kernel matching with the per square metre starting property prices;
3. kernel matching without the per square metre starting property prices.

Discussion

The new subway line in Budapest

The newest M4 metro line in Budapest has been on the political agenda since 1990. However, the plans are even older; the majority of them were created in the 1970s. There were extensive discussions as to whether the metro line would fit either into the structure of the existing Budapest public transportation network or into the reasonable future development scenarios. The aim of the M4 project was to establish a metro line with modern, automated, air-conditioned trains that run even every 1.5 minutes, with modern, airy, and less draughty stations where passengers can wait for the new metro trains on uniquely built platforms. The investment has to facilitate the reconstruction of the surroundings of every station and change the life of Budapest (DBR Metró Projekt Igazgatóság 2018). Metro 4 is a relatively short line (7.34 km), connecting two major railway terminals with a major metro line. The overall budget of the first section included the creation of 10 stations to relieve the downtown area and connect Kelenföld with Baross Square, that is, south Buda with north Pest. The Cohesion Fund application of the project referred to this first section.

Table 1

Comparison of the four metro lines in Budapest

Description	Millennial Underground Metro line	Line 2 (East-West)	Line 3 (North-South)	Line 4 (DBR)
Surface section length (km)	0	1.4	1.3	0
Line length (useful, km)	4.2	10.1	16.6	6.7
Line length (total [from terminal to terminal], km)	4.4	10.3	17.1	7.4
Number of stations	11	11	20	10
Vehicle number (cars)	23	135	252	64
Transport capacity in peak hours (capacity/hour/direction)	6,185	23,790	26,326	20,100
Highest number of passengers in peak hours (passengers/hour/direction)	5,170	14,755	16,710	15,700
Highest number of passengers in peak hours (passengers/abs. peak hour/direction)	5,170	15,885	17,300	16,480
Train pairs per hour running in peak hours	32.7	26.66	24.0	30.0
Daily number of trips taken (thousand passengers/working day)	107	425	610	421

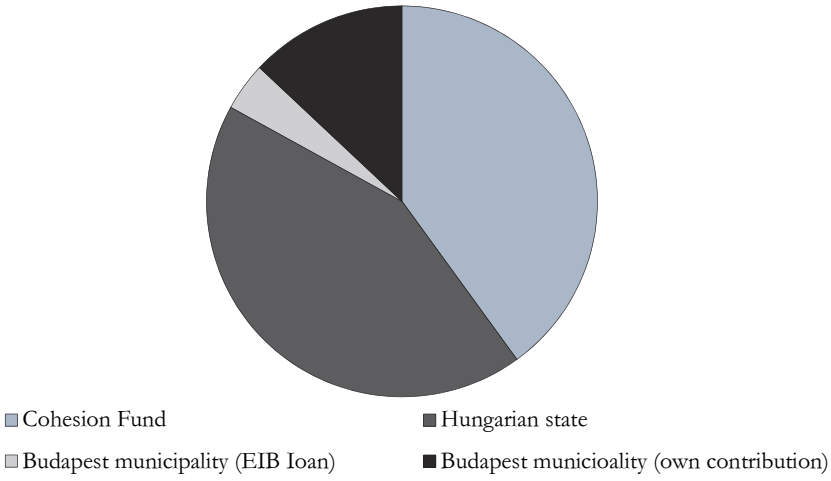
Note: DBR – South Buda-Rákospalota.
Source: DBR Metró Projekt Igazgatóság.

The overall project budget was HUF 353 billion, from which the eligible[6] amount was HUF 292 billion, and Budapest requested EU financial assistance of HUF 224 billion. (DBR Metró Projekt Igazgatóság 2018). The detailed budget is presented in Figure 1.

[6] According to the Cohesion Policy regulation.

Figure 1

M4 construction budget (billion HUF)



The construction of the first section of Metro 4 line eventually received HUF 180.8 billion in EU funding, which, although not the expected maximum amount, is a significant amount of financing to assist the project.

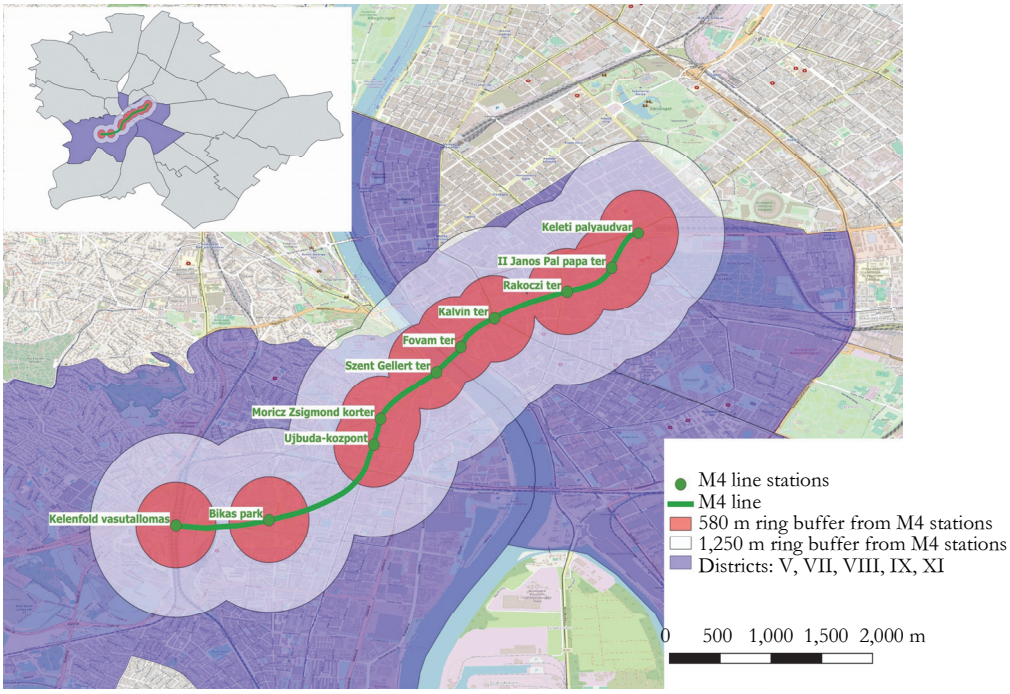
We examined the economic effects of the M4 project and the change in property prices using the following steps:

The first matching was based on the location (district) and the size (in square metres) of the apartments. We matched property selling transactions for the 'before investment' period (2007–2008) with the 'after investment' period (2015–2015)[7]. The new metro line affected five districts in Budapest: V, VII, VIII, IX, and XI. We chose to set the treated area to within a radius of 580 m of the new stations and the control area as a radius of more than 1,250 m from the stations, but within the affected districts. To include a neutral area, we also set up an area between 580 m and 1,250 m of the stations; the effect of the prices was not measured in this area (see Figure 2). Along with the new stations, the undertaking of major surface level developments and restorations in some of the most deprived urban areas (e.g. Rákóczi Square and II. János Pál pápa Square) must also be noted.

[7] The chosen methodology of counterfactual impact evaluation is designed to capture and eliminate the general macroeconomic effects that affected all the real estates. The general growth in real estate prices has been excluded using the diff-in-diff methodology. See Wooldridge (2012).

Figure 2

Map of the new metro stations



We obtained 13,805 observations for the treated properties (5,222 property prices before and 8,583 after the M4 investment) and 13,935 observations for the control properties (5,370 property prices before and 8,565 after the M4 investment). We identified 5,214 matches in the treated and 5,369 matches in the control groups.

Table 2 shows that for the treated properties, the percentage share of the sold apartments between the different districts was very similar before and after the M4 investment, but the average size of the sold apartments increased significantly. This phenomenon is not surprising as the selection of the treated properties was based on their distance from the new metro stations before and after the investment. For the control properties, both the geographical location and the size of the apartments were significantly different.

Table 2

The results of the one-to-one propensity score matching before and after the M4 investment

Variable	Treated property		Control property	
	Coefficient (standard error)	*p*-value	Coefficient (standard error)	*p*-value
Constant	–0.2241 (0.0458)	0.000	–0.3763 (0.0395)	0.000
Size of the apartment (m^2)	–0.0019 (0.0004)	0.000	–0.0008 (0.0004)	0.044
District VII dummy	0.0170 (0.0463)	0.713	1.3197 (0.2811)	0.000
District VIII dummy	0.0264 (0.0417)	0.528	0.1581 (0.0443)	0.000
District IX dummy	0.0399 (0.0563)	0.478	0.0931 (0.0327)	0.004
District XI dummy	0.0237 (0.0425)	0.577	0.2348 (0.0340)	0.000

Table 3

Comparison of the before and after matching values for the treated properties

Variable	Before matching			After matching		
	mean – before investment (standard error)	mean – after investment (standard error)	*p*-value (Wald test)	mean – before investment (standard error)	mean – after investment (standard error)	*p*-value (Wald test)
Size of the apartment (m^2)	56.78 (0.3981)	59.46 (0.3298)	0.0000	56.57 (0.3856)	56.51 (0.3826)	0.9131
District V dummy	0.0816 (0.0038)	0.0880 (0.0031)	0.1817	0.0813 (0.0038)	0.0846 (0.0039)	0.5462
District VII dummy	0.1676 (0.0052)	0.1672 (0.0040)	0.9551	0.1676 (0.0052)	0.1669 (0.0052)	0.9164
District VIII dummy	0.3734 (0.0067)	0.3696 (0.0052)	0.6497	0.3736 (0.0067)	0.3759 (0.0067)	0.8082
District IX dummy	0.0672 (0.0035)	0.0664 (0.0027)	0.8543	0.0667 (0.0035)	0.0641 (0.0034)	0.5793
District XI dummy	0.3102 (0.0064)	0.3087 (0.0050)	0.8557	0.3107 (0.0064)	0.3086 (0.0064)	0.8158

Table 4

Comparison of the before and after matching values for the control properties

Variable	Before matching			After matching		
	mean – before investment (standard error)	mean – after investment (standard error)	*p*-value (Wald test)	mean – before investment (standard error)	mean – after investment (standard error)	*p*-value (Wald test)
Size of the apartment (m^2)	55.93 (0.3895)	57.43 (0.3119)	0.0025	55.88 (0.3869)	55.48 (0.3766)	0.4583
District V dummy	0.1423 (0.0048)	0.1794 (0.0041)	0.0000	0.1421 (0.0048)	0.1429 (0.0048)	0.9121
District VII dummy	0.0041 (0.0009)	0.0006 (0.0003)	0.0001	0.0041 (0.0009)	0.0041 (0.0009)	1.0000
District VIII dummy	0.1058 (0.0042)	0.0998 (0.0032)	0.2619	0.1058 (0.0042)	0.1039 (0.0042)	0.7528
District IX dummy	0.4196 (0.0067)	0.4427 (0.0054)	0.0071	0.4196 (0.0067)	0.4215 (0.0067)	0.8450
District XI dummy	0.3283 (0.0064)	0.2774 (0.0048)	0.0000	0.3284 (0.0064)	0.3276 (0.0064)	0.9345

The initial significant differences between the before and after M4 investment property characteristics disappeared after the matching.

We took the pairs of the sold properties before and after the M4 investment and obtained second propensity scores using three different models. In the models, the treatment variable was always the distance from the new stations (1 if within 580 m and 0 if more than 1,250 m but within the affected districts).

Table 5

Models of the secondary propensity score matching

Model 1 Nearest neighbor matching with the covariates	Model 2 Kernel matching with the covariates	Model 3 Kernel matching with the covariates
apartment size (m^2) district VII dummy district VIII dummy district IX dummy district XI dummy	apartment size (m^2) the before investment per m^2 property prices district VII dummy district VIII dummy district IX dummy district XI dummy	apartment size (m^2) district VII dummy district VIII dummy district IX dummy district XI dummy

The treatment effect was measured in the change of the per square meter property prices before and after the M4 investment (results of the three measurement scenarios are shown in Tables 6–8).

Table 6

Model 1 – The effects of the M4 metro stations on property prices: per square meter price growth of the properties near the new metro stations and the controls, 2007–2014 *

Effect/Metro station	Properties near the stations	Controls	Difference	Standard error	*t*-statistic	Number of observations	Number of treated properties
	in HUF						
Overall effect	45,931	–7,250	53,182**	53,182	2.20	10,583	5,125
Kelenföld	179,199	–16,133	195,333***	63,859	3.06	3,385	301
Bikás Park	105,911	–12,364	118,276*	65,997	1.79	2,180	420
Újbuda-Centre	88,622	–35,798	124,421***	27,145	4.58	3,854	770
Móricz Zsigmond Square	75,009	–12,926	87,935***	23,172	3.79	3,741	656
Szent Gellért Square	108,016	46,215	61,801*	33,682	1.83	4,910	121
Fővám Square	75,425	30,051	45,374*	25,265	1.80	6,040	671
Kálvin Square	60,593	25,145	35,447*	19,724	1.80	6,290	921
Rákóczi Square	–1,790	–22,275	20,485	20,504	1.00	6,727	1,355
II. János Pál pápa Square	–2,300	–25,123	22,823	20,761	1.10	6,704	1,332
Keleti Railway Station	18,618	32,725	–14,107	109,834	–0.13	4,524	854

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

* As described in the Tables 6–8, the three models differ in the number of covariates and the corresponding methods.

Table 7

Model 2 – The effects of the M4 metro stations on property prices: per square meter price growth of the properties near the new metro stations and the controls, 2007–2014

Effect/Metro station	Properties near the stations	Controls	Difference	Standard error	*t*-statistic	Number of observations	Number of treated properties
	in HUF						
Overall effect	45,296	51,813	–6,517	8,502	–0.77	10,583	5,139
Kelenföld	179,199	132,966	46,233***	9,073	5.10	3,385	301
Bikás Park	105,472	120,028	–14,555*	8,448	–1.72	2,180	421
Újbuda-Centre	88,622	98,984	–10,362	6,940	–1.49	3,854	770
Móricz Zsigmond Square	75,009	91,676	–16,667**	7,218	–2.31	3,741	656
Szent Gellért Square	108,016	81,297	26,719	21,752	1.23	4,910	121
Fővám Square	75,635	11,506	64,129***	14,464	4.43	6,040	670
Kálvin Square	61,014	48,719	12,294	10,174	1.21	6,290	920
Rákóczi Square	–225	25,086	–25,311***	8,395	–3.01	6,357	1,296
II. János Pál pápa Square	–2,290	22,179	–24,469***	8,593	–2.85	6,704	1,329
Keleti Railway Station	12,254	17,132	–4,878	32,926	–0.15	4,524	737

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8

Model 3 – The effects of the M4 metro stations on property prices: per square meter price growth of the properties near the new metro stations and the controls, 2007–2014

Effect/Metro station	Properties near the stations	Controls	Difference	Standard error	*t*-statistic	Number of observations	Number of treated properties
	in HUF						
Overall effect	46,089	35,356	10,732	13,028	0.82	10,583	5,119
Kelenföld	179,199	64,928	114,271***	8,135	14.05	3,385	301
Bikás Park	105,911	72,717	33,914***	7,333	4.53	2,180	420
Újbuda-Centre	88,622	62,606	26,016***	6,968	3.73	3,854	770
Móricz Zsigmond Square	75,009	62,040	12,968*	7,259	1.79	3,741	656
Szent Gellért Square	108,016	59,080	48,936**	22,249	2.20	4,910	121
Fővám Square	75,715	43,429	32,285**	14,620	2.21	6,040	670
Kálvin Square	61,014	41,750	19,263	11,853	1.63	6,290	920
Rákóczi Square	–1,533	20,919	–22,452	16,123	–1.39	6,727	1,308
II. János Pál pápa Square	–2,350	18,907	–21,257	16,148	–1.32	6,704	1,316
Keleti Railway Station	12,254	17,132	–4,878	32,926	–0.15	4,524	737

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In Model 1, the growth difference of the treated and control property prices was significant overall. After analysing the effects of the individual metro stations, we found that the stations on the Buda side had more significant **positive** effects on property prices **than on the Pest side**. The effect of three stations were significant (at least 5%):

- Kelenföld – this station is the Buda side terminus of the M4 metro line with direct connection to the Hungarian Railways. This station seems to have the most value-added as it connects the surrounding area to Budapest downtown.
- Újbuda-Központ and Móricz Zsigmond Square are still on the Buda side of the metro line with relatively good surface connections; these are the terminuses of the largest tramlines.

We found no significant effects of the stations on the Pest side.

In Model 2, we controlled for the before investment apartment prices and used a kernel matching method. The effect of the M4 investment on the overall price changes was not significant, but we identified two significantly positive and three significantly negative effects:

- Kelenföld has already been mentioned; Fővám Square is the first M4 station on the Pest side of the town.
- For Móricz Zsigmond Square, we found significantly negative effects, probably due to the special composition of the sold apartments. The apartments

here are larger than the average size (around 64 m^2 instead of 55 m^2), and the price of these apartments in the control area increased dramatically. Rákóczi Square and II. János Pál pápa Square are two of the most deprived areas of Budapest, and even the new metro stations do not seem to have outweighed the negative processes.

We believe Model 3, where we applied the kernel matching method without using the starting apartment prices, is the most reliable. In this model, we found less significant effects when moving from the Buda to the Pest side of the city, which has better links with the Budapest underground network (especially the M2 and M3 lines).

Our results reveal that the new stations have significant positive effects on housing prices in the areas that had not been connected to existing metro lines (especially in the Buda area).

Although it may bring benefits, quantifying and assessing a relationship between sustainability and market value is somewhat more difficult. Sustainability presents a rapidly changing dynamic that has varying, complex assessment criteria (Warren-Myers 2012). Accordingly, to assess a relationship between sustainability and market value of property, there is a need for extensive analysis of unbiased, evidence-based research in individual and broader markets to provide guidance, evidence, and knowledge of the implications of sustainability in the valuation of real estate.

Conclusion

Useful public infrastructural developments have a positive effect on the value of nearby properties. It is reasonable to assume that easier access to downtown areas can be an added value, but the increased traffic, crowds, or noise may outweigh these positive impacts. Economic impacts can vary significantly depending on the type of interventions, the locations and geographical areas served, pre-existing market conditions, and other policy and planning factors. Increased economic effects are possible; we integrated development projects where the transport development initiative is linked to housing or other real estate development projects.

When examining the nearby properties at the M4 metro line stations in Budapest, we have found mixed results for the property prices. The new stations exert a positive effect only in those areas that were not connected directly to existing underground lines (especially in the southern Buda area). Our results support the arguments that the new stations on the Pest side of the city are too close to each other and to the existing and functioning transport network, so their additional value is questionable.

Even though the results provide valuable information for planning forthcoming transport infrastructure in Budapest, there is room for developing this analysis further. For example, using walking distances instead of 'as the crow flies' distance;

using more sophisticated data regarding the quality of the apartments; or further examination of other, especially private development processes, besides the metro investment can provide more detailed findings.

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Construction and validation of an international reputation index: the European case

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The purpose of this paper is to create an index to measure the reputation of countries that belong to the European Union. Data for 28 countries has been taken from the Eurostat database and the method used is principal component analysis. The index is a combination of five different dimensions: (1) Economy, (2) Social Welfare, (3) Environment, (4) Digitalization and (5) Sports and Health, along with thirty-two distinct factors. The top scores in this index are Germany, United Kingdom or Sweden with high values in Economy or Environment. On the other side, we find Greece, Croatia or Cyprus, with a low process of digitalization. The International Reputation Index could be used to assist public policies designed to improve reputation in countries where it is needed.

Introduction

In an increasingly globalised world, a country's reputation is a very important aspect in many dimensions. Reputation serves an important role when nations compete for foreign investments, tourism, and trade, and it is also a critical element in public relations and diplomacy (Yang et al. 2008). In fact, currently, countries are ever more concerned about their reputation and aim to energetically manage and measure it, to gain a competitive advantage (Passow et al. 2005). The number of countries that consider their reputation, image, and brand as serious strengths and as supports for their success in the long term is increasing.

The current globalisation process has caused countries to be fully aware of the way they are depicted because of the significant competition among nations in every industry, market, and aspect of a consumer society (Stock 2009, Saunders 2008, Avraham–Ketter 2008, Dinnie 2007, Skinner–Kubacki 2007, Anholt 2002, 2007,

Olins 2002). A nation's image is important for many reasons, such as self-perception and economic and political reasons, both intra- and internationally (Avraham–Ketter 2008, Dinnie 2007, Anholt 2006, 2005, Fan 2006, Gertner–Kotler 2004, Gilmore 2002). A country's reputational capital could impact its capacity to shape alliances and agreements with other countries (Nye 2004), to affect consumer perceptions and purchase choices among international and national brands (Papadopoulos–Heslop 1993, Jeffe–Nebenzahl 2001), and to attract international investments and tourism (Kotler–Gertner 2002, Tapachai–Waryszak 2000). The status of a country's reputation has convinced policymakers, governments, and society to take significant steps to market their brand and image.

It is always beneficial to improve current measurements that can serve as good assessments of the position of different countries, and based on these measurements, to be able to make different decisions. The importance of an index of such international magnitude will drive how countries allocate resources to improve their 'brand', which, when looking at the different elements that can be affected by a reputation index, can be a determinant in the decisions of a large percentage of the world population. This compels governments to form teams focused on selling the different positive aspects of a country, as well as to improve the different qualities that people are seeking, without forgetting their citizens, who will act as a reference of opinion regarding the various changes accomplished. Therefore, each country's inhabitants will be responsible for measuring the value of those changes.

There are several measurements assessing the image or reputation of countries worldwide, such as the following indexes: Nation Brand Molecule (Rojas-Mendez 2013), Country Brand Strength (Fetscherin 2010), Nation Brands (Anholt 2005), and Fombrun-RI Country Reputation (Passow et al. 2005). Other institutionalised indexes are the Good Country Index, Global Competitiveness Index, and Country Reptrak, among others.

We propose a new index to analyse a nation's reputation. Using information on the 28 nations in the European Union, we compute, via a principal components analysis, this International Reputation Index as a mixture of 32 factors grouped in 5 dimensions: Economy, Social Welfare, Environment, Digitalisation, and Sports and Health.

Results show that the top scores in this index (with 2016 data) are Germany, United Kingdom and Sweden. Contrasting these results to other rankings, Country Reptrak 2016 has as a top 3 comprised of Sweden, Canada and Switzerland. On another hand, the Global Competitiveness Index 2016–2017 has the following top 3: Switzerland, Singapore and United States. The Nation Brand Index for 2017 positions Germany, France and United Kingdom as their top 3, which also equates our results. Finally, the Good Country Index presents Netherlands, Switzerland and Denmark as their top 3.

The rest of this paper is ordered as follows. Section 2 defines the framework utilized for the consideration of the 5 dimensions of the International Reputation Index. Next, section 3 describes the variables used to compute the index. Section 4 presents the methodology used to calculate the index and the following ranking. Section 5 describes results while the final section concludes this paper.

Background

Traditionally, being an economic superpower or having a strong military would have sufficed to ensure a nation's survival and its position on the world stage. However, international relations have experienced a substantial shift and, although these factors are still important, they are not the only ones that establish a country's status and influence.

Country officials and administrations are constantly using branding methods to improve their nation's image worldwide and to create a competitive advantage over other countries. Managing a country's reputation through country branding has gained popularity among both researchers and practitioners (Che-Ha et al. 2016, Pike–Page 2014, Herstein 2012). Different terms have been used to describe this phenomenon, such as destination branding, place marketing, and country or nation branding (Passow et al. 2005).

One of the main reasons to use nation branding methods is rooted in the belief that a robust country brand can yield better results in a nation's sustainable development (Fetscherin 2010, Kleppe–Mossberg 2006). A good global image can improve weak international credibility, increase the nation's political impact, stimulate stronger international agreements and negotiations (Yan 2008), and attract consumers, visitors, businesses, and investors – among other groups – to the country (Morgan et al. 2011, Gudjonsson 2005).

According to Kang and Yang (2010), a nation's reputation refers to the perceptions of a country that are shared by both national and international audiences, based on their own personal experiences with the country, and based on data collected from that nation. Furthermore, Kleppe et al. (2002) state that a nation's image always lies between a personal image, unique to every person, and a public image based on what characteristics, news, and policies of the country are publicly shared. This public image is what can be called reputation (Bromley 1993). Yang et al. (2008) presented through 2 types of individual experience: personal experience and second-hand experience.

On one hand, several researchers have found that individual experience has favourable effects on the awareness of a reputational entity (Yang 2007a, b, Yang–Grunig 2005, Fombrun–van Riel 2003, Grunig–Hung 2002). This increasing awareness could positively affect reputation as a relevant factor when people evaluate a country (Fombrun–van Riel 2003, Deephouse 2000). On another hand, and accord-

ing to Kunczik (1997), people assess multiple aspects of a country, including the nation's economy, people, politics, news, or culture, without a direct experience of these aspects. Instead, their decision-making processes are often done through images of a country.

To achieve a high reputation, nations need to be competitive enough to retain and enhance their resources and to be viewed by their citizens as a place that is able to fulfil their desires and that can provide them with opportunities to improve their skills and enjoy their interests (Morgan et al. 2012, Blichfeldt 2005, Kotler 2004).

National reputation and its impact on a country and its citizens can be examined from two main viewpoints: public diplomacy and nation branding (Yang et al. 2008).

First, from the perspective of public diplomacy, national reputation can be a significant element in international agreements and in achieving a strategic position (Kruckeberg–Vujnovic 2005, Melissen 2005), by developing and enhancing what Nye (2004) calls soft power. The latter is the diplomatic ability obtained through the appeal of a nation's policies, how it treats its citizens, and its collective culture, which can be improved by effective country reputation management. A country's reputation and its relationship with other nations and international stakeholders are, undoubtedly, tools to exercise power, playing a significant role in both public and foreign policy (Wang 2006a, b).

Second, in terms of nation branding, a prominent nation image significantly impacts consumers' perception and willingness to pay for products made in a country. According to Stock (2009), countries should manage their brands to appeal to tourists, to attract foreign investment and talented residents, and to add value to the products it manufactures. Lee (2009) offers a comprehensive literature review on nation branding.

Researchers have analysed several dimensions of nation branding using indexes and models. For example, De Vicente (2004) used four dimensions to analyse country branding: tourism, public diplomacy, export promotion, and investment promotion activities. On the other hand, Gudjonsson (2005) used the following four dimensions: people and culture; politics, structure, government, and policies; economy, industries, companies, and brands; and, geography.

One of the most well-known indexes is the Nation Brands Index (Anholt 2005), which uses six dimensions: exports, governance, investment and immigration, culture and heritage, people, and tourism. Building on Anholt's (2005) research, Johansson (2005) presents an index comprising six dimensions: exports, government policy, citizens, investment and talent, cultural exports, and tourist experience. Amine and Chao (2005) also build on Anholt's (2005) work, presenting the National Brand Pentagon, which focuses on tourism, export brands, foreign policy, investment, and culture.

The Fombrun-RI Country Reputation Index measures 6 dimensions to assess country branding: emotional, physical, financial, leadership, cultural, and social (Passow et al. 2005).

Fetscherin (2010) presented the Country Brand Strength Index, which attempted to measure some aspects of a country's brand strength. It uses five dimensions: Exports, Tourism, Foreign Direct Investment, Immigration, and Government Environment. Finally, Rojas-Méndez (2013) presented Nation Brand Molecule, which comprises seven dimensions: Economy, Geography and Nature, Tourism, Culture and Heritage, Society, Science and Technology, and Government.

Currently, there exist two very important indices that attempt to measure different countries' reputations: Country Reptrak and The Global Competitiveness Report.

Country Reptrak is an index computed annually, which, through a series of factors, generates a classification of the different 55 countries that it aims to assess. To obtain the data for the ranking, interviews regarding the different factors are conducted with people from 23 different countries. The factors examined are grouped in three groups: Quality of life, Institutional quality, and Level of development. All the factors have different weights in the index, by which they are multiplied to correctly weight the groups. This index aims to classify the attractive national qualities of each country. The way it measures perceptions of the country is through an indicator. This indicator seeks to capture the interviewees' perceptions of the countries they are asked about. The indicator is based on the respect, trust, and admiration the interviewee has for the different countries. One of the major problems of this index is the manner of obtaining the data, which does not seem to be the most appropriate in terms of reliability; since approximately 56,000 different people are interviewed, subjectivity characterizes the perceptions and, therefore, overall, the data will not be reliable. Further, the number of factors is relatively small for measuring a country's different aspects, and, additionally, the factors chosen result in different aspects not being measured. Therefore, this is an index based on perceptions, which seeks to analyse 55 different countries in a generalised manner. The subjectivity of this index results in the data not fully meeting different investors' reliability requirements.

The Global Competitiveness Report is a very prestigious index, computed by the companies at the World Economic Forum. This index gathers data from 138 economies and seeks to measure both their productivity and prosperity. The factors used in this index, are completely different than those of Country Reptrak. They belong to three different groups, according to the type of economy that the factor affects. In total, the index uses 12 factors to measure the most important aspects of a country. This index focuses on the economic area of the countries, which involves different types of data and, therefore, constitutes a great reference for investors, if they want to analyse each country's economic aspects. The index shows the different economic aspects of 138 countries. It is published by a prestigious company investi-

gating countries' economic aspects, and can provide a large utility as a great reference for investors trying to determine a country's economic vision. However, it does not cover different aspects such as digitalisation, the environment, and the policies a government imposes on its citizens. This makes this index incomplete as an indicator, since an investor seeks the greatest possible information on a country, looking for factors that cover the maximum number of aspects of that country.

Below, we present our index, which comprises five dimensions.

Data

Our index is based on 32 different factors grouped in 5 dimensions.

Through the Economy dimension, the index seeks to encapsulate all the elements associated with the way a nation manages its resources (Rojas-Mendez 2013). On one hand, tourism is usually the most marketed facet of a country's image (Anholt 2005). On the other hand, news about economic health and policies are significant communication tools for positioning national and international brands (Gudjonsson 2005). Brands that are exported are an influential aspect of a country's brand. Positioning a national brand creates a positive association in consumers, representing a nation's uniqueness and its attractive characteristics. Exported brands reflect the area in which the country is well-known (Che-Ha et al. 2016).

The Social Welfare dimension seeks to bring together several aspects of the lifestyle of a country's citizens, the type of government at a given time, and the benefits this government provides to its citizens (Gotelli 2017). We also measured the educational system, since it can serve as a reference for the future performance of a country (Miranda 2008, Bara 2018). The characteristics of the people and the environment in which they live are some of the most significant parts of a nation's image, brand and reputation. It is essential to study the country's character, customs, and culture and to understand how they can be used to improve the country's brand (Gudjonsson 2005).

The Environment dimension seeks to combine the different aspects that reflect the country's commitment to the environment (Hernández-Contreras 2018). Some of the most influential elements of a nation's characteristics and how these are perceived are its climate, the way it protects the environment, and how cities are portrayed in the world and how they are run (Gudjonsson 2005). A nation can attempt to solve its environmental issues by obtaining assistance and consideration at a global stage. Nations advancing their social responsibility by adhering to environmental causes and using moral and social advertising can attract global attention and aid (Che-Ha et al. 2016).

The Digitalisation dimension seeks to combine both the ability of citizens to have a more digitalised lifestyle and a country's existing facilities for accessing the

internet (Blaya et al. 2017). This dimension allows measuring a country's predisposition towards and adaptation to new technologies.

The last dimension is called Sports and Health and seeks to represent how active and healthy a country's citizens are (Requena 2017). Human capital is one of the most influential communication device in branding a country. Citizens become national ambassadors and produce an image for their country – positive or negative – especially famous individuals, such as celebrities, politicians, and international athletes. This can impact societal sensitivities towards a country by improving its favourable image (Che-Ha et al. 2016).

The data platform from which we have been able to obtain the data for each of the factors is EUROSTAT (2016); we also employed some data from OECD (2016).

Economy

This dimension comprises 10 factors related to a country's economy: *GDP; Moody rating*; *Imports and Exports*; the Harmonized Index of Consumer Prices (*HICP*), to measure the reliability of the economy; *Air transport of goods,* measured as tons of cargo carried by aircraft; *Air transport services,* measured as the number of passengers being transported; Domestic Material Consumption (*DMC*); *Housing prices*; *Government earnings,* measured as a percentage of GDP; and, *Government Debt,* measured as a percentage of GDP.

Social Welfare

This dimension groups 11 factors related to a country's social welfare: *Employment rate*; *Transport and infrastructure,* measured as investment in public transport; *Retirement support,* measured as the employment rate of people between 55 and 65 years old; *Population projection* for 2020-2040; *Social protection,* measured as governmental expenses on social protection programs; *Social exclusion and poverty risk,* measured as the increase, from 2008 to 2016, in the population affected by poverty or social exclusion problems; *Research and development,* measured as a percentage of the government's total investment in research and development; *e-government,* measured as the ability of citizens to interact with public authorities through the internet; *Education,* measured as the percentage of the population with only a secondary education; *Average wage of workers*; and, *Ratio of pension to salary*.

Environment

This dimension is composed of 3 variables related to energy consumption and environmental protection: *Sustainable energy,* measured by the 2016 Trilema Index value; *Environment protection,* measured as CO_2 emissions of new cars; and, *Consumption of*

renewable energy, measured as the percentage of renewable energy consumed compared to the total energy consumed.

Digitalisation

This dimension is formed by 4 variables related to digitalisation: *Employees in the technology sector,* measured as the percentage of all employees in the country who work in media or high-tech businesses; *Employees who work in science or technology,* measured as the percentage of employees working in a science or technology field; *E-commerce,* measured as the percentage of individuals between 16 and 74 years old who use the internet to purchase goods and services; *Skills within the digital world,* measured as the percentage of people with sufficient digital skills to handle societal situations.

Sports and Health

Finally, this dimension combines 4 factors related to health and sports: *Sports Expenditure,* measured as sports' sector costs; *Work in sports,* measured as the employment rate within the sports sector; *Health expenditure,* measured as the percentage of GDP allocated to the health sector; and, *Life expectancy,* measured as women's life expectancy.

Methodology

In the construction of all kinds of indices, an analysis is conducted, through which the researcher decides what weights to assign to each factor in the index. To do this, he or she must take into account the number of factors used in the index (Delbianco 2019, Valkó et al. 2017). In our case, the index consists of 32 factors, comprising the different dimensions. The 32 factors to analyse are grouped in five different dimensions, shown in Table 1 below.

Table 1

Factors of the Reputational Ranking of countries in the European Union

Dimension	Number	Factor	Meaning
Economy	1	GDP	Country GDP
	2	Moody's Rating	Company that rates the economy of the different countries
	3	Outside marketing	Imports and exports
	4	Reliability of the economy	HICP factor for comparisons with inflation
	5	Air transport of goods	Tons of cargo carried by aircraft
	6	Air transport services	Number of passengers carried by companies
	7	Productivity of treated materials	Size of governmental subsidies per kg of matter (Euros)
	8	Housing prices	Housing price increase compared to 2015
	9	Government earnings	Percentage of GDP
	10	Government debt	Government debt as a percentage of GDP
Social Welfare	11	Employment rate	Employment rate
	12	Transport and infrastructure	Percentage of public transport use
	13	Employment rate of people aged 55–65	Ability of companies to support workers near their retirement
	14	Population projection	Projected population change from 2020 to 2040, based on the changes in cities' populations
	15	Social protection	Number of social protection beneficiaries in millions
	16	Risk of poverty or social exclusion	Change compared to 2008
	17	Research and development	Percentage of the government's total budget, and percentage of government investment
	18	E-government	Citizens' ability to interact with public authorities through the internet
	19	Population with only secondary education	Percentage of young people who do not continue their studies after secondary school
	20	Average wage of workers	Average wage
	21	Ratio of pension to salary	Relationship between the salary of a pensioner compared to his or her salary before retirement
Environment	22	Sustainable energy	2016 Trilema Index
	23	Environmental protection	Emissions of new cars
	24	Consumption of renewable energy	2020 goal: percentage of renewable energy in the consumed total
Digitalisation	25	Employees in the technology sector	Percentage of all employees in the country who work in media or high-tech
	26	Employees working in science or technology	Percentage of employees working in science or technology
	27	E-commerce	Percentage of individuals between 16 and 74 years old who use the internet to purchase goods and services
	28	Skills in the digital world	Percentage of people with sufficient skills to handle within the world of basic digital
Sports and Health	29	Sports Expenditure	Costs in the sport' sector; growth compared to 2015
	30	Employment in sports	Result of survey conducted to determine the employment within the sport sector
	31	Health expenditure	Percentage of GDP allocated to the health sector
	32	Life expectancy	Women's life expectancy

For the construction of the International Reputation Index, a Principal Component Analysis (hereinafter referred to as PCA) will be used to choose the variables and weights, according to the methodology described in the OECD handbook (OECD 2008). PCA is a statistical technique that allows the extraction of significant information from a multivariate table and its subsequent representation as a set of main components. These components are a linear combination of the original variables and are constructed according to their order of importance in terms of the total variability they capture from the sample. It is a widely used method in the literature (e.g. Fernandez-Crehuet et al. 2019, 2017, 2016, Jemmali–Sullivan 2014, Bellido et al. 2011).

The objectives of this method are:

a) to reduce the dimensionality of multivariate data through a number of main components that are fewer than the number of original variables
b) to eliminate redundant information by reducing the impact of information redundancy, by not taking into account the accumulation of covariance among the primitive variables
c) to capture, in the new components, part of the total variance, with a minimum loss of information, ensuring the maximum discriminating power between them.

One of the requirements for a correct application of PCA is that variables must be measured on the same scale. There are several methods for normalising data, which include the use of the range of observations, standardisation, distance from or to a reference, or indicators for below or above the mean (OECD 2008). We select standardisation as our method of normalisation, which uses each variable's z-scores. Using the mean (μ) and standard deviation (σ) of each variable, we find the z-score value through the formula $z = \frac{X - \mu}{\sigma}$ (where '*X*' is the value of the variable).

Following Spector (1992), we set the minimum number of variables per dimension to 3, taking into account that 3 elements per category must be regarded as a minimum and not as optimal. All the established groups have at least 3 elements, so this requirement is adhered to.

To assign weights to the variables, we identify the main components for every dimension. To choose the number of components, we apply several criteria, based on OECD (2008):

1. Components whose individual values (or self-values) are greater than 1.
2. Components that individually explain more than 10% of the variance.
3. Components presenting an accumulated explained variance greater than 60% of the total explained variance.

The number of dimensions is 5 (Economy, Social Welfare, Environment, Digitisation, and Sports and Health).

Second, the factor loads given by PCA (through the matrix of rotated components) are used to allocate the variables to each component, by the highest absolute value of the factor load.

Third, following OECD (2008) in the calculation of the index, a matrix is constructed with the squared factor load values. Then, all factors are added to the square of each component and the squared factor loads are divided by the sum. This results in the indicator's percentage of the total unit variance.

As a final step, using the proportion of variation that each component can account for, we correct the squared factor loads of the variables, thus obtaining the final variable weights.

The International Multidimensional Reputation Index

If we look at the relationship between the International Multidimensional Reputation Index and its five components, we observe that the five components are positively related with reputation, which means that a higher level of economy, social welfare, environment, digitalisation and sports and health conditions of a country are all factors related to a better reputation. To compare the different dimensions, different factors have been gathered for each dimension, all of which are normally distributed. We have used the weights obtained from PCA. Furthermore, countries ranking high on our index are also highly ranked in all the components of the index, whereas countries ranking low are also low-ranked in all the components of the index.

Tables A.1, A.3, A.5, A.7, and A.9 in the Appendix present the PCA results on each variable contained within the dimensions of *Economy*, *Social Welfare*, *Environment*, *Digitalisation*, and *Sports and Health*. For the *Economy* dimension (Table A.1), we chose the 4 components with eigenvalues larger than 1. The variation explained by each component exceeds 10% and the components jointly explain 79.8% of the variation. For the *Social Welfare* dimension (Table A.3), we chose the first 3 components, following the same logic as for the last dimension. They are jointly able to explain 64.2% of the variation. For the *Environment* dimension (Table A.5), we chose the first 2 components, able to explain 85.7% of the variation. For the *Digitalisation* dimension (Table A.7), we chose the first 2 components, explaining 92.9% of the variation. For the *Sports and Health* dimension (Table A.9), we chose the first component, as its eigenvalue is larger than unity and it explains more than 10% of the variation, namely, 53.2%.

Factor loadings for the dimensions of *Economy*, *Social Welfare*, *Environment*, *Digitalisation*, and *Sports and Health* are shown in tables A.2, A.4, A.6, A.8, and A.10, respectively. We select the highest factor loading of each variable, and assign the variables to the components as follows: for the *Economy* dimension (Table A.2), the variables *Air transport of goods*, *Air transport services,* and *DMC* are assigned to Component 1; *GDP*, *HICP* and *Government earnings* are assigned to Component 2; *Moody rating* and *Government debt* are assigned to Component 3; and, *Imports and exports* and *Housing*

prices are assigned to Component 4. For the *Social welfare* dimension (Table A.4), *Employment rate, Retirement support, Population projection, Social exclusion, Research and development, e-government,* and *Average wage of workers* are assigned to Component 1; *Transport and infrastructure*, *Social protection,* and *ratio of pension to salary* are assigned to Component 2; and, *Education* on its own is assigned to Component 3. For the *Environment* dimension, *Sustainable energy* and *Consumption of renewable energy* are assigned to Component 1 and *Environment protection* is assigned to Component 2. For the *Digitalisation* dimension, only *Employees in tech* is assigned to Component 2 whereas the rest of the variables are assigned to Component 1. Finally, for the *Sports and Health* dimension, all the variables are assigned to Component 1.

Table 2

Reputational Ranking of countries in the European Union

Country/ Dimension	Ranking	Economy	Social Welfare	Environment	Digitalisation	Sports and Health
Germany	1	1.030884302	0.505692367	0.536440085	0.990352535	1.786393785
United Kingdom	2	0.800413149	0.48533515	0.027313935	0.77068309	2.012473994
Sweden	3	0.177551005	0.379155592	1.523706603	0.77861922	1.027436059
France	4	0.585961167	0.403212836	–0.024448712	0.266648827	1.276104074
Denmark	5	0.002781916	0.348880165	0.189819579	0.981752157	0.621194704
Netherlands	6	0.55065989	0.429904449	–0.439774747	0.677240675	0.779751604
Austria	7	0.133869566	0.154196611	0.740138685	0.425769751	0.375223885
Finland	8	–0.131281627	0.187412021	0.890047323	0.746205359	0.100191168
Spain	9	0.395453512	0.575554821	–0.091687616	–0.263856126	0.598632834
Luxembourg	10	0.253528826	0.43458398	–0.409780548	0.807918628	–0.551199974
Belgium	11	0.280448939	–0.028167702	–0.486784555	0.261914379	0.424344744
Italy	12	0.42323276	0.442292905	–0.294173511	–0.584146575	0.42567827
Estonia	13	–0.481082225	0.121934903	0.461654912	0.14210659	–0.71084786
Slovenia	14	–0.22148916	–0.524939821	0.302634636	0.261775914	–0.316612912
Czech Republic	15	–0.223197154	–0.256798692	–0.182809553	0.348799077	–0.245237506
Slovakia	16	–0.261055209	–0.318984473	0.098761964	0.3087528	–0.529397795
Ireland	17	–0.074071713	–0.062336155	–0.481332824	0.117755229	–0.400344114
Hungary	18	–0.116209437	–0.137182878	–0.046122936	–0.031664001	–0.600545014
Portugal	19	–0.143135795	0.333078026	–0.194669195	–0.745759557	–0.202795745
Latvia	20	–0.418424416	–0.293488329	0.963425842	–0.500934196	–1.285982405
Poland	21	–0.328567234	–0.509491957	–0.187209727	–0.293219569	–0.626290517
Bulgaria	22	–0.479063772	–0.553096453	–0.21659734	–1.189275012	0.189134239
Malta	23	–0.166074997	–0.127231212	–1.096295406	–0.393053444	–0.53914327
Romania	24	–0.442781271	–0.202598986	0.028630886	–1.27469392	–0.441601517
Lithuania	25	–0.418033096	–0.527190204	0.226318515	–0.440443855	–1.234220477
Cyprus	26	–0.37747352	–0.302310191	–0.476551534	–0.718187215	–0.649970457
Greece	27	–0.050437155	–0.182857789	–0.856397686	–0.90053484	–0.612985277
Croatia	28	–0.302407253	–0.774558985	–0.504257075	–0.550525922	–0.66938452

Table 2 shows the computation results of the index and the corresponding ranking, sorted from best to worst. In the computation, we use equal weights for every dimension.

As can be seen, in 2016, the greatest value of the reputation index is attained by Germany. Immediately below Germany are the United Kingdom and Sweden.

Contrasting these results to rankings by other indices, Country Reptrak 2016 exhibits a top 3 comprising Sweden, Canada, and Switzerland. On the other hand, the Global Competitiveness Index 2016-2017 has the following top 3: Switzerland, Singapore, and United States. The Nation Brand Index for 2017 places Germany, France, and the United Kingdom as the top 3, which is very similar to our results. Finally, the Good Country Index presents Netherlands, Switzerland, and Denmark as their top 3.

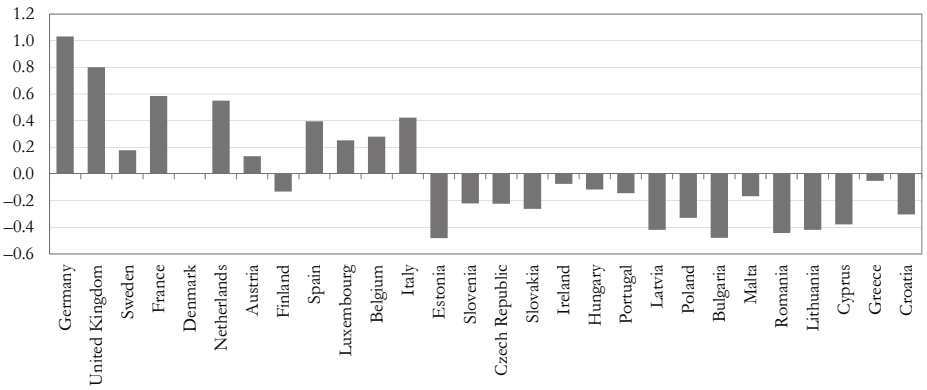
The analysis by dimension is as follows:

Economy

In the economic dimension, which combines 10 different factors, such as GDP, Imports and exports, Government earnings, and Debt, the country in the top position is Germany, whose value is above the average, compared to the other 27 countries. What is interesting and can be seen in Figure 1 is that Sweden, a country that appears third in the overall ranking, exhibits a low – although positive – value. The same happens with Denmark, with a value almost equal to 0. On the other hand, the country lowest in the dimension of economy is Estonia. This country is far below the average of the other countries; therefore, to raise its value in this dimension, it will need to change different aspects of its economy.

Figure 1

Normalised values of the Economy Dimension



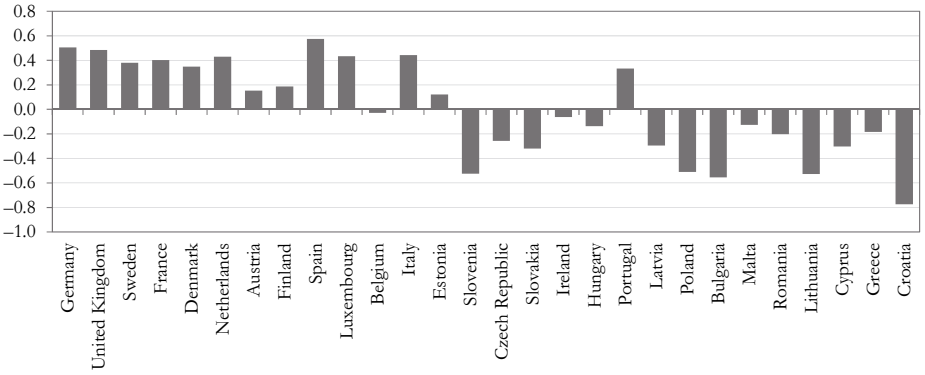
Social Welfare

Within the dimension of social well-being, we found a total of 11 factors, which seek to combine the important aspects of a country's system of government, and other important aspects of its citizens' lifestyle. Variables included in this dimension ranged from *Employment rate* and *Transport and infrastructure* to *Social protection* and *Education*. In this dimension, the country at the top position is Spain, followed by Ger-

many. As regards the negative values in this dimension, the most negative value is exhibited by Croatia, which is at the bottom of the overall ranking.

Figure 2

Normalised values of the Social Welfare Dimension

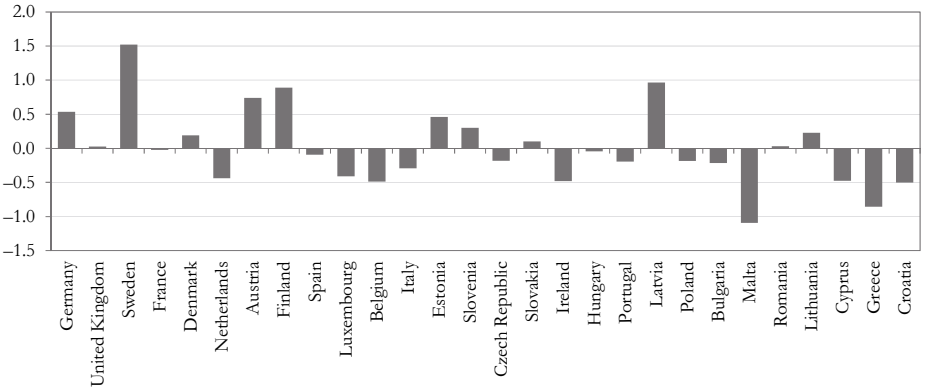


Environment

The environment sector seeks to combine three different factors on energy and sustainability, as well as on the commitment to protecting the environment. The highest positive value of this index is attained by Sweden, due to its large commitment to renewable energies and their high ranking based on the 2016 Trilemma Index. On the other side of the index values lies Malta, which obtained a very low value in the index.

Figure 3

Normalised values of the Environment Dimension



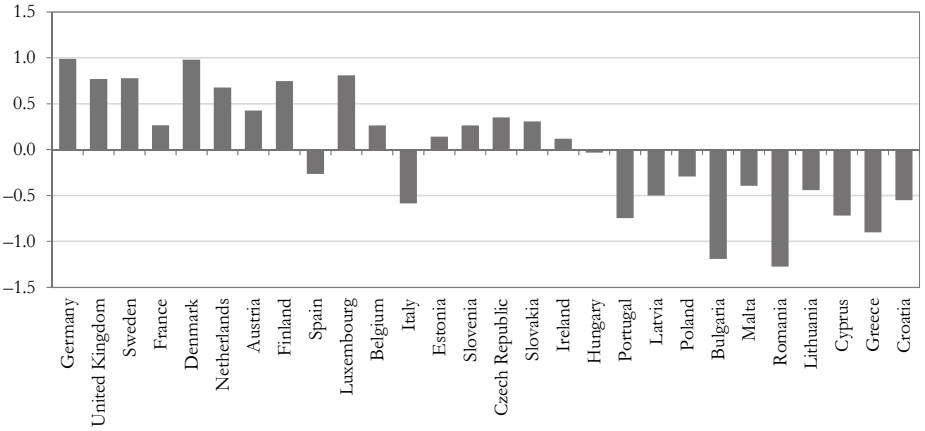
Digitalisation

In the field of technology, which intends to combine a country's technological capabilities, the country with the most prominent score is Germany. This country is a large economic force but also has a very strong technology sector, as a result of the

number of employees working in this sector. In contrast, Romania is the worst country in this dimension, due to its citizens' low level of digital knowledge.

Figure 4

Normalised values of the Digitalisation Dimension

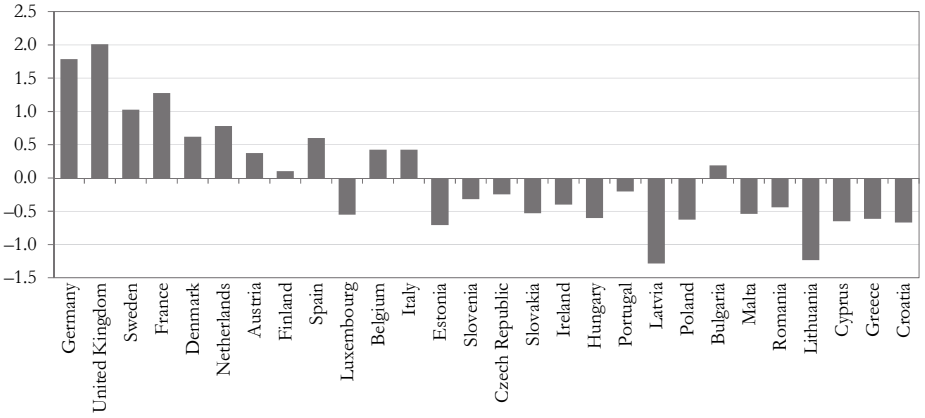


Sports and Health

This is the last, but not a less important dimension of our index; it measures the citizens' sports activity and the health level using 4 different factors. In this dimension, we attempt to combine the different capabilities of the government in the field of health, as well as a society's interest in sports. Here, due to its citizens' great interest in sports, the United Kingdom has the highest value, at a large difference from the second-ranked country. On the other hand, Latvia is in the last position in this dimension, due to large weaknesses in the factors reflecting citizen health.

Figure 5

Normalised values of the Sports and Health Dimension



Conclusion

A country's reputation is a very important aspect in many areas. The current globalisation process has resulted in countries being fully aware of the way they are depicted because of the significant competition among nations in every industry, market, and aspect of a consumer society. A nation's image is important for many reasons, such as self-perception, and economic and political reasons, both intra-nationally and internationally.

We propose the International Multidimensional Reputational Index as an instrument to measure the problems and possibilities countries have for improving their reputation. Thus, the creation of an index for comparing countries, and for discerning the differences among them in a range of factors, should be of great interest to politicians, employers, and individuals.

In this study, we adopt a global perspective, using a set of variables measured at the country level to evaluate the conditions for a country to have a high reputation in Europe. The index is a combination of five dimensions: Economy, Social Welfare, Environment, Digitalisation, and Sports and Health.

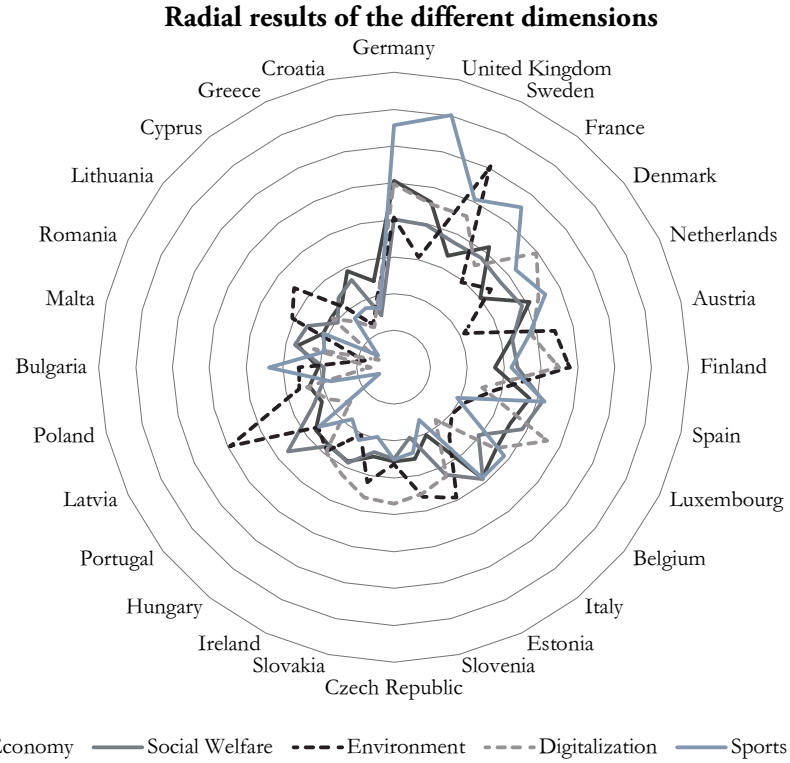
The purpose of the formulation of this index was the measurement of the reputation of the different countries in the European Union. To do this, using data from twenty-eight European countries, we chose 32 different factors, included in five dimensions, which seek to combine the most important aspects of a country's reputation.

The results show that, using our index, the top scores (based on 2016 data) are attained by Germany, the United Kingdom, and Sweden. On the other end of the spectrum, Cyprus, Greece, and Croatia are ranked in the last positions according to our index. Comparing our results to rankings based on other indices, we find there is some agreement. The fact that our index includes more dimensions may prove helpful for international comparisons.

In Figure 6, we can see the countries with the best reputation in each dimension.

To improve its position in the index, each country should decide whether to build on and advertise its strengths as compared to the other 27 European Union member-states, or to act in a different way, focusing on its weaknesses and taking measures to improve them.

Figure 6



We also demonstrate that there are significant country differences in the scores on the different dimensions of the index, indicating that reputation can be improved using a range of policy instruments. To the extent that more data becomes available, the index can be included in further analyses, which would improve our understanding of the concept of a country's reputation.

APPENDIX

Table A.1

Eigenvalues and variance explained by components in the Economy dimension

Com-ponent	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.57240927	35.7240927	35.7240927	3.57240927	35.7240927	35.7240927
2	1.71605413	17.1605413	52.8846341	1.71605413	17.1605413	52.8846341
3	1.53308194	15.3308194	68.2154535	1.53308194	15.3308194	68.2154535
4	1.16357509	11.6357509	79.8512044	1.16357509	11.6357509	79.8512044
5	0.82371219	8.23712189	88.0883263			
6	0.52180501	5.21805007	93.3063763			
7	0.32592519	3.25925188	96.5656282			
8	0.18786959	1.87869591	98.4443241			
9	0.0878282	0.87828202	99.3226062			
10	0.06773938	0.67739385	100			

Table A.2

Rotated factor loadings for variables in the Economy dimension

Denomination	Component			
	1	2	3	4
GDP	–0.110	–0.878	0.237	–0.047
Moody rating	0.400	0.359	0.747	0.136
Imports and Exports	0.080	–0.055	0.223	0.779
HICP	0.341	0.586	0.398	–0.259
Air transport of goods	0.816	0.133	0.162	0.416
Air transport services	0.919	0.082	–0.139	0.066
DMC	0.817	0.128	0.055	0.040
Housing prices	–0.188	–0.172	0.223	–0.778
Government earnings	0.064	0.900	0.068	0.155
Government debt	0.283	0.366	–0.837	0.011

Table A.3

Eigenvalues and variance explained by components in the Social Welfare dimension

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.44638813	31.3308012	31.3308012	3.44638813	31.3308012	31.3308012
2	2.09190846	19.0173497	50.3481508	2.09190846	19.0173497	50.3481508
3	1.52437284	13.8579349	64.2060857	1.52437284	13.8579349	64.2060857
4	0.97619953	8.8745412	73.0806269			
5	0.87384086	7.94400781	81.0246347			
6	0.71577453	6.50704123	87.531676			
7	0.45609976	4.14636147	91.6780374			
8	0.34484199	3.13492719	94.8129646			
9	0.26187281	2.38066189	97.1936265			
10	0.17191957	1.56290519	98.7565317			

Table A.4

Rotated factor loadings for variables in the Social Welfare dimension

Denomination	Component		
	1	2	3
Employment rate	0.799	–0.155	0.332
Transport and infraestructure	–0.218	0.667	0.351
Retirement support	0.6	–0.47	0.026
Population projection	0.618	0.066	0.056
Social protection	0.229	0.692	–0.444
Social exclusion	0.489	0.323	0.258
Research and development	0.666	0.031	–0.318
e-government	0.766	–0.249	–0.358
Education	0.028	0.139	0.927
Average wage of workers	0.788	0.354	–0.203
Ratio pension-salary	0.068	0.748	0.115

Table A.5

Eigenvalues and variance explained by components in the Environment dimension

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.51696768	50.5655895	50.5655895	1.51696768	50.5655895	50.5655895
2	1.05496051	35.1653502	85.7309397	1.05496051	35.1653502	85.7309397
3	0.42807181	14.2690603	100			

Table A.6

Rotated factor loadings for variables in the Environment dimension

Denomination	Component	
	1	2
Sustainable energy	0.77280712	–0.44702538
Environment protection	–0.005	0.95971148
Consumption of renewable energy	0.90660972	0.17846768

Table A.7

Eigenvalues and variance explained by components in the Digitalisation dimension

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.65143444	66.285861	66.285861	2.65143444	66.285861	66.285861
2	1.06414293	26.6035733	92.8894342	1.06414293	26.6035733	92.8894342
3	0.19930761	4.98269037	97.8721246			
4	0.08511502	2.12787541	100			

Table A.8

Rotated factor loadings for variables in the Digitalisation dimension

Denomination	Component	
	1	2
Employees in tech	–0.37	0.992
Employees in science	0.882	–0.327
e-commerce	0.969	0.091
Digital skills	0.947	0.002

Table A.9

Eigenvalues and variance explained by components in the Sports and Health dimension

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.12625907	53.1564768	53.1564768	2.12625907	53.1564768	53.1564768
2	0.88743001	22.1857502	75.342227			
3	0.5426444	13.5661101	88.908337			
4	0.44366652	11.091663	100			

Table A.10

Rotated factor loadings for variables in the Sports and Health dimension

Denomination	Component 1
Sport expenditure	0.891
Work in sport	0.773
Health expenditure	0.141
Life expectancy	0.289

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Modelling severe material deprivation rates in EU regions using fractional response regression

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odds ratios,
fractional response regression

Using Eurostat data for 2016, this study assesses the impact of various economic factors on severe material deprivation rates (SMDR) in European Union (EU) regions. As values of the analysed response variable range between 0 and 1, the study applies fractional regression as well as commonly used linear regression. Results of the extended RESET test indicate that the linear model suffers from misspecification, while there is no reason to reject the hypothesis regarding the adequacy of fractional response models (FRM). Therefore, to assess the unitary impact of explanatory variables on expected values of SMDR, a fractional response regression model with logit link function is used, which enables interpretations of odds ratios. It was found that SMDR is affected by regional-level factors such as median equivalised disposable household income, at-risk-of-poverty rate (ARPR), gross domestics product (GDP) per capita, long-term unemployment rate, and country-level drivers such as relative median at-risk-of-poverty gap, income quintile share ratio, and share of social protection expenditure in GDP.

Introduction

In recent years poverty has commonly been recognised as a state of multidimensional deprivations (Alkire et al. 2015; Asselin 2008). In order to identify poverty, various indicators that capture this phenomenon are incorporated into diverse analyses, depending on the context of the country or purpose of the research. Among others, a multidimensional approach is used in the European Union (EU), where three indicators (ARPR, SMDR, people living in very low work intensity households) are taken into account to assess the effect of implementation of the Europe 2020 strategy on the risk of poverty or social exclusion (Eurostat 2018a). These three indicators, which form the headline indicator, represent related but distinct aspects of poverty or social exclusion. It should be stressed that such an approach is

a result of political coordination involving a series of compromises between political and policy preferences and traditions of member states (Maître et al. 2013).

The first measure, ARPR, is the share of people with an equivalised disposable income below the at-risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income. The next, SMDR, is an indicator adopted by the EU Social Protection Committee that measures the percentage of the population that cannot afford at least four of the following nine items (Eurostat 2017, Guio et al. 2012): 1) to pay their rent, mortgage or utility bills; 2) to keep their home adequately warm; 3) to face unexpected expenses; 4) to eat meat, fish or a protein equivalent every second day; 5) to go on a week-long holiday away from home; 6) to have a television set; 7) to own a washing machine; 8) to have a car; 9) to own a telephone. The last indicator is the share of people aged 0–59 years living in households in which the members of working age (18–59 years, excluding students) worked less than 20% of their total potential during the past year. The definition of the EU's poverty and social exclusion headline target is based on a combination of these three indicators. Thus, it extends the traditional concept of income poverty to cover material deprivation and labour market exclusion, reflecting the multiple aspects of poverty and social exclusion across Europe. It should also be noted that the SMDR reflects absolute poverty, while the ARPR captures relative poverty. This is because absolute measures define poverty on the basis of a normative judgement of, for example, what qualifies as basic needs, wherein the level of fulfilment of considered needs is not compared to the level of fulfilment of needs of other society members. Alternatively, relative measures of poverty fix an arbitrary threshold relative to a typical standard in society (Boarini–D'Ercole 2006).

This study analyses the 2016 data as part of the mid-term review for Europe 2020. We focus on the issue of material deprivation. There are many reasons for our interest in this issue. First, the indicator 'people living in very low work intensity households' is a measure of social exclusion in the area of the labour market and should not be included in the analysis of poverty, as some experts suggest (Panek–Zwierzchowski 2016). Furthermore, the use of the subsequent indicator ARPR in regional analysis has some limitations. In our opinion, the comparison of living conditions in different EU regions on the basis of ARPR raises doubts due to the fact that the poverty threshold is computed separately in each country. As the poverty threshold changes over time and also varies by country, the ARPR approach does not permit a constant benchmark of poverty to be set, which would allow comparisons of poverty across time and space (Panek–Zwierzchowski 2014). Moreover, according to the Eurostat glossary (2017), the ARPR does not measure wealth or poverty, but low income in comparison with other residents in that country, which does not necessarily imply a low standard of living. In contrast to ARPR, the SMDR is an absolute indicator enabling regional comparison within the EU. If only relative na-

tional poverty thresholds were considered, the risk of poverty would seem to be rather similar among the entire EU, masking great differences in living standards among the population (Israel–Spannagel 2013). Instead, considering the inability to afford a particular item or activity is taken to represent the same level of deprivation irrespective of how many other people in the same country are in that situation (Nolan–Whelan 2010). Moreover, the material deprivation indicator seems to take the actual standard of living that people enjoy into account better as it measures the inability to consume goods and services that are seen as basic necessities in the EU conditions. Lastly, analysis of items capturing the same aspect of deprivation in the entire EU enables comparability between regions or countries (Guio 2009).

The current study examines the relationships between SMDR in EU regions and various regional- and country-level economic factors. It focuses on regional-level analysis because regions, not countries, are the key elements of EU policy (Becker et al. 2010). Thus, knowledge of regional differences in material deprivation are crucial for targeted anti-poverty policies (Węziak–Białowolska 2015). Our study also verifies econometric methodology by comparing the appropriateness of fractional response regression and commonly used linear regression. It applies Papke and Wooldridge (1996) methodology suggested to handle fractional response data.

The rest of this paper is organised as follows. First, we briefly review the research on correlates of material deprivation in the EU. In subsequent sections, we describe applied data and methods. Next, we present obtained results and discussion of these. Finally, in the last part of the paper, we summarise the results and provide concluding remarks.

Literature review

As this study analyses material deprivation in the context of the Europe 2020 strategy, in this section we focus only on the literature related to modelling this phenomenon in the EU.

The first group of studies analyses correlates of material deprivation bases on micro-data analysis describing a households' behaviour. Studies in this field use mainly logit or probit models, in which the binary variable usually assumes the value of 1 if material deprivation occurs and 0 otherwise. For example, Nelson (2012), Rezanková and Želinský (2014), Bárcena-Martín et al. (2014), Šoltés and Ulman (2015), Israel (2016), Bruder and Unal (2017), and Saltkjel (2018) examine the impact of various socio-demographic and economic factors on probability of being deprived. In particular, most of the aforementioned studies confirm the role of such characteristics as the household structure, place of residence, income situation, as well as educational achievements and labour market status of the household's head.

The second group of studies concerns the modelling of SMDRs at the country level. For example, using simple two-dimensional analyses, Israel and Spannagel

(2013) reveal negative dependence of the median of households' equivalent income and positive dependence of households' income inequality. Acar et al. (2017) and B. Kis–Gábos (2016) find a negative relationship between the material deprivation rate (MDR) and GDP per capita. Moreover, Nelson (2012) highlights the role of social assistance benefit levels in the decrease in MDRs, and Whelan and Maître (2012) find a negative impact of government social expenditure as a percentage of GDP. Using more advanced econometric analyses, Blatná (2017) applies an autoregressive distributed lag (ADL) model to analyse EU MDRs for 2005–2015. The author finds that the material deprivation rate in the EU-28 depends on the proportion of people living in households with very low work intensity and of people with a secondary or lower level of education. Calvert and Nolan (2012) and B. Kis et al. (2015) use linear panel data models. In the former, the authors highlight the meaningful role of median income and income inequality in explaining the rate of material deprivation. Furthermore, grouping countries into three clusters classified according to the median level of households' income and estimating the models for each group separately, Calvert and Nolan (2012) find that the impact of both these variables are statistically significant only in low-income countries. B. Kis et al. (2015) consider a wide set of potential drivers, wherein they reveal a significantly positive relationship between SMDR and indicators of income poverty as well as the share of young people, while there is a significantly negative association with households' average income, households' savings rate, and employment rate. It is also worth mentioning Dudek's study (2019), in which the generalised estimating equations (GEE) method is applied to analyse country-level panel data. The author finds that SMDR in 2008–2015 was affected by such factors as median equivalised disposable income, relative median at-risk-of-poverty gap, long-term unemployment rate, GDP per capita, the share of social protection expenditure in GDP, and income inequality indices. Moreover, she demonstrates that GEE models for a fractional response variable exhibit better goodness of fit than linear models.

There is a lack of studies relating to the analysis of material deprivation at regional level. The few exceptions include Želinský (2012), who finds that there are significant differences in the material deprivation rates between and among Czech and Slovak regions. In particular, the level of deprivation is found to be higher in Slovakia, and deprived households are highly concentrated in the eastern part of this country. In terms of studies relating to SMDR in EU regions, using 2014 data, Dudek (2018) reveals the role of regional-level factors such as long-term GDP per capita, unemployment rate, median equivalised disposable income, and ARPR. This study aims to provide a deeper insight into the issue of regional severe material deprivation by considering both regional and country-level drivers. Moreover, it considers 2016 data, while Dudek (2018) examines the situation referring to 2014 data.

Data

The current study aims to analyse data on poverty indicators at a regional level using the most detailed Nomenclature of Territorial Units for Statistics (NUTS) level. The NUTS classification is a hierarchical system for dividing the economic territory of the EU[1]. The NUTS classification, specified in Regulation (EC) No 1059/2003 of the European Parliament and of the Council, comprises three levels covering levels 1, 2, and 3 from larger to smaller areas for each member state. However, depending on the country size, not all levels are available for each country (Haldorson 2019, Pathy 2017). For the size of NUTS regions, minimum and maximum population thresholds are defined in the regulation as a principle of the NUTS classification (Brandmueller et al. 2017). Another principle is that regions are composed by aggregating smaller administrative regions, as there is no administrative layer in the member states corresponding to a particular level (Eurostat 2018b).

In this study, the analysis at the regional level is restricted to countries for which relevant data is available. For the NUTS 1 and NUTS 2 level regions, Austria, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Greece, Spain, Finland, Croatia, Hungary, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Poland, Romania, Sweden, Slovenia, and Slovakia are included in the analysis; regions in Belgium, Germany, France, the United Kingdom, Ireland, Malta, and Portugal are excluded[2].

The empirical analysis is based on the following variables measured at the regional- and country-level. To variables measured on regional-level belong:

- GDP per capita expressed in thousands of purchasing power standard (PPS) units (GDP per capita);
- long-term unemployment rate, meaning the number of persons unemployed for 12 months or longer as a percentage of the active population (L_unemployment);
- the proportion of the population aged less than 60 years living in households with very low work intensity (Low_work_intensity);
- median equivalised disposable household income expressed in PPS (Income);
- ARPR.

The following are country-level variables:

- the relative median at-risk-of-poverty gap, which is calculated as the difference between the median equivalised net income of persons below the at-risk-of-poverty threshold and the threshold itself, expressed as a percentage of the at-risk-of-poverty threshold; this is set at 60% of the national median

[1] For more details, see Eurostat (2016).

[2] For Cyprus, Estonia, Luxembourg, and Latvia, no NUTS 2 level regions are described depending on their country sizes. For Lithuania, only two regions are described in NUTS 2 level, however, data is available only at country-level. Thus, the aforementioned countries are included in the analysis at NUTS 1 level with other NUTS 2 level regions. The total number of regions included in the analysis is 162.

equivalised disposable income of all people in a country and not for the EU as a whole (poverty_gap);
- income quintile share ratio calculated as the ratio of total income received by 20% of the population with the highest income to that received by 20% of the population with the lowest income (S80/S20 ratio);
- the ratio of total expenditure on social protection in relation to GDP (Soc_ protection).

It must be emphasised that Eurostat does not provide data on the above three variables at the regional level. Therefore, we consider these data at the country level. We analyse recent data from 2016. Table 1 reports descriptive statistics for all variables considered in the models.

Table 1

Descriptive statistics of variables

Variables	Mean	Standard deviation	Minimum	Maximum
SMDR, %	9.50	9.00	0.00	37.00
ARPR, %	17.70	7.80	4.00	42.00
Low_work_intensity, %	11.00	7.30	2.00	77.00
GDP per capita	26.54	10.39	8.60	76.20
L_unemployment	4.79	4.12	0.80	19.60
Income	14,491.36	4,147.41	6,000	24,900
Poverty_gap, %	25.60	6.60	13.90	36.20
Soc_ protection, %	24.60	5.50	14.60	31.80
S80/S20 ratio	5.35	1.38	3.50	7.70

Methods

Many indicators in social statistics take values in the [0, 1] interval. This class includes headcount ratios such as the material deprivation or ARPRs, and the Gini inequality index. Social scientists and policy planners often need estimates of this type of indicators. In econometric analysis of these phenomena, special regression models have recently been applied (Alkire et al. 2015, Dudek 2019).

We apply the FRM developed by Papke and Wooldridge (1996). FRM is a model of the mean of the dependent variable y conditional on covariates x, which we denote by $E(y|x)=\mu(x)$ Because y is in the [0, 1] interval, to ensure that $\mu(x)$ also belongs to it [0, 1], in an FRM it is assumed that

$$\mu(x_i)=G(x_i\beta) \tag{1}$$

where

$G(\cdot)$ is a known function with $0<G(z)<1$ for $z \in R$,
y_i is a response variable of region i,
x_i is a vector of covariates of region i,

β is an unknown vector of parameters to be estimated.

No other assumption is made about the underlying structure that generates y_i.

Typically, non-linear functional forms used for G are chosen to be a cumulative distribution function. The two most popular examples used in FRM are the logistic function $G(z)=\frac{\exp(z)}{1+\exp(z)}$ and $G(z)=\Phi(z)$, where Φ is the standard normal cumulative distribution function. It should be noted that G is the inverse function for the so-called link function providing the relationship between the linear predictor and the mean of the distribution function. It indicates how the expected value of the response variable relates to the linear predictor of explanatory variables[3].

The non-linear estimation of an FRM's parameters is performed via maximisation of the log-likelihood. The Bernoulli log-likelihood function for the FRM is in the following form:

$$lnL = \sum_{i=1}^{n} y_i \, lnG(\boldsymbol{x}_i'\boldsymbol{\beta}) + (1 - y_i)\ln\left(1 - G(\boldsymbol{x}_i'\boldsymbol{\beta})\right) \tag{2}$$

where y_i is the dependent variable for the i-th region, x_i are the covariates for region i, and n is the sample size.

Such an estimation approach is known as the quasi-maximum likelihood (QML) approach. It uses the Bernoulli log-likelihood because the log-likelihood function is easy to maximise, and because the QML estimator of β is consistent and asymptotically normal, regardless of the distribution of the dependent variable (Papke–Wooldridge 1996). For consistent parameter estimates, the conditional mean must be correctly specified. To test the correct link specification of the conditional mean function, extended Ramsey's RESET test, which is more common in the econometrics literature, can be applied (Ramsey 1969). Therefore, we consider following model instead of (1):

$$\mu(\boldsymbol{x}_i) = G\left(\gamma(\boldsymbol{x}_i'\boldsymbol{b}) + \delta(\boldsymbol{x}_i'\boldsymbol{b})^2\right) \tag{3}$$

where b is the vector of estimates of the parameters β in model (1). If the δ parameter differs significantly from zero, then the hypothesis regarding the correctness of the specification (1) should be rejected.

The partial effects in an FRM of a given variable, say X_j, are given by:

$$\frac{\partial E(y_i|\boldsymbol{x_i})}{\partial x_{ji}} = \beta_j \, g(\boldsymbol{x}_i'\boldsymbol{\beta}) \tag{4}$$

where $g(\boldsymbol{x}_i'\boldsymbol{\beta}) = \frac{\partial G(\boldsymbol{x}_i'\boldsymbol{\beta})}{\partial(\boldsymbol{x}_i'\boldsymbol{\beta})}$,

x_{ji} is a value of j-th explanatory variable for i-th region.

[3] For a discussion on link functions in fractional outcome models, see Smithson–Verkuilen (2006) and Ramalho et al. (2011).

Hence, the significance and direction of the marginal effects may be analysed simply by examining the significance and sign of β_j (Ramalho–Silva 2013). However, it should be emphasised that the marginal effects depend on the values of $\boldsymbol{x}_i$. Thus, these effects vary among the different observations in the sample. Therefore, to provide a simple interpretation of the results, we apply a logistic function enabling an analysis of the so-called odds ratios, wherein odds are defined as the ratio of the expected value of the response variable to its complement. More precisely, taking the ratio of the expected proportion of the population who experience severe material deprivation and the expected percentage of those who do not, so-called odds$= \frac{\mu(\boldsymbol{x}_i)}{1-\mu(\boldsymbol{x}_i)} = e^{(\boldsymbol{x}_i'\boldsymbol{\beta})}$ can be obtained. Thus, when the other explanatory variables in the model are held constant, $e^{(\beta_j)}$ measures the multiplicative effect of a unit change in j-th explanatory variable x_j on the odds ratio. An important property of odds ratios $e^{(\beta_j)}$ is that they do not depend on the level of other variables in the model (Cameron–Trivedi 2010). Specifically, for $\beta_j>0$, the odds are $\exp(\beta_j)$ times larger and $\exp(\beta_j)$ times smaller for $\beta_j<0$. Instead of a multiplicative change in the outcome, some researchers prefer the percent change. If $\boldsymbol{\beta}_j$ is positive, a unit increase in $\boldsymbol{x}_j$ indicates an increase in the odds by $(\exp(\beta_j)-1)*100$. Similarly, if $\boldsymbol{\beta}_j$ is negative a unit increase in $\boldsymbol{x}_j$ denotes a decrease in the odds by $(1-\exp(\beta_j))*100$.

Despite some similarities between FRM and the logistic regression model, it should be noted that the response variable belongs to the [0,1] interval in FRM, but it is a binary variable taking values 0 and 1 in the logistic regression model. FRMs have been applied in a variety of research disciplines, including social sciences, health sciences, and economics. To see how FRMs have been used, see Cardoso et al. (2010), Flores et al. (2015), Grzybowska–Karwański (2015), and Dudek–Szczesny (2017), among others.

Comparisons of models with different sets of explanatory variables can be made on the basis of information criteria, whereas in the formulas defining Akaike information criterion (AIC) or Bayesian information criterion (BIC), instead of the logarithm of likelihood y, the logarithm of quasi-likelihood is taken into account. To assess the fit to empirical data, the pseudo R^2 coefficient is used (Ramalho–Silva 2013), wherein it is equal to the square of the Pearson correlation coefficient between the variable y and its conditional expected value.

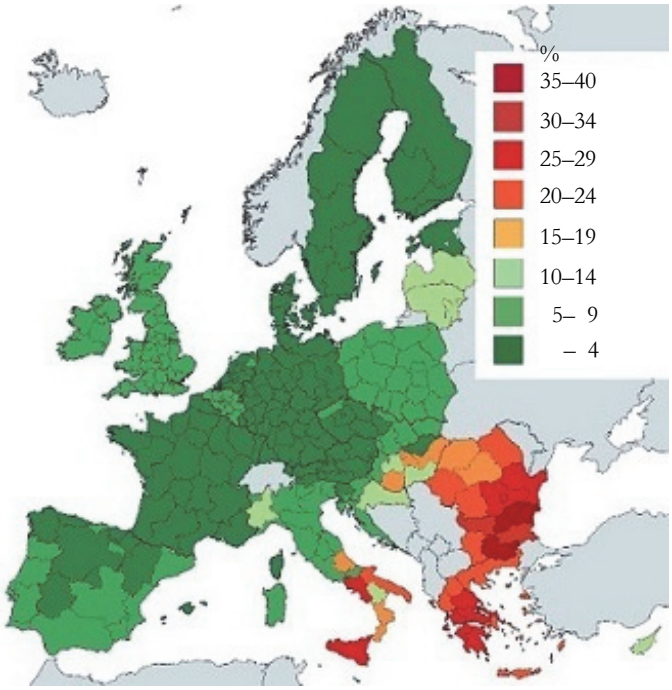
As we use two-level data, it would seem appropriate to apply a multilevel modelling approach. However, Bryan and Jenkins (2016) highlight that such an approach is not recommended for a small number of clusters. This problem concerns in particular the application of non-linear models for EU data with countries as clusters. The authors demonstrate that estimates of parameters summarising country effects are likely to be unreliable. Similarly, Schoeneberger (2016) confirms that more clusters are needed for accurate inference in non-linear models. Therefore, the multilevel methodology is not suitable in the case of non-linear modelling of our data.

Results and discussion

Preliminary analysis of the data revealed the occurrence of a significant differentiation of regional SMDR. In particular, in all regions of Sweden there are recorded values of SMDR below 1%, while in each region of Bulgaria the proportion of the population subject to severe material deprivation was above 30%, except Yugozapaden with 23%. Figure 1 depicts a map of severe material deprivation in EU regions. The coloured scale is divided into eight categories for values between 0 and 40%. Colours on the map change with increments of 5% in SMDR-ranging from the dark green colour representing SMDR between 0 and 5% to the dark red colour indicating SMDR between 35 and 40%. Countries coloured grey are not included in the analysis.

Figure 1

SMDR in EU regions



Source: Created by authors on mapchart.net.

According to Figure 1, countries with low SMDR do not have large differences in severe material deprivation among their NUTS regions. We observe the largest regional disparities in Italy, where there is a high level of discrepancy between the wealthy North and the poor South. In Romania, significant differences are observed between regions coloured with three different shades of red, which relate to SMDR between 15 and 30%. In southern Romania, SMDR is at the highest level, while it is

at the lowest in the centre. In addition, severe material deprivation is somewhat higher in Southern Greece than in Northern Greece, although all the regions show high severe material deprivation compared to other countries. Furthermore, Hungary is one of the countries where considerable regional disparities are observed in SMDR: rates vary between 2 and 20%. In Spain, the north shows lower SMDR than the south.

Unfortunately, Belgium, Germany, France, the United Kingdom, Ireland, Malta, and Portugal do not report any data for NUTS 1 and NUTS 2 levels. Their country-level SMDR are 6, 4, 4, 5, 7, 4, and 8%, respectively. Thus, these countries are shown in green in Figure 1 and do not show huge differences at the country level.

To identify the impact of factors influencing SMDR, we estimated FRMs. As these models require the explained variable to be in the [0, 1] interval, in our econometric analysis we take SMDR as numbers from the unit interval into account. For a clear interpretation of the results we do the same for all variables that are rates or shares, that is, for Soc_protection, L_unemployment, ARPR, and poverty_gap.

To observe the impact of each variable Table 2 presents the pseudo R^2 values for models with only one explanatory variable.

Table 2

Comparison of Pseudo R^2 values in the preliminary models

Regional level variables	Pseudo R^2	Country-level variables	Pseudo R^2
GDP per capita	0.54	Poverty_gap	0.30
L_unemployment	0.09	Soc_ protection	0.36
Income	0.63	S80/S20 ratio	0.48
ARPR	0.46	Together	0.60
Low_work_intensity	0.13		
Together	0.68		

As expected, regional-level median household income plays a substantial role in explaining the SMDR. Furthermore, the high importance of GDP per capita should be noted. This finding can be simply explained because the GDP per capita may be interpreted as general economic affluence reflecting many other socioeconomic variables (Bárcena-Martín et al. 2014); therefore it indicates the average material welfare of society. We find that among country-level variables the highest relevance exhibits an S80/S20 ratio. This indicates that there is a close relationship between inequality within a country and regional SMDR. Additionally, we show pseudo R^2 values for two models: the first one including only regional-level factors and the second model with country-level factors. It can be seen that the combined effect of regional-level drivers is slightly better than that of country-level drivers, but it should be emphasised that such an approach does not take relationships between regional- and country-level factors into account. Thus, in the next step of our analy-

sis, we attempt to build models that include both types of factors. However, considering all eight variables in one model leads to models with insignificant parameters of explanatory variables at the 0.1 level. Therefore, we analyse a few chosen models with the best goodness of fit. Table 3 presents the estimation results.

Table 3

Results of estimation of fractional response regression models

Variables	Models			
	1	2	3	4
Const	0.293 (0.695)	16.381*** (4.678)	14.946*** (3.998)	12.656*** (4.230)
Regional-level variables				
GDP per capita	–0.039* (0.020)	–	–	–
L_unemployment	0.070* (0.037)	–	–	–
Log Income	–	–2.027*** (0.483)	–1.989*** (0.394)	–1.761*** (0.406)
ARPR	–	2.657* (1.539)	–	–
Country-level variables				
Poverty_gap	–	–	5.889*** (2.005)	–
S80/S20 ratio	–	–	–	0.304*** (0.0955)
Soc_ protection	–8.612* (4.468)	–	–	–
AIC	0.475	0.462	0.455	0.453

Note: Robust standard errors in parentheses. For all models, robust standard errors clustered by countries are applied. * indicates statistical significance at 0.10, ** indicates statistical significance at 0.05, and *** indicates statistical significance at 0.01.

The first model includes explanatory variables relating to the economic situation in regions and the ratio of total expenditure on social protection in relation to GDP in the country. The results indicate that the increase in the expected values of the SMDR is influenced by the increase in long-term unemployment, the decrease in GDP per capita, and the percentage share of expenditures on social protection in GDP. These findings are consistent with other studies conducted for country-level data (Acar et al. 2017, B. Kis–Gábos 2016, Whelan–Maître 2012, Nelson 2012, B. Kis et al. 2015, Dudek 2019).

Models 2–4 include the median household income of the population in the given region and one variable relating to poverty situation or income inequality in the regions or countries. We could not incorporate all these variables into one model due to the high correlations between them; pairwise correlation coefficients between ARPR, Poverty_gap, and S80/S20 ratio exceed 0.5. As may be expected, higher

median household income indicates lower SMDR. A significantly negative relationship is observed, which is in line with the studies conducted for country-level data (Calvert–Nolan 2012, Israel–Spannagel 2013, B. Kis et al. 2015, Dudek 2019). Controlling for median household income, a positive association is found between ARPR and SMDR.

When including country-level variables in the models, we find the positive and significant impact of income inequality measured by the S80/S20 ratio and poverty gap, which is in line with other studies conducted for country-level data (B. Kis et al. 2015, Dudek 2019). Thus, rising inequality within a country led to a higher risk of severe material deprivation. Moreover, controlling for median household income the relative median at-risk-of-poverty gap is also statistically significant and positively associated with SMDR. This indicates that grave financial hardship of the poor led to more people being unable to afford basic items.

To provide a quantitative interpretation of obtained results, we present values of odds ratios in Table 4.

Table 4

Odds ratios

Variables	Models			
	1	2	3	4
Regional-level variables				
GDP per capita	0.961	–	–	–
L_unemployment	1.073	–	–	–
Log Income	–	0.131	0.136	0.171
ARPR	–		–	–
		14.253		
Country-level variables				
Poverty_gap	–	–	361.044	–
S80/S20 ratio	–	–	–	1.355
Soc_ protection	0.0002	–	–	–

Taking results for Model 1 into account, assuming the long-term unemployment rate and the ratio of total expenditure on social protection to GDP to be constant, we can interpret the value of 0.961 for the GDP per capita as a decrease in the odds by about 4% (3.9=(1–0.961)*100)) caused by growth in the GDP per capita of one thousand PPS units. Furthermore, we can state, ceteris paribus, that a one-percentage-point increase in the long-term unemployment rate is accompanied by a 7.3% (7.3=(1.073–1)*100)) growth in the ratio of expected percentage of the population that experiences severe material deprivation to expected percentage of population that do not. Similarly, a one-percentage-point increase in the ratio of total expenditure on social protection to GDP corresponds to an almost 100% decrement in the odds; 100 ≈ 99.98=(1–000.2)*100).

Analysing the results for Models 2–4, we consider logarithmic transformation of income as one of an explanatory variable. Thus, we can observe that a 1% increase in median equivalised disposable household income is associated with a decrease in the odds ratio by more than 80% (86.9=(1–0.131)*100 in Model 2; 86.4=(1–0.136)*100 in model 3 and 82.9=(1–0.171)*100 in Model 4), ceteris paribus. Instead, if the median equivalised disposable household income remains unchanged, a one-percentage-point growth in ARPR corresponds to more than a 14-time increase in the odds ratio, and a one-percentage-point increase in the poverty gap coincides corresponds to over a 300-time growth in the odds ratio. Furthermore, enhancing the income quintile share ratio by one is associated with a 36% growth in the odds.

Our results indicate that besides the level of median household income in the region, its distribution in the country also plays a role in determining regional SMDR. Although household income and inequality are important factors, differences in the economic development of regions and institutional distinctiveness also lead to disparities in this respect. In our opinion, the Cohesion Policy of the EU should play an important role in reducing well-being inequalities between regions through a variety of financial supports.

Aside from the identification of the effects of various factors on SMDR, we compare results for FRM models with those for linear regression models obtained for the same explanatory variables-sets. Corresponding pseudo R^2 coefficients and p-values in the RESET test are presented in Table 5.

Table 5

Comparison of results for FRM and linear regression models

Statistics for models	Model			
	1	2	3	4
FRMs				
Pseudo R^2	0.573	0.658	0.696	0.735
p-value in RESET test	0.761	0.973	0.510	0.417
Linear regression models				
Pseudo R^2	0.488	0.593	0.668	0.711
p-value in RESET test	below 0.01	below 0.01	below 0.01	below 0.01

Note: p-value in RESET test is p-value for δ parameter in equation (3).

Results in Table 5 indicate that fractional regression models are more appropriate than linear models. On one hand, as the δ parameter differs significantly from zero, the hypothesis regarding the correctness of the linear specification (l) should be rejected. On the other hand we fail to reject the null hypothesis of correct specification of FRMs. Additionally, taking the values of the pseudo R^2 measure into account, we can state that FRMs exhibit better goodness of fit than linear models.

Thus, our findings contribute to the SMDR literature in which linear models have been mostly applied.

To summarise, we find that all explanatory variables together appear to fulfil their role well in explaining differences in regional SMDR. In the literature on poverty and social exclusion, while various studies have been conducted at the national level, the analyses of material deprivation at the regional level is rather scarce and mostly limited to one or two countries. In our study, we demonstrate that severe material deprivation is a local phenomenon with between- and within-country variability. The obtained results imply that the EU requires more targeted anti-poverty policies at the regional level and strict monitoring of their implementation.

Conclusions

SMDRs were found to be widely dispersed across regions in the EU. As a general assessment, we can state that in the west and north of Europe, regional SMDR are lower than in the south and east side of Europe. In particular, in Bulgaria, all regions except one exhibit the highest level of SMDR while all regions in Sweden display a very low level, almost zero. Moreover, our study reveals large regional differences in Italy with south-north polarisation. In addition, considerable differences are also observed among the regions in Romania and Hungary.

Using the fractional variable output methodology, the study evaluates the impact of main drivers derived from the literature. We demonstrate that in the analysis of SMDR, fractional regression models with logit link function are more appropriate than linear models. It means that the relationship between SMDR and examined factors is non-linear.

Our results reveal that differentiation in SMDR across EU regions can be partly explained by the examined factors. We found that mean household incomes, ARPR, income inequality, and poverty gap stand out as the significant drivers of regional SMDR. This indicates that the income situation of households has a substantial impact on the proportion of the population in the region that cannot afford at least four of the nine items considered in the context of the Europe 2020 strategy. Our analysis also reveals that the level of regional GDP and the regional long-term unemployment rate mirroring economic conditions of regions play important roles in this regard. Moreover, the country-level variable involving the ratio of total expenditure on social protection in relation to GDP contributes to curbing the rise in SMDR. Thus, generous social policy reduces severe material deprivation. Finally, it should be highlighted that our results are consistent with other studies performed for country-level data.

Regarding the limitations of our study and directions for further research, we list some important issues. First, the analysis conducted herein needs to be extended to include all NUTS 2 level EU regions. Better data sources are required to obtain

accurate insights into severe material deprivation among vulnerable groups at the regional level. Furthermore, for a reliable overview of multidimensional poverty, the EU should monitor the severity of material deprivation at the regional level. Thus, examining the changes in SMDR is an important topic for research. The issue of material deprivation should be thoroughly examined because knowledge about regional dimensions of poverty and social exclusion is crucial for achieving social cohesion in the EU.

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Empirical analysis of the distribution of urban parks in Japan

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As the population of urban areas increases, there is growing concern over the quality of urban environments and parks, which are of strategic importance for the sustainability of the increasingly urbanized society. Urban parks have many important functions that provide ecological benefits; human health, well-being, and safety benefits; and economic benefits. These functions correspond to the concept of sustainability and are related to the enjoyment of the basic rights that people intrinsically possess. Therefore, it is desirable for urban parks to be equally distributed amongst the population. This study examines whether the urban park area per capita is equal amongst the regions of Japan, by using various methods applied to Japanese prefectural data from between 1975 and 2015. The results show an increase in urban park area per capita and a relative decreasing trend concerning inequality amongst the prefectures' inhabitants. However, prefectures with a relatively low area of urban parks per capita remain basically the same.

Keywords:
urban park,
inequality,
Japan

Introduction

With over half of the global human population living in urban areas (United Nations Population Fund 2007), there is growing concern over the quality of urban environments, and urban parks are of strategic importance for the sustainability of the increasingly urbanized society (Chiesura 2004). Urban green spaces such as urban parks create urban ecosystems that provide ecological benefits and benefits to human health and well-being (Tzoulas et al. 2007, Breuste et al. 2013, Jennings et al. 2016, Sutton–Anderson 2016). Concerning the ecological benefits, urban parks have been observed to mitigate heat island effects in built environments (Spronken-Smith–Oke 1998, Hamada–Ohta 2010, Oliveira–Andrade 2011, Hamada et al. 2013, Vidrih–Medved 2013) and reduce surface water runoff, which can support urban areas in adapting to climate change (Gill et al. 2007). They also provide health and recreation services, which have been covered extensively in past literature (Bedimo-

Rung et al. 2005, Giles-Corti 2005, Pretty et al. 2005, Maller et al. 2006, Cohen et al. 2007, Lee–Maheswaran 2011, Wolch et al. 2011). Akpinar et al. (2016) examined the impact that urban green spaces had on mental and general health across Washington State in the United States. This impact was also studied by Song et al. (2015) regarding walks through urban parks in Chiba, Japan. Also, Takano et al. (2002) studied the association between urban parks and longevity. Green spaces' impact on obesity and stress was also studied in Denmark (Nielsen–Hansen 2007). Other benefits provided by urban parks include safety, which has been reviewed in relation to urban parks' role in supporting disaster prevention and emergency evacuation (Amemiya 2003, Masuda 2003, Zhu et al. 2016). There is also research on the relationship between urban parks and communication in the community and how providing common spaces encourages the development of social ties (Coley et al.1997, Kuo et al. 1998, Chiesura 2004, Walker 2004).

Urban parks also provide economic benefits. The aesthetic and recreational values of urban parks can increase property values (Chiseura 2004). Studies on urban parks in relation to housing and land prices based on the hedonic pricing model support this (e.g. Morancho 2003, Aikoh et al. 2008, Komatsu 2008, Tajima 2003, Panduro–Veie 2013, Czembrowski–Kronenberg 2016).

These services provided by urban parks are extremely important to 'the right of citizens to pursue life, freedom and happiness' as stated in Act 13 of the Japanese Constitution. The Declaration of the United Nations Conference on the Human Environment and the Rio Declaration on Environment and Development raised awareness of environmental rights and brought about the trend of environmentalism. As of 2017, 148 of the 196 national constitutions recognise environmental rights to varying degrees, with Portugal, Argentina, Columbia, Costa Rica, and Brazil adopting enforceable fundamental environmental rights (May 2006, Otsuka 2007, O'Gorman 2017). The environmental justice movement historically focused on health consequences related to the inequitable distribution of environmental hazards, but in recent years it has expanded to include the inequitable distribution of the positive contributions of natural environments to health and well-being (Floyd et al. 2008, Bruton–Floyd 2014, Jennings et al. 2016). Inequitable access to and experiences of these nature-related benefits remain a prominent barrier to sustainable development (Agyeman et al. 2003, Jennings–Johnson Gaither 2015, Jennings et al. 2016). Taking the benefits of urban parks and their relation to fundamental human rights into consideration, society should strive to ensure equal access to urban parks. In Japan, since the amendments to the enforcement ordinance of the Urban Park Act in 2012, local governments have been encouraged to provide, with regional considerations in mind, a specific area of urban park per resident (Ministry of Land, Infrastructure, Transport and Tourism 2012). This leads to the research question of whether urban parks in each region are currently provided equally per resident.

Therefore, this paper will analyse and compare the distribution of urban park area per capita by prefectures in Japan.

There are numerous studies on inequality in the area of income (e.g. Bigard et al. 1998, Buchinsky–Hunt 1999, OECD 1996). Concerning economic inequality, research has been conducted on whether the economic inequality between developed and developing countries converged due to the difference in the rate of economic growth (e.g. Barro–Sala-i-Martin 1992, Sala-i-Martin 1996). There are also studies in the area of the environment that look at a number of environmental indicators to analyse inequality. They cover emissions such as CO_2, SO_2, and NO_x (e.g. List1999, Strazicich–List 2003, Brock–Taylor 2004, Alvarez et al. 2005, Stegman 2005, Aldy 2007, Shimamoto 2017) as well as energy per capita (Shimamoto 2018). Inequality in health has also been covered in past studies (Maynou et al. 2015, Pickett–Wilkinson 2015, Egri 2017). However, to the best of my knowledge, a study of inequality in the provision of urban parks has not been conducted and inequality studies focusing on urban parks in Japan do not exist. This paper attempts to develop on previous studies by applying a long-term data set on the area of urban parks in Japan to study the equality of the urban park area per capita amongst the prefectures of Japan. This paper will (1) analyse the trend concerning urban park area per capita and the changes in the nation's average standard; (2) apply a number of approaches using inequality indicators to study distribution inequality to avoid any bias from a particular method; and (3) supplement the analysis with background information that could influence inequality.

The second section will explain the methods and data used in the analysis. The third section will provide the results concerning the changes in the urban park area per capita for all urban parks over recent years and trends in inequality by prefecture. The fourth section will summarize the results and provide a conclusion and possible policy implications.

Methods and data

Methods

As an indicator of inequality, the coefficient of variance (CV) was employed. The CV is obtained by dividing the standard deviation by the mean in order to address the problem of the variance depending on the mean. Hence, the equation is as follows:

$$CV = \frac{1}{\mu_t}\sqrt{\frac{1}{n}\sum(y_{i,t} - \mu_t)^2} = \frac{\sigma_t}{\mu_t} \quad (1)$$

where i denotes prefecture, t is time period, y_i represents the urban park area per capita for each prefecture for a time period, μ is the mean of the urban park area per capita for all urban parks in the country for a time period, and n represents the

number of prefectures. A characteristic of the CV is that it attaches equal weights to transfers at different levels.

As the second indicator of inequality, the standard deviation of logarithms (SDL) was adopted. This is defined as follows:

$$SDL = \sqrt{\frac{1}{n}\sum(lny_i - ln\mu)^2} \tag{2}$$

The logarithmic conversion makes it possible to put more emphasis on the changes amongst the prefectures which belong to the low-performing group. In order to attach greater importance to lower urban park area per capita levels it is necessary to stagger urban park area per capita levels. Where the CV attaches equal weight to changes at different levels, the SDL attaches more weight to changes at the lower end (Litchfield 1999). Hence, the logarithmic transformation is useful for highlighting differences at the lower end of the urban park area per capita scale (Sen 1997).

The third indicator used was the relative mean deviation (RMD), as below:

$$RMD = \frac{1}{n\mu_t}\sum|\mu_t - y_{i,t}| \tag{3}$$

The numerator on the right-hand side of the equation (3) represents the degree of dispersion between y_i, which is the urban park area per capita of each prefecture, and μ, which is the mean of the urban park area per capita covering all urban parks in the country in terms of absolute value. As in the case of CV, this was divided by μ so that the indicator did not depend on the mean. Hence, this represented the degree of relative dispersion of urban parks per capita in absolute value terms. If the urban park area per capita in all prefectures was equal, the indicator was 0. On the other hand, if only one prefecture had urban parks, it was 2(n–1)/n. Therefore, the smaller the indicator, the smaller the inequality in urban park area per capita. However, since this indicator depended on the absolute value of the difference between the urban park area per capita for each prefecture and the average of all urban park areas per capita, it was noted that the indicator was unresponsive to changes for prefectures which were above or below the mean (Sen 1997).

As the fourth indicator used to address this problem, the Gini coefficient (GINI) was adopted. This indicator is defined as follows: suppose that a country is composed of a number of prefectures, *n*. Given that urban park area per capita for each prefecture for a time period is $y_{i,t}$, and the mean of urban park area per capita for all urban parks for the time period is μ_t, then the order from the smallest urban park area per capita for the time period would be $y_{1,t} \leq y_{2,t} \leq y_{3,t} \leq \ldots$. Based on the above, the GINI was represented as follows:

$$GINI = \frac{1}{2n^2\mu_t}\sum\sum|y_{i,t} - y_{j,t}| \tag{4}$$

Here, the GINI represents the ratio between the mean of the urban park area per capita for all urban parks and the mean of the difference in the urban park area per capita between any two prefectures in absolute value terms, *i*, *j*. Based on this indicator, in a case where the distribution of urban park per capita was completely equal, the GINI was 0. On the other hand, if only one prefecture had urban parks, GINI equalled 1. The benefit of this coefficient is that it provides an intuitive interpretation (Conceição–Ferreira 2000). However, a characteristic of the GINI is its sensitivity to central observations, in this case giving greater weight to changes that occurred to the urban park area per capita in the middle of the scale and not much weight to urban park area per capita changes at the extreme ends. Furthermore, very different urban park area per capita distributions can present the same GINI (Afonso et al. 2015).

Next, as an indicator of inequality, the Theil index (TI), which incorporates the entropy concept into information theory, was applied. This index utilises the fact that the maximum value of entropy is attained by a uniformly distributed random variable. According to this index, the larger the difference between the maximum value and the entropy of an urban park area per capita, the larger the inequality. The TI can be represented as follows:

$$TI = \frac{1}{n}\sum \frac{y_{i,t}}{\mu_t}\left(ln\frac{y_{i,t}}{\mu_t}\right) = \frac{1}{n}\sum \mu_t \, ln\frac{1}{\mu_t} - \sum y_{i,t} \, ln\frac{1}{y_{i,t}} \tag{5}$$

A limitation of the TI, according to Sen (1997), is it slack of intuitive sense.

The above indicators do not place emphasis on the differences between the prefectures with urban park area per capita on the upper end or the lower end. Therefore, I conducted an examination where the percentile ratio was used in order to focus on the dispersity at the tail ends for urban park area per capita. That is, I made use of p90/p10, which represents the ratio of the upper 10% of the urban park area per capita to that of the lower 10%. However, this indicator is dependent on the selection of the percentile. Hence, in addition to p90/p10, I also used the p75/p25, which represents the ratio of the upper 25% of the urban park area per capita to that of the lower 25% in order to ensure more robust results. Although these indicators are useful for measuring the differences between the upper tail and the lower tail, they are unable to measure the differences between the upper and median or between the lower and median. Hence, in order to examine those differences, I employed the ratio of those percentiles to the median, i.e. p90/p50, p10/p50, p75/p50, and p25/p50.

Since the above indicators do not visually capture the distribution of the urban park area per capita, I used histograms to examine the shape and change of the distribution. When analysing this, the relative urban park area per capita for each prefecture against the overall mean (relative UPApc) was observed for each time period and split into five categories based on the relativity to the mean. Furthermore, I examined whether the expansion/reduction in inequality amongst the prefectures

occurred through changes in the ranking of the urban park area per capita or occurred with no changes to the ranking. The main purpose was to analyse whether the preferences or actions of the prefecture regarding the provision of urban parks is changeable over time. Hence, I utilised the Spearman's rank correlation coefficient to measure the correlation in ranking of the urban park area per capita. The equation is as follows:

$$SRC = 1 - \frac{6\sum(a_{i,t} - b_{i,t})^2}{n(n+1)(n-1)} \quad (6)$$

This equation applies the calculation of Pearson's product-moment correlation coefficient to the ranking. n denotes the number of prefectures, i is the prefecture, and t is the time period. a, b represent the rank for each time period. If the rankings of all of the prefectures are the same, the indicator will equal to 1. If the rankings of all of the prefectures are the same when reversed, the indicator will be –1. Moreover, the top and bottom10 prefectures' urban park area per capita was examined to determine the frequency of the same prefectures appearing in the top and bottom 10. When examining the changes in the ranking of urban park area per capita by prefecture, I often compared several time periods and start and end years of the observation periods. Multiple sample years and periods were adopted in this way to avoid different results depending on the sample year or period used in the comparison. Thus, this paper examines the first and last years of the observation, 1975 and 2015; the first 5 years of observation, 1975–1979 (1976 and 1977 are omitted due to a lack of data); the last 5 years of observation, 2011–2015; the first 10 years of observation, 1975–1984 (1976 and 1977 are omitted due to a lack of data); and the last 10 years of observation, 2006–2015.

Data

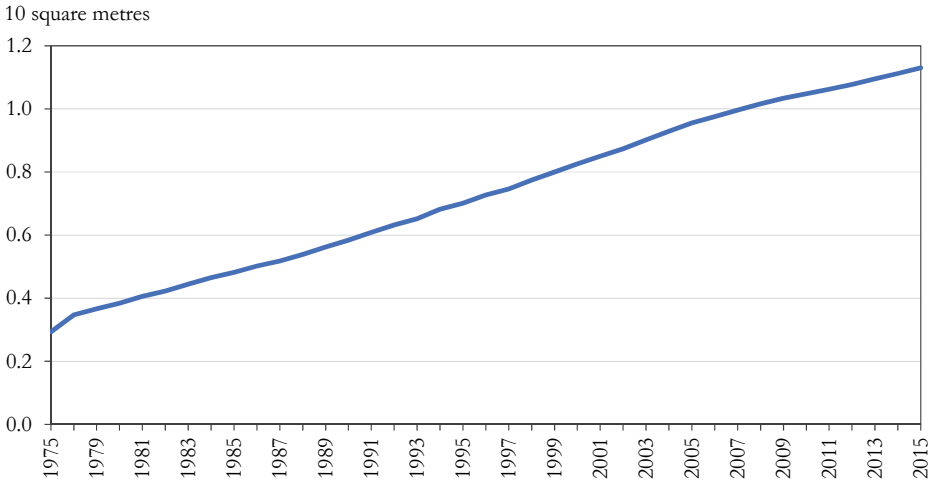
The population data and urban park area data were obtained from the e-Stat of the Ministry of Internal Affairs and Communications (2018); these data come from the Population Census and Population Estimates by the Ministry of Internal Affairs and Communications, and the 'Survey on the Existing State of Urban Parks' (Toshi-Koento-Seibi-Genkyo-Chosa) by the Ministry of Land, Infrastructure and Transportation and Tourism, respectively. The urban park area per capita for each prefecture was calculated by dividing the area of urban parks in each prefecture by the population of each prefecture. I used all 47 prefectures from Hokkaido to Okinawa and the time period between 1975 and 2015. The time period unit was fiscal years. The definition of an urban park was set as a park and green space based on Article 2 of the Urban Park Act, which includes park facilities and green spaces set up by the local government or country.

Results

First, the mean of the urban park area per capita for all urban parks in Japan was examined to observe any changes over time. The main purpose of this was to observe the improvements in the accessibility and availability of urban parks.

Figure 1

Mean of total urban park area per capita (UPApc) in Japan



As indicated in Figure 1, the calculations for all urban parks in Japan showed an increasing trend between 1975 and 2015.

Table 1

Period comparison of UPApc

Denomination	Ratio
2015 : 1975	3.846
2006–2015 : 1975–1984	2.696

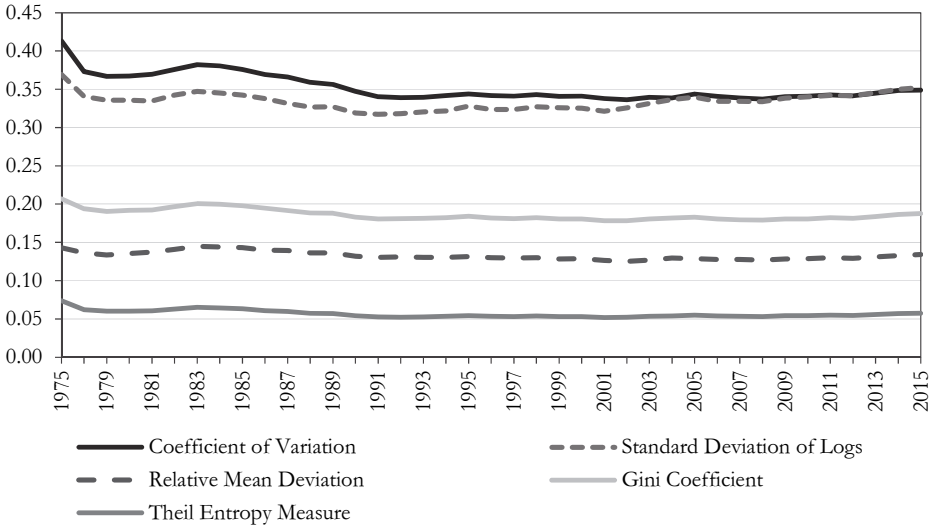
As seen in Table 1, the urban park area per capita in 2015 was 3.842 times larger than that in1975. In order to avoid impacts from particular events specific to a particular year that could occur in single year comparisons, it is important to conduct comparisons between multi-year periods. Therefore, I conducted a comparison between the mean of the urban park area per capita for the first 10 years of observation (1975–1984) and that of the last 10 years of observation (2006–2015). The results showed that the urban park area per capita in the last 10 years was 2.696 times larger than that in the first 10 years.

Next, it was necessary to examine whether the inequality amongst the prefectures concerning urban park area per capita has improved. My main purpose here

was to examine whether the availability of urban parks is equally distributed among all residents or if there are differences depending on the prefecture. The unequal provision of urban parks depending on the prefecture could lead to dissatisfaction based on the Easterlin (1974) paradox, where people are influenced by relative comparisons of things rather than the absolution of a thing. This is similar to the concept of relative deprivation that is often discussed in the area of income inequality, where inequality is felt if the income is relatively low even if it is high in absolute terms.

Figure 2

Inequality indicators of UPApc



Accordingly, various indicators related to inequality were utilized. As Figure 2 attests, the results showed no trend that indicated an increase in inequality between 1975 and 2015 in any indicators of CV, SDL, RMD, GINI, and TI.

Table 2

Period comparison of inequality indicators

Coefficient	1975/2015	1975–1979 / 2011–2015	1975–1984 / 2006–2015
Coefficient of variation	0.844	0.898	0.905
Standard deviation of logs	0.953	0.993	0.992
Relative mean deviation	0.939	0.956	0.930
Gini coefficient	0.907	0.935	0.927
Theil entropy measure	0.776	0.857	0.861

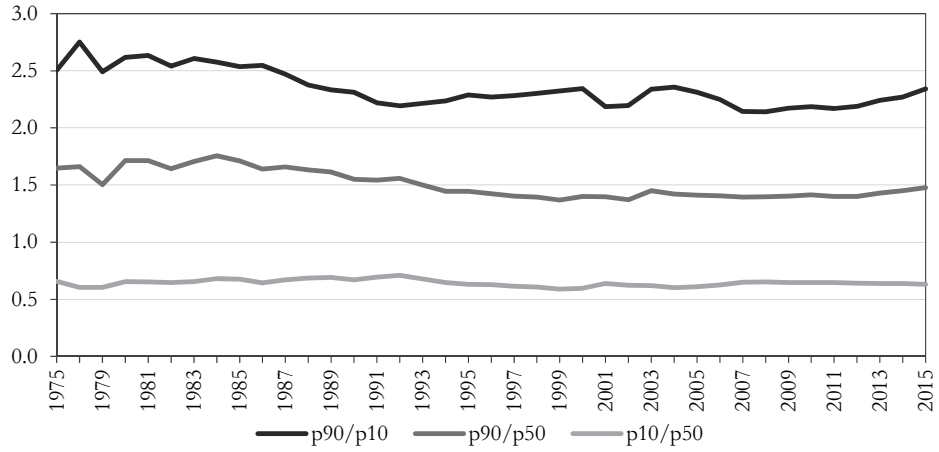
For example, according to Table 2, the ratio of the last year observed to the first year observed is 0.844 for CV, 0.953 for SDV, 0.939 for RMD, 0.907 for GINI, and 0.776 for TI, all of which indicate a decreasing trend in inequality. The results are the same for all indicators even in the comparison between the first 5 years (1975–

1979) and the last 5 years (2011–2015) of the observation period and the first 10 years (1975-1984) and the last 10 years (2006–2015).

Next, concerning the ratio of percentile, which focused on the difference between the upper and lower end results for urban park area per capita for each prefecture, the results are indicated in Figure 3.

Figure 3

Percentile ratio of UPApc: p90/p10, p90/p50 and p10/p50



As seen in Figure 3, according to p90/p10, which measured the difference between the upper and lower 10%, there was a decreasing trend in inequality of urban park area per capita amongst prefectures for the time period of 1975 to 2015. Table 3 shows that the ratios for the three observation periods examined were all less than 1, which suggests a declining trend. This indicates that the differences between the urban park area per capita for prefectures in the higher and lower end have decreased. The results also showed that the difference between the urban park area per capita for prefectures in the median and those in the upper 10% decreased. However, as seen in Figure 3, the results did not show a clear trend for the difference between the urban park areas per capita for prefectures in the lower 10% compared to the median (p10/p50), which requires further examination.

Table 3

Period comparisons of the percentile ratio of UPApc

Denomination	p90/p10	p90/p50	p10/p50	p75/p25	p75/p50	p25/p50
2015/1975	0.935	0.897	0.960	0.963	1.116	1.159
2011–2015/1975–1979	0.868	0.893	1.027	0.959	1.005	1.047
2006–2015/1975–1984	0.853	0.850	0.996	0.935	1.026	1.098

Note: The values above/below 1 represent the increase/decrease in inequality of urban park area per capita.

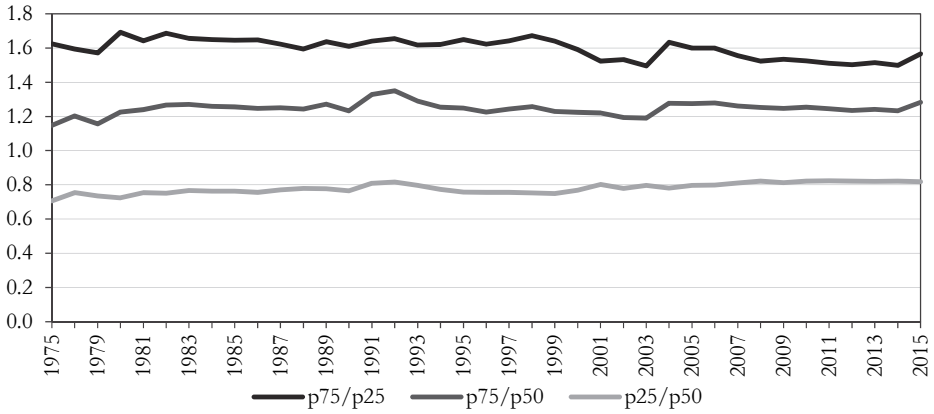
The results of the p10/p50 in Table 3 show slightly increasing and slightly decreasing results for inequality depending on the sample period selected for compari-

son. For instance, the inequality in the urban park area per capita over the last 10 years (2006–2015) slightly increased compared to that of the first 10 years (1975–1984). This can be observed in the ratio of the last 10 years to the first 10 years, which is less than 1. On the other hand, the inequality in the urban park area per capita in the last five years (2011–2015) slightly decreased compared to that of the first five years (1975–1979). This confirms that consistent results for inequality in the urban park area per capita between prefectures in the median and lower end have not been obtained.

Next, since the results changed depending on the percentile selected, I examined the ratio of the upper 25% to the lower 25% (p75/p25).

Figure 4

Percentile ratio of UPApc: p75/p25, p75/p50 and p25/p50



As Figure 4 makes it clear, the results showed that, concerning the ratio of urban park area per capita between the upper and lower 25% (p75/p25), there was a decreasing trend between 1975 and 2015.However, the decrease in the ratio was smaller than the results of the ratio between the urban park area per capita for the highest and lowest 10% (p90/p10) for the same period. The results also suggested that the differences in ratio between the upper 25% and the median (p75/p50) and between the lower 25%and the median (p25/p50) increased for the same time period. The details can be observed in Table 3. Since the ratio of urban park area per capita for the upper 25% to the median (p75/p50) was over 1 for all of the periods observed, it confirmed an increase in inequality compared to the median. However, the difference in the ratio between the lower 25% and the median (p25/p50) was decreasing more than the increase between the ratio of the top 25% and the median (p75/p50). This suggests that the inequality between the top and bottom 25% (p75/p25) has slightly decreased.

Next, in order to visually capture the shape of the distribution of the urban park area per capita, I conducted examinations using histograms.

Figure 5 (a)

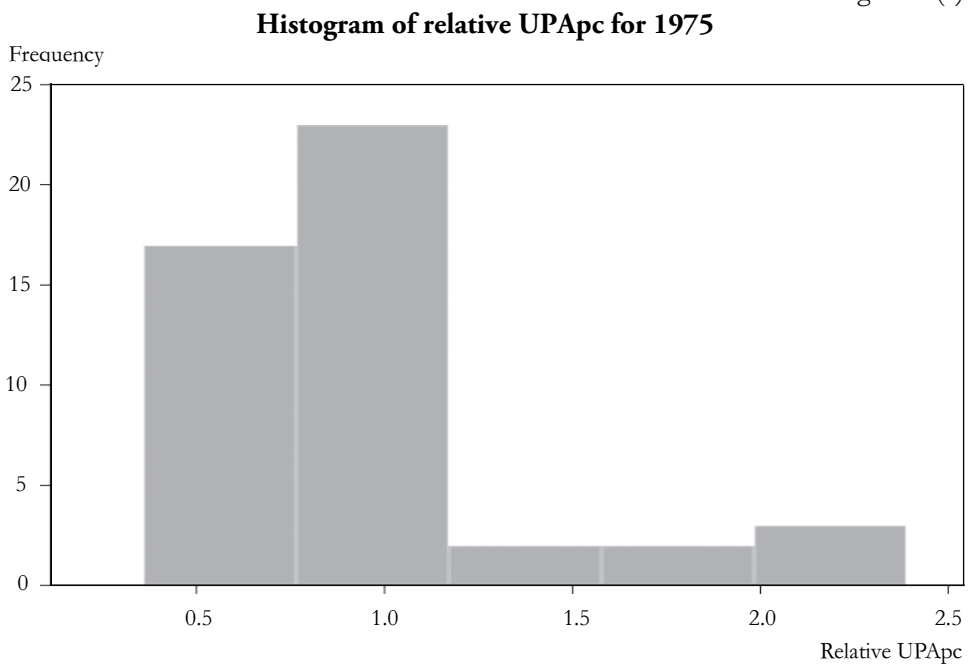


Figure 5 (b)

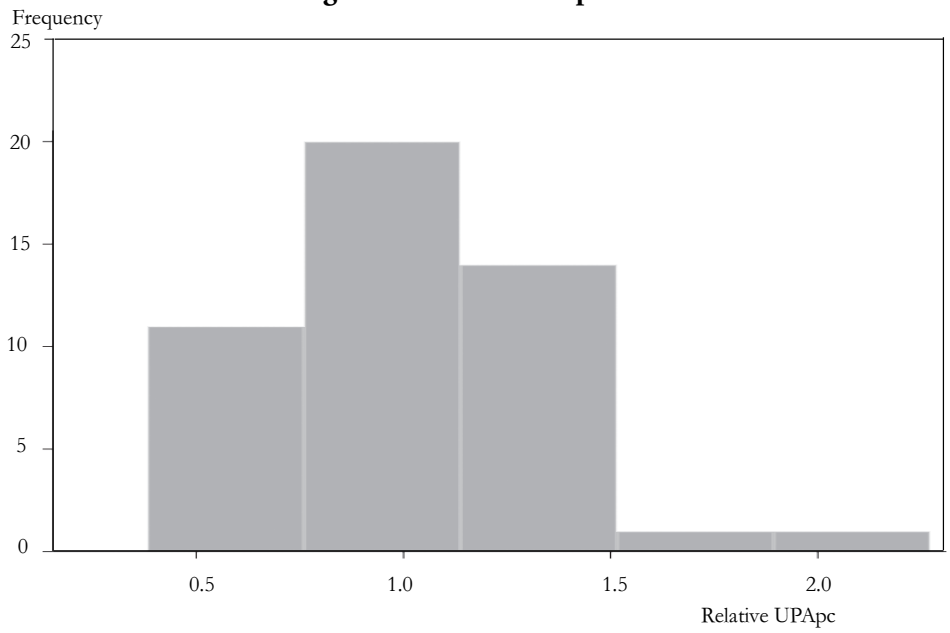


Figure 6 (a)

Histogram of relative UPApc for the first five-year average

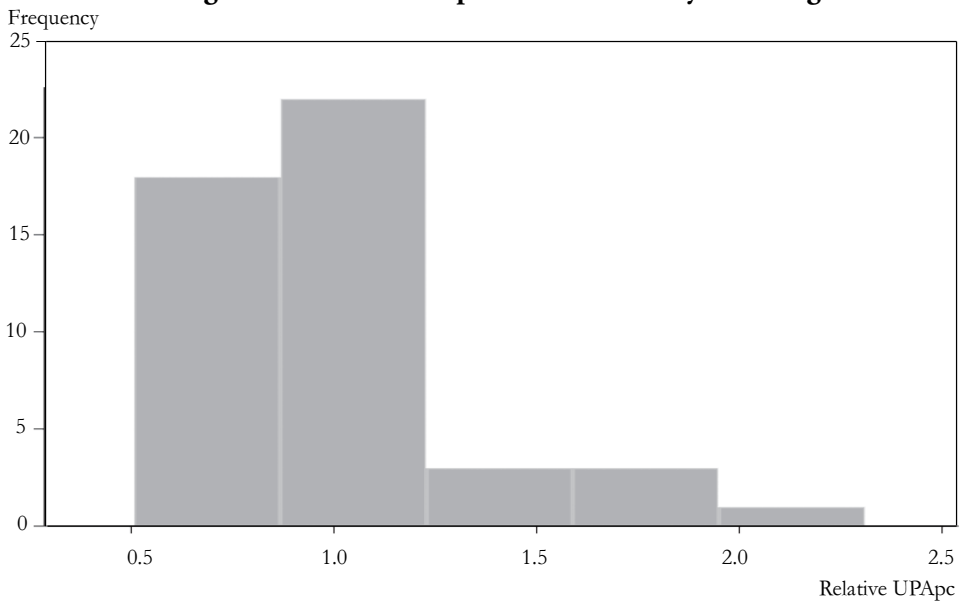
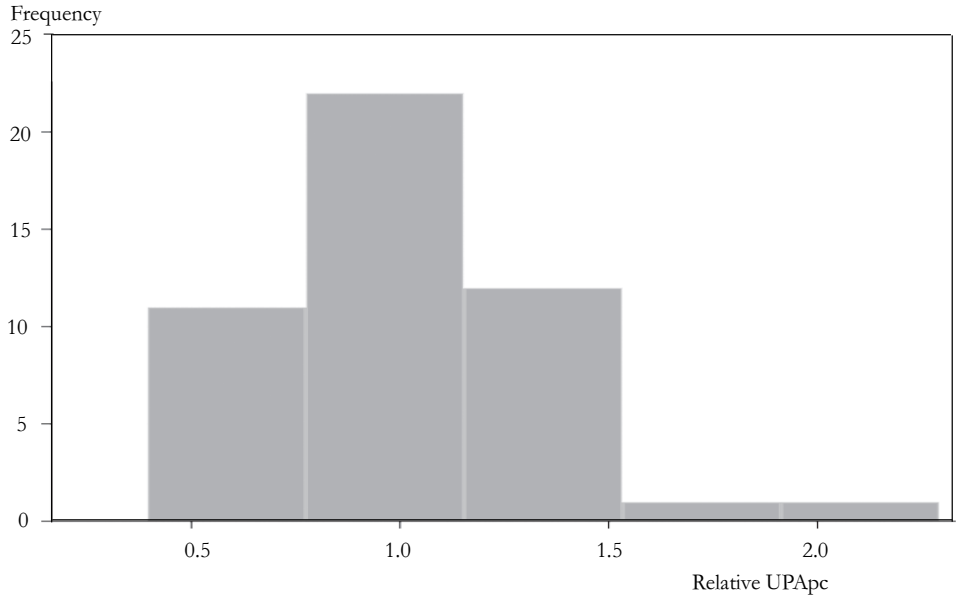


Figure 6 (b)

Histogram of relative UPApc for the last five-year average



As seen in Figure 5 (a), (b), the results showed that only the number of prefectures which belonged to the median category (third category from the left) increased considerably in 2015, compared to 1975, and the other categories decreased in 2015, compared to 1975. In particular, the number of prefectures which belonged to the lowest category (first category from the left) showed a considerable decrease. However, since a comparison of single years could be affected by single-year-specific events, the mean of the urban park area per capita of the first five years of observations was compared with that of the last five years. As Figure 6 (a) (b) attests, the results showed a considerable increase in the median category between the last five years of the observations and the first five years. However, the lowest category showed a considerable decrease in this observation as well as a decrease in the second upper category (fourth from the left). These results suggested that the prefectures which belonged to the median category considerably increased, while the prefectures in the lowest category considerably decreased. The histograms of these results did not depict any increasing trend in inequality between the prefectures. Maps provided in the appendix can be referred to concerning the changes in the urban park area per capita for each prefecture over time. Based on the results obtained through the various methods outlined above, a slightly decreasing trend was identified concerning inequality in the urban park area per capita between Japanese prefectures from 1975 to 2015.

Next, the changes in the ranking of prefectures according to the urban park area per capita were examined to observe if the changes in the ranking had affected the declining trend in inequality or if the inequality had been reduced due to minimal changes in the ranking.

Table 4

Spearman's rank correlation for prefecture UPApc

Denomination	1975 vs 2015	1975–1979 vs 2011–2015	1975–1984 vs 2006–2015
Spearman's rho	0.6686***	0.7694***	0.8234***
Prob> |t|	0.000	0.000	0.000
N	47	47	47

*** Significance level of 1%.

The Spearman's rank correlation coefficient, as shown in Table 4, confirmed a significance level of 1% for all of the sample periods observed (1975 to 2015; the first 5 years of observation to the last 5 years; and the first 10 years of observation to the last 10 years) and rejected the null hypothesis that the rankings were not correlated. In other words, the ranking of the available urban park area per capita by prefecture was relatively stable, which suggests that annual changes in the prefec-

tures' preferences or actions regarding the development of urban parks did not significantly change over time.

In order to understand this trend in more detail, the trend of the top 10 largest prefectures concerning the urban park area per capita and the bottom 10 was examined.

Table 5

UPApc bottom and top 10 prefectures

(Unit: persons per hectare)

1975–1984 Average					1985–1995 Average				
	Bottom 10		Top 10			Bottom 10		Top 10	
1	Kanagawa	0.213	Hokkaido	0.885	1	Kanagawa	0.326	Hokkaido	1.324
2	Tokyo	0.228	Miyazaki	0.706	2	Tokyo	0.329	Miyazaki	0.989
3	Okinawa	0.231	Gunma	0.693	3	Tokushima	0.340	Fukui	0.969
4	Tokushima	0.235	Fukui	0.674	4	Wakayama	0.347	Toyama	0.898
5	Kochi	0.238	Nara	0.663	5	Kyoto	0.375	Gunma	0.859
6	Shiga	0.238	Miyagi	0.522	6	Kochi	0.393	Nara	0.838
7	Wakayama	0.255	Toyama	0.512	7	Osaka	0.395	Shimane	0.819
8	Kumamoto	0.259	Yamaguchi	0.486	8	Saitama	0.406	Akita	0.800
9	Iwate	0.269	Shimane	0.476	9	Shizuoka	0.410	Miyagi	0.726
10	Shizuoka	0.270	Ishikawa	0.468	10	Kumamoto	0.417	Hyogo	0.724
1996–2005 Average					2006–2015 Average				
	Bottom 10		Top 10			Bottom 10		Top 10	
1	Tokyo	0.396	Hokkaido	1.919	1	Tokyo	0.423	Hokkaido	2.422
2	Kanagawa	0.431	Miyazaki	1.380	2	Kanagawa	0.504	Miyazaki	1.719
3	Osaka	0.482	Toyama	1.236	3	Osaka	0.515	Yamagata	1.491
4	Tokushima	0.489	Fukui	1.203	4	Chiba	0.627	Toyama	1.433
5	Wakayama	0.493	Shimane	1.124	5	Wakayama	0.659	Aomori	1.429
6	Kyoto	0.522	Akita	1.122	6	Saitama	0.661	Miyagi	1.426
7	Saitama	0.550	Yamagata	1.115	7	Tokushima	0.665	Akita	1.405
8	Chiba	0.552	Miyagi	1.095	8	Kyoto	0.688	Fukui	1.404
9	Kochi	0.592	Tochigi	1.082	9	Aichi	0.730	Shimane	1.390
10	Kumamoto	0.611	Gunma	1.071	10	Kumamoto	0.744	Kagawa	1.388

As Table 5 shows, with regard to the bottom 10 prefectures, in all 4 time periods (1975–1984, 1985–1995, 1996–2005 and 2006–2015) examined, the 5 prefectures of Tokyo, Kanagawa, Wakayama, Tokushima and Kumamoto consistently ranked in the bottom 10. The four prefectures of Osaka, Kyoto, Kochi and Saitama appeared in three of the four time periods examined and Chiba and Shizuoka appeared in two. These results confirmed that most of the bottom 10 prefectures were consist-

ently low performers. Furthermore, prefectures with high population densities such as Tokyo, Kanagawa, Osaka, and Saitama were seen in the bottom 10, which suggested that the urban park area per capita tends to be lower in such prefectures. Concerning the top 10 prefectures, the 6 prefectures of Hokkaido, Miyazaki, Toyama, Fukui, Shimane, and Miyagi appeared in all 4 time periods. Akita and Gunma appeared in three of the four periods and Yamagata and Nara appeared in two. These results also indicated limited changes in the top 10 performing prefectures and also that prefectures with low population densities tended to appear in the top 10.

Table 6

Spearman's rank correlation for prefecture population density and UPApc

Denomination	2006–2015	1975–2015
Spearman's rho	–0.6522***	–0.5756***
Prob> |t|	0.000	0.000
N	47	47

*** Significance level of 1%.

Table 7

Regression for urban park area per capita on population density

Denomination	UPApc 2006–2015	UPApc 1975–2015
PD 2006–2015	–0.011***	
	(0.000)	
PD 1975–2015		–0.007***
		(0.001)
Constant	1.210***	0.827***
	(0.000)	(0.044)
F test	18.73	12.78
Prob> F	0.0001	0.0008
R squared	0.294	0.221
B-P/C-W test	2.22	2.61
Prob> chi-square	0.136	0.106
N	47	47

Note: Standard errors in parentheses.
***p<0.01, **p<0.05, *p<0.1
PD: Population density
B-P/C-W test: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Table 8

Average population density and UPApc for 2006–2015

(a)

	Top 10 Population Density (persons per hectare)		Bottom 10 UPApc (1,000 m² per capita)	
1	Tokyo	94.256	Tokyo	0.423
2	Osaka	66.958	Kanagawa	0.504
3	Kanagawa	61.652	Osaka	0.515
4	Saitama	27.960	Chiba	0.627
5	Aichi	24.964	Wakayama	0.659
6	Kyoto	22.498	Saitama	0.661
7	Hyogo	20.105	Tokushima	0.665
8	Fukuoka	18.398	Kyoto	0.688
9	Chiba	17.571	Aichi	0.730
10	Nara	16.328	Kumamoto	0.744

(b)

	Bottom 10 Population Density (persons per hectare)		Top 10 UPApc (1,000 m² per capita)	
1	Hokkaido	2.478	Hokkaido	2.422
2	Akita	3.374	Miyazaki	1.719
3	Iwate	3.564	Yamagata	1.491
4	Yamagata	4.061	Toyama	1.433
5	Aomori	4.221	Aomori	1.429
6	Fukushima	4.714	Miyagi	1.426
7	Kagoshima	5.180	Akita	1.405
8	Niigata	5.239	Fukui	1.404
9	Shimane	5.579	Shimane	1.390
10	Toyama	5.876	Kagawa	1.388

Table 9

Average population density and UPApc for 1975–2015

(a)

	Top 10 Population Density (persons per hectare)		Bottom 10 UPApc (1,000 m² per capita)	
1	Tokyo	88.658	Tokyo	0.349
2	Osaka	67.149	Kanagawa	0.375
3	Kanagawa	55.894	Osaka	0.433
4	Saitama	25.360	Tokushima	0.440
5	Aichi	23.445	Wakayama	0.446
6	Kyoto	22.682	Kyoto	0.473
7	Hyogo	20.047	Saitama	0.483
8	Fukuoka	17.752	Chiba	0.489
9	Nara	16.148	Kumamoto	0.518
10	Chiba	16.101	Kochi	0.536

(b)

	Bottom 10 Population Density (persons per hectare)		Top 10 UPApc (1,000 m² per capita)	
1	Hokkaido	2.569	Hokkaido	1.668
2	Akita	3.791	Miyazaki	1.218
3	Iwate	3.828	Fukui	1.080
4	Yamagata	4.304	Toyama	1.043
5	Aomori	4.721	Gunma	0.976
6	Fukushima	4.976	Shimane	0.973
7	Niigata	5.350	Akita	0.965
8	Kagoshima	5.390	Miyagi	0.958
9	Shimane	5.926	Yamagata	0.948
10	Toyama	5.984	Nara	0.938

Hence, the relationship between the urban park area per capita and population density was observed. The population density was calculated by dividing the prefectural population by the area of inhabitable land in the prefecture. First, I examined all prefectures to make a rank correlation between population density and urban park area per capita. According to the Spearman's rank correlation coefficient, the results (see Table 6) showed that the correlation between population density and

urban park area per capita for all prefectures was significantly negative for both the last 10 years of the observation and all of the years of the observation. Using ordinary least squares, the regression for the mean of the urban park area per capita for each of the above time periods on the mean of the population density for each of the time periods was obtained. As indicated in Table 7, the results of the coefficients were negative and significant[1].Next, when examining the bottom10 prefectures and the top 10 on the relationship between urban park area per capita and population density, the mean of the last 10 years of the observations (see Table 8) showed that the 6 prefectures of Hokkaido, Akita, Yamagata, Aomori, Shimane, and Toyama, which were in the top 10 for urban park area per capita, appeared in the bottom 10 concerning population density. Moreover, the results also showed that the 7 prefectures of Tokyo, Kanagawa, Osaka, Chiba, Saitama, Kyoto, and Aichi, which were in the bottom 10 for urban park area per capita, appeared in the top 10 concerning population density. As Table 9 shows, the same results were found for the mean of the observation period between 1975 and 2015, with 5 prefectures out of the top 10 prefectures according to urban park area per capita appearing in the bottom 10 concerning population density and 6 of the bottom 10 prefectures based on urban park area per capita were included in the top 10 prefectures for population density. This implies that the limited changes in the ranking of the urban park area per capita by prefecture were influenced by factors such as population density, which showed little change over the time periods observed.

Conclusions

Urban parks fulfil a number of functions that provide ecological benefits, human health benefits, well-being and safety benefits, and economic benefits. These functions are considered to be important for sustainable development. They also support society's trend of growing health consciousness and community activities and are related to maintaining fundamental human rights. This leads to the importance of the society reducing inequality of urban parks' distribution amongst the population. This paper studied whether the urban park area per capita is supplied equally amongst different regions by applying prefecture-level data from between 1975 and 2015 to a number of methodologies. The results showed that, overall, the average urban park area per capita in Japan is growing and there was no indication of a growing trend in inequality amongst the prefecture inhabitants concerning urban park area per capita over time. These results suggest that the ability of residents to enjoy the benefits of urban parks is growing relatively equally amongst the prefectures of Japan. However, there were some points of note. The difference between the prefectures in the top 25% and the median showed a growing trend. This may suggest that some effort is necessary to reduce the inequality in the urban park area in these prefectures. For example, prefectures that fall into these percentiles may

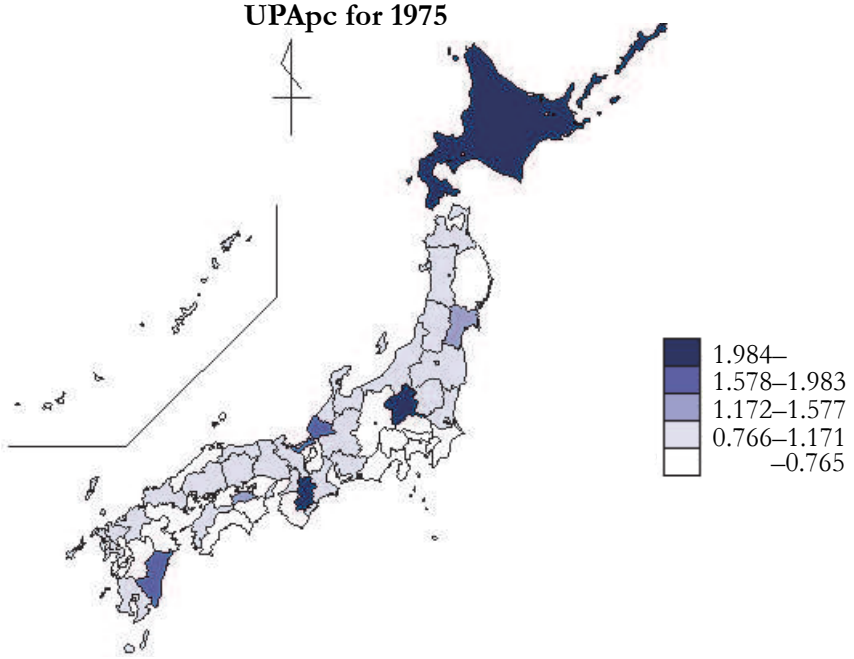
[1] The results of the Breusch–Pagan/Cook–Weisberg test for heteroscedasticity could not reject the null hypothesis, which assumed constant variance for the regression analysis for both time periods. Hence, the standard error was used.

need to promote the necessity of establishing urban parks and apply for subsidies. The second concern was that the ranking of the urban park area per capita did not show any significant change. This suggests that the preferences or priorities relating to the establishment of urban parks have not changed and there may be a reason to explain this immobilization. To explain this in more detail, the top-performing 10 and bottom-performing 10 did not show much change in the ranking. The top 10 consisted mainly of prefectures with relatively low population densities and the bottom 10 included prefectures with relatively high population densities. This means that the opportunity cost to overcome the restriction of a high population density will be higher for the bottom 10. However, considering the frequent natural disasters from earthquakes and typhoons such as the Great Hanshin-Awaji Earthquake, the Great East Japan Earthquake, the July 2018 floods and the 2018 typhoon 21, as well as environmental challenges such as the heat island phenomenon, the need for urban parks has increased in population-dense areas. Thus, appropriate measures such as the promotion of the functions of urban parks and the provision of subsidies may be required to support the development of urban parks in these prefectures. I hope these results assist in promoting the reduction of inequality amongst regions concerning the urban park area per capita and contribute to building a sustainable society.

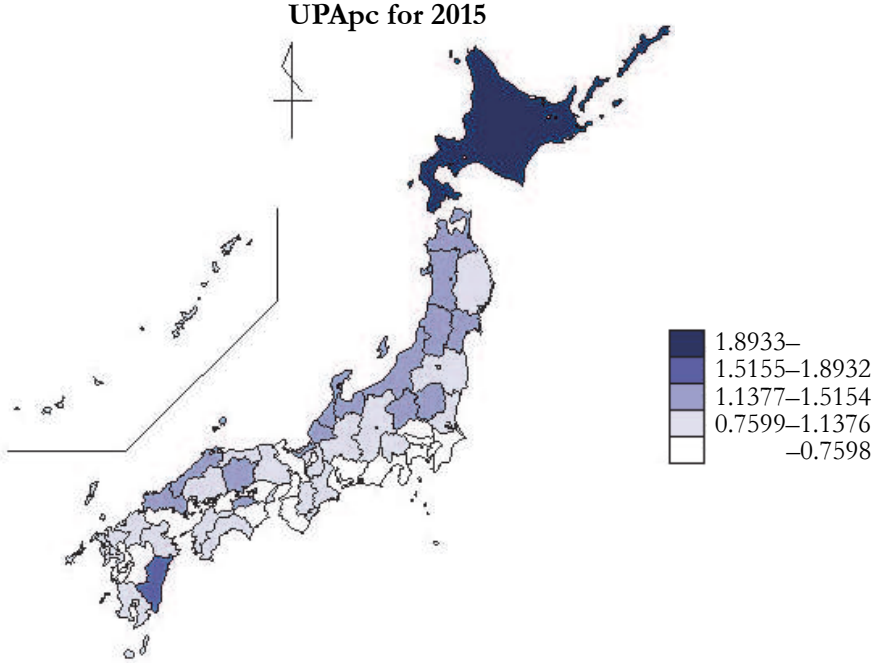
APPENDIX

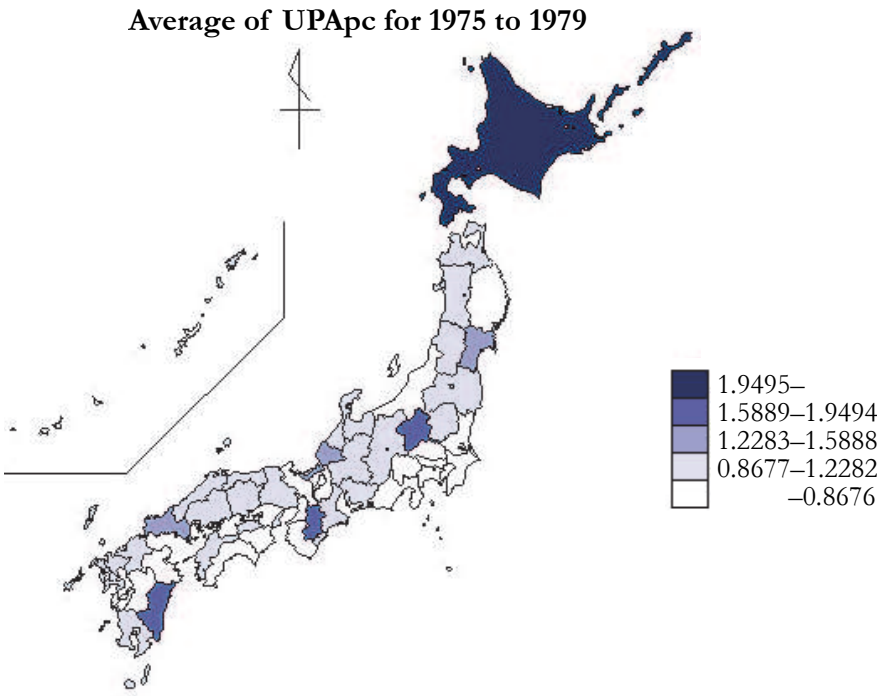
Urban park area per capita (10 m²) by prefecture

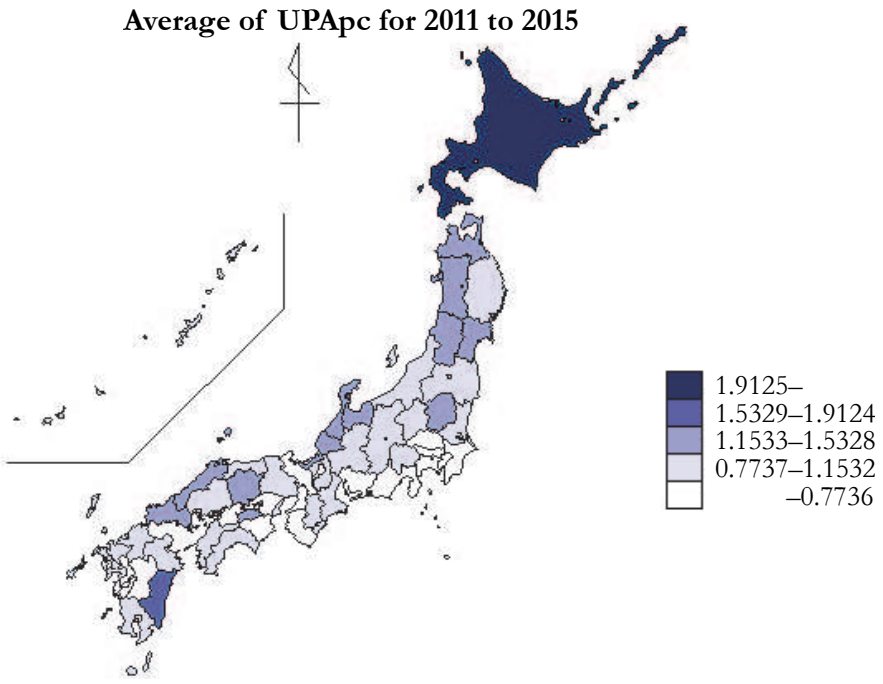
UPApc for 1975



UPApc for 2015




Average of UPApc for 1975 to 1979
1.9495–
1.5889–1.9494
1.2283–1.5888
0.8677–1.2282
–0.8676


Average of UPApc for 2011 to 2015
1.9125–
1.5329–1.9124
1.1533–1.5328
0.7737–1.1532
–0.7736

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Regional taxable capacity measurement methodology based on factors that determine tax gaps based on the example of the Republic of Dagestan

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taxable capacity, measurement methodology, tax gap, integral indicator, shadow sector of the economy

Background: This paper analyses the existing methods for measuring a region's taxable capacity and presents the authors' proposed approach.
Objective: The paper's objective is to develop a method for measuring a region's taxable capacity which could significantly increase accuracy in tax revenue predictions.
Methods: Comparative and situational analyses, as well as expert evaluations are applied.
Findings: A method for measuring regional taxable capacity is developed based on tax gap figures. This study specifies and supplements a method for evaluating a region's tax potential using the indicators that determine a tax gap. Unlike well-known approaches, this method can significantly improve the evaluation's reliability and accuracy, and allows identification of opportunities in order to grow the tax revenues of sub-federal budgets. A comparative analysis of the results of evaluating the taxable capacity of the Republic of Dagestan using different methods shows that the highest value is its tax potential, which takes the tax gap into account. This suggests that the real tax potential is not fully realized and there is room for development.
Conclusions: The measurement methodology used to determine a region's taxable capacity involves an integral indicator, which is composed of private parameters. The final measurement indicator should be based on criteria that can be represented by a number of qualitative indicators. These criteria should accurately and completely determine the actual taxable capacity of a region.

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Introduction

The development of efficient tools to measure a region's (territory's) taxable capacity is a crucial task for governments when they implement tax planning and forecasting activities. At the same time taxable capacity is considered to be the maximum level of financial resources that can be accumulated in budget revenues by applying the existing standards in fiscal legislation. A reliable evaluation of a region's taxable capacity plays a crucial role for the government as it performs its duties and for the country in its effort to find possible reserves in a territory's taxable capacity.

The theoretical and applied aspects of measuring a region's taxable capacity have been extensively examined in national and foreign economic publications. At the same time, a lack of unified tools for legislation-based measurement of a region's taxable capacity results in significant difficulties when planning budgeted tax revenues at different levels. Sub-federal authorities can independently choose the calculation methodology, whereas the parameters of taxable capacity and the measurement tools for the tax base, which are used for planning budgeted revenues, are not specific statistical indicators, which decreases efficiency in implementing fiscal policy.

Aliev et al. (2014), Bénassy-Quéré et al. (2014), and Garbarino (2014) describe a number of methodological approaches for measuring a region's taxable capacity. These methods are essentially based on per capita income, tax rates, tax bases, gross regional product, and other information. The choice of measurement methods depends on a number of factors, including data about the behaviour of financial resources in a Russian Federation (RF) subject; the reliability of the information on the region's social and economic development; and easy-to-use measurement procedures, among others. Moreover, we believe that the measurement methodology must be simple, fool proof, and reliable. It should cover the maximum number of components that characterize the actual taxable capacity of a territory.

Thus, the purpose of this study is to solve an important problem – developing a methodology for measuring a region's taxable capacity, with the goal of increasing the accuracy of estimating tax collection. Moreover, understanding the actual taxable capacity with all its determinants plays a crucial role.

Methods

The development of a method for measuring a region's taxable capacity involves the general scholarly methods of scientific abstraction; dialect logics; comparative situational, financial, statistical, economic, and mathematical analysis; as well as expert analysis. Economic publications provide many methods for measuring a region's taxable capacity.

One method for measuring a region's taxable capacity is based on *gross regional product (GRP)*, which considers the total costs of goods (work and services) manufactured using the region's economic resources (land, labour, and capital) for a par-

ticular time period and accounts for the revenues generated in a region with no regard for the registration location of physical persons or entities. The incomes of citizens residing in a particular region make up a significant share of GRP volume, because they work where they live. Beside citizen incomes, GRP includes the incomes of non-residents that are also taxed and attributed to the region, as well as revenues from hotel services and tourists' purchases. This method has some disadvantages, such as discrepancies caused by the specific features of the tax structure that occur when identifying a region's taxable capacity. For example, companies pay profit tax depending on where they are registered, without regard for the location of their business activities. Also, the sums of inter-budget transfers from the federal budget to sub-federal level budgets are not taken into account. This approach makes it difficult to plan and forecast tax revenues, because the capacity measurement is delayed. These circumstances cause discrepancies in evaluating taxable capacity and a region's GRP.

In contrast to the previous method, *a method based on taxable resource evaluation* provides more trustworthy information regarding taxable capacity by reducing the gap between GRP and the actual taxable resources. This method was developed as an alternative to the method based on GRP, and is a result of the fact that taxable capacity calculations did not account for the impact of some federal taxes and the financial aid to regions from the federal centre. This method more accurately reflects the actual values of a region's tax resources when compared to the GRP method, and does not suffer from distortion of regional data. An advantage of the method is its compliance with the general competency of top-down governance, spread between budget distribution and fiscal legislation. However, it requires a significant amount of information and does not identify the dynamics in taxable capacity in terms of structural changes.

A method based on the taxable capacity coefficient (TCC) simplifies forecasting as it depends on one factor only. This method has a number of disadvantages. First, it is based on tax revenues actually in the budget with no adjustment for tax arrears, which causes an unfavourable result. The method also lacks motivation for territories to fairly identify their taxable capacity, as well as their involvement in finding the reserves to increase it. This measurement method presupposes a linear correlation between tax collection and added value, which is invalid because of tax progressivity.

Another method for measuring a region's taxable capacity is based on *per capita income indicator* and is mainly connected to income tax. To estimate the region's taxable capacity, the population's average income is found, and the indicators that reflect the population differentiation levels based on per capita income are defined. This method can be applied if there is information about per capita income in RF regions. A disadvantage of this method is that it should not be applied unless

individual income tax is the largest fiscal value in the revenue portion of the territories' budgets.

Simplicity and transparency play a crucial role in measuring a region's taxable capacity. This is true for the method of identifying taxable capacity *based on tax revenues actually collected in the region*. The key idea for this method is that the maximum taxable capacity (the law-based capacity) cannot be reached because of two factors: arrears and allowances. This method estimates a region's taxable capacity with due regard for the taxes actually collected, the amount of tax arrears in the period examined, and the amount of shortfalls caused by regional and local allowances.

Table 1

Classification of the methods for measuring a region's taxable capacity

Method	Advantages	Disadvantages
Methods based on a resource approach		
A set of tax resources	High degree of factual accuracy about the actual taxable resources in the territory	Significant expenses in preparing the information bases, incomplete records of taxation elements, different conditions for filing, and exploitation of resources
Attracting new resources	Helps in evaluating the actual resources of the region that shape the taxable capacity	Difficulty determining the estimates due to the need to process a huge amount of data
Methods based on a fiscal approach		
Direct account	High accuracy and completeness of accounting for tax bases; somewhat helps in accounting for shadow turnover	Effort-intense, high requirements for the quality of the information; it does not account for additional resources that can be involved in taxation; applied in case of a lack of information for the RTS method
Per capita income	Taxable capacity depends on population incomes; fool-proof calculations and information are available	The method can be applied provided personal income tax has fiscal importance for the revenue of the territory's budget; approximate estimates of capacity
The additive property of taxable capacity	A possibility of accounting for federal allowances	This method requires a huge amount of data
Tax revenues actually collected	Fool proof calculations, information for estimates is available	Territory development capacity cannot be identified, the region's taxable capacity is difficult to plan, a gap exists between the taxes actually collected and actual taxable capacity

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(Continuation.)

Method	Advantages	Disadvantages
Representative Tax System (RTS)	An unbiased approach that is highly accurate in measuring a region's taxable capacity	A labour-intensive approach, difficult to understand
Simplified measurement method	Easy to do, information is available	Distortions in the measurements due to estimates based on the key budget-funded taxes, limitations in measuring the taxable capacity of municipal units
	Methods based on a mixed approach	
Taxable capacity coefficient	Easy to do and low labour intensity	Arrears at the budget system levels are not accounted for, low motivation for territories to find their local reserves, estimates based on a possible linear relationship between added value and tax revenues
Regression analysis	Requires less input, low labour intensity for calculations, no need for accurate calculation of standard tax bases and representative tax rates	A significant number of tax bases are limited by the regions' data, method difficulty, method lacks relative transparency
	Methods based on a reproduction approach	
GRP	Accounts for incomes in a region with no regard for the registration places of individuals or an entity's location	Discrepancies in identifying the region's taxable capacity determined by the specific features in the tax structure, measurement is delayed, no recognition of a specific approach for calculating GRP
Evaluation of veiled activities	Information about veiled incomes specifies the amount of the regional tax base	Reliable information is difficult to obtain, credibility is relative to the transactions in the veiled activities, no regard for specific regional features in measuring taxable capacity
	Methods based on an institutional approach	
Distribution of transfers from the Fund for Financial Support of the Regions (FFSR)	The most transparent method and calculations can be controlled	Comprehensive and conceptual difficulty regarding the object to be measured, criteria for budget alignment, region's consumption needs, and taxable capacity
Indicative analysis	Information for calculating taxable capacity is available	Taxable capacity does not consider veiled incomes

This analysis helps classifying the methodologies into the following categories: resource approaches, fiscal approaches, mixed estimates, and reproduction and institutional conceptual approaches (Table 1).

Justification of the assessment criteria for tax cooperation in the region

Our understanding of taxable capacity supposes that the methodology for measuring the competitive capacity of a region uses an integral indicator which could be composed of a system of private parameters that:

- affect the theoretical taxable capacity;
- identify the possibility of including a forecasted tax base;
- affect the scales of the veiled tax base; and
- affect the dynamics of tax debts.

In contrast to private parameters, an integral indicator offers a comprehensive understanding of a region's taxable capacity. Moreover, the private parameters identify a set of factors that impact the development of the actual taxable capacity, offering the ability to design a mechanism for its improvement.

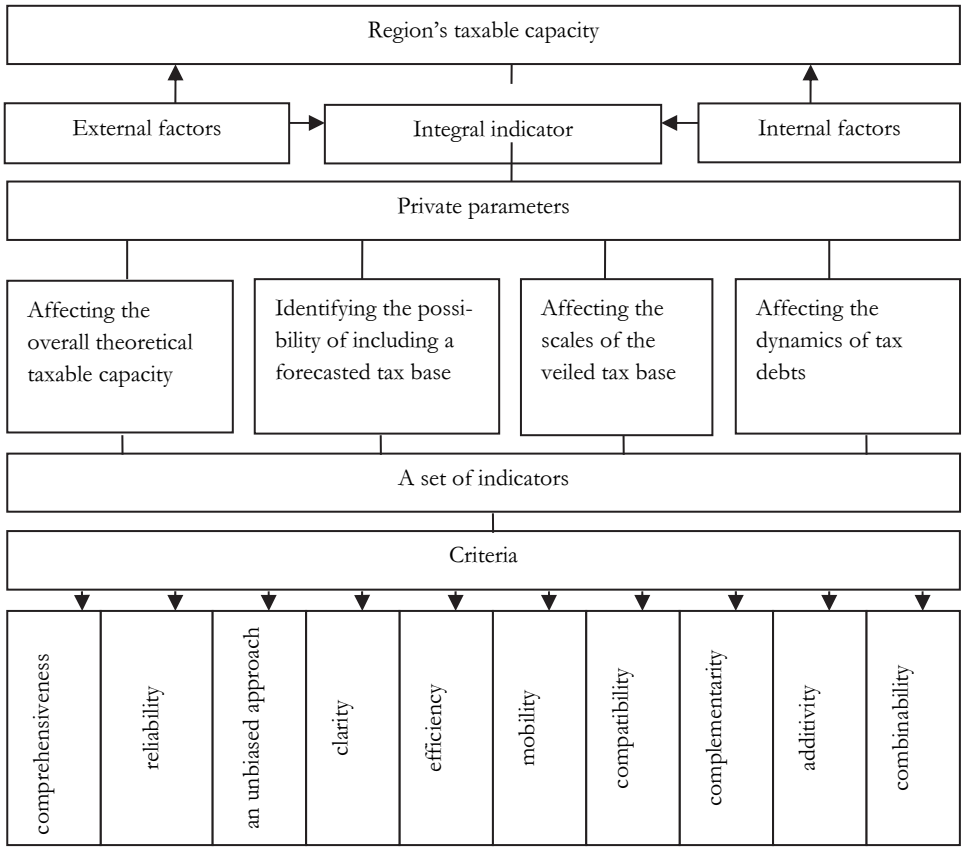
The final evaluation indicator must be based on criteria that could be represented by a number of qualitative and quantitative indicators. In turn, these criteria must fully and reliably represent the region's actual taxable capacity, because the reliability of the final evaluation depends on an unbiased approach to the key parameters of the object in question. We believe that key criteria that satisfy these requirements include:

- comprehensiveness (comprehensive coverage of the information about the research's object);
- reliability (showing reliable data in the research processes);
- an unbiased approach (evaluation indicators are independent from the impact of other factors);
- clarity (clear potential for identifying the research object for a parameter characterized aspect);
- efficiency (the choice of an adequate number of indicators, without too many details, that provides an efficient analysis of the object in question);
- mobility (showing the development of the research process under the influence of factors from internal and external surroundings);
- compatibility (possibility of comparison based on the analysed subject and object, time period and evaluation approach);
- complementarity (compliance with the set tasks; each indicator should be aimed at measuring the progress toward achieving a particular goal);
- additivity (the ability to decompose a whole analysed object into its structural parts);
- combinability (complementarity of the indicators, which could show different sides of the object in question).

Thus, a structural logical diagram to define the criteria and indicators for measuring a region's taxable capacity is shown in Figure 1:

Figure 1

A structural logical diagram defining the criteria and indicators for measuring a region's taxable capacity



Keeping the enumerated criteria in mind, a measurement methodology should primarily be based on a representative fiscal system adjusted to the indicators and parameters setting the estimation errors. The results of the research show that this approach results in fewer estimation errors (Mironova–Khanafeev 2016, Okello 2014). The calculation method is additionally adjusted for specific evaluation goals and tasks, factors that determine the region's taxable capacity, and the specific features of the territory's institutional and economic organization.

Results

The amount of funds planned to be mobilized into the budgetary system does not typically match the values actually calculated. The difference is usually negative; that is, the state budget receives a lower amount of taxes compared to the level expected. This phenomenon is known worldwide as a tax gap. A tax gap indicates a difference between the sum of taxes which could theoretically be paid by the taxpayers provided they completely and timely observe the fiscal legislation and the sum of taxes actually paid. This term was borrowed from the English (tax gap), where it is applied with a similar meaning. This means that the tax gap issues exists in all countries and is global in nature.

There is a direct correlation between the value of the taxable capacity and the tax gap, because the latter is connected to the tax base and tax liability. Violations of fiscal legislation standards (purposeful or unintended) result in a reduced tax base and distort the calculations of actual taxable capacity. Moreover, the annual tax base and associated macroeconomic indicators can change.

Tax gaps can arise for different reasons, although they significantly distort the final estimates of taxable capacity. By summarizing the practices in other countries and in Russia, we can identify the following reasons for tax gaps:

- errors made by the bodies performing the registration and holding the records of taxpayers and taxable items;
- changes in fiscal legislation, usually leading to a reduction in the budget revenue base (a lower tax rate, tax allowances, or tax abolition);
- an income decrease and shadow financial and economic activities;
- wilful tax evasion;
- excessive minimization of tax liabilities to keep an enterprise operating;
- registration of organizations in low tax zones;
- tax arrears for various reasons; and so on.

We believe there are far more reasons for tax gaps. This complicates the measurement of the tax gap value and thus taxable capacity. Further, some reasons are rather difficult to predict and assess, because the mechanisms used by economic entities to veil taxable items are difficult to identify.

In many countries, the occurrence of tax gaps is monitored by key budget-funded taxes based on random inspections and verification of the indicators of financial and economic performances. Some scientists-economists estimate that the tax gap level in Russia is less than 7.6% (Igonina et al. 2016a). However, we disagree with this approach due to the high level of the shadow sector in the Russian economy (approximately 50%) and the scale of tax evasion. These two specified parameters could result in a much higher value for the tax gap.

We feel that the tax gap should be estimated in terms of tax types, while studying all the factors that affect it. In turn, taxable capacity can be measured with due regard for the tax gap value.

Thus, the formula to measure a region's taxable capacity is as follows:

$$НП_{р} = \sum_{i=1}^{n} (НП_{i} + НР_{i})$$

where $НП_{р}$ is the region's taxable capacity; $НП_{i}$ is the taxable capacity of a particular tax type; $НР_{i}$ is the tax gap for a particular tax type; n is the amount of taxes received by the region's budget.

It is impossible to account for the full range of factors that contribute to the development of a tax gap. These factors include the most relevant reasons that affect taxable capacity. For example, a change in the corporate profit tax rate to 1% since 2017, which is transferred to the sub-federal budget, significantly decreased their profit base. The level of the shadow sector of the economy and the sum of tax arrears are also key factors in determining the size of the tax gap. It should be remembered that a shadow sector is shaped by the factors mentioned above (income fraud and shadow financial and economic activities, intentional tax evasion, excessive minimization of tax liabilities to keep enterprises operating, registration of companies in low tax zones, etc.). We should also consider the fact that calculations are based on data from fiscal and other bodies, which may not have the actual picture. We face a challenging task in attempting to identify the level of the shadow sector of the economy, despite numerous methodologies. However, the estimates for taxable capacity cannot ignore the shadow sector of the economy in the Republic of Dagestan because of its scale (some experts believe that the shadow sector of the economy in the Republic of Dagestan represents 40 to 70% of its economy).

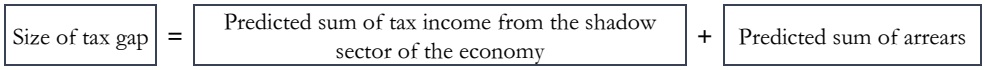
We share the opinion of some scientists (Musaeva et al. 2015b) and think that tax gap calculations should account for the primary circumstances:

- measurement against each tax type;
- accounting for different factors and assumptions.

Thus, the size of the tax gap can be shown as follows (Figure 2).

Figure 2

Indicators of a tax gap



In order to measure the taxable capacity of the Republic of Dagestan and then make comparisons we estimate its value by applying different methods found in the literature and used in practice. The methods were selected based on their advantages: widespread application, information available for estimates, an unbiased approach, accuracy in measuring the region's taxable capacity, the possibility of accounting for the region's incomes with no regard to the registration place of persons or the location of entities-taxpayers.

The analysis and overview of the methods for measuring taxable capacity justifies the using of one of the following methods:

– a method that uses tax revenues actually collected;
– a method that uses a representative fiscal system; or
– a method that uses gross regional product.

The method that uses tax revenues actually collected and is officially approved for estimates in the Republic of Dagestan states that the amount of taxable capacity (TC) is derived from the taxes actually paid for a particular period (Ta), the change in tax arrears for the same period (Art), and the sum of the allowances for taxes paid to the RF subject budget (Alt), which is presented in the following equation:

$$TC = Ta +/- \Delta Art + Alt$$

The results presented in Table 2 indicate that the taxable capacity of the Republic of Dagestan for the period in question exceeds the taxes actually collected by 4.1–5.5%% on average. In addition, 2013 saw an 18.8% increase in actual tax revenues, and the tax arrears substantially grew by +6.9%, while the allowance dynamics for taxes paid to the RF subject budget are significant, with growth of more than 30%. For the period 2013 to 2016, the taxable capacity in the Republic of Dagestan calculated using the method of tax revenues actually collected grew by 20% compared to the 2013 amount.

Table 2

Taxable capacity of the Republic of Dagestan calculated using the method of tax revenues actually collected

Indicators	2013	2014	2015	2016	2016, % by 2013
Actual tax collection, million RU	20,052.1	21,486.8	20,974.0	23,815.3	+18.8
Changes in the amount of arrears, million RU	+106.8	+121.6	–98.3	+114.2	+6.9
Allowances for taxes transferred to the RF subject budget, million RU	842.2	1,052.9	964.8	1,095.8	+30.1
Taxable capacity, million RU	21,001.1	22,661.3	21,840.5	25,025.3	+19.2
Correlation between taxable capacity and the taxes actually collected index	104.7	105.5	104.1	105.1	+0.4

Note: Based on data from the Federal Fiscal Service (Retrieved from https://www.nalog.ru/rn77/related_activities/statistics_and_analytics/forms/ https://www.nalog.ru).

Thus, the estimates of taxable capacity using the method of tax revenues actually collected identify areas for further expansion of taxable capacity;

- a decrease in the arrears boosts the actual collection of taxes and makes the tax potential of the next time period of a better quality;
- the growth in the allowance sums for taxes paid to the RF subject budget worsens a territory's taxable capacity.

The method that uses GRP is one of the most popular methods for measuring a territory's taxable capacity. This method is attractive due to its low labour intensity and a relatively simple calculation procedure. Moreover, the required information is official and available (Popova 2014).

In this approach, taxable capacity is measured using the following indicators:

– the country's average tax rate;
– GRP in a particular region;
– the country's total GRP; and
– the common tax liabilities of the regions.

The average tax rate is determined based on the correlation between the tax liabilities of all regions in the country and the country's total gross regional product. Under this method, the tax liabilities of all regions are calculated based on both tax revenues and tax arrears, and their increase, which is added to the tax liabilities.

The regions' taxable capacity is next defined using the method based on the country's average tax rate and GRP (Table 3).

Table 3

Taxable capacity of the Republic of Dagestan measured using the GRP method

Indicators	2013	2014	2015	2016	2016 in % by 2013
GRP of all regions, billion RU	53,013.6	59,188.3	65,750.6	69,254.1	130.6
Tax liabilities of all regions, billion RU	5,957.6	6,453.9	10,723.4	13,287.4	223.0
Arrears of all regions, billion RU	354.2	358.3	827.5	1,031.7	291.2
Changes in the arrears in tax liabilities, billion RU	+35.5	+4.1	–489.4	–693.2	2,052.6
Average tax rate, %	11.97	11.52	16.82	19.67	164.3
GRP in the Republic of Dagestan, billion RU	452. 9	528. 1	559.7	562.5	124.1
Taxable capacity, billion RU	5,421.2	6,083.7	9,414.1	11,064.4	204.0

Note: Prepared using data from the Federal Fiscal Service, access mode – https://www.nalog.ru and the Federal Statistics Office, access mode – http://www.gks.ru.

Table 3 shows that the taxable capacity of the Republic of Dagestan doubled between 2013 and 2016 and reached 11064.4 billion RU in 2016. At the same time, the dynamics of the indicators that contribute to taxable capacity illustrate the unequal impact of conditions such as the country's average tax rate, the GRP in the Republic of Dagestan, the total gross regional product, as well as the common tax liabilities of the regions.

For example, factors such as growth in the tax liabilities of all regions by 123% and growth in the arrears of all regions by 191.2% extensively affect improvement in the taxable capacity of the Republic of Dagestan. At the same time, it should be noted that with significantly low dynamics of the GRP in all regions (+30.6%) and the GRP in the Republic of Dagestan (+24.1%), the dynamics of the average tax

rate seems to be more substantial (+64.3%), which determines the 104% expansion in the taxable capacity of the Republic of Dagestan.

Next, we calculate the basic taxable capacity by tax types and the associated tax rates (Table 4).

Table 4

Calculation of the basic taxable capacity in the Republic of Dagestan by tax types

Indicators	2013	2014	2015	2016	2016 in % by 2013
Basic taxable capacity, million RU, total	**15,922.6**	**18,534.0**	**19,443.2**	**23,295.0**	**146.3**
including					
Personal income tax	8,076.4	9,987.6	8,708.2	11,013.1	136.3
Corporate profit tax	850.9	1,056.5	1,891.5	2,166.4	254.6
Excise taxes	1,603.2	1,536.7	1,642.3	1,705.4	106.3
Corporate property tax	2,525.0	2,734.9	2,807.2	3,093.7	122.5
Transport tax	419.4	803.2	1,102.1	1,382.6	329.6
Mineral tax	18.1	19.3	979.8	30.1	166.2
Official fee	69.6	99.4	98.3	130.3	187.2
Personal property tax	128.5	147.1	0.0	236.2	183.8
Land tax	919.7	842.4	0.0	1,300.6	141.4
Total income tax	704.6	880.7	1,090.2	1,140.9	161.9
Other taxes and levies	607.2	426.2	1,123.6	1,095.7	180.4

Note: Based on data from the Federal Fiscal Service, access mode – https://www.nalog.ru.

This analysis of the taxable capacity structure in the Republic of Dagestan for 2013–2016 includes the tax gap and shows that taxes such as the personal income tax (41.6–43.9%%), corporate property tax (13.1–14.9%%), and corporate profit tax (10.0–12.2%%) comprise a significant share of the taxable capacity. The total share of these indicators for the period in question ranges from 64.7% to 71.0% (Table 4). Hence, improving the taxable capacity in the Republic of Dagestan requires local tax offices to focus on directing the capacities of taxes such as personal income tax, property tax, and corporate profit tax.

Table 5 compares the results of measuring the taxable capacity for the Republic of Dagestan for 2013–2016 using the different measurement methods. Table 5 clearly shows that the taxable capacity estimated with a tax gap has the highest value. This means that the actual taxable capacity is not fully implemented and there are some reserves for development.

Table 5

Comparative analysis of the taxable capacity of the Republic of Dagestan measured by different methods

(million RU)

Measurement method for taxable capacity	2013	2014	2015	2016	2016 in % by 2013
Tax revenues actually collected	21,001.1	22,661.3	21,840.5	25,025.3	+19.2
Gross regional product	5,421.2	6,083.7	9,414.1	11,064.4	+104.0
Tax gap based taxable capacity	28,627.7	34,435.3	33,690.2	39,880.5	+39.3

Discussion

The aspects of measuring a region's taxable capacity, fiscal federalism, and an efficiency increase in fiscal policy are analysed in papers by foreign scholars: Okello (2014), Said–Singini (2014), Saez–Stantcheva (2018), Raczkowski (2015), Rinaudo (2014), Roy–Chowdhury (2017), and Stern (2016). These scholars based their studies on a RTS. This method is the most popular tool for measuring taxable capacity. The method predicts the possible tax revenues in a regional budget with by applying standard or average tax base rates to each type of tax valid for that country. Canada, Germany, and Switzerland are quite experienced in applying this method. In Canada, the concept of fiscal federalism is known for its high degree of regional authority autonomy, and requires a special national template to compare different tax bases, because the territory's taxable capacity is measured with regard to the cumulative tax bases of 37 regional and local taxes. The method for measuring taxable capacity based on the representative system is also used in Russia (Musaeva et al. 2015a, 2015b, Mironova–Khanafeev 2016, Sinelnikov-Murylev et al. 2011).

The method's advantage is its reliable identification of a region's tax revenue capacity. However, frequent cases of tax evasion, a high level of shadow revenues of market subjects, frequent changes in fiscal legislation and other factors, as well as the demotivation of fiscal bodies and regional authorities to show their unbiased taxable capacity, decrease the efficiency of managing taxes and their role in the social and economic development of the region.

The RTS method based on average tax rates for particular tax bases is aimed at predicting the possible tax revenues for the region's budget. Information about the amount of a region's tax base is collected in the state's fiscal system. Under this method, the tax revenue capacity is defined for each tax with regard to the tax base and an average tax rate.

The RTS method sees taxable capacity as the amount of possible tax payments into the region's budget. In addition, a unified tax structure for the territories and uniform taxation rates in the regions, as well as an average level of regional tax effort, serve as prerequisites for the calculations.

The RTS method requires a wide range of information across the RF regions: the amount of taxes and levies actually collected, tax bases, tax rates, and the level of tax effort.

The following algorithm is applied to each region to identify the territory's tax revenue capacity:

- the revenue items of local budgets are specified;
- the revenues of particular regions are classified;
- the structure of the standard tax burden and representative taxation rate are identified; and
- the region's taxable capacity is measured (Pinskaya et al. 2018).

These estimates and application of this method provide the amount of tax revenues that could be collected by the region, provided the region used a representative fiscal system. Overall, the territories' tax revenue capacity is measured by adding the taxable capacities of separate taxes. The taxable capacity estimates for a particular tax also account for changes in legislation related to this tax. The capacity of tax revenues is measured separately for the following taxes: value added tax, personal income tax, property tax, excise tax, corporate income tax, and natural resource consumption tax. There is also an element of taxable capacity defined by the remaining taxes that is not accounted for in measuring the separate taxable capacities.

Thus, the RTS method evaluates the skills of the region's authorities in managing the tax returns to the budget based on a fixed taxable base. With a number of advantages (unbiased identification of the taxable capacity amount), the approach also has some drawbacks, with the most crucial one being its high labour intensity.

Many Russian scholars have contributed to the issue of identifying taxable capacity. For example, Aliev et al. (2014, 2015), Igonina, (2016a, 2016b), and Suleymanov et al. (2016, 2018) measure taxable capacity by analysing inter-budget relationships. However, such an approach does not comprehensively cover all the main aspects of taxable capacity, because many other financial and economic parameters are ignored.

The method of classification based on identifying the direct and indirect measurement methods for the region's taxable capacity turns out to be very popular. *Direct methods* regard the figures for the collected tax revenues in the RF subjects, while *indirect methods* are based on the economic parameters that characterize the region's development.

Igonina's approach (Aliev et al. 2015) is worth mentioning: it summarizes the measurement methods for the region's taxable capacity:

- approaches based on economic income figures (per capita income, gross regional product, combined tax resources);
- approaches based on tax base figures (direct account, RTS)
- approaches based on the actual tax payment figures and their updates (actual tax revenues, updated by the actual tax payments) (Aliev et al. 2015).

In their analysis of a region's taxable capacity, many scholars point out the measurement method that uses a TCC as an independent approach (Fjeldstad 2013).

On the whole, the proposed analysis of the content, advantages, and drawbacks of the existing methods for measuring taxable capacity is a prerequisite for further improvement in the appropriate measurement methodology. In addition, we believe that a RTS, which has minimal measurement errors, should be the starting point for the method used to measure a territory's taxable capacity.

The methods for measuring taxable capacity described here and in other papers do not update capacity for the value of the shadow turnover and non-activated capacity, which lowers the actual amount of predicted budget revenues.

Conclusion

Finding a solution for strengthening the region's taxable capacity is of theoretical and practical importance for further development of regional economic units and for supporting the RF subjects in their duties to fulfil their social and other obligations. Territorial budget capabilities determine the solutions for all functions and tasks in the controlled areas and ultimately the living standards for the population. It should also be noted that foreign practices are known for their extensive experience in developing taxable capacity, which could benefit the Russian regions.

In general, an analysis of the content, advantages, and disadvantages of existing methods for assessing tax potential is a prerequisite for developing an improved optimal evaluation methodology. At the same time, the starting point for improving the territories' tax potential evaluation methodology should be, in our opinion, a RTS, the results of which show minimum evaluation errors.

Tax potential evaluation methods presented in the literature as well as above do not primarily provide clarification of the magnitude of the shadow economy and non-activated capacity, which reduces the real amount of potential revenues.

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Adaptation of the UN's gender inequality index to Ukraine's regions

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This article analyses the application of the Human Development Index (HDI) and its derivative indices that take into account the gender factor. Currently, this index is used both for ranking countries based on their level of human development and for studying the situation in regions in the context of the indicators of this index. We proceed from the fact that, for countries for which sub-national regional indicators are very diverse in different spheres, it is expedient to adapt not only the index of human development, but also the indices of the development of human potential, taking into account the gender factor. This study suggests an adaptation of the Gender Inequality Index (GII) in the United Nations' (UN) basic methodology to the sub-national level. The method suggested by the authors enables the use of this adaptation for a revision of the system of indicators for which the index is determined. Our results allowed us to compare the indicators and the trends in the two methods for calculating the sub-national indices based on the corresponding indicators in the observed country from the previous 10 years. We concluded that the GII indicators based on an entire country and those derived by the UN's basic methodology do not reflect a wide sub-national disparity. The expansion of the base of the indicators for the determination of GII allowed the development of a new method for a sub-national GII adaptation. The aim was to adjust GII calculated according to the basic methodology and, therefore, to provide more objective political, economic, and social recommendations in the context of development of human potential, taking into account the gender factor.

Keywords:
gender,
adaptation,
sub-national level,
statistical methodology,
Human Development Index,
gender factor,
Gender Inequality Index,
Erasmus+ Project:
Gender Studies Curriculum

Introduction

Since 1990, the United Nations Development Program (UNDP) has published the World Human Development Reports. The methods for calculating the various indices for measuring human development appear in the technical applications of these documents. These indices allow a comparative analysis of the progress of particular countries and regions of the world. Every year, the number of countries for which these indices are calculated increases. To date, more than 180 countries have been represented in the statistical annexes of these reports. Since 1994, most of these countries have been publishing the annual national human development reports (Kolesov 2008).

The method of calculating the HDI was published for the first time (UNDP 1990) in the 1990 UN experts' report 'The Concept and Measurement of Human Development'. In 1995, the method of calculating two human development indices – Gender Development Index (GDI) and Gender Empowerment Measure (GEM) (UNDP 1995) – started taking into account the gender factor. The idea embodied in these indices is based on the statement that gender inequality inhibits human development, and the average level of achievements in a particular country cannot be adequately evaluated without considering the inequality between men and women. In the formulation of 'The Concept and Measurement of Human Development', the idea was that development is a process in which the person is in the centre. Consequently, the main components of HDI at the UN level were health, education, and material well-being.

Currently, HDI is used both to rank countries in terms of human development and to examine the situation in different regions according to the indicators used in this index. Thus, the HDI can be adapted to the sub-national level. Since the statistical indicators for calculating HDI are available, it is natural to expand the set of indicators that characterize human development in a particular country with additional economic, educational, and health indicators.

For countries where the sub-national indicators vary across regions, it is advisable to adapt not only HDI, but also the human development indices with the gender factor. Moreover, the indicators of the GII in a single country can conceal serious sub-national imbalances and disparities. Therefore, this study proposes a method for adapting GII to the sub-national level.

Literature review

The indices that can be used to assess the gender parity in a country or region can be categorized as simple or complex. The main simple indices for estimating the gender inequality in demographic and social statistics are summarized in Akbash et al. (2018). Simple indices measure gender inequality based on a single indicator in a

particular area. Recently, much research has been devoted to the analysis of inequalities for various sub-national simple indicators. For example, sub-national health inequalities without a gender factor are considered in Egri (2017) and Uzzoli (2016).

For gender analysis that covers several areas of human activity simultaneously, complex indices are used. These indices are calculated at the country level and used to rank countries by the level of gender inequality in the context of human development.

Attempts have been made in some countries to assess the regional development of society. For example, an international methodology was used in Poland (NHDRP 2012) and China (CNHDR 2013). The indicators for achieving the UN's Millennium Development Goals (ESD 2009) were used as the basis for calculating regional HDI in the Russian Federation (RUNDP 2006),

In 2000, the National Academy of Sciences of Ukraine developed a national methodology for assessing human development (Libanova et al. 2002). This methodology was based on the use of 96 indicators, reflecting nine aspects of human development: living conditions, social environment, the state of the labour market, social financing, demographic development, health care, education, material well-being, and ecological status. Since 2001, the State Statistics Committee of Ukraine began the annual monitoring of the Regional Human Development Index. Further, in 2003, the first report on the level of human development in the regions of Ukraine was prepared by the Institute of Demography and Social Research of the National Academy of Sciences of Ukraine and the State Statistics Committee of Ukraine (HDU 2003). This approach to adapting the HDI is original, but it raises the logical question regarding the possible multicollinearity among the variables in the calculations – although Libanova et al. (2002) attempted to eliminate this problem by introducing weights.

Main research results

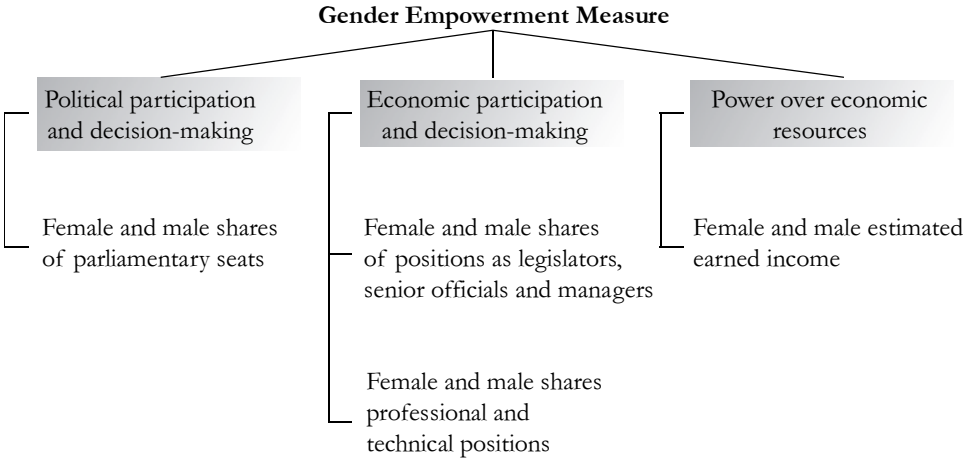
Description of the data and its sources

To adapt GII to the sub-national level (e.g. the Kirovohrad region in Ukraine), the GII's analysis period, and its trends during 2010–2017, we use the basic method for calculating the index from the technical annexes of the Human Development Report (UNDP 2018). GII characterizes, for the countries (areas) on which qualitative and quantitative data exist, the degree of the unfavourable position of one of the physiological sexes (in this case, females) in three dimensions: empowerment, economic activity, and reproductive health. Hence, GII shows the degree of the negative influence on human development due to the inequality in achievements between women and men in these dimensions.

Recall that GEM has been used since 1995 to demonstrate gender inequality, and, in 2010, it was replaced by GII. GEM reflected the inequalities between men and women in political and economic participation and decision-making positions, as well as positions in the management of economic resources. The structure of the dimensions and indicators of GEM is shown in Figure 1.

Figure 1

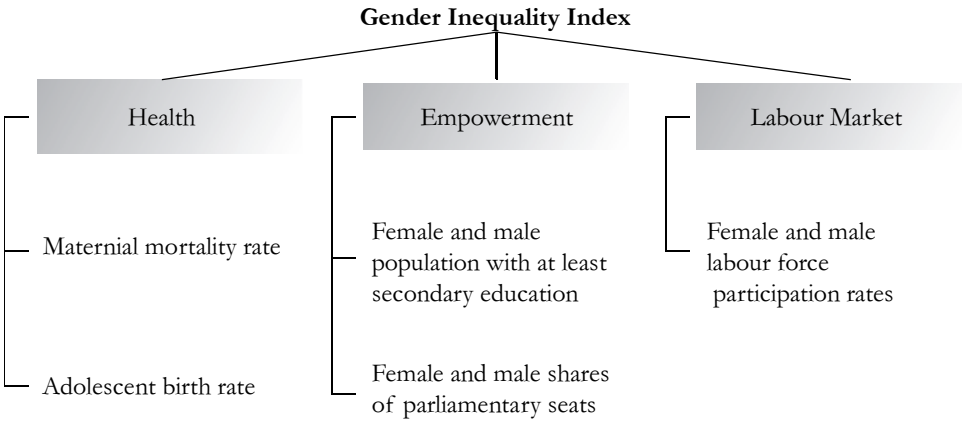
Calculating the GEM – graphical presentation



GII reflects not only the disadvantaged position of women in sharing political power, but also in reproductive health. It also displays inequality at the level of secondary education. The structure of the dimensions and indicators of GII is shown in Figure 2.

Figure 2

Calculating GII – graphical presentation



Later in this article, we will demonstrate the calculation of GII at the sub-national level using the basic UN methodology without changing the set of indicators, and also offer our own version of the GII sub-national adaptation with an expanded base of indicators that will be more sensitive to gender inequality in the key areas of human activity.

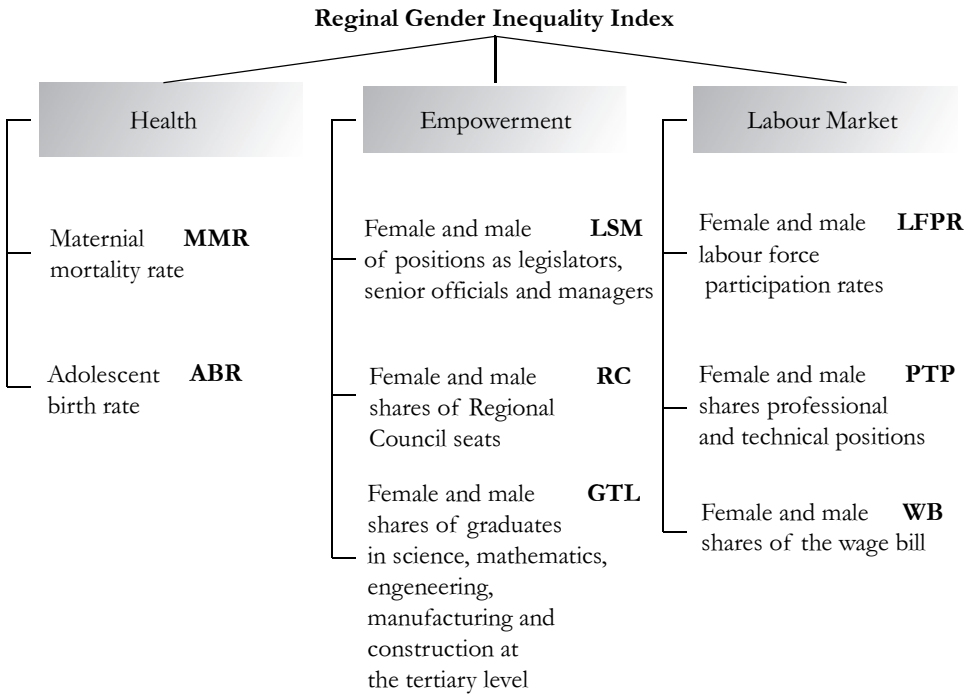
To construct a regional GII, we combined the GEM and GII indicators as follows:

- The dimension of Health in GII remains unchanged in structure.
- The dimension of empowerment has been modified. The 'Female and male shares of parliamentary seats' indicator was replaced by the corresponding 'Female and male shares of the Regional Council seats' indicator. The 'Female and male population with at least secondary education' indicator is not relevant at the level of Ukrainian regions, since secondary education is compulsory for all. Moreover, this figure has not been calculated since 2001 – since the last census in the country. Accordingly, this educational indicator – 'Female and male population with at least secondary education' – was replaced by the more relevant and more informative 'Female and male shares of graduates in science, mathematics, engineering, manufacturing, and construction at the tertiary level', selected from the Human Development Data in Dashboard 3: Women's empowerment (UNDP 2018). Additionally, the indicator 'Female and male shares of positions as legislators, senior officials, and managers' has been added to GII. Moreover, the indicator 'Female and male shares of positions as legislators, senior officials, and managers' has been added from set of indicators of GEM.
- The Labour market dimension has been expanded with two indicators from GEM. The indicator 'Female and male shares of professional and technical positions' has been added. Also included was the indicator 'Female and male shares of the wage bill', from which the indicator 'Female and male estimated earned income' was calculated. However, at the sub-national level of one country, there is no need to recalculate women and men's incomes into US dollars, so we settled on their shares of the wage bill. The indicator 'Female and male labour force participation rates' has been retained.

Figure 3 shows the structure of the adapted regional GII, as well as abbreviations of the GII indicators that will be used in the article.

Figure 3

Calculating regional GII – graphical presentation



This change in the method of calculating the regional GII for Kirovohrad allows us: a) to take into account the existing regional disparity in the characteristics of a possible existing gender inequality in a wider number of indicators; b) to investigate the dynamics of this change, not only in the general regional GII over a given period, but also the dynamics of their composite indicators; and, c) to provide objective political, economic, and social recommendations for a particular region in the context of human development with a gender perspective.

Calculation of regional GII according to basic UN methodology

Based on the UN methodology, we create Table 1, showing the definition and data sources for all composite GII indicators (UNDP 2018).

Table 1

Indicators and data sources for UN's regional GII

Indicator	Definition	Data source
	Health	
Maternal mortality ratio (MMR)	Number of deaths due to pregnancy-related causes per 100,000 live births.	Databank of the State Statistics Service of Ukraine (DSSSU 2017).
Adolescent birth rate (ABR)	Number of births to women ages 15–19 per 1,000 women ages 15–19.	State Statistics Service of Ukraine. Population Of Ukraine. Demographic Yearbook (SSSU 2017).
	Empowerment	
Share of seats in Regional Council (RC)	Proportion of seats held by women in the Regional Council, expressed as a percentage of total seats.	Kirovohrad Regional Council website: www.oblrada.kirovograd.ua
Population with at least some secondary education (SE)	Percentage of the population aged 25 and older who have reached (but not necessarily completed) a secondary level of education.	The data were obtained based on the results of Ukraine's last census in 2001 and have not been updated yet (DSSSU 2017).
	Labour market	
Labour force participation rate (LFPR)	Proportion of working-age population (ages 15 and older) engaging in the labour market, either by working or by actively looking for work, expressed as a percentage of the working-age population.	Main Department of Statistics in Kirovohrad Region (DSKR 2017).

Next, we present the main steps of the basic method of calculating GII in the form of Table 2 (UNDP 2018).

Table 2

Steps for calculating the UN's regional GII

№	Step	Calculation
1	Treating zeros and extreme values	Since a geometric mean cannot be computed from zero values, a minimum value of 0.1 percent is set for all component indicators.
2	Aggregating across the dimensions within each gender group using geometric means.	For women, the aggregation formula is $G_F = \sqrt[3]{\left(\frac{10}{MMR} \cdot \frac{1}{ABR}\right)^{1/2} \cdot (RC_F \cdot SE_F)^{\frac{1}{2}} \cdot LFPR_F}$ And, for men, the formula is $G_M = \sqrt[3]{1 \cdot (RC_M \cdot SE_M)^{1/2} \cdot LFPR_M}$
3	Aggregating across the gender groups using a harmonic mean.	$HARM(G_F, G_M) = \left[\frac{(G_F)^{-1} + (G_M)^{-1}}{2}\right]^{-1}$

(Continued on the next page.)

(Continuation.)

№	Step	Calculation
4	Calculating the geometric mean of the arithmetic means for each indicator	$\overline{health} = \frac{\left(\sqrt{\left(\frac{10}{MMR}\right)\cdot\left(\frac{1}{ABR}\right)}+1\right)}{2}$ $\overline{emp} = \left(\sqrt{RC_F \cdot SE_F} + \sqrt{RC_M \cdot SE_M}\right)\cdot {}^{1}/_{2}$ $\overline{LFPR} = \frac{LFPR_F + LFPR_M}{2}$ $G_{F,M} = \sqrt[3]{\overline{health}\cdot\overline{emp}\cdot\overline{LFPR}}$
5	Calculating GII	$GII = 1 - \frac{HARM(G_F, G_M)}{G_{F,M}}$

Implementation of GII calculation according to basic UN methodology

Step 1. Because a geometric mean cannot be computed in the presence of zero values, a minimum value of 0.1 percent is set for all component indicators. Further, as higher maternal mortality suggests poorer maternal health, for the maternal mortality ratio, the maximum value is truncated to 1,000 deaths per 100,000 births and the minimum value set at 10. The rationale is that countries where maternal mortality ratios exceed 1,000 do not differ in their inability to create conditions and ensure support for maternal health, that countries with 10 or fewer deaths are performing at essentially the same level, and that small differences are random. The representation of women in countries' (regions') parliaments (regional councils), fixed at a level of 0%, will be encoded as 0.1% because: a) the geometric mean cannot have zero values, and b) women in such countries (regions) still have some political influence.

In Tables 3 and 4, we present the data values that will be used to calculate, using UNDP methodology, the GII for Ukraine and the sub-national adaptation of GII (using the example of Kirovohrad Oblast) for the period 2010–2017.

Table 3

Composite indicators of the GII for Ukraine

Year	Health		Empowerment				Labour market	
	ABR	MMR	PR female	PR male	SE female	SE male	LFPR female	LFPR male
2010	28.3	18	8.2	91.8	91.5	96.1	62.3	72.6
2011	30.8	26	8.0	92.0	91.5	96.1	52.0	65.4
2012	28.0	25	8.0	92.0	91.5	96.1	47.5	63.9
2013	26.1	32	8.0	92.0	91.5	96.1	53.3	66.6
2014	25.7	32	9.4	90.6	91.5	96.1	53.0	66.6
2015	25.7	23	11.8	88.2	91.7	95.9	53.2	66.9
2016	24.1	24	12.1	87.9	94.3	96.0	52.2	67.4
2017	23.8	24	12.3	87.7	94.5	95.6	46.9	63.0

Table 4

Composite indicators of the GII for the Kirovohrad region

Year	Health		Empowerment				Labour market	
	ABR	MMR	RC female	RC male	SE female	SE male	LFPR female	LFPR male
2010	38.6	85.5	16.16	83.84	94.2	92.1	58.1	67.4
2011	39.6	28.4	16.16	83.84	94.2	92.1	57.8	69.6
2012	42.2	18.1	16.16	83.84	94.2	92.1	57.8	71.0
2013	39.5	0.0	16.16	83.84	94.2	92.1	56.0	69.0
2014	40.9	37.8	16.16	83.84	94.2	92.1	55.2	67.5
2015	41.5	10.6	14.75	85.25	94.2	92.1	54.4	68.5
2016	34.1	33.9	14.75	85.25	94.2	92.1	54.0	67.5
2017	29.5	0.0	14.75	85.25	94.2	92.1	54.5	67.7

Taking into account the extreme values in the calculations, we set the MMR values for the Kirovohrad region in 2013 and 2017 at 10.

Step 2. Aggregation is the first step towards making the GII available for interconnection (calculated using the formulas in row 2 of Table 2).

Step 3. The female and male indices are aggregated by the harmonic mean to create the equally distributed gender index, to generate an equally distributed gender index (calculated using formulas in row 3 of Table 2). Using the harmonic mean of within-group geometric means captures the inequality between women and men and adjusts for the associations among dimensions – that is, it accounts for the overlapping inequalities in the different dimensions.

Step 4. The reference standard for computing inequality is obtained by aggregating female and male indices using equal weights (thus treating genders equally) and then aggregating the indices across the dimensions (calculated using the formulas in row 4 of Table 2). $\overline{health}$ should not be interpreted as an average of the corresponding female and male indices, but rather, as half the distance from the norms established for the reproductive health indicators – fewer maternal deaths and fewer adolescent pregnancies.

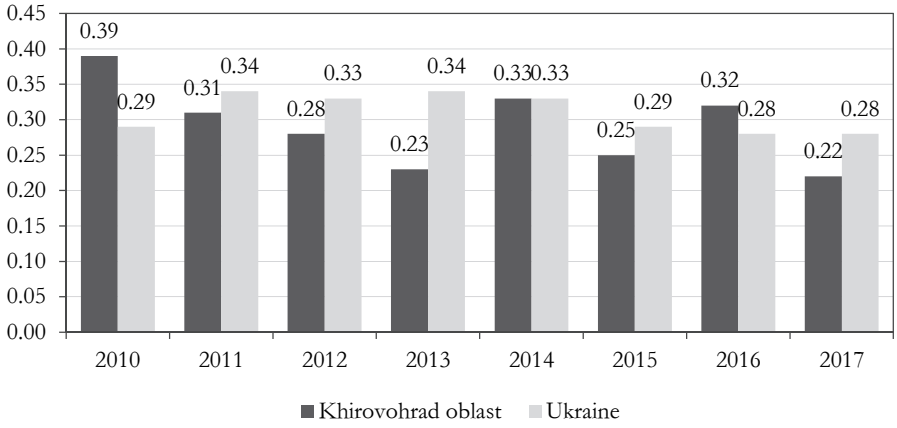
Step 5. Comparing the equally distributed gender index to the reference standard yields GII. It ranges from 0 – where women and men fare equally – to 1 – where one gender fares as poorly as possible in all measured dimensions (calculated according to the formulas in row 5 of Table 2).

Analysis of the outcome of comparing the results of the GII calculation according to the basic methodology for a country and its region

The results of the calculation of GII according to the basic methodology and the dynamics across 2010–2017 in Ukraine and the Kirovohrad region are presented in Figure 4.

Figure 4

Dynamics of GII values (calculated according to the basic method)



All index values are in the interval [0.216, 0.388], therefore, we can conclude that there are gender inequalities, but, compared to those in other countries, the values are not critically low (e.g. UNDP (2018)). However, the analysis of the dynamics in GII confirms the thesis that the overall GII of the country does not reveal the sub-national disparities. The variability of GII is within the limits of permissible values – in Ukraine, it does not exceed 9%, and, in the Kirovohrad region, it is 21%. However, there is no direct linear relationship between the dynamics of these indicators (the correlation coefficient is negative, namely, –0.156). Consequently, the indicator of the regional GII takes into account the peculiarities of the region, the trends of which do not coincide with (or deviate from) the characteristics of the country as a whole. Indeed, a statistical analysis of the data in Tables 3 and 4 allows us to draw the following conclusions: a) in the analysed region and in the country as a whole, there is a partial direct relationship between the dynamics of the ABR indicators (correlation coefficient 0.573) and the dynamics of the LFPR female indicators (correlation coefficient 0.323); b) there is a strong negative correlation between RC and PR dynamics (correlation coefficient –0.971), and there is also a partial feedback between the dynamics of MMR values (correlation coefficient –0.517) and dynamics of LFPR male indicators (correlation coefficient –0.484); c) there is no connection between the dynamics of the SE indicators for both women and men. Thus, using the example of adapting the calculation of GII according to the basic methodology, it is obvious that the indicators of GII for the entire country do not reflect the rather wide sub-national disparities. Consequently, it will be impossible to use the general (for the whole country) political, economic, and social recommendations in the context of human development, taking into account the gender factor, for a specific region. Therefore, the recommendations above should be adjusted for a particular region to reflect the results of the GII adaptation for the sub-national level.

Other factors are also relevant to women's well-being, such as the use of free time, access to assets, domestic violence, empowerment at the local level, the division of professions into 'female' and 'male' in the labour market, and the gender wage gap. It is obvious that if we take into account all these factors, GII would be calculated based on a larger number of indicators and, therefore, would be more objective. However, at the country level, it is not possible to collect some of the data. Nevertheless, for some indicators at the level of a country's regions, such an opportunity always exists.

Calculation of regional GII using an adapted methodology

Table 5 below presents the definitions and data sources for all the composite indicators of the adapted regional GII (UNDP 2018).

Table 5

Indicators and data sources for regional GII using an adapted methodology

Indicator	Definition	Data source
	Health	
Maternal mortality ratio (MMR)	Number of deaths due to pregnancy-related causes per 100,000 live births.	Databank of the State Statistics Service of Ukraine (DSSSU 2017)
Adolescent birth rate (ABR)	Number of births to women aged 15–19 per 1,000 women aged 15–19.	State Statistics Service of Ukraine. Population Of Ukraine. Demographic Yearbook (SSSU 2017)
	Empowerment	
Share of seats in Regional Council (RC)	Proportion of seats held by women in the Regional Council expressed as a percentage of total seats.	Kirovohrad Regional Council website: www.oblrada.kirovograd.ua
Female and male shares of graduates in science, mathematics, engineering, manufacturing, and construction at the tertiary level (GTL)	The female and male shares of graduates in science, mathematics, engineering, manufacturing, and construction at the tertiary level: Share of female tertiary graduates in 'Natural Sciences, Mathematics, and Statistics', 'Information and Communication Technologies', and 'Engineering, Manufacturing, and Construction' programs.	Main Department of Statistics in Kirovohrad Region (DSKR 2017)
Female and male shares of positions as legislators, senior officials, and managers (LSM)	Female and male shares of positions defined according to the International Standard Classification of Occupations (ISCO-88) to include legislators, senior government officials, traditional chiefs and heads of villages, senior officials of special-interest organizations, corporate managers, directors and chief executives, production and operations department managers, and other department and general managers.	

(Continued on the next page.)

(Continuation.)

Indicator	Definition	Data source
	Labour market	
Labour force participation rate (LFPR)	Proportion of the working-age population (aged 15 and older) involved in the labour market, either by working or actively looking for work, expressed as a percentage of the working-age population.	Main Department of Statistics in Kirovohrad Region (DSKR 2017)
Female and male shares of professional and technical positions (PTP)	Female and male shares of positions defined according to the International Standard Classification of Occupations (ISCO-88) to include physical, mathematical, and engineering science professionals (and associate professionals), life science and health professionals (and associate professionals), teaching professionals (and associate professionals) and other professionals and associate professionals.	
Female and male shares of the wage bill (WB)	Female and male shares of the wage bill in non-agricultural sectors.	

We present the main steps of the method for calculating the adapted regional GII in the table form (Table 6).

Table 6

Steps to calculate the adapted regional GII

№	Steps	Calculating
1	Treating zeros and extreme values	Because a geometric mean cannot be computed in the presence of zero values, a minimum value of 0.1 percent is set for all component indicators.
2	Aggregating across the dimensions within each gender group using geometric means	For women, the aggregation formula is $G_F = \sqrt[3]{\left(\frac{10}{MMR}\cdot\frac{1}{ABR}\right)^{1/2}\cdot(GTL_F\cdot RC_F\cdot LSM_F)^{\frac{1}{3}}\cdot(LFPR_F\cdot PTP_F\cdot WB_F)^{\frac{1}{3}}}$ and, for men, the formula is $G_M = \sqrt[3]{1\cdot(GTL_M\cdot RC_M\cdot LSM_M)^{\frac{1}{3}}\cdot(LFPR_M\cdot PTP_M\cdot WB_M)^{\frac{1}{3}}}$
3	Aggregating across gender groups using a harmonic mean	$HARM(G_F, G_M) = \left[\frac{(G_F)^{-1}+(G_M)^{-1}}{2}\right]^{-1}$
4	Calculating the geometric mean of the arithmetic means for each indicator	$\overline{health} = \frac{\left(\sqrt{\left(\frac{10}{MMR}\right)\cdot\left(\frac{1}{ABR}\right)}+1\right)}{2}$ $\overline{emp} = \left(\sqrt[3]{GTL_F\cdot RC_F\cdot LSM_F}+\sqrt[3]{GTL_M\cdot RC_M\cdot LSM_M}\right)\cdot 1/_2$ $\overline{LabourMarker} == \left(\sqrt[3]{PTP_F\cdot WB_F\cdot LFPR_F}+\sqrt[3]{PTP_M\cdot WB_M\cdot LFPR_M}\right)\cdot 1/_2$ $G_{F,M} = \sqrt[3]{\overline{health}\cdot\overline{emp}\cdot\overline{LabourMarker}}$
5	Calculating GII	$GII = 1-\frac{HARM(G_F, G_M)}{G_{F,M}}$

Implementation of the sub-national adaptation GII

The main stages of the implementation of the sub-national adaptation coincide with the stages of determining the GII according to the basic methodology. Therefore, we describe only the new features. Table 7 presents the values that will be used to determine the GII in the Kirovohrad region (with dynamics for the period 2010–2017) according to the methodology above.

Table 7

Composite indicators of the adapted GII for the Kirovohrad region

Year	Health		Empowerment						Labour market					
	ABR	MMR	RC female	RC male	GTL female	GTL male	LSM female	LSM male	PTP female	PTP male	LFPR female	LFPR male	WB female	WB male
2010	38.6	85.5	16.16	83.84	38.40	61.60	22.35	77.65	63.2	36.8	58.1	67.4	46.99	53.01
2011	39.6	28.4	16.16	83.84	26.86	73.14	21.15	78.85	64.6	35.4	57.8	69.6	45.16	54.84
2012	42.2	18.1	16.16	83.84	22.92	77.08	17.05	82.95	62.5	37.5	57.8	71.0	45.33	54.67
2013	39.5	0.0	16.16	83.84	22.01	77.99	17.32	82.68	61.8	38.2	56.0	69.0	45.33	54.67
2014	40.9	37.8	16.16	83.84	21.16	78.84	17.54	82.46	60.3	39.7	55.2	67.5	45.33	54.67
2015	41.5	10.6	14.75	85.25	20.54	79.46	25.9	74.1	58.5	41.5	54.4	68.5	43.21	56.79
2016	34.1	33.9	14.75	85.25	20.00	80.00	24.2	75.8	59.4	40.6	54.0	67.5	43.10	56.90
2017	29.5	0.0	14.75	85.25	19.80	80.20	24.8	75.2	60.2	39.8	54.5	67.7	43.04	56.96

Note that the calculation of women's and men's share of the total wage bill in the Kirovohrad region for the period in question was performed according to the traditional method (UNDP 2018). For example, for 2010, the calculation was as follows:

$$S_f = \frac{\frac{Wf}{Wm} \times EAf}{\frac{Wf}{Wm} \times EAf + EAm} \cdot 100\% = \frac{0{,}939 \times 48{,}56}{0{,}939 \times 48{,}56 + 51{,}44} \cdot 100\% = 46{,}99\%$$

where $\frac{Wf}{Wm}$ is the ratio of female to male wage, EAf is the female share of the economically active population, and EAm is the male share. The male share of the wage bill is calculated as $S_m=1-S_f$.

The calculation of women's and men's share of the total wage bill is shown in Table 8.

Table 8

Calculation of S_f and S_m in the Kirovohrad region

Year	Ratio of female to male wages in non-agricultural sectors $\frac{Wf}{Wm}$	Female share of the economically active population EAf	Male share of the economically active population EAm	Female share of the wage bill S_f	Male share of the wage bill S_m
2010	0.939	48.56	51.44	46.99	53.01
2011	0.875	48.48	51.52	45.16	54.84
2012	0.901	47.92	52.08	45.33	54.67
2013	0.901	47.92	52.08	45.33	54.67
2014	0.901	47.92	52.08	45.33	54.67
2015	0.851	47.20	52.80	43.21	56.79
2016	0.845	47.27	52.73	43.10	56.90
2017	0.842	47.30	52.70	43.04	56.96

We analyse the selected indicators at the mathematical level to substantiate their differences (Table 7). We are more interested in the correlation of gender differences among the indicators AFR, MMR, RC, LSM, GTL, PTP, WB, and LFPR than in the correlation among them. To measure the gender differences, we use Specific Gender Asymmetry Indices (GAI_{RC}, GAI_{GTL}, GAI_{LSM}, GAI_{PTP}, GAI_{LFPR}, and GAI_{WB}). The definition of the Specific Gender Asymmetry Index was introduced in Akbash et al. (2018). These factors will determine which indicators affect the overall GII the most.

Let us turn to the analysis of the Specific Gender Asymmetry Indices of indicators by year. We will analyse all indicators with the exception of those in the health dimension (the AFR and MMR health indicators at the level of the Kirovohrad region are not correlated; their correlation coefficient is 0.16), which only assesses the performance of women.

Table 9

Specific Gender Asymmetry Indices of GII composite indicators for the Kirovohrad region

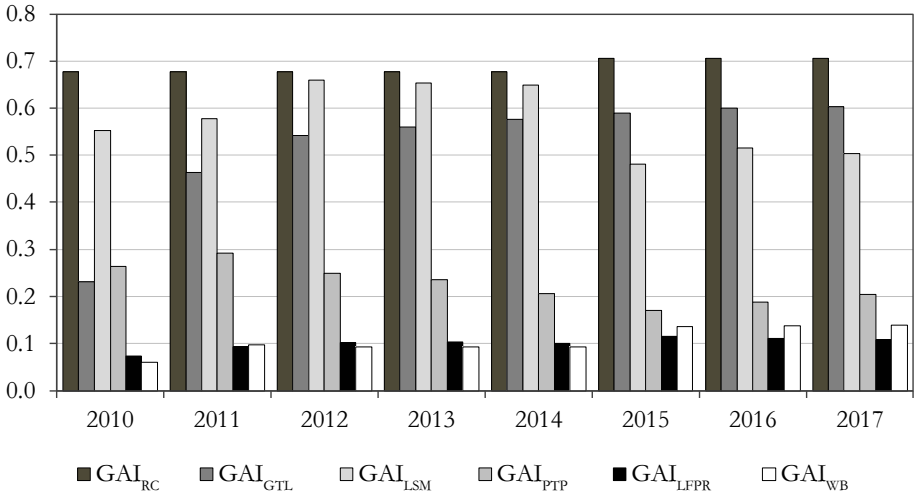
Year	GAI_{RC}	GAI_{GTL}	GAI_{LSM}	GAI_{PTP}	GAI_{LFPR}	GAI_{WB}
2010	–0.68	–0.23	–0.55	0.26	–0.07	–0.06
2011	–0.68	–0.46	–0.58	0.29	–0.09	–0.10
2012	–0.68	–0.54	–0.66	0.25	–0.10	–0.09
2013	–0.68	–0.56	–0.65	0.24	–0.10	–0.09
2014	–0.68	–0.58	–0.65	0.21	–0.10	–0.09
2015	–0.71	–0.59	–0.48	0.17	–0.11	–0.14
2016	–0.71	–0.60	–0.52	0.19	–0.11	–0.14
2017	–0.71	–0.60	–0.50	0.20	–0.11	–0.14

At the Kirovohrad region level, we can say that all indicators, except for 'Female and male shares of professional and technical positions', are characterized by a gender asymmetry towards men, but the level of this asymmetry is completely different. Thus, we can establish the weight of the indicators' influence in GII at the level of the Kirovohrad region in the following order: RC, LSM, GTL, PTP, WB, and LFPR.

Figure 5 shows these differences for the absolute values of the Specific Gender Asymmetry Indices, since GII does not take into account the direction of gender asymmetry (towards women or men), but only adjusts its overall level.

Figure 5

Specific Gender Asymmetry Indices for the Kirovohrad region: GAI_{RC}, GAI_{GTL}, GAI_{LSM}, GAI_{PTP}, $GAIL_{FPR}$, and GAI_{WB}



In Figure 5, the gender asymmetries of two dimensions – Empowerment (GAI_{RC}, GAI_{GTL}, GAI_{LSM}) and Labour market (GAI_{PTP}, GAI_{LFPR}, GAI_{WB}) – are clearly distinguished in separate groups. The asymmetry of the indicators in the Empowerment dimension is much higher than that of the indicators in the Labour market dimension.

Let us analyse the significance of the correlation of the coefficients in the groups of indicators, based on the absolute values of the coefficients in Table 9. We begin the analysis with the indicators of the Empowerment dimension group (RC, GTL, and LSM).

Table 10

Bivariate correlations among GAI_{RC}, GAI_{GTL}, and GAI_{LSM}

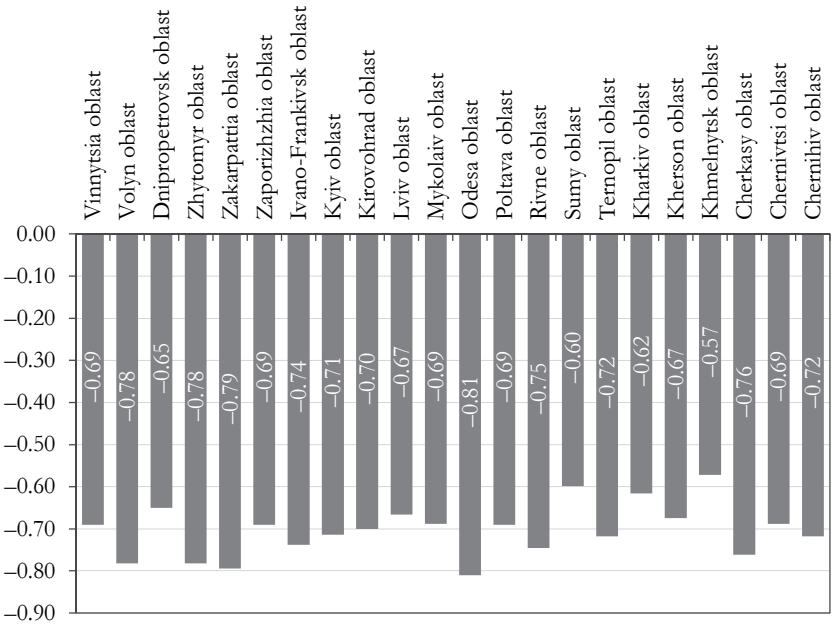
Denomination		GAI_{RC}	GAI_{GTL}	GAI_{LSM}
GAI_{RC}	Pearson Correlation	1	0.504	–0.842**
	Sig. (1-tailed)		0.101	0.004
	N	8	8	8
GAI_{GTL}	Pearson Correlation	0.504	1	–0.014
	Sig. (1-tailed)	0.101		0.487
	N	8	8	8
GAI_{LSM}	Pearson Correlation	–0.842**	–0.014	1
	Sig. (1-tailed)	0.004	0.487	
	N	8	8	8

** Correlation is significant at the 0.01 level (1-tailed).

We see one significant correlation with feedback between the GAI_{LSM} and GAI_{RC} indicators, but, as the correlations are negative, we cannot remove one of the indicators, since they do not show the same thing.

Figure 6

Specific Gender Asymmetry Index GAI_{RC} (Ukraine, from 2015 to 2017)



The greatest asymmetry at the regional level, in the indicator 'Share of seats in the Regional Council', is typical, and gender inequality has only increased over the years. This indicator, although it does not change every year, is very important in the formation of GII, since it is characterized by significant differentiation at the level of the sub-national regions. If we analyse this indicator in all of Ukraine's regions (with the exception of the Donetsk and Luhansk regions, for which data are unavailable), we will see a significant differentiation at the level of gender asymmetries (Figure 6).

Gender asymmetry for RC in Ukraine varies from –0.57 (Khmelnytsk oblast) to –0.81 (Odesa oblast).

Let us turn to the analysis of the indicators of the Labour market dimension group (PTP, WB, and LFPR).

Table 11

Bivariate correlations among GAI_{PTP}, GAI_{LFPR}, and GAI_{WB}

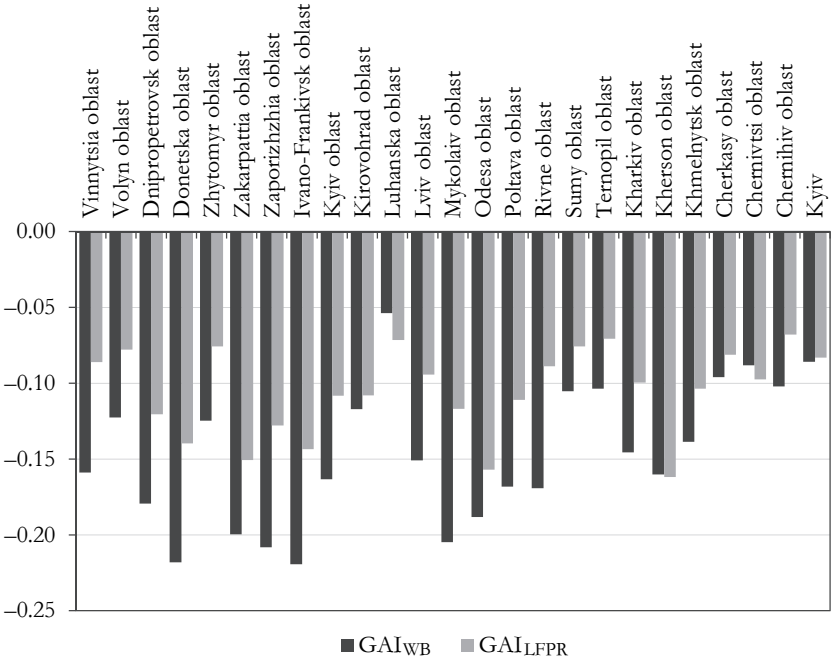
Denomination		GAI_{PTP}	GAI_{LFPR}	GAI_{WB}
GAI_{PTP}	Pearson Correlation	1	–0.741	–0.740
	Sig. (1-tailed)		0.018	0.018
	N	8	8	8
GAI_{LFPR}	Pearson Correlation	–0.741	1	0.859**
	Sig. (1-tailed)	0.018		0.003
	N	8	8	8
GAI_{WB}	Pearson Correlation	–0.740	0.859**	1
	Sig. (1-tailed)	0.018	0.003	
	N	8	8	8

** Correlation is significant at the 0.01 level (1-tailed).

We can see that only one correlation is significant – the one between the indicators GAI_{LFPR} and GAI_{WB} at the Kirovohrad region level. However, even with such a significant correlation in the Kirovograd region, we cannot conclude that one of these indicators should be excluded, since the situation in other sub-national regions may not be so explicit. Since all constituent indicators for calculating the WB and LFPR indicators are available for all of Ukraine's sub-national regions for 2017 on the State Statistics Service of Ukraine website, it is possible to analyse the correlation between the gender asymmetries in WB and LFPR for all sub-national regions. It is important to analyse both in the context of the region over the years and in the context of the structural components of GII by sub-national regions. Since all values for both indicators are negative, it is not necessary to analyse their absolute values.

Figure 7

Specific Gender Asymmetry Indices: GAI_{LFPR} and GAI_{WB} (Ukraine, 2017)



Interestingly, the correlation of 0.792 is also significant at the level of Ukraine's sub-national regions (Table 12).

Table 12

Bivariate correlations between GAI_{LFPR} and GAI_{WB} for Ukraine's sub-national regions

Denomination		GAI_{WB}	GAI_{LFPR}
GAI_{WB}	Pearson Correlation	1	–0.792**
	Sig. (1-tailed)		0.000
	N	25	25
GAI_{LFPR}	Pearson Correlation	0.792**	1
	Sig. (1-tailed)	0.000	
	N	25	25

** Correlation is significant at the 0.01 level (1-tailed).

However, there is a nuance to which attention should be paid: the lack of correlation between the indicators WB_{male} and $LFPR_{male}$ (the correlation coefficient is 0.187). In addition, the country GAI_{WB} values are at a much larger scale (0.17) than that of GAI_{LFPR} values (0.09).

Note that the multiple correlation coefficient (concordance) between absolute values of GAI_{RC}, GAI_{GTL}, GAI_{LSM}, GAI_{PTP}, $GAI_{LFPR,}$ and GAI_{WB} is 0.14 and non-significant. This means that all the indices are independent among themselves.

Thus, the selected set of indicators (Table 5) is complete for a comparative analysis of the GII for Ukraine's sub-national regions.

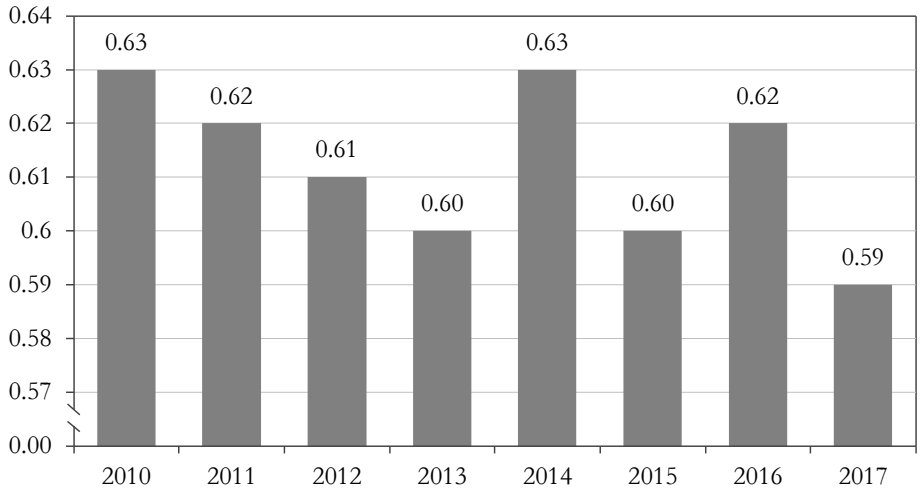
The choice of indicators is also justified by the limited availability of gender data at the level of the sub-national regions of the country. Most dimensions of the Empowerment and Labour market are not included in the State Statistics Service of Ukraine. However, these data are available in the statistical collections of all of Ukraine's sub-national regions, which are published annually by the main departments of statistics of these regions by request and with the support of the 'Gender responsive budgeting' project (http://grbproject.org). Gender responsive budgeting is an internationally recognized tool that ensures the achievement of de-facto gender equality and contributes to effective allocation of public funds. However, the gender data set of these collections is very limited in terms of demographic indicators, health care, education, employment and unemployment, physical education, and sports. Therefore, at this stage of measuring gender data, it is too early to introduce the expansion of the base of GII indicators. It would be advisable for these collections to add another section with calculations of complex gender indices (e.g. GII), adapted for the sub-national regions of the country, that will allow ranking the sub-national regions of the country by the level of gender inequality and gender development.

Analysis of the results of sub-national adaptation of the GII according to the proposed methodology

The results of the calculation of GII for the Kirovohrad region and the study of its dynamics over 2010–2017 are presented in Figure 8. The values of GII are in the interval [0.60, 0.64] and are much higher than those calculated by the basic method (compare to the results in Figure 4). The obtained results confirm the existence of the pronounced sub-national characteristics, indicate the existence of sub-national disparity, and show the presence of specific sub-national problems in the context of the negative impact on human development due to the inequality of achievements of women and men as reflected in these measurements and their indicators.

Figure 8

Dynamics of GII values (calculation according to the proposed method) for the Kirovohrad region



A meaningful analysis of the results of computing the regional GII according to the proposed methodology allows us to draw conclusions and offer recommendations. First, GII's high value indicates that it is too early to discuss gender equality in the Kirovohrad region.

Second, the indicators of the first dimension (MMR and ABR) and the indicators of the second dimension (LFPR, PTP, and WB) have a small effect on the 'deterioration' of the level of GII. This is because all indicators are close to parity, if we consider: (1) their values and tendency to decrease (in the case of the first dimension) and (2) the ratio of the value of 'Female and male shares of professional and technical positions', the ratio of 'Labour force participation rate', and the ratio of 'Female and male shares of the total wage bill' (in the case of the third dimension). However, it is obvious that appropriate recommendations in the field of economic activity and policies to support women's participation in a region's labour force will contribute to the successful formation of relations on equal terms.

Third, greatest impact on the decline GII was provided by second-dimension – women's empowerment – indicators, namely, participation and decision-making powers both in political (RC) and economic (LSM) areas, as well as the female share of graduates in science, mathematics, engineering, manufacturing, and construction at the tertiary level (GTL). Consequently, the main recommendations in the context of human development of the Kirovohrad region from a gender perspective should be related to ensuring women's high educational potential in the field of natural,

exact, and technical sciences, which will increase women's participation in political decision-making and will enhance economic management and the labour market.

Conclusions and prospects for further research in the field of study

The results of this study provide an opportunity for us to formulate the following conclusions:

1. The use of UNDP methodologies and the integration of regional indicators allow the sub-national adaptation of the human development indices from a gender perspective without the expansion of the base of indicators for calculating these indices. The results of this universalization of the sub-national adaptation allow the comparative analysis of the progress in the development of human potential both in individual country's sub-national regions and in regions of different countries worldwide.
2. The need for a sub-national adaptation of the human development indices with a gender factor (in our case, GII) is the existence of the objective danger that the indicators of GII on an entire country do not reflect rather wide sub-national disparities. As a result of the calculation of the overall country index, it becomes impossible to provide accurate political, economic, and social recommendations in the context of human development with a gender factor that would be effective and optimal for all the sub-national regions of the country. Therefore, the aforementioned recommendations for each sub-national region should be adjusted to reflect the results of the sub-national adaptation of GII.
3. The expansion of the base of indicators for the determination of GII allowed us to create a new methodology for the sub-national adaptation of GII. Testing this methodology on the example of the Kirovohrad region (Ukraine, study period 2010–2017) enabled us to refine the GII indicator compared to the baseline calculation and, therefore, to provide more objective political, economic, and social recommendations in the context of human development with a gender factor.

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Public service as an indicator of competitiveness

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The practice of the integrated organisation of public services is partly the result of budgetary constraints. In the course of financial and task fulfilment planning, unequal public service accessibility is an issue in many cases. It mostly affects disadvantaged regions and penalizes the concerned resident population by causing adverse selection with respect to wellbeing and living conditions. In this study, the author analyses the relationship between public service practices and economic competitiveness at the county level for Hungarian regions. The study also examines the relationship between the provision of consumable and non-consumable public goods and economic competitiveness. Using a latent variable model, the author presents the relationship between certain public services and economic indicators with respect to the examined territorial units. Subsequently, following the subdivision of the examined territorial units into lower-level administrative units, the author draws a parallel between the endogenous resources and public services in each territorial unit, and tests the hypotheses with a two-sample t-test on cross-sectional data.

Keywords:
public services,
public goods,
competitiveness,
territoriality,
regionalism,
equal opportunities,
model, t-test,
endogenous resources,
hypothesis test

Introduction

Research studies during the field-work have defined competitiveness in several ways. However, reflecting on each context presented in these studies, one can easily acknowledge that the notion of territorial competitiveness is so complex that a holistic approach has to be applied (Piwowarski 2018). The state's service delivery system and the consistency of its regulatory mechanisms have a prominent role in supporting the economy, addressing social needs, and ensuring competitiveness. The lack of a consistent and reasonable legal environment in public services may hamper the sustainable development of the above mentioned sectors.

This situation may occur because public services are organised under the influence of state financing and state pressure in many cases. Thus, the quality and scale

of services cannot be maintained at the same level with the changing conditions of subsidies (Bódi–Horváth 2013).

Territorial capital items promote competitiveness. The point is that the municipality network has institutionalized so-called communities from geographically interconnected and coherent groups of municipalities based on their demographic and territorial peculiarities. The literature differentiates three types of communities in Hungary (Bódi–Horváth 2013, Vida 2016):

- a community of municipalities surrounding a city – an interrelated urbanised group of municipalities with at least half a million inhabitants (5% of the permanent population);
- a community of municipalities that have become part of an agglomeration – interrelated and urbanised group of municipalities inhabited by at least 50,000 people altogether and located around one or more municipalities with more than 15,000 inhabitants in each;
- an urban community of small and mid-sized municipalities – interrelated and completely built-up urbanised area inhabited by 3,500–50,000 people.

The above mentioned concentration somehow reflects the evolution of the Hungarian economy, with special regard to the territorially stigmatic features and social processes of socialist industrialisation (Sebők 2015). These features and processes are discussed in relevant research studies on Hungary (Csath 2014, Dicső 2010). The studies reveal the territorial and demographic features of socialist industrialisation in relation to the current public administration units (counties) in Hungary. These were also considered to be the relevant public administration units[1] during the period examined by the authors. The oversized public administration system and the often superfluous public services provided greater security and exerted spatial concentration on the society to a lesser extent.

If the country's competitiveness is examined on a management basis with longitudinal data, the process comes to an end in the years after the system change (Gyuris 2014), when the social and economic structures were altered. The period witnessed the emergence of new economic, social, and demographic trends. Meanwhile, the unintended consequences and spill-over effects of the establishment of industrial centres spread through the economy and the social space (Kovács–Somlyódiné 2008, Kövesdi 1986), posing a challenge to the concerned local self-government institutions, public administration entities, and the local inhabitants. At the same time public administration reform forced municipalities most affected by emigration and population ageing to undertake a large-scale rationalisation regarding the concerned bodies and infrastructures. (Kincses–Bálint 2016a, b, Lados–Hegedűs 2019). Thus, the municipalities concerned entered into a cycle that causes adverse selection in terms of demography. As a result, public health care and education ser-

[1] Since 2011, this has slightly changed as a result of the EU-funded Magyary Zoltán Public Administration Development Programme for the implementation of the complex institutional and territorial rationalisation of the Hungarian public administration system.

vices in the concerned territories deteriorated as well (Kincses–Tóth 2015). This kind of public service rationalisation may widen the gap between the lagging and well-performing regions. An examination of territorial competitiveness needs to consider two important aspects: territorial cohesion – optimally, with a homogeneous demographic structure – and equal access to public goods.

Territorial cohesion is an essential goal of territorial development policy. The French define regions as territorial units that are, on the one hand, capable of establishing networks between different structural levels and, on the other hand, are able to exploit endogenous resources (Lengyel 2003).

Ultimately, modernisation promotes a new principle that is contrary to the centre–periphery model: small and mid-sized towns, which are the main components of the French municipality network. Thus, theory and practice indicate a duality that rationalisation of public services and public administration units may impair equal access to public services. This may threaten territorial cohesion within the nation state. According to some scientific approaches, the number of central municipalities must be reduced anyway (Pütz–Spangenberg 2006).

By and large, as a result of population decline and the depletion of public resources experts expect the elaboration of the strategy of decentralised concentration, but they also expect that new forms of public service (mobile and online) may provide a solution to the problem (Maribel et al. 2014). Their explanation is as follows: a decentralised network of municipalities can only be sustained by economically strong centres and agglomerations; therefore, concentration of activities is essential for municipalities. The conference of ministers for territorial development agreed on a catalogue of minimum services in 1968. This is acceptable based on the principle of effectiveness – especially in regard to sustainably providing equal access to public services – and cost efficiency, because accessibility of the service delivery system can be improved via resource allocation (Kaiser 2014).

Connection of competitiveness

According to Lengyel, a Hungarian regionalist economist, territorial competitiveness is 'the ability of companies, industrial sectors, regions, nations and supranational regions to generate a relatively high income and to reach a relatively high level of employment' (2003 p. 75.). According to a game theory interpretation, a market actor can presumably gain only as much as the others lose (Bork 1977). Therefore, territorial or public administration units competing against each other within nation states can gain an advantage only at the expense of others.

It is important to note that throughout the literature there are numerous definitions of competitiveness based on GDP as an indicator. But these approaches are not applicable in comparative analyses focusing on territories within a nation state. This is because, on the one hand, the exact location of the output cannot be examined in space. On the other hand, for a more exact picture, one should preferably

consider the volume of industrial production as an indicator when comparing inner territories or public administration units.

At the corporate level, companies can be considered competitive if they are able to contribute to the growth of the national economy (Nemes Nagy–Lőcsei 2015) and adapt to the changing demands of consumers (Ozdemir et al. 2016). According to this logic, citizens who are able to adapt to the challenges of the labour market and cope with labour market competition can be considered competitive.

An important prerequisite to individual competitiveness is the existence of public service (education, health care, and cultural goods in particular) conditions which are a necessary but not sufficient condition of corporate competitiveness (Csath 2014). One of the centres of research on public services in Hungary is the so-called Good State Research Workshop,[2] where researchers aim to develop complex indicators in order to make the performance of public administration and public services measureable. In a chapter on competitiveness in a multivolume work (Ozdemir et al. 2016), the author includes population-related indicators accessible via public services in a group of composite indexes. Research on public goods describe their subject on the basis of a neoclassical economic concept which categorises goods according to their right of use (Gyuris 2014, Kincses–Tóth 2015).

Accordingly, public goods are classified into rivalling and non-rivalling types. The chances of public goods participation have no upper limit, but the state is responsible for quality assurance in a certain part of this category (mainly infrastructure). In the case of rivalling public goods whose consumption is limited, the chance of equal access is nullified. Another group of rivalling public goods comprises club goods whose consumption is tied to certain conditions. These goods are mainly related to costly infrastructure, where consumers must pay some sort of service provider fee in order to get access to these goods. (Rácz 2017, Tóth–Nagy 2016).

The latter two-fold categorisation of public goods shows – particularly with regard to the differentiation of the resident population of territories within the same country – that the chances of their provision are influenced by the geographical dimension as well. When it comes to redistribution and the maintenance of public goods, the fact remains that the residents of each region do not benefit equally from the public goods because their environment and their financial capabilities determine their consumption opportunities (e.g. one who does not own a car cannot use public roads to the same extent as one who does).

Modern constitutions of countries which are based on the rule of law usually adhere to the principle of uniformity when regulating citizens' right to healthy life and equal opportunities. This principle prevails moderately in Hungary with recently introduced reforms regarding equal access to public services (Lakatos et al. 2015). In my opinion, the amount of public services provided to citizens has a significant influence on (labour market) competitiveness and equal access to health care and

[2] The workshop operates at the National University of Public Service.

education for the regional population. The quality of education and health care services (which are public goods) exert an impact on the quality of life because of the above mentioned factors. The features of public services (Siska–Szabó 2015) are enlisted below:

- every member or group of the community is equally entitled to these services;
- the use of services is passive; there is no need for a separate agreement or for the active participation of the ones concerned;
- there is no competition among consumers for the services.

It can be deduced that if access to the service (e.g. education and health care system) is reduced, the regional community of residents may find itself in a more disadvantageous situation.

Territorial differences in public services

In order to compare territorial competitiveness and the spatial concentration of public services, researchers (Szabó–Kovács 2018) carried out a territorial examination in Hungary at district level. The research involved 3,147 municipalities which were arranged into a cluster structure composed of six groups. Table 1 presents the main components of the Hungarian system of municipalities based on the research.

Table 1

The location of the final cluster centres in the space determined by the main components – the features of each cluster according to the data of 2016

Main components	Clusters					
	1	2	3	4	5	6
1. Poverty, social welfare system: basic infrastructure	–0.34	–0.20	–0.27	0.00	0.09	0.11
2. Child care in kindergartens, primary education, basic health care services	0.10	0.21	0.24	0.80	–1.09	–1.00
3. Secondary education	1.14	3.06	–0.50	–0.25	–0.17	–0.13
4. Higher education	13.31	–0.13	–0.27	–0.03	–0.04	–0.04
5. Economic competitiveness, businesses	0.16	0.06	0.06	–0.05	–0.08	0.27
6. Family welfare and wellbeing	0.74	0.94	2.60	–0.32	–0.29	–0.16
7. Culture, mobility	0.04	–0.01	–0.16	–0.15	–0.06	2.97
8. Rate of the elderly/elderly care	–0.05	–0.02	0.08	0.01	0.05	–0.88

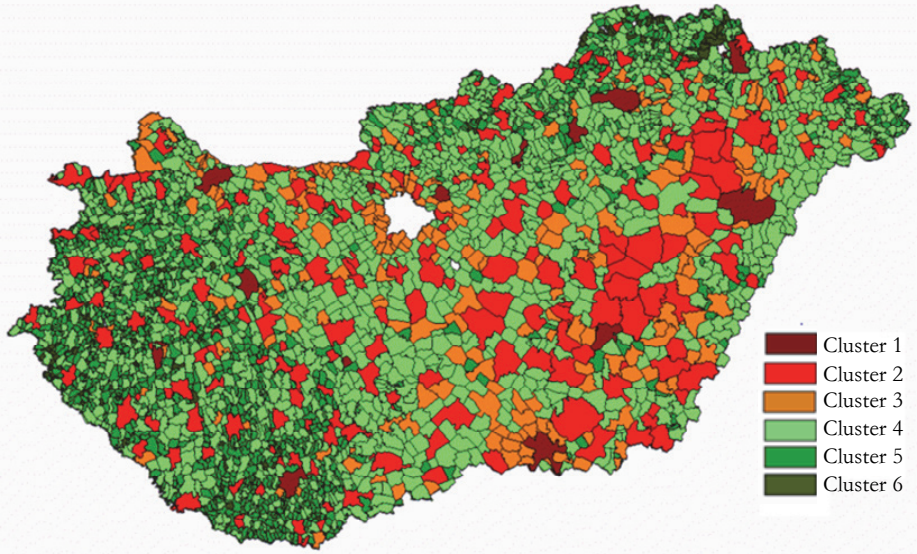
Note: 'Factor space': 6 clusters in the 8-dimensional space.
Source: Szabó–Kovács (2018 p. 19.).

The following steps helped interpret the results: representation and analysis of the distribution of the main component variables via histogram; identification of the known muster municipalities in every cluster; and examination of some values of the original (not yet standardised) variables. The most important variable was population, which differs greatly among individual clusters despite the fact that this indi-

cator was not included neither in the main component analysis nor in the cluster analysis (see Figure 1).

Figure 1

Cluster classification of Hungarian municipalities



Source: Own elaboration based on 2015 data from the VATI database.

Analysis of the relationship between public services and the economic sector

This examination is intended to reveal the causal relationship between the single functions of public service and the volume of industrial production, which is mostly used to measure territorial competitiveness in the context of the nation state. What peculiarities do the dynamics of the involved variables show at the NUTS 3 territorial level? In order to answer this question, I applied the latent variable model, conceptualising the indicators on the basis of a publication (Sayed-Mohammed 2010) written by an incumbent mayor[3] and of 2016 data[4]. All these resulted in the following model. The dependent variables are the three sectors (primary, secondary, tertiary) of industrial production (lp_n)[5]. These are the representatives of economic activity. The independent variables are broken down into different groups as follows:

- the variable *human services* includes the indicators of public education *(Ko_n)*, cultural education *(Km_n)*, and health care services *(Hea_n)*;

[3] The author has been the mayor of Alsómocsolád for 20 years.

[4] Source: VÁTI–TeIR database.

[5] The value of lp_3 shows the low-competitiveness induction of the third (service) sector.

- the variable *social services* (So_n) includes the indicators of personal care, cash benefits, and benefits in kind;
- the variable technical and infrastructural services includes the following public utility networks:
  - drinking water supply (Iv_n);
  - wastewater management (Sv_n);
  - transport (hk_n);
  - energy supply (En_n).
- the indicators of the coverage of *waste management* (rub_n) include the amount of transported household waste, the size of the covered area, the number of municipalities involved in waste collection, etc.
- the indicator of *postal service and communications* includes the number of post offices, telephone lines, and internet and telephone subscriptions.

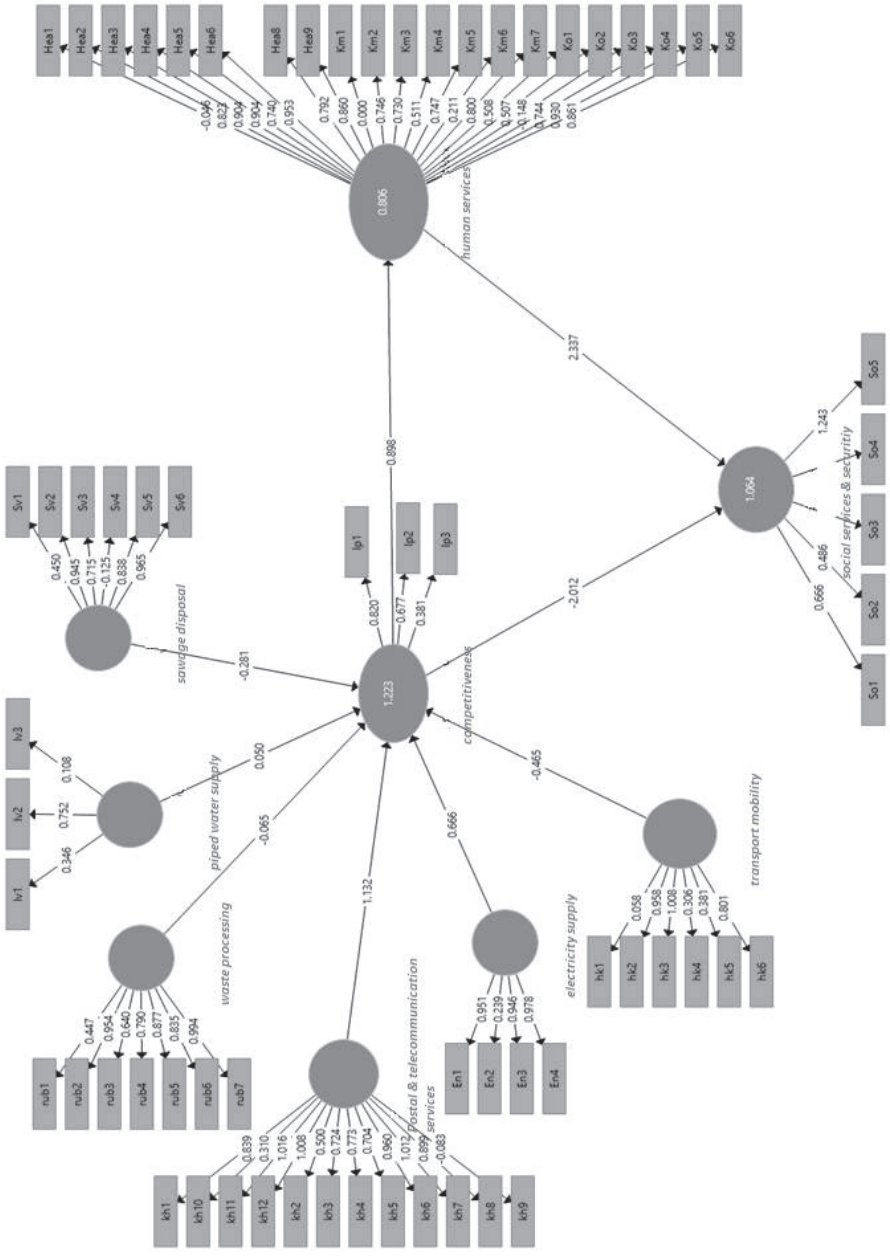
We assume structurally describable causal relationships between the variables. The model setup considers these relationships. Accordingly, the chosen variables can be divided into two groups of internal and external variables. Factors that are not affected by another variable are called exogenous factors. Factors sustaining an external impact from other factors specified in the model are called endogenous factors.

The program that creates the model operates with these exogenous and endogenous factors which describe the direct and indirect relationships between the variables. The model applies a path analysis procedure using the causal relationships between the variables, which are connected by the program via regression equations. The method is better than the usual latent variable procedures because this structural relationship is factored into the model. Latent variable modelling (SEM) is a mathematical process in which multiple operations run on the variables such as factor analysis and multivariate regression.

The derived results explain the variables located on the peaks of the graphs, indicating the regression coefficients on the edges. Algorithms related to latent trait analysis assume normal distribution in the course of factor analysis during the operations. Providing the measurement model is the first step to setting up SEM. We first create latent variables, and then introduce further variables into the model if the well-known mathematical and statistical tests run on the data loaded into the submodel show acceptable results.

Figure 2

Latent variable modelling



Source: Author's own elaboration with SmartPLS 3.0.

Among the indicators of drinking water supply, the variable *'number of households connected to the public utility drinking water network' (lv_2)* is significant for competitiveness and logically acceptable[6], since an increase in housing construction represents economic boom and a favourable legal environment. The length of pipelines in the drinking water network and number of households connected to this network are more static, and therefore less able to indicate economic processes, as clearly revealed by the values of lv_1 and lv_3. Among wastewater management indicators, only the investment-intensive indicators *(Sv_2, Sv_3, Sv_5, Sv_6)* represent economic development, though at a high significance level *(≤ 0.7)*. In the human services category, the number of service hours of the general practitioner per week *(Hea_1)* is not a significant indicator from an economic aspect, while other indicators in relation to health care infrastructure and access to medical specialists *($Hea_{1\text{-}9}$)* may have strong effects since concentration of population is a prerequisite for high access to doctors' services. At the same time, when examined separately, these high-degree causal links – particularly the number of doctor's visits *(Hea_5)* – could refer to a bad health condition in the resident population or even to an ageing society. However, this is not the case here since competitiveness and human services are internal factors affecting each other significantly *(0.898)*.

For cultural education, the variables *'number of creative educational communities' (Km_1)* and *'number of members of creative educational communities' (Km_6)* are irrelevant to competitiveness (Egedy et al. 2018). The same goes for *'number of computers in public educational institutions (considering the seat of the institution)' (Ko_1)* since it also has a low (and moreover negative[7]) value.

The link between competitiveness and social status can also be observed in the social provision for the regional resident population. Although one indicator *('the number of daytime nurses and carers employed in basic social provision' (So_2))* may be considered as low, the other dimensions *(So_1* and *$So_{3\text{-}5}$)* – public services provided to the elderly and social benefits – show strong causal links. The dynamics of the internal model between competitiveness and social provisions is negative *(–2.012)*, with a strong indirect effect between the two variables.

One observes an opposite effect between the competitiveness of a region and the level of use of its social provision system. In relation to local transport, the model shows three weak indicators (hk_1, hk_4 and hk_5). The variables *'average age of buses', 'number of relations in local transport'*, and *'number of buses in local transport'* depend on the density of the region's resident population and, according to the result *(0.05–0.4)*, cannot be directly linked to competitiveness. However, the frequency of transport services, passenger-kilometres, and passenger capacity show strong *(0.8–1.0)* causal links. The internal model shows a slight indirect effect *(0.46)*

[6] According to the cited literature, the acceptable value is ≤ 0.5.
[7] We assume an indirect effect, which may arise from the location concentration.

between mobility and competitiveness which can be explained by the centre-periphery effect. The deployment of mobility infrastructure and satisfactory access to public services in some cases – through labour force mobility – exert an opposite effect on competitiveness (Siska–Szabó 2015, Tóth–Nagy 2016).

Among the indicators of *'energy supply'*, only *'amount of electricity provided to the households'* appears to be irrelevant *($En_2 = 0.239$)*, while other parameters, which are also infrastructure dependent, have very strong causal relationships with competitiveness. It is also clear that the energy supply variable has only a moderately significant effect on competitiveness. Higher values, which relate to network deployment, infrastructure provision and energy consumption, show the same level of variation.

Weak *(kh_2)* or unacceptable *($kh_{9,10}$)* indicator values of the 'post and communications' variable refer to postal services, while stronger values *($\leq 0.70–1.016$)* are related to the deployment of network services (e.g. telephone and internet subscriptions). Among the indicators of competitiveness industrial production *(lp_1)* exerts a very strong, and manufacturing *(lp_2)* a moderately strong effect on the territorial competitiveness at the Hungarian NUTS 3 level. Public services have a significant correlation with competitiveness in both the endogenous and exogenous parts of the model.

The relationship between endogenous resources and public services

The issue of resource allocation of public goods is quite often addressed in the international literature (Samuelson–Nordhaus 2012, Huang et al. 2015). According to Jones–Williams (1998), the answer is in the limit of substitution. The authors claim that the input for the production of one public service is dispensable during the production process, and replaceable with an additional unit of the production of another public service, with the supply level remaining unchanged. Therefore, if we assume that the technical substitution disadvantage for capital and labour during the production of a public good is equal to one unit, then the replacement loss for the public good is equal to the technical substitution disadvantage for capital and the value of production. This fiscal approach is acceptable, but the territorial lack of social latent functions, quantifiable costs, and public services from a management perspective may trigger an erosion[8] that may damage the economy.

Therefore, the substitutability of public services is not evident in all cases because, according to Marshall's theory,[9] the consumption disadvantage emerging from the lack of two different types of public goods is not the same because their

[8] Examples are domestic migration, alteration of the demographic and/or cohort structure of the municipalities.

[9] Alfred Marshall's consumer surplus theory culminates in the consumer limit: a family's opportunities to replace public services are hampered by its financial conditions.

replacement differentiates between them (Bódi–Horváth 2012), and exerts a negative external effect on the basis of social status and financial position.

The competitiveness impact of public services lies in supply. As the previously outlined model shows, public goods which arise from public services may have a population concentration effect as well, since consumers centre on a broader market of providers. In the field of social sciences, particularly within economic theories, there are two branches of science which deal with the interpretation of competitiveness. These are economics and organisation and management sciences. The above mentioned branches of science have different approaches when it comes to competitiveness, because their basic assumptions are different (Némethné Gál 2009). In this regard, regional economics focuses on restricted access to goods and on competition between companies for a better economic environment.

Therefore, the territorial units also compete, on the one hand, for economic investors – since they are the key to development – and, on the other hand, for public administration and tax legislation advantages. Effective access to the latter advantages is vital for the expansion of opportunities which can be provided to the investors (Cserny et al. 2016).

Table 2 – which contains the different theoretical approaches – is a summary of the different strategies which determine competition.

Table 2

Summary of tangential theories of territorial competitiveness

	Theoretical aspects of the explanation of territorial competitiveness	Indicators related to the theories
1.	Neoclassical theory	Number and volume of investments Initial boundary conditions Human resources
2.	New growth theory	Endogenous technological factors Intensity of innovation
3.	Theory of competition based on cost advantages	Labour cost Cost and price of state inputs
4.	Theory of knowledge-based factor	Characteristics of input factors Characteristics of output factors
5.	Geo-economic theory	Impacts of agglomeration Urbanisation Costs of transportation Economy of scale factors Sectoral specifications

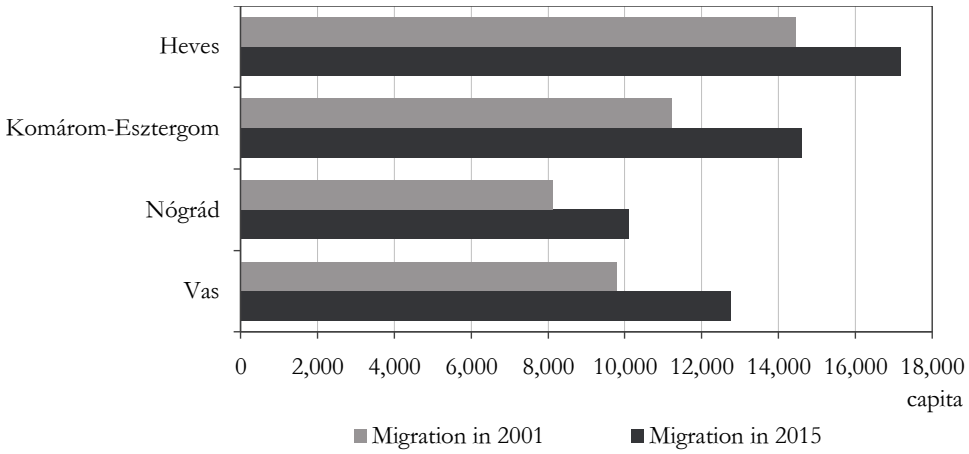
Note: These theories are typically based on measures like high GDP per capita or GDP per working hour.
Source: Author's own elaboration based on Lukovics (2007).

According to the neoclassical theory (Samuelson–Nordhaus 2012), the market facilitates territorial convergence, so market mechanisms do not need state intervention. According to the theory, income differences level off due to production factors.

Nowadays, however – considering the outmigration of the mobile labour force – the practical application of endogenous theories has come to the fore. This occurred, at least in the examined territories, due to the outmigration of the working-age population from counties which were the basis of the previously presented model.

Figure 3

Outmigration of the examined counties based on two cross-sectional data sets (in the years 2001 and 2015)



Source: Author's own elaboration based on the TeIR database.

As shown in Figure 3, population size changes not only with the natural decrease but also because of domestic migration. The two cross-sectional data sets contain data for the year before and the seventh year after the 2008 economic crisis. The increased migration shown in the second data series presumably reflects the free movement of the labour force consequent to Hungary's EU accession in 2004. This tendency has altered the intensity of the use of public services, highlighting the issue of fiscal sustainability.

Selection of aggregates or indicators is a key component of territorial competitiveness analysis. One needs to be prudent when using such examination methods particularly because, 'considering the current economic toolkit, they are inadequate or inaccurate to carry out a measurement which is reliable enough' (Tóth 2010, p. 66.). According to Tóth, economics differentiates between exactly measurable (e.g. financial capital or produced capital) and less measurable intangible goods such as human capital, intellectual capital, organisational capital, social capital, and cultural capital. Considering that intangibles are not related to accounting or economics, it is hard to quantify them. However, they represent a stock of assets which contributes to economic performance.

When interpreting territorial competitiveness, Lukovics (2008) highlights several elements of the internal characteristics which influence competitiveness within one

region. A parallel can be drawn between each of these elements and some kind of public service category (see Table 3).

Table 3

Parallel between competitiveness and public services

	Endogenous sources	Parallel with public services
A	Volume of capital	Costs in connection with the operation of infrastructure.
B	Geographical attribute	Supply of public utilities and roads.
C	Qualitative and quantitative composition of the region's human resources	Quality and accessibility of public education
D	Quality of physical infrastructure	Accessibility and utilisation of public services, territorial coverage of the services
E	Social, cultural, traditional background	System of cultural institutions, accessibility of public recreation opportunities
F	Decisions of the (central or local) governing institutional system	Accessibility of services provided by government offices, decrees issued by local governments on eligibility for preferential treatment.
G	System of relations of the market actors	Level of development of the institutional system which provides services in connection with enterprise development (trade unions, chambers, incubators run by local governments or non-profit entities, etc.)
H	State of the environment	Public services focusing on the sustainability of residential and business environment – public utility services catering to the resident population or newly created businesses on the examined territory (e.g. public network services, ICT infrastructure, personal transportation, health service, etc.)

Source: Author's own elaboration based on Lukovics (2008).

Hypothesis test

The examination is based on the fact that the number of supply locations decreased after decentralisation. I assume a causal relationship in the examined regions between output and factors C and H in Table 3. Accordingly, we can hypothesise a close correlation between output and medical care and between output and primary education at high significance level.

We can avoid the distorting effect (relevant to public services) of the central areas by examining territorial units below the public administration level of the chosen territorial units (NUTS 3). At this point, it should be mentioned that the role of the district-level public service system – whether the district-level framework is appropriate for providing mid-level services or delivering basic services in an integrated and quality manner – was not clear during its establishment.

After its introduction it became clear, however, that the district level primarily concentrates on providing basic services in the following fields: public education,

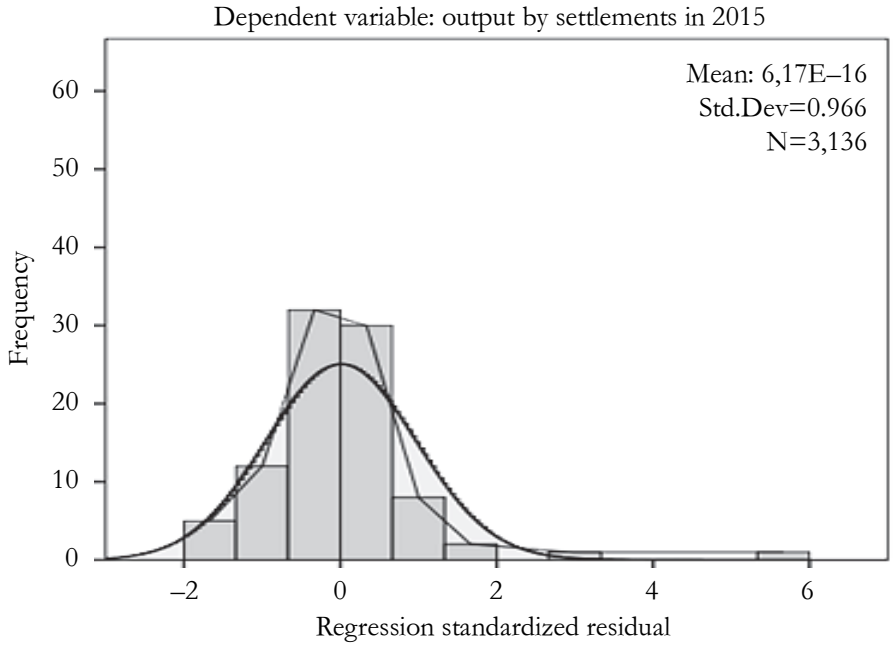
social and health care services, protection of families, children, and the youth, library service, local public transport, public road maintenance and surveillance over local government financial management (Kovács–Somlyódyné 2008).

The examinations carried out on the public education and the health care systems as described above suggest that the county-level relationships have a higher level of significance than the district level.

Among the public services affected by the Hungarian public administration reform, elementary level public education and basic health care were included in the model as independent variables. Output[10] was treated as the dependent variable. To demonstrate the adequacy of the criteria laid down for the method (two-sample t-test) chosen for the statistical test, I carried out a normality test on the basic population (of the municipalities of Hungary) examined. A normal distribution is a prerequisite for the two-sample t-test (Neuhauser 2002, Rochon et al. 2012, Rasch et al. 2011). Figures 4 and 5 demonstrate the analysis results of the municipalities' output data.

Figure 4

Histogram with normal distribution of the population (Hungarian municipalities) output

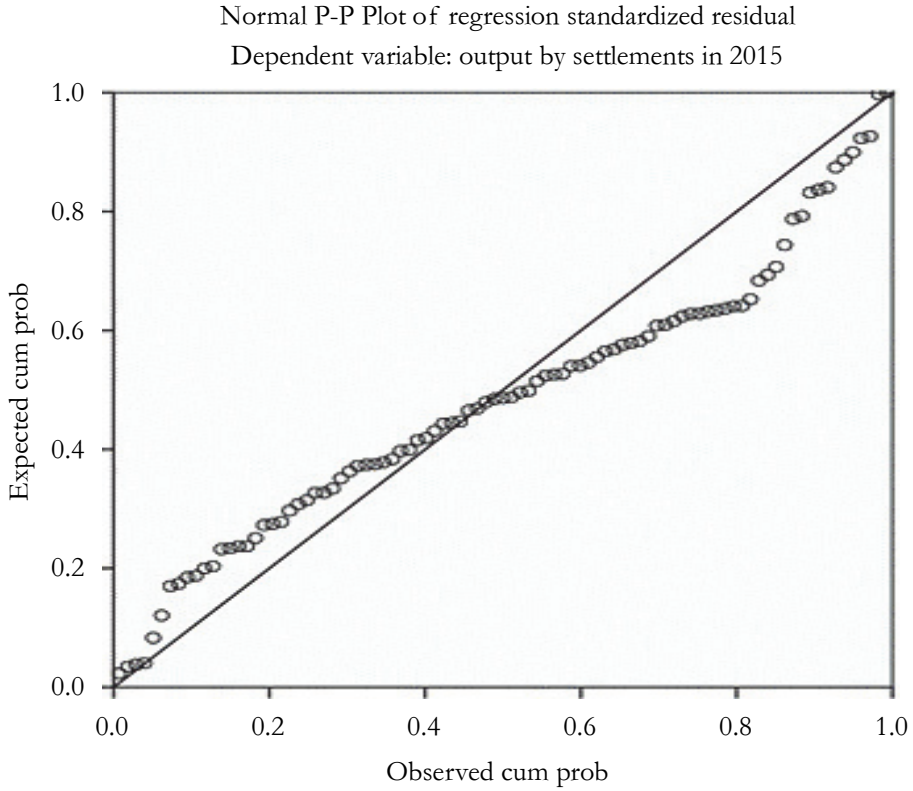


Source: TeIR database.

[10] I considered output a better indicator of competitiveness because it is free from seasonal effects (e.g. tourism), unlike the indicator of gross added value.

Figure 5

P-P plot with normal distribution of the population (Hungarian municipalities) output



Source: TeIR database.

The test, carried out on the basic population showed that the significance level was not acceptable for two independent variables:

- number of services provided by children's GP: ϱ = 0.174,
- number of locations where kindergarten service is provided: ϱ = 0.491.

The indicators of the latent variable model (see Figure 2) are included partly in Table 3 (points G and H). The statistical test carried out on these variable pairs can be seen in Table 4.

Table 4

Results of the two-sample t-test

Denomination	Paired samples correlations Nógrád county			Paired samples correlations Komárom-Esztergom county			Paired samples correlations Heves county			Paired samples correlations Vas county		
	N	correlation	sig.	N	correlation	sig.	N	correlation	sig.	N	correlation	sig.
						Pair 1						
Total output & number of services provided by children's GPs, 2015	121	0.804	0.000	74	0.754	0.000	114	0.632	0.000	368	0.924	0.000
						Pair 2						
Total output & number of services provided by GPs, 2015	121	0.801	0.000	74	0.695	0.000	114	0.665	0.000	368	0.938	0.000
						Pair 3						
Total output & number of locations where kindergarten service is provided, 2015	111	0.803	0.000	70	0.751	0.000	104	0.685	0.000	249	0.843	0.000
						Pair 4						
Total output & number of locations where primary school is provided, 2015	107	0.708	0.000	70	0.730	0.000	104	0.683	0.000	222	0.891	0.000
						Pair 5						
Total output & number of kilometres completed per person in local transport, 2015	3	0.612	0.580	6	0.020	0.971	3	0.000	1.000	10	0.872	0.001
						Pair 6						
Total output & number of cars by domicile of the operator, 2015	3	0.766	0.445	6	0.387	0.474	3	–0.368	0.760	10	0.975	0.000

As the table shows, public services and the volume of output clearly have a close relationship in three of the examined Hungarian counties. The relationship between the intensity of GPs' service provision and public education (pairs 1, 2, 3, and 4) can be considered strong because both correlation ($\varrho \leq .75$) and significance level (t=.000) are strong. Also, we can find strong correlation between health services and economic activities (see table 5). The results for local (urban) transport are barely interpretable (probably because of the low sample size [Neuhauser 2002]), and a strong connection with the output can be found only for the county of Vas. In addition, the data series refers only to public road transport (pairs 5 and 6), but does not include railway transport. We could obtain sophisticated results with the inclusion of this indicator in the model. Overall, the above mentioned values clearly verify my first hypothesis – namely, that public education and basic health care service have a strong connection with output. This confirms indirectly, that accessibility and supply of services affect territorial competitiveness as well. Figure 6 shows that output exerts a boosting effect on public education in the first two counties (Heves and Komárom-Esztergom). Furthermore, medical care requires a lower level of intensity in these counties. This is certainly because working-age people are concentrated in territories with relatively higher output levels and they need less medical care. This of course raises a question: how do the above mentioned facts differentiate the public administration status of municipalities? A comparison between Figures 3 and 4 reveals that out of the four counties, Nógrád witnessed the lowest change in population size during the period examined and – probably because of the large number of small villages concentrated in the county – provided a low level of medical care (Bódi–Horváth 2012). This fact is representative of the overall picture of an ageing population of permanent residents who are rather unwilling to change their residential status. The two-sample t-test did not produce any interpretable results of mobility indicators and number of basic education institutions for pairs of districts with similar size and number of permanent residents within the same county.

Table 5

Correlations in sample pairs

Denomination		N	Correlation	Sig.
Pair 2	Total output (2015) & Number of services provided by GPs (2015)	8	0.815	0.014
Pair 3	Total output (2015) & Number of services provided by children's GPs (2015)	8	0.711	0.048

The above result may be due to a demographic or ethnic factor while the lack of accessible services within the examined location and the travelling habits of the ageing generation may result in the lack of mobility as well (Siska–Szabó 2015). The first presumption about district-level public administration has only been partly

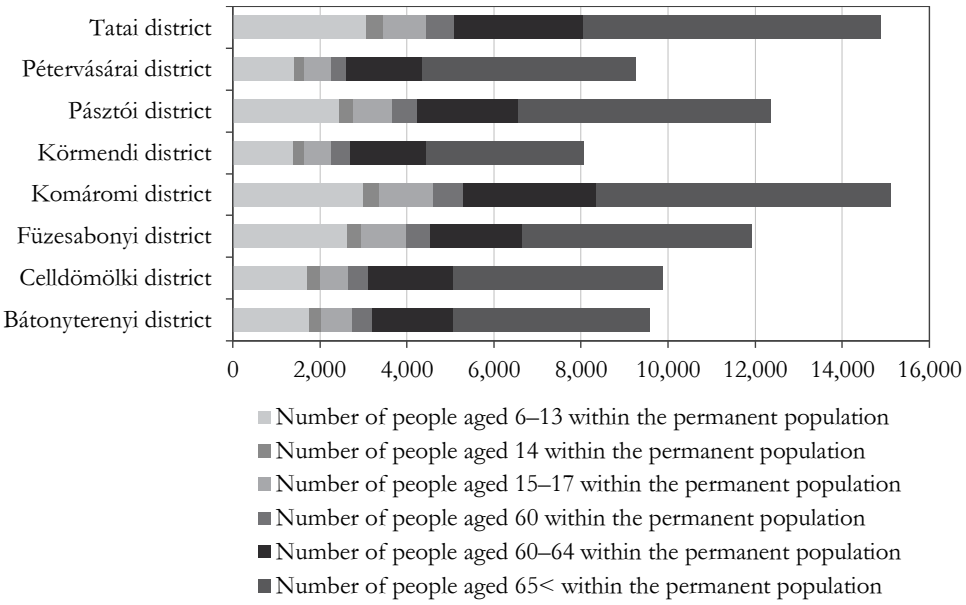
verified, since the correlation and significance level of the statistical test which was carried out on data from 2015 excluded primary school supply and mobility from the pairs.

Figure 6 not only shows ageing – in line with my previous remarks – but also reflects the amorphous cohort structure in the chosen district pairs' public services, which were excluded from examination. This demonstrates that the generation most covered by primary education is underrepresented (mainly in the two districts of Heves county – Bátonyterenye and Pétervására) whereas the low-mobility generation, which is eligible for pension and was previously supposed to be age-bound, is overrepresented at the district level. Obviously, tasks related to primary schools and public road transport are performed at a lower level.

However, this study has verified the hypothesis that the lower the level of the public administration unit, the lower the correlation between the variable pairs, and the weaker the significance level, using county- and district-level data (with the centre effect removed).

Figure 6

The primary-school and pensioner generations in the districts of four counties (Permanent population by age in 2015)



Source: Author's own elaboration based on TeIR data.

I tested the model for internal consistency at the district level according to the results of the two-sample t-test. This process divides the scale items in all possible ways into two groups, for which the correlation is computed at every single stage.

The Cronbach's alpha indicator is the average of all these correlation values. This is the indicator that is most often applied to measure internal consistency, which must reach a threshold of 0.6. The result shows strong internal consistency for the four variable pairs (Cronbach's alpha = 9.68), (Hair et al. 2017) and even for the independent variable of the two variable pairs (basic service provision of schools and mobility) which were excluded from the process. However, this result strengthens the hypotheses of two examinations, also verified at the public administration level, namely, that the centralised public service system disadvantages the permanent resident population of the small village regions. It is particularly true for the non-mobile resident population. For them, supplies which are part of the basic supply of public services are hardly – if at all – accessible.

Conclusion

The literature-based examination revealed public service groups which directly affect territorial competitiveness. Beside its positive effect, territorial concentration has several non-intended functions among its latent ones because the negative externalities of economic concentration expand with an increase in population density. Furthermore, the resultant population-draining effect may induce the working-age generation of the surrounding regions[11] to migrate (Sayed-Mohammed 2010). In parallel, the villages begin to age, resulting, obviously, in a partial decline of public services.

This paper attempts to analyse the relationship between the regional presence of the state as the provider of public services and the competitiveness factors of the examined area at county and district levels.

It also systematises the potential economic functions of public services and internal resources; furthermore, it points out that such exogenous and endogenous variables are worth including in the model to reveal the connections. These variables have explanatory power regarding competitiveness.

The analysis reveals that an infrastructure-intensive public service environment presupposes strong municipalities as far as competitiveness is concerned. This may lead to resident population concentration, which is a prerequisite for capital inflows. Therefore, the diffusion of public services throughout the regions is a significant factor of competitiveness.

[11] NUTS 3 territorial units.

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