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Environmental Innovation Impact analysis with the GMR-Europe Model*

Abstract

This study introduces and applies a modelling system that is suitable for the impact assessment of environmental innovations referred to as "Blue Economy" innovations. The paper's contribution to the literature is threefold. First, the building of a multi-sector computable general equilibrium (CGE) model, which provides the theoretical framework for studying the economic impacts of using waste as a production input. Second, the creation of an empirical methodology through which new Blue Economy technologies can be concretely accounted for in regional input-output tables. Since Blue Economy innovations are mostly built on local inputs, their effects are primarily local. Third, given that interregional spillovers of local impacts might also be significant, through interregional trade or migration, a modelling approach that can follow complex spatial processes is applied. The broader model framework chosen is the GMR-Europe model.

Keywords: GMR model, Blue Economy, computable general equilibrium models, TFP, innovation.

Introduction

Compared to traditional, "green" environmentally friendly technologies, Blue Economy innovations require lower costs and offer a positive return in the short term (Pauli 2010). The subtitle of Pauli's book ("10 years, 100 innovations, 100 million jobs"), though it does not lack a marketing trick that is still acceptable in a popular publication, stimulates the economic perspective. Might these innovations indeed have such a significant impact? Besides protecting the environment, are they indeed more effective economically? How can we estimate the economic implications of these innovations more precisely? These questions motivated the modelling approach introduced in this study.

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Typical innovations recommended by Pauli (2010) are technological novelties that turn a by-product, usually treated as waste, into the raw material of another economic activity. Perhaps the most popular example is the innovation that produces edible mushrooms on coffee grounds, which is otherwise considered mass-produced waste. Such technologies both mitigate environmental pollution and waste production, and lower the demand for natural resources. Consequently, Blue Economy innovations fundamentally change the relationships among economic sectors, since an unutilized material becomes a raw material for another sector after the introduction of the innovations.

Modelling Blue Economy innovations poses a threefold challenge for the economic analyst. The first challenge is the development of a model framework that can handle the effects of the transformation of waste into a useful material. The second challenge is the representation of new technologies in a way that makes the "translation" of a new technology into the structure of an empirical economic model possible. The third challenge is related to the method of estimating the geographical impacts of an innovation. Although the effect will clearly be stronger in the geographical area where the implementation of the new technology takes place, the spillover effects that indirectly arise in other regions through for example trade or migration need to be recognised. It is also important to measure the magnitude of the impact of Blue Economy innovations on the nation's economy as a whole.

Methodologies available in the literature have only limited relevance for resolving the modelling challenges set by Blue Economy innovations. The first group of models dealing with waste management, specifically recycling, focus only on the determination of the quantity of waste produced, but it lacks an explicit waste management sector (Barata 2002). The second group of models already and explicitly includes waste management and processing. In the three-sector equilibrium model of Miyata (1995), one of the sectors is responsible for processing of waste. Thus the cost of waste management is endogenously determined. Speck (1997) introduces a six-"sector" model where four sectors describe the technologies optionally available for the economy; the fifth sector can be interpreted as waste management that reduces environmental pollution, while the sixth sector includes the waste decomposing capability of nature. The sector in charge of waste management reduces the environmental burden through spending, but the model does not take into consideration the opportunity to utilize waste as a raw material. Different technologies use different mixes of interim products, labour, capital and natural resources. The optimal technology, given the circumstances, is determined by society based on a social welfare function. The disadvantage of this solution is the difficulty related to the appraisal of technologies that change over time.

Though the models described above already endogenously include the cost of waste management, they do not consider recycled waste as a raw material. The problem investigated by Baumgärtner (2004) stands closest to the types of innovations analysed in our study. The author studies recycling of waste paper as a raw material that can be reused in paper production. Waste paper can be valued positively as a secondary resource, but in excess, it is a harmful waste that burdens the environment. This view is strengthened by empirical observations showing that the price of waste paper is positive in some periods while negative in others. To underpin this, Baumgärtner (2004) analyses a two-sector economy where the by-product of one sector is either utilized by another as a raw material

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or must be processed as a waste that induces costs for the company. The cost of waste processing is exogenously given in the model. The author points out that the price of waste paper is negative and equals the cost of waste processing if the waste is not fully utilized. However, Baumgärtner's (2004) solution is one of partial equilibrium, since it does not model the waste-processing sector. The cost of waste processing is exogenously given.

Each of the three types of models introduced in the above categorization play a significant role in our solution. The paper's intention is the development of a model that explicitly enables the utilization of waste as a raw material, similarly to that of Baumgärtner's (2004) solution, but does so in a general equilibrium framework that endogenously includes the price of waste management, as in Miyata's (1995) model.

This study introduces and applies a modelling system that is suitable for the impact assessment of environmental innovations referred to as "Blue Economy" innovations. The paper's contribution to the literature is threefold. First, the building of a multi-sector computable general equilibrium (CGE) model, which provides the theoretical framework for studying the economic impacts of using waste as a production input. Second, the creation of an empirical methodology through which new Blue Economy technologies can be concretely accounted for in regional input-output tables. Since Blue Economy innovations are mostly built on local inputs, their effects are primarily local. Third, given that interregional spillovers of local impacts might also be significant, through interregional trade or migration, a modelling approach that can follow complex spatial processes is applied. The broader model framework chosen is the GMR-Europe model.

The paper is structured as follows. The second chapter introduces the structure of the model. First, the GMR-Europe model is briefly presented, and then the extension of this model is described. Data are presented in the third chapter. This is then followed by a Blue Economy innovation economic impact study. The summary concludes the paper.

The environmental innovation impact analysis model

The GMR-Europe model

Quantifying the impacts of Blue Economy innovations was carried out within the framework of the GMR (Geographic Macro and Regional) model. This model can take into consideration the national and regional impacts of different economic interventions. It is frequently used for the impact assessments of interventions targeting R&D, human capital, and that of the EU cohesion policy both for the European Union (Varga et al. 2009 and 2013, Varga–Törma 2010), and for Hungary (Varga et al. 2008, Járosi et al. 2010).

The GMR approach is an economic development policy impact-modelling framework. GMR models provide ex-ante and ex-post evaluation of development policies such as promotion of R&D activities, human capital advancement or improved physical accessibility. The models simulate macro- and regional economic impacts while taking into account geographical effects such as regional innovation system features, agglomeration, migration and costs of transportation. The intention of the GMR research programme is to develop efficient and relatively simple model structures, which fit the generally weak quality of regional data.

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The GMR model consists of three blocks: regional productivity (Total Factor Productivity, TFP), Spatial Computable General Equilibrium (SCGE), and the macroeconomic (MACRO) model blocks. The effect of interventions (e.g. R&D support, infrastructure, investments) on total factor productivity is determined in the *TFP block*, the equations of which are estimated by econometric methods. The detailed technical description of the block's structure can be found in the papers of Varga et al. (2009, 2013) and Varga and Törmä (2010).

Changes in the values of the main economic variables (output, employment, prices) induced by the effects of changing TFP are determined in the *SCGE model block* for each region. Thus, the aim of the model block is to evaluate the economic impacts of different economic policy interventions at the regional level. In the short term, equilibrium demand and supply for products and factors are equal to each other; however, wages might differ among regions. Wage differences might induce migration from lower wage regions; ultimately, wages impacted by migration are equalized among regions. Thus, not only each region but also the whole spatial system reaches equilibrium.

The SCGE model block takes into consideration those geographical impacts that reinforce centripetal forces, that is, spatial concentration through the change of regional productivity. In addition, the impacts mitigating centrifugal effects such as increasing congestion and costs of transportation. Regions are connected by interregional trade and migration of capital and labour. The SCGE block is a static one, the dynamism of the system is ensured by the TFP model and the macroeconomic block.

The *macroeconomic block* of the GMR-Europe model includes QUEST III (Ratto et al. 2009), a dynamic stochastic general equilibrium (DSGE) model developed by the European Commission. MATLAB software is used to jointly run the TFP, the SCGE and the MACRO model blocks.

The present investigation is the first use of the GMR system for a particular case when external shocks enter the model in the form of a special environmental innovation. To be able to estimate regional and macro-level effects of Blue Economy innovations, we restructured the CGE model of one region (the Hungarian Southern Transdanubian region) in the GMR-Europe model in order to make it suitable for our investigation. Since this transformation affects the SCGE block, the next subsection focuses primarily on this block.

Extension: The structure of the GMR-Europe BLUE model

The GMR-Europe model analyses the spatial effects of various economic policy interventions within a mutually connected (by means of interregional trade, geographic and knowledge network spillovers, migration of labour and capital) regional model system of 144 European regions. The present investigation transforms a selected region of this complex system to make it suitable for the modelling of Blue Economy innovations. Regional models belonging to the SCGE block of the GMR-Europe model are one-sector models that consider one aggregate product: regional GDP. However, the evaluation of the impacts of Blue Economy innovations requires a multi-sector approach. Thus, we extended one region (in the particular example the Southern Transdanubian region) of the SCGE model block into a multi-sector one. This multi-sectoral extended regional model is called the "BLUE" regional model hereinafter.

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Besides the above-mentioned change in the GMR-Europe model, many special amendments were also needed in the structure of the sectorally divided regional model to make it suitable for the analysis of Blue Economy-type innovations. Special attention was devoted to the transformed role of waste, since, after the introduction of a Blue Economy innovation, waste works as a production input, thus creates value. Besides this, it is important to emphasize that waste is a by-product, which means that the production of good(s) and the supply of its recyclable waste are not independent. The rest of this subsection discusses the alterations we made in the GMR-Europe model in detail.

Firms

The waste management sector plays an outstanding role in the multi-sector model, since the quantity of waste to be processed mainly depends on the amount of waste recycled owing to the introduction of the innovation. Thus, there are *m* sectors differentiated in the model, *n* of which behave similarly, while the waste processing sector is signed with a separate index, *w*.

In their production, companies use two primary resources (capital and labour) and respectively intermediate products produced by other sectors. Primary resources are assumed to be perfectly mobile among the sectors, thus having the same price in each sector. Value added is produced with primary resources following a Cobb-Douglas technology, while the use of intermediate factors is characterized by a Leontief technology. Every company emits waste during production that is transported and processed by the specialized waste management sector. Waste generated can be separated into two parts: a recyclable one that can be sold as a raw material according to the new Blue Economy technology, and a non-recyclable part. The non-recyclable share of waste is linearly proportional to the output of the company. The company's demand for waste processing equals to a_{wi} of each unit of production. On the other hand, the share of potentially recyclable waste that is actually treated as a waste ($RUWW_i$) varies as it depends on the reutilized quantity of the total recyclable waste produced. Thus the production function of firms has the following form:

$$x_i = \min\left(\frac{X_{1i}}{a_{1i}}, \frac{X_{2i}}{a_{2i}}, \dots, \frac{X_{ni}}{a_{ni}}, \frac{X_{wi}}{a_{wi}}, \frac{RUWW_i}{ruww_i}, \frac{RUWD_i}{\tau_i}, \frac{A_i {L_i}^{\alpha_i} {K_i}^{1-\alpha_i}}{b_i}\right),$$

where x_i is the gross output of firms belonging to sector i, X_{ji} is the quantity of product produced by sector j and used in sector i, and $RUWW_i$ represents the quantity of waste transported and potentially reused. $ruww_i$ shows the quantity of by-products dispatched as waste. However, contrary to the demand of ordinary raw materials this is not constant, but variable. Owing to the introduction of Blue Economy innovations, companies can use an additional raw material besides the products of other sectors: recyclable waste. $RUWD_i$ shows the quantity of recycled waste used in sector i, while τ_i represents the demand for recycled waste per unit of output in sector i. L_i and K_i signal the quantity of labour and capital used in the sector, α_i and A_i are parameters of the Cobb-Douglas production function, while b_i is the value added per unit of gross output.

The demand functions of companies for capital and labour are the following:

$$K_i = \left(\frac{(1-\alpha_i)}{\alpha_i} \cdot \frac{w}{r}\right)^{\alpha_i} \cdot \frac{x_i}{A_i} \qquad (1)$$

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$$L_i = \left(\frac{\alpha_i}{(1-\alpha_i)} \cdot \frac{w}{r}\right)^{1-\alpha_i} \cdot \frac{x_i}{A_i}, \qquad (2)$$

where w is the wage rate, r is interest on capital, while the other notations follow the above-described interpretation. During the production of their main products, companies also create by-products that can potentially be used as raw materials after the introduction of the innovation. We assume that the quantity of recyclable waste generated is linearly proportional to the output, thus:

$$RUWT_i = \rho_i \cdot x_i, \qquad (3)$$

where $RUWT_i$ stands for the total quantity of recyclable waste produced, while ρ_i is recyclable waste per unit of output.

Blue Economy innovations make it possible for firms to utilize by-products (previously being treated as waste) as raw materials. The demand for recyclable waste is described by the following function:

$$RUWD_i = \tau_i \cdot x_i, \qquad (4)$$

We assume that companies producing by-products agree to provide recyclable waste for free because they no longer have to bear the costs of transporting and processing of waste anymore. Thus, the quantity of a by-product utilized equals to the demand of those companies utilizing it as raw material. The demand is proportionally distributed among the sectors. Consequently, the quantity of recyclable waste that can be used as raw material is supplied by sector i according to the following:

$$RUWS_i = \frac{\sum_j RUWD_j}{\sum_j RUWT_j} \cdot RUWT_i \qquad (5)$$

where $RUWS_i$ shows how much is offered for recycling from the total by-product by company i. The remaining recyclable waste must be processed by the waste management sector. Its value cannot be negative, thus the maximum amount that a company can offer as waste for recycling is what it has produced.

$$RUWW_i = RUWT_i - RUWS_i \geq 0 \qquad (6)$$

The quantity of the by-product transported as waste per unit of output can be calculated by the following ratio:

$$ruww_i = \frac{RUWW_i}{x_i}.$$

Assuming perfect competition, the zero profit condition must be met in the case of each company, thus

$$p_i \cdot x_i = \sum_j^m p_j a_{ji} x_i + p_w \cdot RUWW_i + w \cdot L_i + r \cdot K_i, \qquad (7)$$

where p_i stands for the price of the product of sector i, while w and r represent the price of labour and capital.

Households

Consumer behaviour is modelled by a representative household. Households consume the products of all sectors and their utility is described by the following utility function

$$U = \prod_{i=1}^m C_i^{\alpha_{Hi}},$$

where C_i is the consumption of the household from product i, and α_{Hi} is the parameter of the Cobb-Douglas utility function.

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The household spends its entire income on buying consumption goods, thus

$$Y = \sum_{i=1}^{m} p_i \cdot C_i,$$

where Y represents the income of the household.

The utility maximizing demand function of the household is the following:

$$C_i = \frac{\alpha_{Hi} \cdot Y}{p_i}, \quad (8)$$

The primary resources are owned by the households thus their income equals to the products of the prices and supplied quantities of primary resources.

$$Y = w \cdot L_S + r \cdot K_S, \quad (9)$$

where L_S and K_S represent the supply of labour and capital.

Market equilibrium conditions

In case of equilibrium on the labour and capital markets factor, demand of companies equals to the supply of households, thus

$$\sum_i^m L_i = L_S, \quad (10)$$

$$\sum_i^m K_i = K_S, \quad (11)$$

The households' supply of labour and capital is exogenously given in a particular period, but it can change in the long run owing to interregional migration.

Equilibrium of product markets necessitates that gross production equals to the demand by companies and households. In case of the traditionally behaving n sector this can be described as follows:

$$x_i = \sum_{j=1}^{m} a_{ji} x_i + C_i \quad if\ i \neq w \quad (12a)$$

In case of the waste management sector, (12a) is complemented by a further element that represents the quantity of recyclable waste thrown out as waste.

$$x_w = \sum_{j=1}^{m} a_{jw} x_w + \sum_j^n RUWW_j + C_w \quad \text{if } i = w \quad (12b)$$

The model includes a total of $9m + 3$ equations and $9m + 3$ vairables, but these equations are not independent, since one of the equations can be expressed by using the others, so it can be dropped. To get a regular system of equations again, we fix the price of one of the resources that of capital and this fills in the role of the numeraire.

Impact mechanisms in the extended GMR-Europe model

In accordance with the logic of the SCGE model block, we search for the regionally different factor prices (ws, and rs) that ensure the equilibrium of demand and supply for factors at the regional level. The same holds for the Southern Transdanubian region, however, the demand for labour and capital is not aggregately determined since the sectorally disaggregated BLUE model comes into action in case of this single region. Thus, the SCGE model block includes aggregate Southern Transdanubia, while the BLUE model block provides its sectoral details and the current values of variables are corresponded to each other one by one. The details can be studied in Figure 1.

Since the factor prices are sectorally identical, the value of w is the same in the BLUE model as in the aggregate Southern Transdanubian segment of the SCGE model. The same holds for r. Both model blocks can be calculated by optionally choosing w and r, but most

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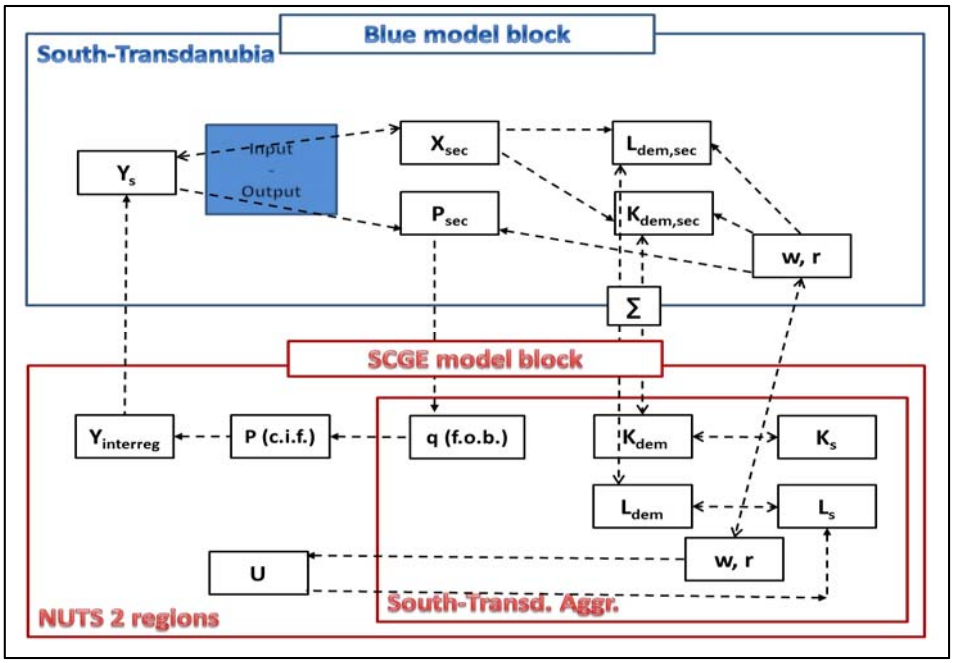
likely, this does not initially lead to equilibrium on the factor markets. Thus, we search for factor prices at which the demand for labour equals to its supply ($L_{dem}=L_s$) and the demand for capital equals to capital supply ($K_{dem}=K_s$). Factor demands are sectorally ($L_{dem,sec}$ and $K_{dem,sec}$) calculated in the BLUE model, and they are influenced not only by prices, but also by the sectoral value added figures based on sectoral outputs (X_{sec}). Additionally, sectoral product prices (P_{sec}) are also influenced by the factor prices.

Figure 1

The BLUE model in a one-sector environment



Source: own compilation.

The sectoral structure of prices and value added evolving in the BLUE model determines the aggregate "f.o.b." (excluding transportation costs) product price of the region through which Southern Transdanubia participates in interregional trade. By adding transportation costs, we get the "c.i.f" (p) price by which Southern Transdanubia competes on the different regional markets including its domestic market. Through modelling interregional trade, we get the aggregate demand ($C_{interreg}$) for the products of each region, including Southern Transdanubia. However, in case of this region, aggregate demand is also sectorally determined within the BLUE model block (C_{sec}). Sectoral input-output relationships establish the connection between sectoral demand for final products of Southern Transdanubia and sectoral outputs. At this point we close the circle in Figure 1, thus, at any pairs of factor prices (w, r) and sectoral outputs, the sum of sectoral factor demands provides the aggregate factor demands of the region. In case of the "proper" choice of factor prices, factor demands must be equal to factor supplies. These equilibrium factor prices are determined by an algorithm, which is followed in solving the system of

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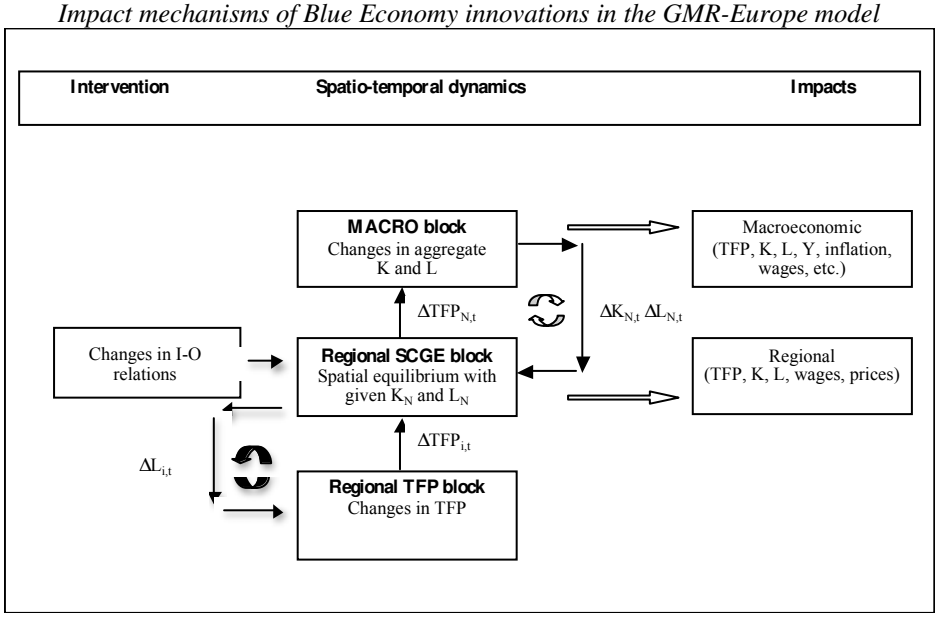
equations assuming constant factor supply in the short run. This is why we call this solution the short run equilibrium that applies for one period of time. The results are substituted into the utility function (U) of the SCGE model block that helps to calculate labour force migration; ultimately, the supply of labour (L_s) will also change.

Figure 2 shows how the different parts of the model are connected. Our intervention goes through the different blocks of the GMR model as follows. In the first step, the new input-output table representing a Blue Economy innovation is inserted into the regional SCGE model. At the same time, the original, unmodified TFP values from the TFP block are also inputted. Following the modified input-output tables, the quantity of capital, labour and production, wages, interest on capital and the prices of products are calculated for each region and each time period.

Figure 2

Impact mechanisms of Blue Economy innovations in the GMR-Europe model



Source: own compilation.

Differences in the utility among the regions induce labour migration and capital flows, which cause a change in the TFP of the regions. In the third step, the new regional TFP values are calculated and inserted in the macro block. Finally, owing to the effect of the new TFP values, current values of the macro variables are determined for every period. In the fourth step, the changes of capital and labour calculated in the macro block will be distributed among the regions based on the pattern of regional TFP changes generated by the intervention for each period. In the fifth step, the SCGE model block runs again with the modified quantities of capital and labour and the new quantities and prices will be calculated for each region and each time period.

Thus, we compare the impacts on certain macroeconomic and regional variables (such as output, employment, investment, prices, etc.) calculated with the new I-O table

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representing a Blue Economy innovation (the "scenario") with variables calculated without this innovation (the "baseline"). Differences in the values of the variables between the baseline and the scenario are considered as the impacts of the introduction of an innovation. The following section shows how we applied the model system for simulating the likely effects of a blue economy innovation introduced in the Southern Transdanubian region.

A Blue Economy innovation: growing mushroom on coffee grounds. Data and results

The innovation we choose from the examples in Pauli (2010) is relevant for the Southern Transdanubian region, and its impacts are technically treatable within the GMR-model system. This led to the selection of the technology of growing mushroom on coffee grounds. Mushroom growing in the Southern Transdanubian region (especially in the area of Pécs) can be considered as significant (711 tons in 2009, dominantly champignon). The merit of the selected Blue Economy innovation is that, contrary to traditional technologies of mushroom growing, it uses coffee grounds, which remain after brewing coffee as a substratum. This process requires significantly less input (chemical, sterilization, energy), since the coffee grounds are already sterile after brewing. Thus there is no need for further processes. Additionally, the material (the coffee grounds), which is usually deposited as waste can serve as a production input.

Our study analyses the likely impacts of a complete shift in the technology of mushroom growing from the current one to a form where the entire mushroom growing process is based on coffee grounds. This study only accounts for the impact of coffee grounds collected from catering sites. Restaurants and coffee bars already store coffee grounds separately (for operational reasons); thus we can assume that they are willing to give it free to a potential mushroom grower. Besides this, collection of coffee grounds does not induce extra costs on restaurants; additionally, they can make savings by paying less to the waste-processing sector. Nevertheless, collection of coffee grounds entails significant transportation costs that must be considered among the costs of mushroom growing. Technical details on I-O table regionalization and deriving the data on mushroom growing technology are provided in the Appendix. Since the sector analysed (mushroom growing) only represents a small proportion of the total production of the Southern Transdanubian region, aggregate results at the regional level are expected to be minor only. Let us first analyse the change in output in the first year. These impacts are shown in Table A2.

The most striking result is the increase in the output of the mushroom producing sector by 11 percent. This rise is down to the decreased costs of mushroom production because one of the inputs (coffee grounds) is now freely available for producers. Resulting from the decline in costs, companies can supply mushroom for a lower price, which in turn increases the quantity demanded. A further expected result is the shrinking of the waste-processing sector, even if only on a small scale. As there will be less coffee-ground waste. On the other hand, the output of the sector that includes transportation ("Wholesale and retail trade, repair of motor vehicles and motorcycles, Transportation and storage, Accommodation and food service activities") increased. This is because coffee-ground has to be collected from multiple sites and in relatively small portions, which increase transportation need. A further interesting result is the increase in electricity required due

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to both direct and indirect effects. The direct effect is the relatively high demand of the mushroom growing sector for electricity, since appropriate humidity and temperature play a significant role in mushroom growing. Thus, increased mushroom production requires increased electricity production and air conditioning. Furthermore, it can be assumed that higher transportation need also increases the demand for energy.

Output of the agricultural sector slightly decreased because of the substitution of the raw material that stemmed earlier from this sector (compost) by coffee-ground. It is also worth mentioning that the output of chemicals also decreased, because of the use of the already sterile coffee grounds. Application of this input thus does not require further treatment of the substratum in mushroom growing.

Summary

Our study introduced a model framework that is applicable to the impact assessment of particular kinds of environmental innovations called Blue Economy innovations. The main novelty of these technologies is that they use certain products, which are usually considered waste, as production inputs. These innovations reduce the production of waste on the one hand and diminish the raw material needs of the economy on the other. To be able to analyse the effects of such innovations, we used a multi-sector general equilibrium model that can reveal the transformed relationships among economic sectors. Due to relatively high transportation costs, these innovations rely much on spatial proximity of firms, which should also be incorporated into the structure of impact models. To account for the role of geography in our analysis, we applied the GMR-Europe model. The SCGE block of the GMR-Europe model was developed in a way that it became suitable for the impact assessment of these innovations. Finally, we illustrated the capabilities of the model with a specific example. We analysed the effects arising from the use of coffee grounds as a substratum in mushroom production (a Blue Economy innovation) and compared them to those of a widely used current technology. The empirical analysis was run for data of the Hungarian South Transdanubian Region. Due to the small share of the mushroom growing sector in the regional economy, the effects found are quite small. Even against this, we experienced visible impacts, primarily owing to changes in intersectoral relations.

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APPENDIX

A1. Regionalizing Input-Output tables

Many technical problems had to be resolved during the impact assessment of the chosen Blue Economy innovation. With respect to the inputs, a solution must have been found on how to take into consideration and insert the technology of a previously non-existing, entirely new branch and how the starting values of the input data can be generated. Since producers will use a new technology with the implementation of the innovation, a methodology is needed that can take into consideration the change in the production technology. We used an input-output table estimated for the Southern Transdanubian region to analyse the technology of the Blue Economy innovation. The impact assessment was run within the framework of the GMR-Europe model. Since (as it has already been discussed in the previous chapter) this model includes only one aggregated sector, it is not able to take into consideration the interconnections of different industrial sectors. Thus for the analysis we extended the SCGE model block in a way that we were able to track inter-sectoral effects of the innovation.

The estimated regional input-output table served as the base for the simulations. A physical input-output table would be an excellent instrument for the impact assessment. However, for Hungary, the table of intersectoral connections expressed in physical units is not available, so we used the traditional monetary table of intersectoral relations. A further problem is that the Hungarian Central Statistical Office (HCSO) compiles only national

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I-O tables, thus first we had to estimate it for the Southern Transdanubian region to be able to analyse the effects of the innovation.

There is a broad literature on the regionalization of input-output tables (Kuhar et al. 2009). The three types of methods that have been most widely applied are the *survey*, *non-survey* and *hybrid* methods (Bonfiglio 2005). When survey methods are followed, companies in the region are asked to provide production data and then the table will be compiled based on the data received. A distinct advantage of this method is that it can detect input-output relations with a good estimate. However, the disadvantage is that the determination of those is a very costly process. Non-survey methods can be used if there is no data available on input-output connections in the region; consequently, the whole table must be estimated. These methods require only a few data and are relatively easy to carry out. Additionally, they are not so costly compared to the survey methods. However, their disadvantage is that they cannot provide precise results. The hybrid methods are meant to unify the advantages of the previous two groups, namely appropriate precision and relatively low costs. This requires the availability of preliminary (survey) data on regional input-output connections. Usually, the most important and largest branches of the region are mapped with a survey and after that, the remaining parts of the table are estimated by a non-survey method. Since no survey data are available for Southern Transdanubia, we used a non-survey method to carry out the estimation. The regionalization of the table followed a two-step process. First, by using the LQ-method, we adjusted the cells of the coefficient matrix to regional production specificities, and determined the scale of interregional export and import; then we ensured the fit to the regional data by using the RAS method. More technical details on these techniques can be found e.g. in Bonfiglio (2005) and Flegg and Thomo (2013).

A2. Deriving data on mushroom growing technology

Since mushroom growing is part of agriculture in the HSCO tables, we decided to separate the mushroom growing sector from agriculture. Consequently, we established a new input-output table that included mushroom growing as a new sector additional to agriculture excluding mushroom production. Of course, there is no overlap between these two sectors. During the model runs, this table was inserted into the SCGE block. We consider the results attained with this table as the baseline scenario.

The alternative scenario includes the effects of the Blue Economy innovation. The starting point was the regional input-output table estimated previously. However, during the analysis we assumed that the whole mushroom growing industry of the region uses the new technology thus the whole branch shifts to the new production method. Consequently, the impact assessment will show the results expected if the Blue Economy innovation is applied in the entire mushroom growing sector. We assumed that the entire amount of coffee grounds that can potentially be collected from catering places were used by the mushroom growing sector. The output of the sector was calculated then by assuming the application of the new technology. After estimating the output and inputs required, data of the mushroom growing sector with the old technology was replaced by the data estimated with the new technology in the input-output table. Then the model was run again using the new table.

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Table A1

Technological coefficients in case of traditional and Blue Economy types of mushroom growing

Sector	I-O coefficients	
	traditional	Blue type
Agriculture, forestry, fishing	0.200	0.056
Mining and quarrying	0.054	0.000
Manufacture of food products, beverages and tobacco products	0.000	0.000
Manufacture of textiles, wearing apparel, leather and related products	0.000	0.000
Manufacture of wood and paper products, and printing	0.000	0.000
Manufacture of chemicals and chemical products, Manufacture of pharmaceuticals, manufacture of coke	0.019	0.000
Manufacture of rubber and plastics products, and other non-metallic mineral products	0.111	0.046
Manufacture of basic metals and fabricated metal products, except machinery and equipment	0.000	0.000
Machinery	0.000	0.000
Other manufacturing and repair and installation of machinery and equipment	0.000	0.000
Electricity, gas, steam and air conditioning supply	0.073	0.118
Water supply	0.001	0.001
Construction	0.000	0.000
Wholesale and retail trade, repair of motor vehicles and motorcycles, Transportation and storage, Accommodation and food service activities	0.000	0.099
Information and communication	0.000	0.000
Financial and insurance activities	0.000	0.000
Real estate activities	0.000	0.000
Professional, scientific and technical activities, Administrative and support service activities	0.000	0.000
Public administration and defence; compulsory social security, Education, Human health and social work activities	0.000	0.000
Arts, entertainment and recreation, Other services, Other activities	0.000	0.000
Mushroom	0.000	0.000
Sewage, waste management and remediation activities	0.000	0.000

The technological coefficients of the two types of mushroom growing can be found in Table A1. The differences are rooted in the differences between the two technologies. For example, traditional mushroom growing has a higher agricultural coefficient, since, besides mushroom spawn it also uses compost. Additionally, the Blue Economy Innovation does not use any output of the mining industry, while the traditional production does (sand and peat). It can also be seen that only the traditional method of growing requires the use of chemicals, however, raising the crop on coffee grounds has a larger energy demand (especially due to lightning). Water consumption is not significantly different and approximately equal in both cases. Resulting from the need of transporting coffee grounds, the Blue Innovation also uses the trading sector as an input. In restaurants of the Southern Transdanubian region, approximately 214,000 tons of coffee grounds are produced annually that can potentially be used for mushroom growing.

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Table A2

Expected sectoral impacts of the implementation of Blue Economy-type mushroom growing

Sector	Gross output (X)		
	baseline	scenario	change, %
Agriculture, forestry, fishing	549.076	548.929	–0.0267
Mining and quarrying	12.154	12.108	–0.3773
Manufacture of food products, beverages and tobacco products	153.324	153.323	–0.0004
Manufacture of textiles, wearing apparel, leather and related products	50.710	50.709	–0.0015
Manufacture of wood and paper products and printing	24.839	24.839	–0.0005
Manufacture of chemicals and chemical products, Manufacture of pharmaceuticals, manufacture of coke	252.638	252.610	–0.0111
Manufacture of rubber and plastics products and other non-metallic mineral products	64.321	64.295	–0.0409
Manufacture of basic metals and fabricated metal products, except machinery and equipment	66.936	66.935	–0.0019
Machinery	184.489	184.490	0.0001
Other manufacturing and repair and installation of machinery and equipment	4.821	4.821	–0.0001
Electricity, gas, steam and air conditioning supply	223.899	223.947	0.0213
Water supply	7.800	7.800	–0.0049
Construction	414.626	414.628	0.0004
Wholesale and retail trade, repair of motor vehicles and motorcycles, Transportation and storage, Accommodation and food service activities	1054.307	1054.390	0.0079
Information and communication	133.623	133.624	0.0008
Financial and insurance activities	151.926	151.927	0.0005
Real estate activities	449.392	449.401	0.0019
Professional, scientific and technical activities, Administrative and support service activities	288.944	288.947	0.0011
Public administration and defence; compulsory social security, Education, Human health and social work activities	1250.779	1250.770	–0.0007
Arts, entertainment and recreation, Other services, Other activities	181.508	181.508	0.0004
Mushroom	0.738	0.817	10.8212
Sewage, waste management and remediation activities	21.148	21.148	–0.0026

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From Global Economic Crisis to Armed Crisis: Changing Regional Inequalities in Ukraine*

Abstract

Despite the new geopolitical situation caused by the revolution at Maidan in February 2014, little is known about the real economics of Ukraine and its internal spatial disparities. In the survey of regional disparities, data on incomes, employment and unemployment were involved and completed by those on migration and age structure of the population. The spectrum of available data at rayon level is not particularly broad, but this is counterbalanced by the ca. five hundred territorial units that provide a minute picture of the inequalities. According to the classic view, the spatial pattern of economic development is opposite to the Central European west to east slope. In Ukraine, Eastern regions are not more developed as a whole but they accommodate more developed large urban centres. Spatial differences grew most rapidly during the period of economic decline (1990–2000). However, these disparities were mitigated during the two years following the global financial crisis as the latter mainly affected the large urban centres of the economy. Conversely, the Donets Basin as a whole was highly exposed to the effects of these crises owing to its outdated industrial structure (coal mining, iron and steel industry). This led to a rearrangement in the ranking of the east Ukrainian regions based on GDP per capita: Dnipropetrovs'k overtook Donets'k, and the Dnieper Region (including Zaporizhzhia) has a higher output per capita than Donbas. A significant part of the productive capacities and incomes are found in the Donbas, an area hit hard by the fighting; their loss would further deteriorate the state of the country's economy. The fighting in the Donbas that did by far the greatest harm to the economy among the post-Soviet conflicts. It happened in a period when Ukraine, after the transformation crisis, had been on the path of growth for more than one decade. Concerning population number, area and economic weight, the Donbas exceeds Transnistria or Karabakh by an order of magnitude.

Keywords: Ukraine, crisis, separatism, regional inequalities, rayon level.

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Introduction

The European Union merely found itself facing a new challenge when the new government of Ukraine, formed in February 2014, announced its willingness to accept the associated membership offered by the organization. The Russian reaction, which took the western world by surprise, had driven Ukraine – hitherto balancing between the EU and Common Economic Space dominated by the Russian Federation – into a stalemate. As the conflict deepened, the EU was forced to change its policy toward Ukraine. It had to commit to integration in response to the country's new leadership, which was now urging them to do so; a great responsibility for both economies. The EU's intention is to integrate a country of significant territory and a population of 45 million, whilst combating a number of economic issues. Whereas, Ukraine will place its centuries-old economic and cultural relations with Russia on an entirely new basis. The question marks only kept on multiplying in 2014, when politics seemed to neglect economic realities.

Despite the new geopolitical situation, little is known about the real economics of Ukraine and its internal spatial disparities. After overcoming the transformation crisis of the 1990s, the country produced spectacular annual GDP growth (5–10%) in the first half of the 2000s (official data from the State Statistics Service of Ukraine). This development has slowed since 2005 and eventually was broken by the global crisis in 2008. Although GDP recovered after the drastic (15%) drop of 2009, and showed 3–5% increase in 2010–11, hardly any growth was recorded in 2012–13. The stability of the state economy collapsed, debts rocketed, and the country otherwise strangled by corruption was forced to take out an IMF loan. Simultaneously, the bitter fighting between the Orange and Russia-oriented political elites not only hampered internal socio-economic reforms but emphasised the east–west spatial division of the country ever more dramatically. The events in February 2014, initially brought about a western–nationalistic turn in Kyiv and in the west of the country; this was followed by separatist riots in the east that enjoyed political and military support from Russia. By March, the conflict escalated to an international level. The economic problems of Ukraine thus became disguised by the (civil) war and the Russian intervention in the Crimea and east Ukraine.

The historical and cultural background of the east–west division within the country was highlighted in a previous study (Karácsonyi et al. 2014). Although an analysis of the conflict (Crimea, Donets Basin) is not included here, nevertheless, it might be important to raise the following questions: Does this division also appear in the level of economic development; Have differences in the level of regional development played their part in deepening the economic and then the political crisis, or was it the conflict that had a strong effect on regional disparities; and in general, how did the global crisis exacerbate the inequalities already existing in Ukraine?

Due to the significance of the country, geographers and economists in Ukraine and abroad have dealt with socio-economic conditions extensively (Åslund 2005 and 2008, Balabanov et al. 2003, Mrinska 2004, Van Zon et al. 1998, Van Zon 2001). A number of researchers emphasized that Ukraine inherited essential regional disparities from the Soviet period which were strengthened after 1990 (Mykhnenko–Swain 2010, Shablii 2001, Libanova et al. 2012). The adverse effect of the regional asymmetry and east-west dichotomy in Ukraine significantly deepened during 1990s (Gukalova 2009, Skryzhevska

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2008). Mykhnenko and Swain argued that the predominance of centripetal over centrifugal drivers of regional development explains the persistence and divergence of the country's space-economy (Mykhnenko–Swain 2010). Zubarevich showed that the economic inequality of regions in terms of GDP per capita increased until 2008. This was caused by the weakness of the Ukrainian state with a financial shortfall for its redistribution policy (Zuberevich 2010). Lane stressed on the different responses of the CIS and New EU member countries to the financial and economic crisis of 2007 onwards. The firsts were relatively less dependent on, and less integrated into the world financial system. Consequently, direct contagion from the global financial crisis, although significant, had less impact on them. Future economic scenarios for Russia, Belarus and Ukraine, involve not only exchange with the world system, but greater domestic development (Lane 2011). Mezentsev, Pidgrushnyi and Mezentseva focused on economic and social factors of the regional inequalities in Ukraine and the multi-layered character of the socio-spatial polarization (Mezentsev–Pidgrushnyi–Mezentseva 2014). More recently, OECD (2014) published a lengthy report on the inequalities in the country.

However, as a rule, these studies are vague in a spatial sense as they focus on the general aspects of politics and economics; there are also problems with databases suitable for territorial analyses. Taking into account that an average oblast in Ukraine corresponds to the EU NUTS-2 level size, it becomes obvious that only very vague, highly generalised regional trends could be deduced from the survey at this level. It compares to Germany being analysed at the level of Länder. Moreover, two of the 27 entities, notably Kyiv and Sevastopol' are not regions but national-level subordinated municipalities. This leads to a high dispersion of the resulting values with respect to areas, population numbers or incomes. Even in possession of reliable data at county (oblast) level, only a very general picture can be obtained about the disparities.

Therefore, this resolution should be refined with the involvement of district/rayon data. Such detailed analyses were carried out by Baranovsky (2007, 2009, 2010). Economic data at rayon level on a national scale have been available since the early 2000s. The narrow spectrum of the data is counterbalanced by the ca. five hundred territorial units providing a minute picture of the inequalities. In addition, due to the higher number of elements, a broader scale of methods can be applied to the regional analyses. For the sake of comparison: the area of these rayons is still more than twice the size of the Hungarian statistical (micro-)regions (LAU-1).

Rayon level database – a closer approach

In the survey of regional disparities, data on the incomes, employment and unemployment were involved, completed by those on migration and age structure of the population. These data (in a unified compilation of topics) are available at the rayon level in the statistical yearbooks of oblasts. There are no data on the economy at a higher spatial resolution (by settlement) or a normalized spatial database similar to T-star (of the Hungarian Central Statistical Office) or EUROSTAT. Consequently, the authors had to produce one. Recently, there were attempts in Ukraine to publish demography data in an electronic database but the indicators are meagre, and it only includes the last two years of data.

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For the sake of comparability, a spatial database was established that eliminated the administrative changes over the recent past (668 rayons in 2000 and 674 rayons in 2012). The number of rayons is 674 (2014), but of these, 184 are urban settlements of rayon status, i.e. enclaves within rayons (city municipalities of regional /i.e. oblast/ significance). Their data had to be aggregated with those of the enclosing rayon to reach an adequate dispersion of spatial extension (Karácsonyi 2010). In the course of the aggregation, the weighted average wages were accepted where the number of the employed persons represented the weight. After aggregation in the estimation of the unemployment rate, the weight was again the number employed. The ultimate database contained 501 entities of the rayon level data, showing much lower dispersions in comparison with the initial dataset, both in real (V_{674}=68,3%; V_{501}=39,3%) and population (V_{674}=213,7%; V_{501}=203,9%) dimensions (Karácsonyi 2010).

There exist two interpretations of what comprises employment in Ukraine. In a strict sense, this group consists of wage and salary earners or employees (payroll employees), but small enterprises and private entrepreneurs are excluded from the dataset. These people are employed in factories (industry), on farms (agriculture), in offices (state administration) or in private firms (services), and receive a regular (monthly) salary for their work. Their number at county (oblast) and district (rayon) levels is published in statistics; even average nominal wages are determined and calculated from these data. Only part of the total volume of incomes appears and represents per capita incomes indirectly. In a wider sense, small entrepreneurs and persons pursuing agricultural activities are also included among the employed (as well as employees proper). In the early 1990s, more than 90% of workers were wage and salary earners (overwhelmingly employed by the state) i.e. factory workers, office employees or *kolkhoz* peasants. During the period of economic transformation, their ratio almost halved (55% in 2003), and they were replaced by small entrepreneurs and individual farmers (under economic pressure). The process of the decrease in wage and salary earners culminated in 2004, with a slow growth in their number in 2005–2006.

The ratio of those working in small enterprises exceeded 50%, which means that about half of the employed persons do not appear in rayon-level data. The number of people working for small businesses grew by 35% between 2000 and 2013 and is estimated at 10 million (Table 1). Their share is the highest in Transcarpathia, however, since 2003–2004, they represent ca. half of employment in the western part of the country. In contrast, in the eastern Donets'k oblast they have the lowest share, which can be explained by the high dependence of local employment on big enterprises and the minor role of private initiatives. The average wages of people working in small businesses lag behind those of the other employees, thus despite their high ratio, they do not have a significant impact on the regional income disparities. Concerning employment rates, only approximate figures can be deduced at rayon level.

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Table 1

Employment in Ukraine

Year	Payroll employees	Employees in small enterprises (1000)	Ratio of total employment (%)
1995	18 252	5 473	23
2000	13 678	7 591	35.7
2001	12 931	8 085	38.5
2002	12 235	9 144	42.8
2003	11 711	9 738	45.4
2004	11 316	8 980	44.2
2005	11 388	9 292	44.9
2006	11 433	9 297	44.8
2007	11 413	9 491	45.4
2008	11 390	9 582	45.7
2009	10 653	9 538	47.2
2010	10 604	9 662	47.7
2011	10 556	9 768	48.1
2012	10 589	9 765	48.0
2013	10 164	10 240	50.2

Source: State Statistics Service of Ukraine.

The real scale of unemployment could only be deduced from the contraction of the number of the employed. These data – like anywhere else – can be obtained by two methods: by using ILO methodology and from the number of registered unemployed at the State Service of Employment. Nowhere in the world do these data coincide, but in Ukraine they differ considerably. The ratio of jobless according to ILO (7.4% in 2013) is more than twice as high as that calculated from the registered unemployed (1.8% in 2013). It might be taken for granted that real parameters of unemployment are closer to the figures obtained through ILO methodology.

Rates calculated from registered unemployment, and a database of the number of wage and salary earners and their average nominal wages broken down by rayon are made available for public use. The rigid regulation of registered unemployment hardly represents actual unemployment, but it is likely to reflect spatial disparities. An attempt was made to calculate disparities in the employment ratio and per capita incomes at rayon level from the raw indicator values, i.e. from average nominal wages and number of employees (Table 2). For calculating the actual employment ratio, the population in working age (15–64 years) was only available for 2012. Therefore, in the previous years, the number of employees was related to the total population, and so was influenced by the age structure.

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Table 2

Absolute and specific variables of the labour market in Ukraine by rayon

Absolute variables	Source
Total number of employed	Unpublished by rayon
Number of employees	Published by rayon
Number of unemployed	Unpublished by rayon
Total volume of income of all employed	Unpublished by rayon
Total volume of wages	Calculated from average wages multiplied by the number of employees
Specific variables	**Source**
Average nominal wages of employees	Published by rayon
Unemployment ratio	Published by rayon
Employment ratio	Calculated from number of employees compared to the total population (2003-2012)/working age population (2012)
Incomes per capita	Calculated from the total volume of wages to the population

Source: own compilation.

In the course of the analysis, beyond the mapping of the data and more simple descriptive statistics, other indicators of disparities (for example concentration rate, Hoover Index, relative dispersion) were deployed as well. The survey had to be started by filtering out errors in the rayon-level database. Along with typist's literal mistakes, there were cases when individual values could not be explained by socio-economic reasons. If the error was obvious, estimations came to the fore. However, Derzhkomstat has tended to modify data on unemployment, and the sets published at a later date differed from the initial one; in these cases only long-term trends can be observed. Otherwise data on the labour market provide a rather mosaic picture about the country as they depend on the topography of large urban centres, but the dynamics of several years make certain regional processes discernible.

Spatial disparities in the economy

Demographic background of the economy – "worker" and "entrepreneur" Ukraine

Since the proclamation of independence, Ukraine – along with the economic crisis – has also had to face demographic decline (Skryzhevska–Karácsonyi 2012). It threatens to have a considerable detrimental effect on society, the economy and human resources respectively. Between the two previous censuses (1989 and 2001), the total population of Ukraine contracted by 7.5% i.e. by 3.8 million persons. Between 2001 and 2014, it shrank by a further 3 million and was estimated to have been 45.2 million in 2014. Despite a considerable outmigration from the country, the contraction is mainly caused by a natural decline (Skrizhevska–Karácsonyi 2012).

The ageing index (elder-child ratio) points to an unfavourable demography pattern that accelerated particularly between 2004 and 2007. It means that more elderly people have lived in the country than children since 2004. Due to a persistent growth in the birth rate

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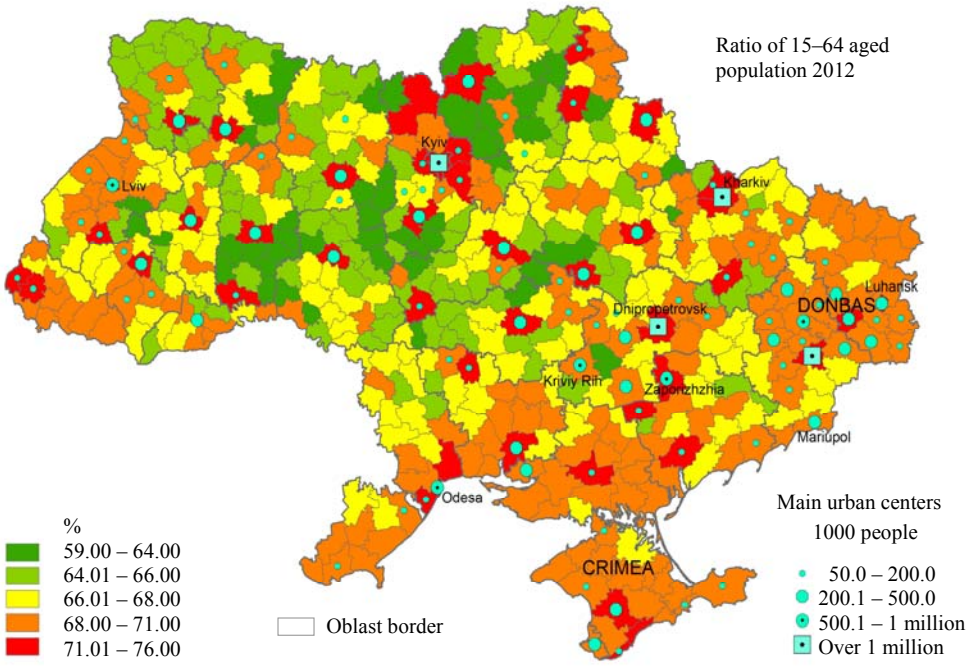
in the 2000s, there has been an increase in the ratio of those in the child age group. The death rate has shown a downward trend, but the natural decrease still accounts for an annual 3-4‰.

Based on the natural change in the population, the country's territory can be divided into clearly separable regions, also reflected by their age structure. The ratio of the working-age population is the lowest in the central rural areas owing to the rapid ageing (Figure 1), whereas, it is the highest in the urban agglomerations. Within the rural population, the ratio of elderly people reaches its maximum in the north-eastern part of the country. In the eastern Donbas, the share of the elderly is considerable, even in the urban population. Although, the ageing is not so advanced as in the north-east, where there has been a natural decrease since the 1970s. The western regions (the Carpathians and Volhynia) are characterized by a more balanced, younger age structure and high natural increase.

Figure 1

Working age population in Ukraine, 2012



Source: own compilation.

Following the turn of the millennium, the economically active segment of the age group between 15–70 years included more than 22 million people, whereas the population of working age (females between 15 and 54, males between 15 and 59 years) numbered 20.5 m. These figures represent 62% and 71% activity rates, respectively. It should be noted that the data obtained by different methods might vary considerably. For instance, the census of 2001 put working-age economic activity at a mere 65.5%. Economic activity has been on

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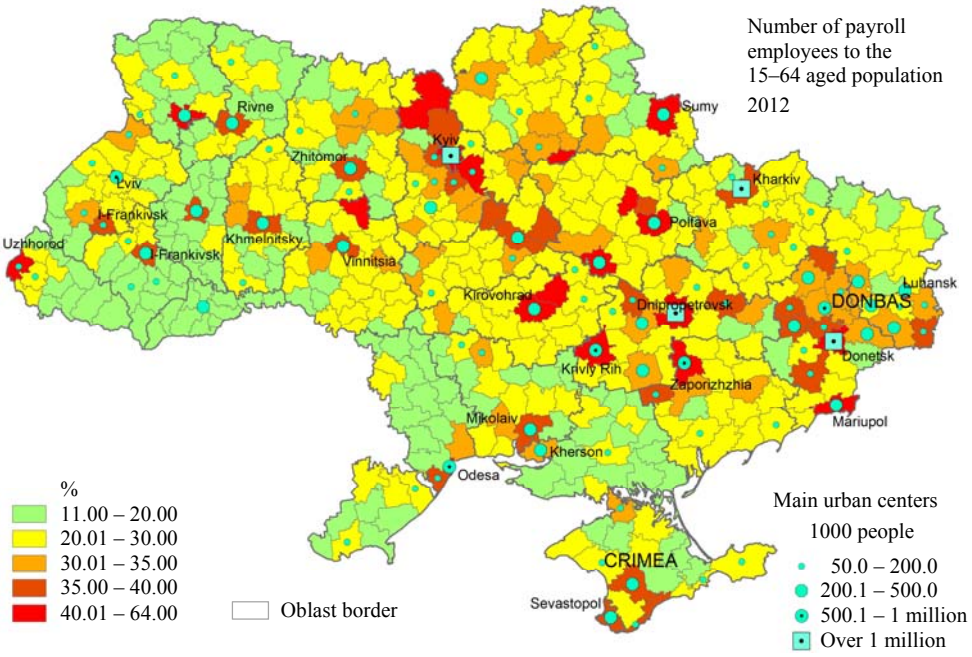
the rise since 2004 (with the exception of 2009), despite that stemming from the shrinking population, it dropped below 22 m by 2013 among people aged between 15 and 70 years.

The overwhelming part of the economically active population consists of 20.4 m employed people as of 2012. The 1990s saw a dramatic decrease, that accelerated between 1995 and 2000, of 3.5 m people. Since 2001, some positive changes seem to have occurred, i.e. there has been a stabilising trend and even growth in the number of employed. The global economic crisis of 2008 had a negative impact on employment, and to a large extent, it was not able to reach 2005 levels even in 2013. The highest employment rate figures for wage and salary earners are found in the environs of large cities, with the trend rising eastward (Figure 2). These data, however, do not include those private entrepreneurs and small enterprises, which could add a lot to the figures in the western part of the country and urban regions.

Figure 2

Rate of employment, 2012



Source: own compilation.

The level of economic development is also reflected in migration movement (Massey 2004) as people move towards regions offering the most favourable economic conditions. Regional wage differences play a decisive part in the spatial distribution of migrants (Hatton, Wiliamson 2005). Urban centres are also the primary target areas in Ukraine, where a broad spectrum of labour opportunities is available. The Kyiv metropolitan region receives the largest number of migrants, and the eastern industrial agglomerations are attractive, except for the two main centres of Luhans'k and Donets'k hit by outmigration. Despite the inward movement, for urban centres in the east (Kharkiv, Dnieper Region), in-

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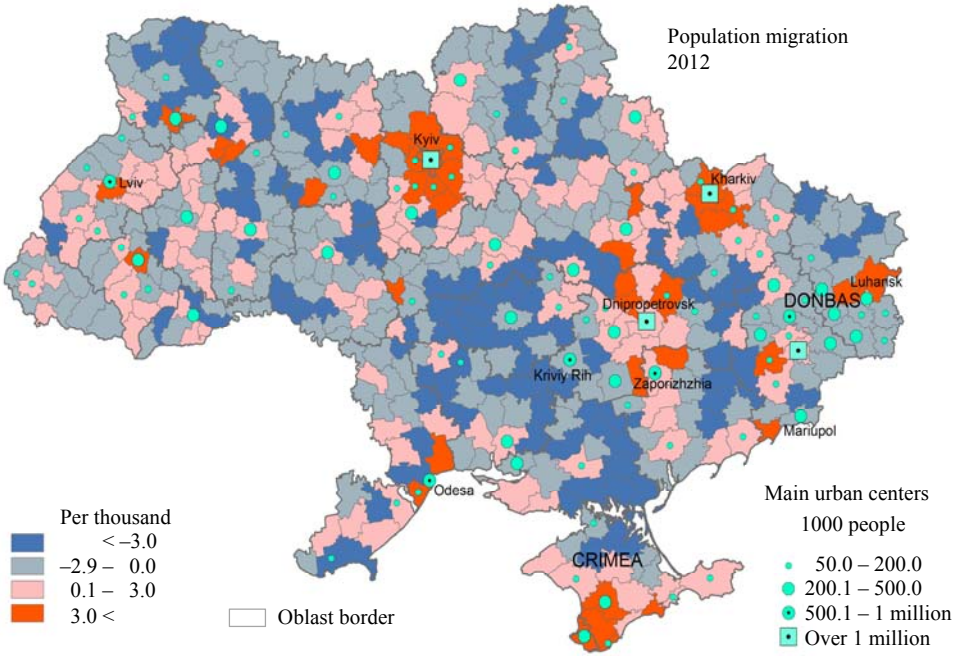
migration is unable to counterbalance the natural decrease. Alongside migration from the countryside to urban settlements as a characteristic feature of the Soviet era, there appeared suburbanization on the urban fringe and desurbanization in rural areas. Along with the necessity (not welfare) outflow, the marine coastal zones located relatively close to big cities are becoming the primary target areas. Odesa region or the southern seaside of the Crimea on the Black Sea might become the Ukrainian sunbelt in the future, however, the future of the Crimea is now a question.

Figure 3

Migration, 2012



Source: own compilation.

The role of the regions in Ukraine in international labour migration varies significantly. Western areas of the country are a major donor to international labour migration, involving about 11% of the population of working age. (Ukraina. Mihratsiinyi profil', 2013). It should be stated that the majority (over 54%) of labour migrants from Ukraine are from rural areas, 66% of them are male, and their average age is 36.2 years. Labour migrants are characterized by a lower level of education than the national average level of the population (Malynovska 2011).

Urban regions as development poles

According to the classic perception, the spatial pattern of economic development is opposite to the Central European west to east slope. Moving eastward there is a rise in the development level. Actually average nominal wages, employment and unemployment at

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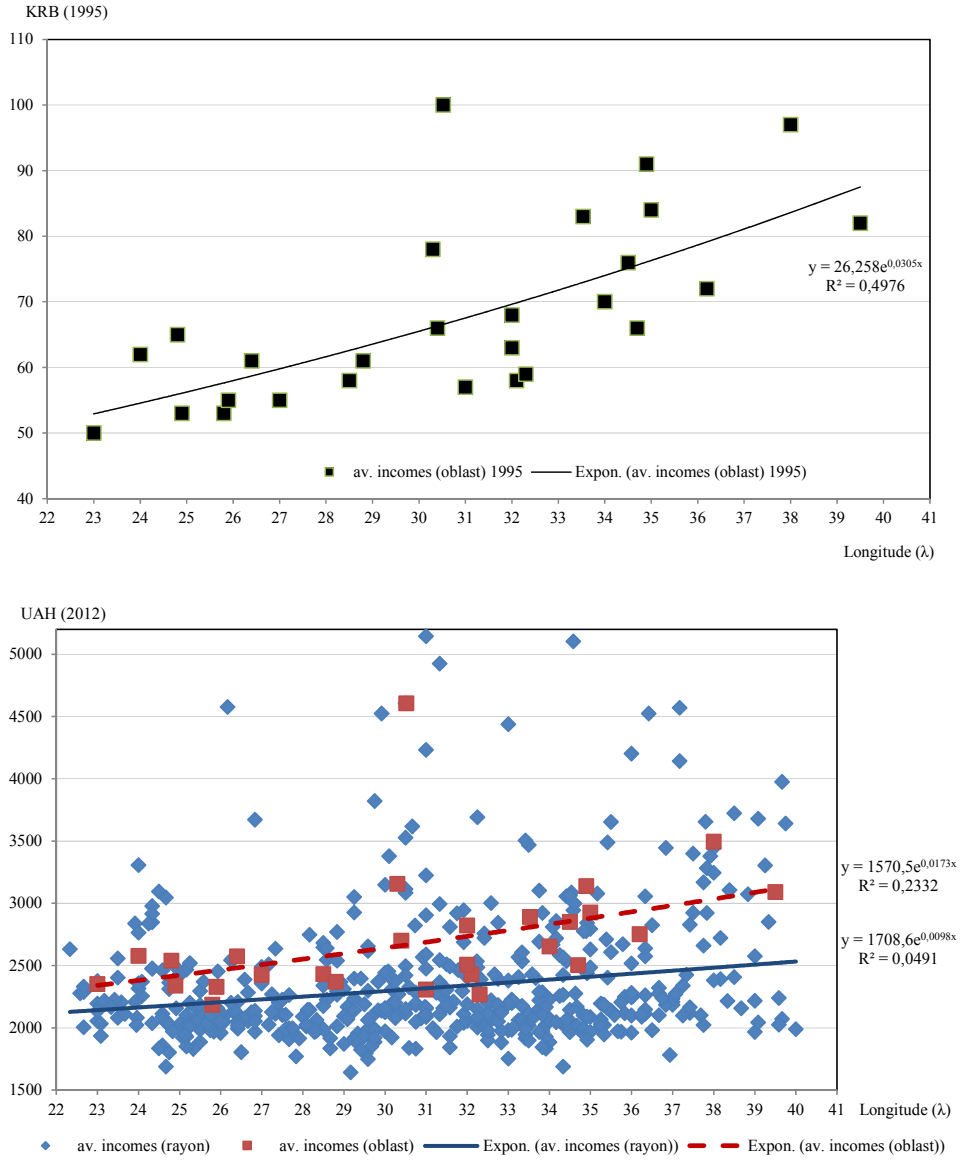
the county level showed a massive east-west slope in the mid-1990s (R^2=0.49), but that resulted from the transformation crisis (Dövényi–Karácsonyi 2008); since then, it has decreased considerably. Such a significant correlation with geographical longitude cannot be demonstrated either at county or rayon level (Figure 4), i.e. spatial disparities on a national scale are not to be deduced from the east–west division.

Figure 4

Variations of incomes and the east–west dimension



Source: own compilation.

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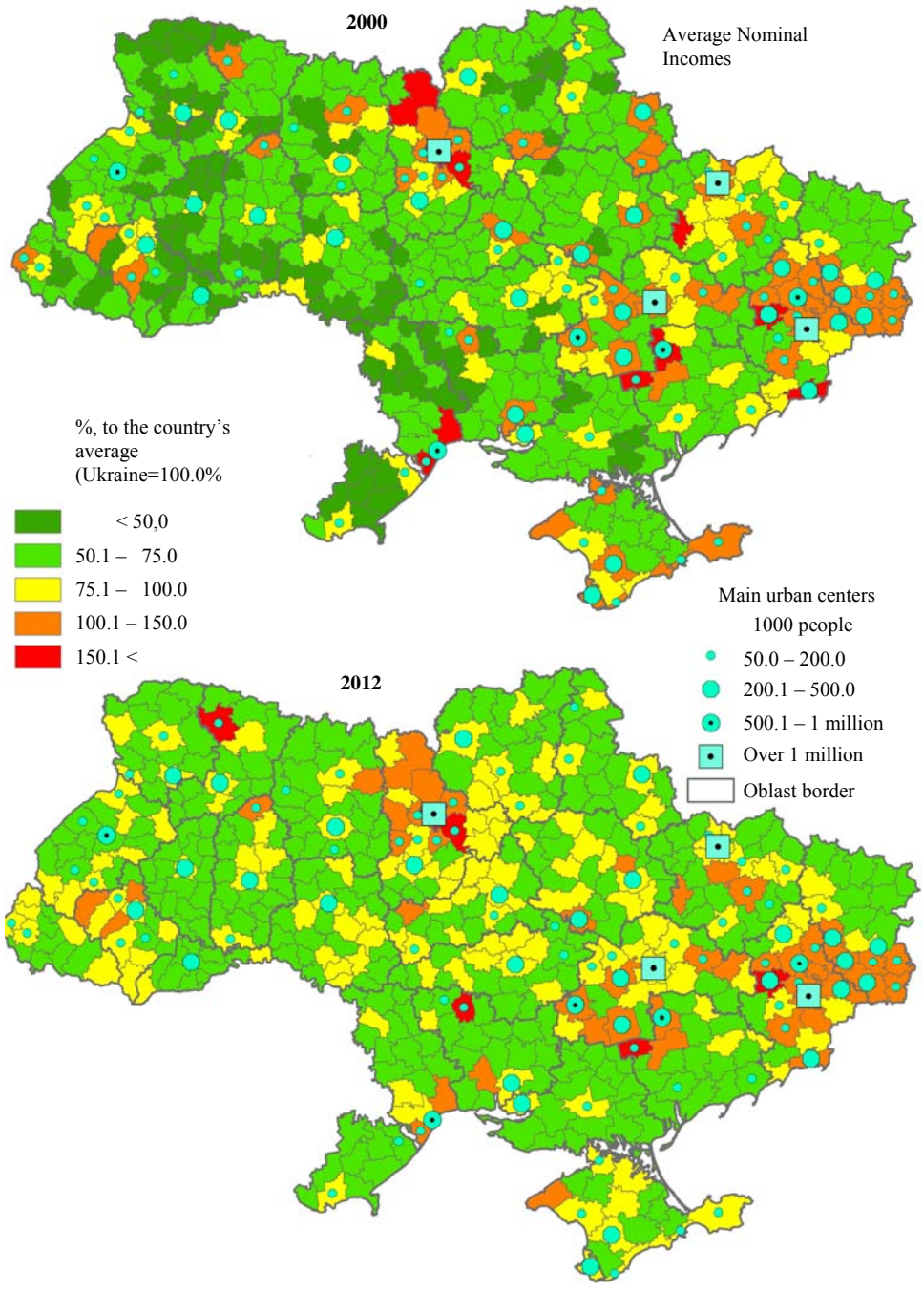
Figure 5

Monthly income to the country average in 2000 and 2012



Source: own compilation.

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Rayon-level data on average nominal wages, employment and unemployment, are functions of the distance from urban centres (r>0.4) and the level of urbanization (r>0.5) (Table 3). Wages and salaries well above the average are to be found in large cities and industrial centres, whereas extremely low wages are a characteristic of expansive rural areas, especially of mid-west Ukraine (Figure 5). Differences in incomes reflect a considerable gap between urban and rural areas. The huge disparities of urbanization across the country mean that 65% of rural inhabitants live in the western part of the country, where the rural population share is 44%. An even more nuanced picture emerges if we exclude Kyiv's 2.8 million inhabitants. In this case, urban dwellers account for only half of western Ukraine's population. In contrast, urban dwellers account for 78% of the population in the eastern part of the country. In regions comprising the major industrial centres, e.g. in the Donets Basin, the inhabitants live almost exclusively in urban areas. Along with Kyiv, the eastern regions (Donets'k, Dnipropetrovs'k and Zaporizhzhia) produce an overwhelming part of the GDP and industrial output (Maksymenko 2000). Odesa is the only 1 million population city falling outside the area delineated by Kyiv–Dnipropetrovs'k–Donets'k–Kharkiv. (The population of Odesa was below 1 million in 2012-13, although by 2014, it was again over 1 million.) Apart from Lviv, there are only minor economic centres in the western half of the country.

Eastern regions are not more developed as a whole, but they accommodate large urban centres representing growth poles. There are less developed peripheral rural areas around them, as is demonstrated by the higher dispersion of the average wages and salaries.

The relationship between the average wages and eastern longitude of setting became increasingly accidental in the first half of the 2000s, and the close connection with urbanization also vanished with the improvement of the economic situation in the hitherto extremely poor rural areas. In the 2000s, especially after the global crisis the eastern regions gradually lost their relative favourable position, while urban growth poles were as a rule hit hard by the economic crisis.

Table 3

Correlation between average wages, urbanization and eastern longitudes on rayon level

r, n=501	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Urbanization	0.66	0.64	0.64	0.62	0.61	0.60	0.60	0.57	0.52	0.51	0.51	0.50
Longitude (λ)	0.31	0.28	0.25	0.22	0.21	0.20	0.21	0.21	0.21	0.21	0.22	0.22

Source: own calculation.

Polarization and levelling – effects of the crises

Similar to the countries of the East European region, transformation of the economy has been accompanied both by growing social inequalities and widening spatial disparities (Mykhnenko–Swain 2010, Skryzhevska 2008, Mezentsev–Pidgrushnyi–Mezentseva 2014). Spatial differences grew most rapidly during the period of economic decline (1990–2000). In 1985, nominal wages in Kyiv city hardly exceeded the average in the Ukrainian Soviet Socialist Republic; by 2001, they represented 1.8-fold value of the national average. As far as average wages and employment are concerned, the number of spatial units with figures above average continiued to shrink during the 2000s. This means that the growth

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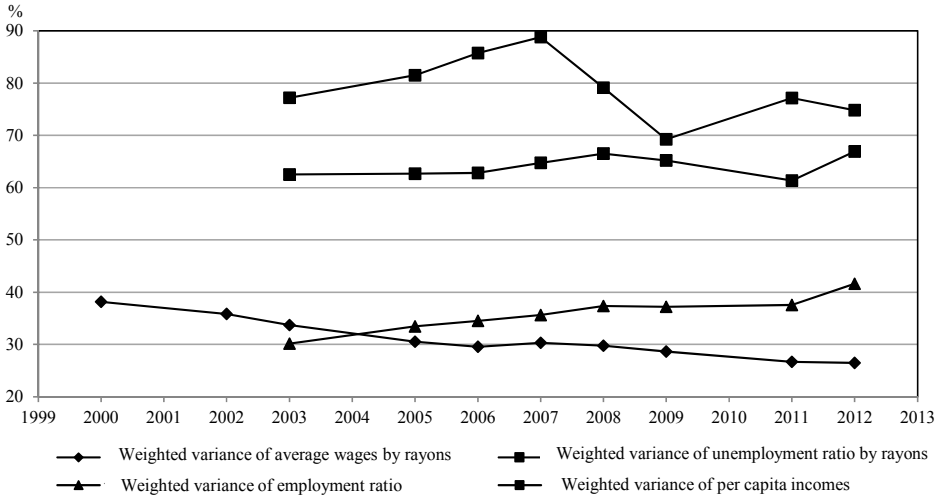
was maintained by poles less in number but being considerably stronger in the early 2010s than a decade before.

In spite of the increasing polarization, the regional differences showed a downward trend in average wages and salaries because the previous extreme low figures remaining below half the national average had disappeared from the western regions (Figure 5). Paradoxically, levelling of average wages was caused partly by the apparently growing inequalities of employment (Figure 6). When calculating average income, a growing number of small enterprises could not be taken into account; nor were they included in the employment figures During the 2000s, employment (without small enterprises) could only rise in the large urban regions while decreasing in the rest of the country. Under the impact of transformation, farming-related workplaces with low wages and salaries disappeared primarily in the western rural areas, while private and small entrepreneurship came to the fore for economic reasons. Average wages have thus significantly increased in these peripheral rural regions.

Spatial disparities were mitigated during the two years following the global financial crisis as the latter mainly affected the large urban centres of the economy. Since 2011, the labour market has undergone a real differentiation in the wake of the recovery of urban regions from the crisis. Since 2009, the employment ratio increased mainly in the eastern regions of the country with a higher level of urbanization. Nevertheless, while in the Dnieper Region and Kharkiv, employment has been raised significantly, the Donets Basin could improve its positions only slightly. Even during the last decade, rising employment was only recorded in the cities of Donets'k and Luhans'k i.e. in the oblast centres. Entrepreneurial activity has been lower in the eastern regions as they depend overwhelmingly on the large industrial enterprises, and this exacerbated the general crisis here. Coal mining, determinant in the southeastern part of the basin, could only survive on state subsidies.

Figure 6

Spatial disparities of average wages, employment and unemployment



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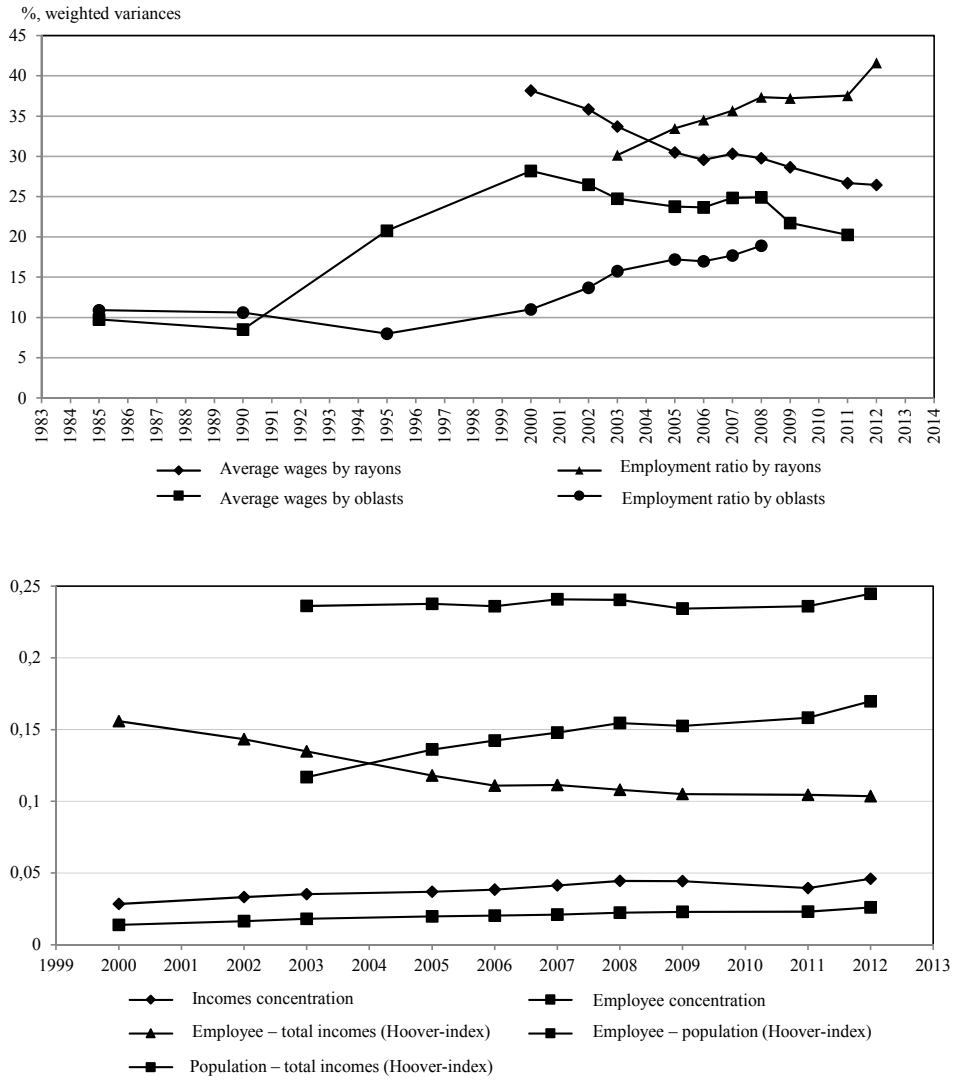

Source: own calculation.

The rapid rise in unemployment came relatively late in Ukraine, starting from the mid-1990s when market-oriented reforms aimed at economic transformation were launched (Kupets 2005). The important part played by small enterprises in employment is indicated by the considerable decrease in unemployment in the central rural region. This was even more pronounced in the west of the country close to the EU, in Galicia and Transcarpathia, during the 2000s, after the transformation crisis terminated. Spatial disparities in unemployment grew until 2007, then during the global crisis, a levelling occurred due to the lack of job opportunities appearing in the large urban centres. By 2012, strikingly high figures of unemployment were only recorded in the eastern peripheral regions, due to lower

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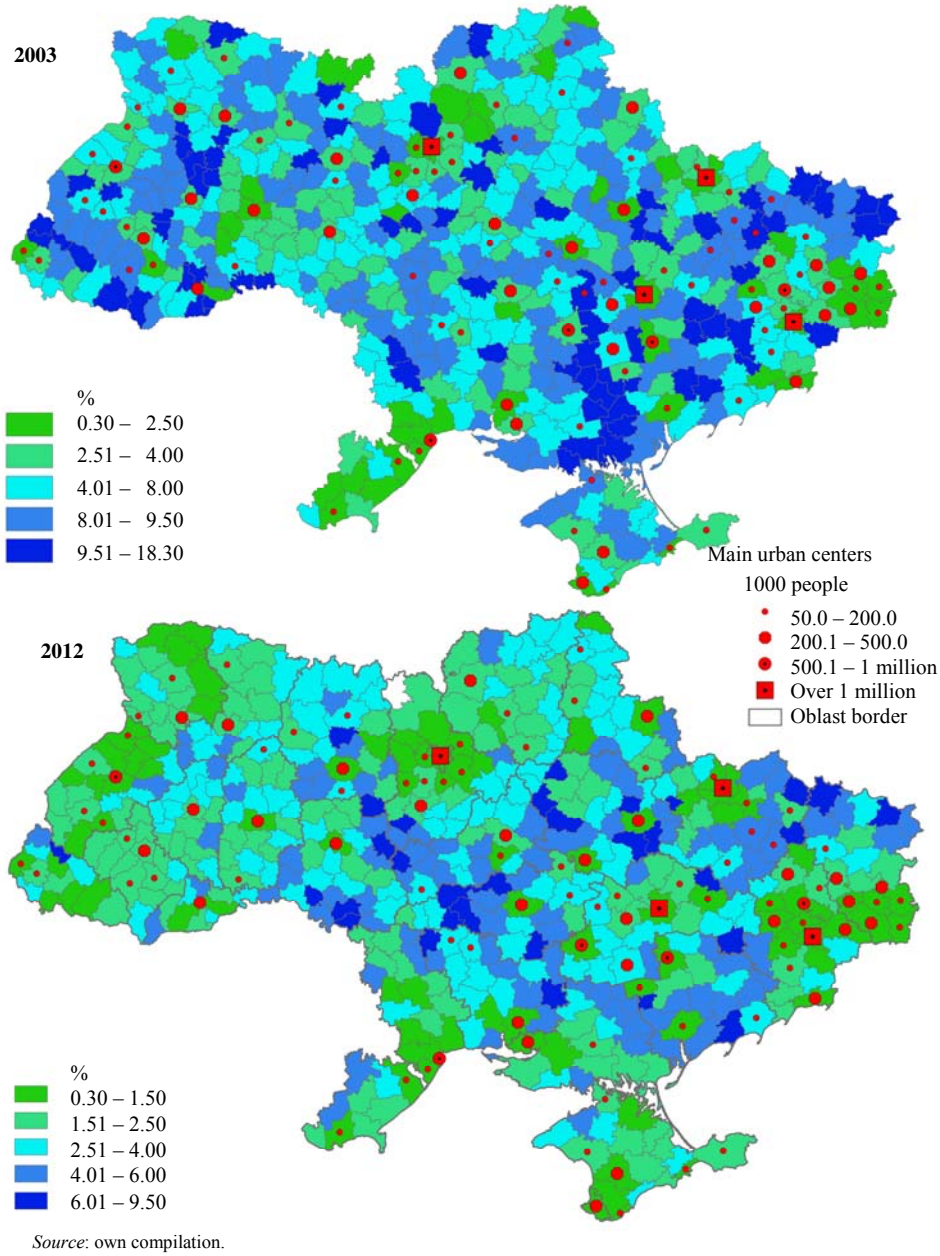
entrepreneurial activity of the population. Extreme unemployment values in this case show maximum dispersion; this can be attributed to the low figures in urban agglomerations and high ones in the rural spaces (Figure 7).

Figure 7

Unemployment 2003, 2012



Source: own compilation.

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From crisis to separatism or crisis due to separatism?

Following the transformation crisis, and especially after the global financial collapse, the large urban spaces (Kyiv, Kharkiv metropolitan regions and agglomerations along the Dnieper River), were as a rule able to improve their economic position and recover from a considerable decline. The industry of the cities along the Dnieper consists of high-tech companies (missile and aerospace technology, Mrinska 2004). However, the Donets Basin as a whole was highly exposed to the effects of these crises owing to its outdated industrial structure (coal mining, iron and steel industry). This led to a rearrangement in the ranking of the east Ukrainian regions based on GDP per capita: Dnipropetrovs'k overtook Donets'k, and the Dnieper Region (including Zaporizhzhia) now has a higher output per capita than Donbas.

The Donets Basin has the most aged population on a national basis, and a large-scale outmigration has stricken the region. Whereas, the western regions are the primary source of migration towards the EU (Malynovska 2011). From the eastern part of the country (particularly from the less prospective Donets Basin), many young native Russian speakers have migrated to Russia, with the Moscow Metropolitan Region as the main target area (Zapadniuk 2011, Zovnishnia trudova migratsiia 2009).

The western half of the country was the most successful area of the 2000s, having risen from significant underdevelopment to close to the national average. In the marginal zone located close to the EU, that used to be a neglected border zone during Soviet times, unemployment dropped considerably as a result of the mushrooming small enterprises and foreign capital investment. Regional inequalities have been on the decrease between east and west, testifying to a relative devaluation of eastern Ukraine's position.

To sum up: a parallel cannot be drawn between the east–west economic dichotomy and recent political processes. Even though there is a close correlation between the ratio of Russian speakers and higher average wages, this might be attributed to the Russian minority mostly living in the urban areas (Table 4). The weakening correlation and shift of the centre of gravity of incomes towards the north-east are a clear indication of the eastern regions (including Russian-speaking ethnic blocks) having lost their absolute economic leadership.

Table 4

Correlation between average incomes and native tongue of the population on rayon level

(%)

Denomination	2000	2002	2003	2005	2006	2007	2008	2009	2010	2011	2012
Ukrainian speakers	–0.39	–0.39	–0.38	–0.35	–0.35	–0.34	–0.32	–0.30	–0.30	–0.29	–0.29
Russian speakers	0.48	0.47	0.46	0.43	0.42	0.42	0.39	0.38	0.37	0.37	0.37

Source: own calculation.

Areas in Donbas hit by the armed conflict extend all over this industrial region. The simplest method to measure economic effects is to examine economic indicators of the rayons affected by the conflict (Figure 8). The involvement of the individual rayons in the hostilities can be estimated through the turnover in the presidential elections of 05.25.2014 by rayon in Donets'k and Luhans'k oblasts. Those rayons, where the number of voters lagged behind the figures usual "in peacetime" or where the election did not take place at all, were obviously outside of Ukrainian central government control. In these areas, the government made an attempt to re-establish its power by armed intervention in June through August 2014.

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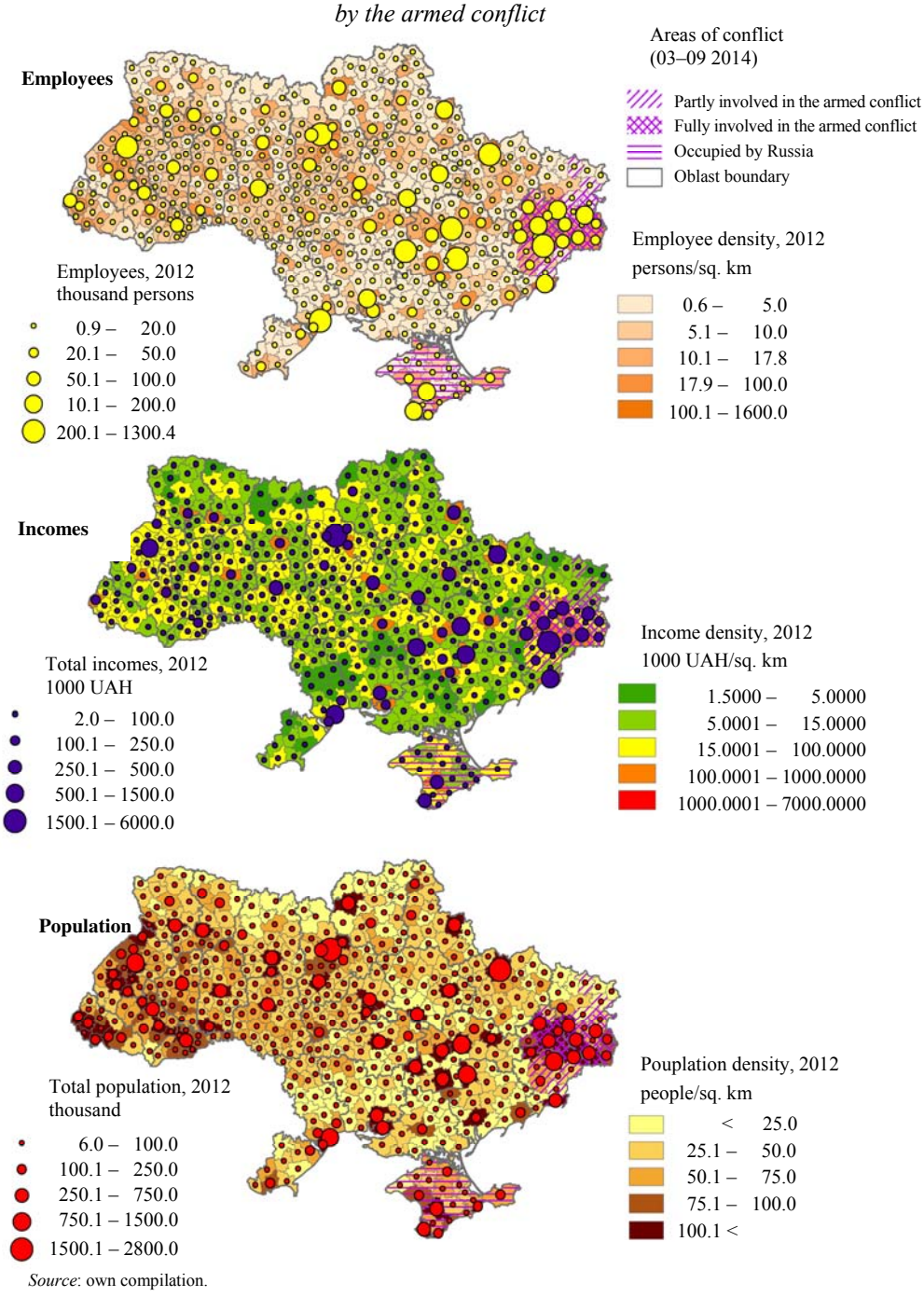
Figure 8

Distribution of population and incomes in Ukraine and the areas affected by the armed conflict



Source: own compilation.

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Donets'k and Luhans'k oblasts were characterized by indicator values over the national average in every respect between 2003 and 2012. The only exceptions were the years of the global crisis starting with 2008, when unemployment rose (Table 5). The average wages were not lower than ten years previously. The opposite was true throughout Crimea and Sevastopol', where indicator values remained below average. The problem with the official statistics rests with the missing data on small enterprises. The economy of the urban regions in east Ukraine and especially that of the Donbas is much more sensitive to central government subsidies than the economy in the western part of the country, which is supported by a strong sector of small enterprises. Cancellation of central subsidies or elimination of the economic cooperation between Russia and Ukraine might seriously affect whole branches of industry with significant numbers of workplaces, and provoke social unrest. The economic roots of the conflict thus rest with the dependence on state subsidies provided by central government. Clashes in the Donbas have their origin in politics; the outdated structure of the economy plays only a relative and indirect part.

Table 5

*Economic indicators for the Crimea and the rayons of Donets'k and Luhans'k oblasts affected by the fighting in 2014**

	2003	2005	2006	2007	2008	2009	2010	2011	2012
					Average wages to the country average				
Crimea	92.3	92.2	92.3	91.6	90.4	91.3	91.6	89.2	89.5
Donets'k	116.8	118.6	115.0	114.2	112.0	111.3	115.7	117.8	116.3
Luhans'k	111.2	110.0	107.8	109.0	108.7	109.1	112.2	114.3	112.5
					Per capita incomes to the country average				
Crimea	85.2	84.7	82.7	83.0	81.6	84.8	95.2	81.7	79.7
Donets'k	125.4	130.9	127.6	128.0	125.7	122.2	141.6	133.1	131.0
Luhans'k	117.1	119.7	118.1	120.9	121.6	120.6	140.8	132.7	130.5
					Employees to the total population				
Ukraine	**25.3**	**24.8**	**25.0**	**25.0**	**25.1**	**23.6**	**21.5**	**23.1**	**23.5**
Crimea	23.3	22.8	22.4	22.7	22.6	21.9	22.3	21.1	21.0
Donets'k	27.1	27.4	27.8	28.0	28.1	25.9	26.2	26.1	26.5
Luhans'k	26.6	27.0	27.4	27.7	28.0	26.1	26.9	26.8	27.3
					Unemployment				
Ukraine	**3.35**	**2.76**	**2.40**	**1.94**	**2.41**	**1.75**	**1.68**	**1.50**	**1.53**
Crimea	2.94	2.12	1.62	1.21	1.55	1.18	1.23	1.36	1.24
Donets'k	2.59	1.98	1.63	1.15	1.78	1.40	1.08	0.89	0.95
Luhans'k	2.02	1.45	1.28	1.01	1.49	1.00	0.86	0.73	0.84

* Donetsk and Luhansk affected by fighting area calculated from the data of presidential election in Ukraine (25.05.2014) – rayons where were no elections, or partly no elections (as not controlled by the central government).

Source: State Statistics Service of Ukraine.

The armed conflict is expected to have far-reaching and more serious implications for the economy than any of the previous crises. Because of the anticipated flight of capital,

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the lag between the Donbas and the rest of the urban regions will widen, stemming from the unfavourable industrial structure of the former.

A significant part of the productive capacities and incomes are to be found in the Donbas, hit hard by the fighting; their loss would further deteriorate the state of the country's economy. Already, in autumn 2014, restrictions to energy consumption had to be introduced because of the fall in coal production of Donbas, as the latter has a direct impact on national GDP. The armed conflict has extended over an area equivalent to half of Hungary, making up 7% of the country's territory. Here, more than one-fifth of the working-age population and one-quarter of the employed live; more than 25% of GDP is produced here (Table 6). The Russian–Ukrainian conflict affects 10 million people (including the Crimea). All this means that one-quarter of the economic assets were not under the control of the central government in 2014, which will lead to a spectacular shrinkage of GDP. Taking into account an overall national decline of 10% and adding the fall shared by the areas affected by the conflict, the general decline might increase up to 30–40%.

Table 6

*Affected area, population and income during the war in 2014 – estimated from 2012 rayon level data**

Area	Area (km^2)	Population (persons)	15–65 years old population (persons)	Employees (1000 persons)	Total incomes (1000 UAH, 2012 prices)
Crimea	25,830	2,333,524	1,654,926	488.9	1,322,481
Donets'k	21,767	4,271,386	3,020,356	1,132.5	3,979,016
Luhans'k	17,602	3,467,487	2,490,526	946.5	3,218,386
Donbas total	39,369	7,738,873	5,510,882	2079	7,197,402
Total	*65,199*	*10,072,397*	*7,165, 808*	*2,567.9*	*8,519,883*
In % (Ukraine =100%)					
Crimea	4.3	5.1	5.2	4.6	4.1
Donets'k	3.6	9.4	9.4	10.6	12.3
Luhans'k	2.9	7.6	7.8	8.8	10.0
Donbas total	6.6	17.0	17.2	19.4	22.3
Total	*10.9*	*22.2*	*22.4*	*24.0*	*26.4*

* In case of Donets'k and Luhans'k only rayons affected by the fighting. Donetsk and Luhansk affected by fighting area calculated from the data of presidential election in Ukraine (25.05.2014) – rayons where were no elections, or partly no elections (as not controlled by the central government).

Source: State Statistics Service of Ukraine.

It would be difficult to predict the long-term effects of the crisis because its end is not yet in sight. According to one scenario, Russia is to retain its military influence in the Donets Basin and to keep the local industry working through subsidized energy prices, similar to Transnistria. In this case, the Donbas will be unable to rely on the influx of foreign capital to modernize its industry. There has been a large-scale outmigration further deteriorating the otherwise unfavourable age structure.

If the Kyiv central government fails to resume its control over the Donets Basin, it might be a limiting factor for economic and international orientation of Ukraine in the

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future. It should be emphasized that this is a merely new but at the same time quite familiar situation in the post-Soviet space. The Donets Basin and the Crimea just add to the frozen post-Soviet crises in Transnistria, Karabakh, South Ossetia and Abkhazia – but there are differences in the spatial dimensions and timing. The present conflict arose more than twenty years after the disintegration of the USSR and following the "freezing" of the other post-Soviet clashes, in a delayed historical context. There are two reasons for this. First, in the early 1990s, a conflict of this kind could have threatened a clash of two nuclear powers, as Ukraine gave up its nuclear weapons stockpile only with the Budapest Memorandum signed in 1994; in exchange, the great powers (among them the Russian Federation) provided security assurances. Second, Russia of the time teased by the events in Transnistria, Nagorno-Karabakh, Abkhazia, Tajikistan and Chechnya could not undertake such a conflict. The size and economic importance of the region affected by the conflict (Table 7) indicate that among the post-Soviet conflicts so far, it was the fighting in the Donbas that did by far the greatest harm to the economy. It happened in a period when Ukraine, after the transformation crisis, had been on the path of growth for more than a decade. Concerning population, area and economic weight, the Donbas exceeds Transnistria or Karabakh by magnitude. Some 10 million people are affected in an area two-thirds of Hungary (65 thousand sq. km). Ukraine would barely be able to solve its economic problems using only internal resources. Moreover, the whole post-Soviet space just having started to recover from the decline caused by the global crisis might sink into a deep economic depression.

Table 7

Size of "frozen and hot" conflicts in post-Soviet space

Conflict area	Country	Date (since)	Area (1000 km^2)	Population around 2010 (1000 persons)	Ratio of the country's area (%)	Ratio of the country's population (%)
Transnistria	Moldova	1990	4.1	505	12.0	12.5
South Ossetia	Georgia	1991	3.9	51	5.7	1.0
Abkhazia	Georgia	1992	8.6	242	12.4	5.0
Nagorno Karabakh	Azerbaijan	1991	11.4	146	13.0	1.5
Crimea	Ukraine	2014	25.8	2,300	4.3	5.1
Donbas	Ukraine	2014	~39	~7,700	~6.6	~17

Source: own calculation from the data published by the statistical offices of Ukraine, Moldova, Georgia, Azerbaijan and the above-mentioned non-recognized countries.

Conclusions

The spatial disparities of economic life in Ukraine are consequences of the inequalities in the level of urbanization characterized by a massive west–east dichotomy. The spatial pattern of the economy is also dualistic, with the entrepreneurial western areas vs. the eastern regions depending on the large industrial enterprises. During the take-off of the economy following the transformation crisis, disparities tended to grow; the global crisis then temporarily reduced the advantage of the growth poled. At the same time, the relative position of the Donets Basin within the country deteriorated due to the overwhelmingly

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uncompetitive industries. The present problems of the economy are rooted in the postponement of the economic reforms and an outdated structure that has been exacerbated by the global crisis. Although spatial inequalities lessened during the initial years after the crisis, the small enterprise sector in the west and urban regions, with a more competitive economic structure, managed to overcome the crisis in a relatively short time.

The present conflict did not originate from the growing spatial disparities or the lagging of the eastern territories. It stemmed from an east anxious that in the case of a possible western orientation, the less competitive sectors of the economy might be eliminated, with a special reference to the Donbas. Damage caused to the economy by the warfare exceed the combined loss during the conflicts since the disintegration of the USSR, due to the utmost economic importance of the affected Donbas. One-fifth of the economy of Ukraine virtually vanished; in addition, the world is facing a new geopolitical situation in the post-Soviet space, one that threatens to thoroughly rearrange the further orientation of future integrations.

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Modelling the spatial structure of Europe*

Abstract

How can spatial location affect the operation of society, population or economic conditions? What is the role of neighbourhood and distance in social phenomena? In what way can a social organisation limit spatial barriers? How would spatial structures be affected by the attraction and repulsion of territorial units? Does society only use or also design regions? These questions are explored in this study.

This work analyses some important issues, concepts and analysis procedures of the territorial structure of society and social processes of spatiality. It does not contain a comprehensive theory of spatiality and regional science; it is primarily a practical empirical research.

Many theoretical works aim at defining the spatial structure of Europe. This article provides an overview of models describing the spatial structure of Europe. The study describes the economic spatial structure of Europe using bi-dimensional regression analysis, based on the gravity model. The spatial structure of Europe is illustrated with the help of the gravity model and spatial auto-correlation. With these patterns, it is possible to justify the appropriateness of the models based on different methodological backgrounds by comparing them with the results of this paper.

The subject of field theory concepts and methods that can aid regional analyses is examined, and attempts to offer a synthesised knowledge with a wide variety of examples and methods.

Keywords: bi-dimensional regression, Europe, gravity model, spatial autocorrelation, spatial models.

Introduction

Some of the theories, models and descriptions engaged in the socio-economic spatial structure of Europe are static, i.e. they focus on the current status and describing structures. We classify the 'European Backbone' by Brunet (1989), including what later became called 'Blue Banana' or the 'Central European Boomerang' by Gorzelak (2012), into this

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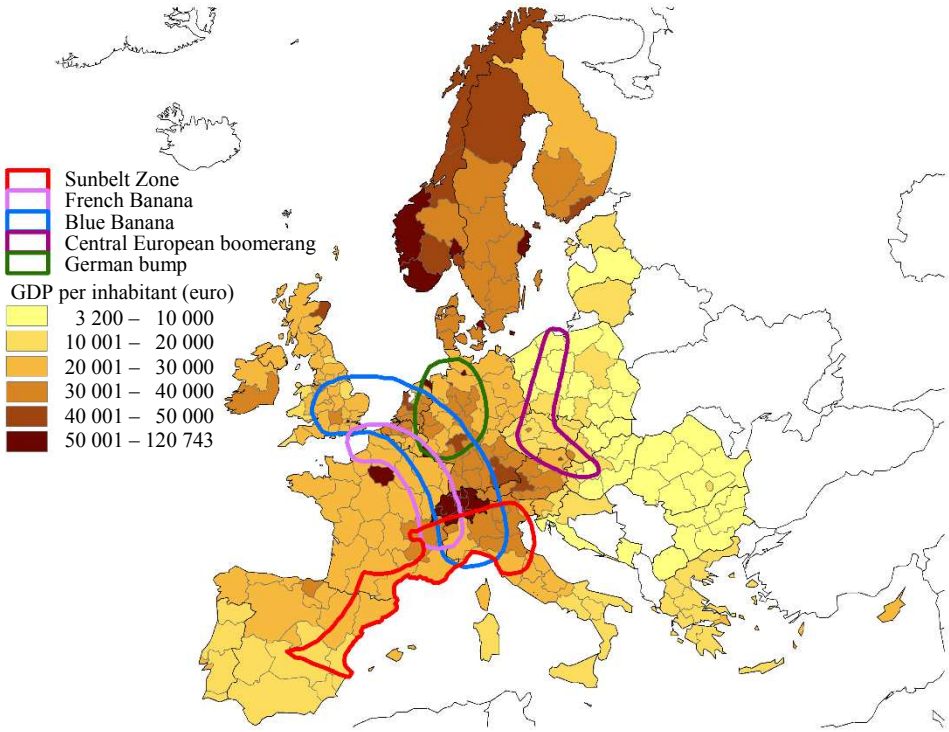
group (Figure 1). Attempts to visualise different polygons (triangles, tetragon) (Brunet 2002) also fall into this category.

Figure 1

Spatial structure models 1



Source: own compilation based on Brunet (1989) and Gorzelak (2012).

Among popular spatial structure models are visualisations that highlight potential movements and changes in spatial structure and development. Some of these are presented, without any claim to completeness. One of them is the developing zone on the northern shore of the Mediterranean Sea, called the European Sunbelt by Kunzmann (1992) (discussed in Kozma 2003) through association with one of the rapidly growing southern zones of the United States of America.

The model of the 'Red Octopus' can be classified as a dynamic model, since it focuses on the future and introduces potential future changes. It is a vision for 2046, showing which of Europe's regions will develop the fastest (Figure 2). In this structure, the body and the Western arms stretch approximately between Birmingham and Barcelona, and toward Rome and Paris. Its form stretches towards Copenhagen–Stockholm–(Helsinki) to the North and Berlin–Poznan–Warsaw and Prague–Vienna–Budapest to the East (van der Meer 1998). Unlike earlier visualisations, this form includes the group of developed zones and their core cities, highlighting the possibilities for decreasing spatial differences by visualising polycentricity and 'eurocorridors' (Szabó 2009). Development is similarly visualised by the 'Blue Star' (Dommergues 1992), with arrows to indicate the directions

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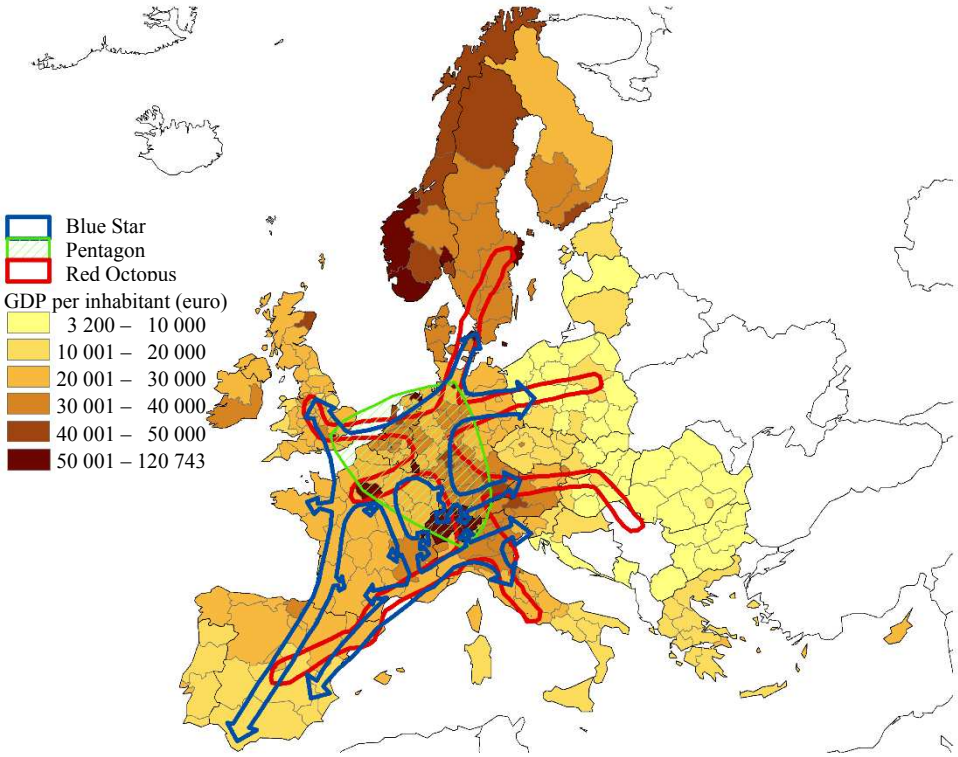
of development and the dynamic areas. Besides the triangle, other polygons are also used to visualise spatial structure, like the quadrangle of London-Amsterdam-Paris-Frankfurt by Lever (1996) or the pentagon that has increased its importance in recent years (Figure 2). The "European Pentagon" is the region defined by London-Paris-Milan-Munich-Hamburg in the European Spatial Development Perspective (ESDP) in 1999.

Figure 2

Spatial structure models 2



Source: own compilation based on van der Meer (1998) and Dommergues (1992).

We argue that the description 'Bunch of Grapes' by Kunzmann & Wegener (1991) and Kunzmann (1992; 1996) includes change and the visualisation of development (Figure 3). By focusing on the polycentric spatial structure, urban development and the dynamic change of urban areas can be highlighted (Szabó 2009). Polycentricity has become an increasingly popular idea, and a key part of the European Spatial Development Perspective (ESDP, agreed at the European Union's Council of Ministers Responsible for Spatial Planning, in Potsdam, 10−11/05/99) (European Commission 1999). It also has an increasing role in the European cohesion policy (Faludi 2005, Kilper 2009). At the same time, however, critical statements appear against this kind of planning approach, for example from the point of view of economic efficiency or sustainable development (Vandermotten et al. 2008).

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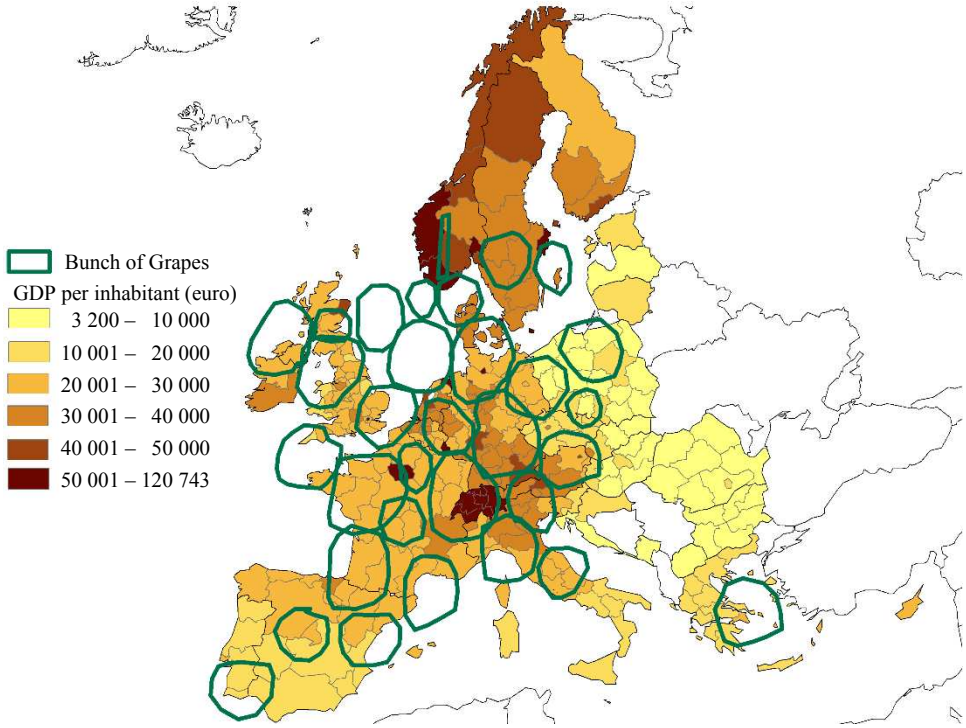
Figure 3

Spatial structure models 3



Source: own compilation based on Kunzmann & Wegener (1991) and Kunzmann (1992, 1996).

In many cases, it is not the form describing the spatial structure or the quality and the extension of the formation – i.e. the static description – that is the crucial question, but rather the visualisation of the changes, processes and the relationships among regions. Moreover, it is important to analyse the ways and developments that can create the opportunity to utilise advantages and positive effects (Hospers 2003). The paper offers a synthesised knowledge with a broad range of visualisations of examples and methods. Dynamic visualisations can help in this process.

In the following sections, the background of these spatial structural relations and models are examined more thoroughly with the use of the gravity model and bi-dimensional regression. In all of the examples, gross domestic product (GDP) values are applied as a determining measure of territorial development, since the authors believe that its use allows a detailed analysis of spatial structure. GDP is used since this is the most widely used economic variable.

Gravity models and examination of spatial structure

Gravity and potential models that are based on the application of physical forces, are an important approach for examining spatial structure. The use of a gravity analogy in

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examining territorial and spatial structures is not new. This approach, however, does not focus on descriptions by numbers and scalars but the use of vectors. With the approach presented here, attraction directions can be assigned to a given territorial unit that are caused by other units. The universal gravitational law, Newton's gravitational law, states that any two point-like bodies mutually attract each other by a force, the magnitude of which is directly proportional to the product of their mass and is inversely proportional to the square of the distance between them (Budó 1970) (Eq. 1):

$$F = \gamma \cdot \frac{m_1 \cdot m_2}{r^2}, \qquad (1)$$

where the proportionality measurement γ is the gravitational constant (regardless of space and time).

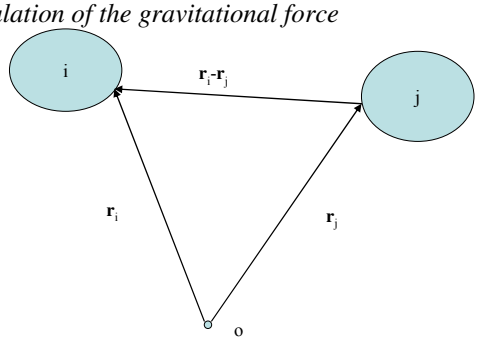
If the radius vector from point mass 2 to point mass 1 is designated by *r*, then the unit vector from point 1 to point 2 is —***r,*** and therefore the gravitational force applied on point mass 1 due to point mass 2 is (MacDougal 2013):

$$\vec{F}_{1,2} = -\gamma \cdot \frac{m_1 \cdot m_2}{r^2} \cdot \frac{\vec{r}}{r}. \qquad (2)$$

A gravitational force field is confirmed if the direction and the size of gradient K can be defined at each point of the given field. To do so, if K is a vector, three pieces of data are necessary for each point (two in the case of a plane), such as the rectangular components K_x, K_y, K_z of the gradient as the function of the place. However, many force fields , like the gravitational force field, can be described in a much simpler way, that is, using instead of three variables only one scalar function, termed the potential (Figure 4) (Budó 1970).

Figure 4

Calculation of the gravitational force



The force that is applied on i due to j $\vec{F}_{ij} = -\gamma \cdot \frac{m_i \cdot m_j}{r^2} \cdot \frac{\vec{r}_i - \vec{r}_j}{r}$

Source: own compilation.

Potential has a similar relation to gradient as work or potential energy has to force. If in the gravitation field of gradient K, the trial mass on which a force of ***F=mK*** is applied is moved from point A to point B by force ***–F*** (without acceleration) along with some curve,

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then the work of $L = -\int_A^B F_s ds$ has to be done against force ***F*** based on the definition of work. This work is independent of the curve from A to B. Therefore it is the change of the potential energy of an arbitrary trial mass:

$$L = E_{potB} - E_{potA} = -\int_A^B F_s ds = -m\int_A^B K_s ds .$$

Dividing by *m*, the potential difference between points B and A in the gravitational space is:

$$U_B - U_A = -\int_A^B K_s ds .$$

By utilising this relationship, in most social scientific applications of the gravitational model, space was intended primarily to be described by only one scalar function (see for example the potential model) (Kincses–Tóth 2012), while in gravitational law, it is mainly the vectors characterising space that have an important role. The main reason for this is that arithmetic operations with numbers are easier to handle than calculations with vectors. In other words, for work with potentials, solving the problem also means avoiding calculation issues.

Even if potential models show, often correctly, the concentration focus of the population or GDP and the space structure, they are not able to provide any information on the direction towards which the social attributes of the other regions attract a specified region, or on the force with which they attract it.

Therefore, by using vectors, we are trying to demonstrate in which direction the European regions are attracted by other regions in the economic space compared to their real geographical position.

With this analysis, it is possible to reveal the centres and fault lines representing the most important areas of attractiveness, and it is possible to visualise the differences in respect of the gravitational orientation of the regions.

In the traditional gravitational model (Stewart 1948), the 'population force' between i and j is expressed in D_{ij}, where W_i and W_j are the populations of the settlements (regions), d_{ij} is the distance between i and j, and g is the empirical constant:

$$D_{ij} = g \cdot \left(\frac{W_i \cdot W_j}{d_{ij}^2}\right) . \qquad (3)$$

Spatial structure analyses applying potential often present not the gravitation force law but analogous procedures; they define different potential functions.

Of these, we examine those in the form

$$L = \sum_{i,j} g \cdot \left(\frac{W_i \cdot W_j}{d_{ij}^k}\right) \qquad (4)$$

k=1, 1.5, 2,..... in more detail. These potentials are transformed using the formula – detailed above – between potential and forces into forces.

With the generalisation of formula (3), the following relationship is given in Eqs. (5) and (6):

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$$D_{ij} = \left|\vec{D}_{ij}\right| = \frac{W_i \cdot W_j}{d_{ij}^c}, \qquad \vec{D}_{ij} = -\frac{W_i \cdot W_j}{d_{ij}^{c+1}} \cdot \vec{d}_{ij} \tag{5, 6}$$

where W_i and W_j indicate the masses taken into consideration, d_{ij} is the distance between them and c is the constant, which is the change in the intensity of the inter-territorial relations as a function of the distance. With the increase of the force, the intensity of the inter-territorial relations becomes more sensitive to the distance and at the same time, the importance of the masses gradually decreases (Wilson 1981, Dusek 2003).

With this extension of the formula, not only the force between the two regions but also its direction can be defined. In the calculations, it is worth dividing the vectors into x and y components and then summarising them separately. In order to calculate this effect (the horizontal and vertical components of the forces), the necessary formulas can be deduced from equations 5 and 6:

$$D_{ij}^X = -\frac{W_i \cdot W_j}{d_{ij}^{c+1}} \cdot (x_i - x_j) \text{ and} \tag{7}$$

$$D_{ij}^Y = -\frac{W_i \cdot W_j}{d_{ij}^{c+1}} \cdot (y_i - y_j), \tag{8}$$

where x_i, x_j, y_i, y_j are the coordinates of centroids of regions i and j.

If, however, the calculation is carried out for each region included in the analysis, the direction and the force of the effect on the given territorial unit can be defined using Eqs. (9) and (10):

$$D_{ij}^X = -\sum_{j=1}^{n} \frac{W_i \cdot W_j}{d_{ij}^{c+1}} \cdot (x_i - x_j), \qquad D_{ij}^Y = -\sum_{j=1}^{n} \frac{W_i \cdot W_j}{d_{ij}^{c+1}} \cdot (y_i - y_j) \tag{9, 10}$$

With these equations, the magnitude and the direction of the force due to the other regions can be defined in each territorial unit. The direction of the vector assigned to the regions determines the attraction direction of the other regions, while the magnitude of the vector is related to the magnitude of the force. In order to make visualisation possible, the forces are transformed to proportionate movements in Eqs. (11) and (12):

$$x_i^{\text{mod}} = x_i + \left(D_{ij}^X * \frac{x^{\max}}{x^{\min}} * k \frac{1}{\frac{D_{ij}}{D_{ij}^{X\min}}} \right) \text{ and} \tag{11}$$

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$$y_i^{\text{mod}} = y_i + \left(D_{ij}^{Y} * \frac{y^{\max}}{y^{\min}} * k \frac{1}{\frac{D_{ij}^{Y\max}}{D_{ij}^{Y\min}}} \right), \quad (12)$$

where X_i mod and Y_i mod are the coordinates of the new points modified by gravitational force, x and y are the coordinates of the original point set, their extreme values are x_{max}, y_{max}, x_{min}, and y_{min}, D_{ij} are the forces along the axis and k is a constant, in this case its value is 0.5. This value was obtained as a result of an iteration process.

Linear projection can also be approached in another way, which will be considered as the second method in the following. The direction of the vector assigned to the regions also determines the direction of attraction of the other territorial units, while the length of the vector will be proportionate to the magnitude of the effect of force. In order to make mapping and visualisation possible, the forces obtained are transformed to proportionate movements in the following way (Eqs. (13) and (14)):

$$x_i^{\text{mod}} = x_i + \left(D_{ij}^{X} * (x^{\max} - x^{\min}) * \frac{1}{D_{ij}^{X\max}} \right) \text{ and} \quad (13)$$

$$y_i^{\text{mod}} = x_i + \left(D_{ij}^{y} * (y^{\max} - y^{\min}) * \frac{1}{D_{ij}^{y\max}} \right). \quad (14)$$

X_i mod and Y_i mod are the coordinates of the new points modified by gravitational force, x and y are the coordinates of the original point set, their extreme values are x_{max}, y_{max}, x_{min} and y_{min}, D_{ij} are the forces along the axes x and y, and their maximums are D_{ij}^{xmax} and D_{ij}^{ymax}.

The simultaneous applicability of the two types of projection attempts to eliminate incidental mode effects, and intends to guarantee common results independent of the projections.

It is worth comparing the point set obtained by the gravitational calculation (using GDP as mass with the baseline point set, that is, with the actual real-world geographic coordinates (and later with each other), and examining how space is changed and distorted by the field of force. In this comparison, not only conventional gravitational fields may be located as shown in other models, but also gravity direction. With this analysis, it is possible to reveal the centres and fault lines representing the most important areas of attractiveness, and it is possible to visualise the differences in the gravitational orientation of regions. In order to realise this in practice, two-dimensional regression needs to be used.

Bi-dimensional regression

It is possible to compare the new point set with the original one by applying this analysis. This comparison can be carried out with visualisation, but in the case of such a large number of points, this is unlikely to provide a promising result by itself. More constructive results can be obtained by applying bidimensional regression analysis (see the equations

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related to the Euclidean version in Table 1), which is a quantifiable method. In this examination, GDP is applied as a weighting variable.

Table 1

Equations of the bidimensional Euclidean regression

1. Regression equation	$\begin{pmatrix} A' \\ B' \end{pmatrix} = \begin{pmatrix} \alpha_1 \\ \alpha_2 \end{pmatrix} + \begin{pmatrix} \beta_1 & -\beta_2 \\ \beta_2 & \beta_1 \end{pmatrix} * \begin{pmatrix} X \\ Y \end{pmatrix}$
2. Scale difference	$\Phi = \sqrt{\beta_1^2 + \beta_2^2}$
3. Rotation	$\Theta = \tan^{-1}\left(\frac{\beta_2}{\beta_1}\right)$
4. β_1	$\beta_1 = \frac{\sum (a_i - \bar{a}) * (x_i - \bar{x}) + \sum (b_i - \bar{b}) * (y_i - \bar{y})}{\sum (x_i - \bar{x})^2 + \sum (y_i - \bar{y})^2}$
5. β_2	$\beta_2 = \frac{\sum (b_i - \bar{b}) * (x_i - \bar{x}) - \sum (a_i - \bar{a}) * (y_i - \bar{y})}{\sum (x_i - \bar{x})^2 + \sum (y - \bar{y})^2}$
6. Horizontal shift	$\alpha_1 = \bar{a} - \beta_1 * \bar{x} + \beta_2 * \bar{y}$
7. Vertical shift	$\alpha_2 = \bar{b} - \beta_2 * \bar{x} - \beta_1 * \bar{y}$
8. Correlation based on error terms	$r = \sqrt{1 - \frac{\sum \left[(a_i - a_i)^2 + (b_i - b_i')^2 \right]}{\sum \left[(a_i - \bar{a})^2 + (b_i - \bar{b})^2 \right]}}$
9. Resolution difference of sum of squares	$\sum \left[(a_i - \bar{a})^2 + (b_i - \bar{b})^2 \right] = \sum \left[(a_i' - \bar{a})^2 + (b_i' - \bar{b})^2 \right] + \sum \left[(a_i - a_i')^2 + (b_i - b_i')^2 \right]$ SST=SSR+SSE
10. A ′	$A' = \alpha_1 + \beta_1 (X) - \beta_2 (Y)$
11. B ′	$B' = \alpha_2 + \beta_2 (X) + \beta_1 (Y)$

Sources: Tobler (1994) and Friedman & Kohler (2003), cited by Dusek (2012 64).

In the equations in Table 1, x and y refer to the coordinates of the independent form, a and b designate the coordinates of the dependent form, and a' and b' are the coordinates of the independent form in the dependent form. α_1 refers to the extent of the horizontal shift, while α_2 defines the extent of the vertical shift. β_1 and β_2 are used to determine the scale difference (Φ) and Θ is the rotation angle. SST is the total sum of squares, SSR is the sum of squares due to regression and SSE is the explained sum of squares of errors/residuals that is not explained by the regression.

To visualise the bidimensional regression, the Darcy program (Vuidel 2009) can be useful. The grid is fitted to the coordinate system of the dependent form, and its modified interpolated position makes it possible to further generalise the information about the points of the regression.

Empirical analysis

The arrows in Figure 5 show the direction of movement, and the grid shading refers to the nature of the distortion. Dark shaded areas refer to concentration and to movements in the same directions (convergence), which can be considered to be the most important gravitational centres.

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Our analysis is carried out at NUTS 2 level. The comparison of the results (between real and modified coordinates) with those of bidimensional regression can be found in Table 2.

Table 2

Bidimensional regression between gravitational and geographical spaces

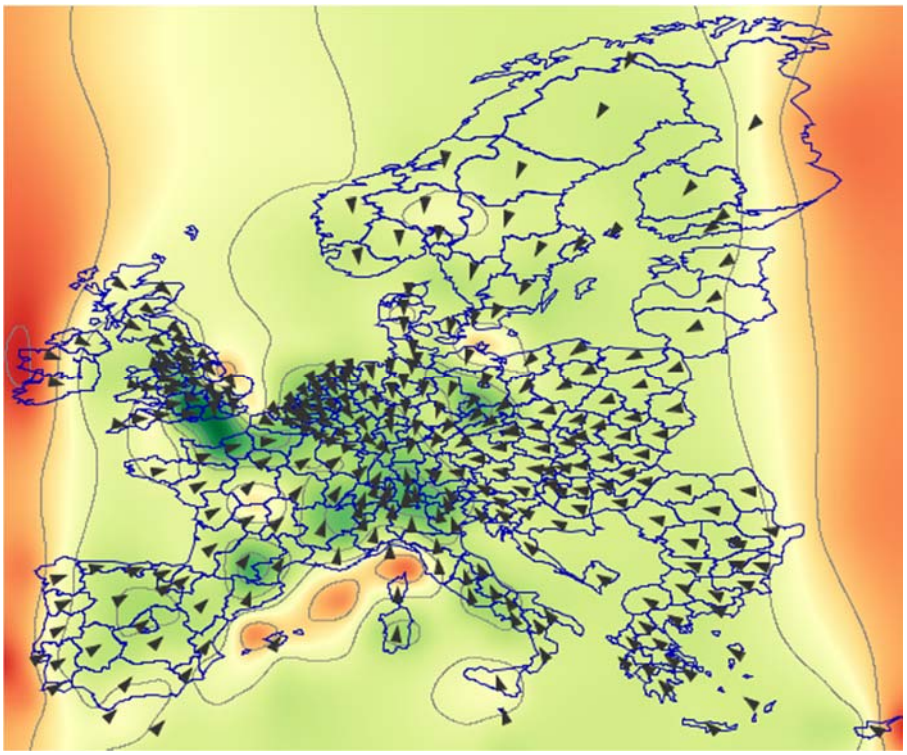
Methods	r	α_1	α_2	β_1	β_2	Φ	Θ	SST	SSR	SSE
1st method	0.96	0.01	0.04	1.00	0.00	1.00	0.00	35,223	34,856	367
2nd method	0.94	0.07	0.30	0.99	0.00	0.99	0.00	55,829	53,141	2,687

Sources: own calculation.

As seen in Table 2, the difference between the two methods is not significant, visualisation results can be considered with certain constraints independent of projections. The relationship between gravitational and geographical coordinates is closer in the case of the first method. The reason for this is that horizontal and vertical shifts as well as scale difference and the angle of rotation is smaller in the case of the first one. Because of these, naturally, the sum of squares of the difference is also substantially lower.

Figure 5

Directions of distortion of gravitational space compared to geographical space for European regions (NUTS 2), 1st method



Sources: own compilation.

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As shown in Fig. 5, regional concentrations can be unambiguously seen, and these are considered to be the core regions. Based on the analysis carried out at NUTS 2 level, five gravitational centres, slightly related to each other, can be found in the European space. Gravitational centres are regions that attract other regions, and the gravitational movement is toward them. These five centres or cores are: 1) the region including Switzerland, Northern Italy and the French regions neighbouring Switzerland; 2) the region including the Benelux countries, Paris and its surroundings and most of the regions in England; 3) the region including Berlin and Brandenburg; 4) the region including Central Italy and 5) the region including Languedoc-Roussillon, Midi-Pyrénées and Catalonia. Primarily, it is these core areas have an effect on the regions in the examined area.

We find that the key element of the economic spatial structure of Europe is the structure reflected by the Blue Banana and the German Hump theory.

Issue of distance

In the presented gravitation models, diverse approaches were applied to distance. This is an accepted practice in social scientific analyses even if it differs somewhat from the original physical analogy, since the square of distance is applied in that, number 2 here means the law, and the value here is not 1.99 or 2.01 but exactly 2. Therefore, the models are not gravitational models but ones based on gravitational analogy, so distance dependences were calculated taking into account other distance exponents in order to examine the roles of masses and distance in modelling the European gravitational space.
As found by Tamás Dusek (2003, p. 47) in his work on the gravitational model: "With the increase of the exponent, the intensity of inter-territorial relations becomes more sensitive to distance, in parallel with which the significance of masses gradually declines."

Table 3

Correlation coefficients in case of the two methods, taking into account different exponents

c	1st method	2nd method
0.0	0.752964844	0.693314218
0.5	0.738790230	0.922820959
1.0	0.859542280	0.790773055
1.5	0.860785077	0.725618881
2.0	0.860891879	0.717864602
2.5	0.860918153	0.715549296
3.0	0.860926003	0.714371559

Source: own compilation.

The c values presented here are the c values in formulas 4 and 5, and k=c-1 (and this k is k in the new formula!)

Cases c=0, c=0.5 and c=1 are difficult to reconcile with traditional approaches to space, it can be seen that by increasing c values, the impact area of forces is reduced, which implies the quasi-convergence of correlation coefficients when applying projections.

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Change of spatial structure

The following section attempts to take into account the change of the structure through the gravity calculations for 2000 and 2011. In order to measure changes, the two gravity sets of points are compared and analysed (2000 and 2011). The two-dimensional regression calculations are shown in Tables 4 and 5. Although we are aware of changes in spatial structure taking more than a decade, it was not possible to take into consideration a longer period than this. This is due to the latest change in the NUTS nomenclature, and that data corresponding to the present territorial breakdown is only available for the years between 2000 and 2011.

Table 4

Bidimensional regression between gravitational and geographical spaces

Years	r	α_1	α_2	β_1	β_2	Φ	Θ	SST	SSR	SSE
2000	0.96	0.01	0.03	1.00	0.00	1.00	0.00	35,243	34,876	367
2011	0.96	0.01	0.04	1.00	0.00	1.00	0.00	35,223	34,856	367

Source: own compilation.

Table 5

Bidimensional regression between gravitational spaces

Years	r	α_1	α_2	β_1	β_2	Φ	Θ	SST	SSR	SSE
2011/2000	1.00	0.00	0.01	1.00	0.00	1.00	0.00	35,223	35,223	0

Source: own compilation.

The results show that there is a strong relationship between the two-point systems; the transformed version of the original set of points can be obtained without using rotation ($\Theta = 0$). No essential ratio difference is observed between the two shapes.

As can be seen, there was no marked change in the European spatial structure in the past period. Despite this, it is yet worth examining the spatial picture of the change in the period between 2000 and 2011, since the changes taking shape during this time may form the core elements of the modification of the spatial structure. In terms of the changes from 2000 to 2011, seven gravity centres are shown on the map, indicated by shaded ellipses (Figure 6). They show a crucial part of the economic potential of big cities. Such hubs are the surroundings of Rome, Marseille-Zurich, Madrid, Toulouse, Brussels, Gothenburg, Praha-Chemnitz, etc. Gravity 'breaklines' can be seen in Germany, around Berlin, and in central France.

In general, the change was not fundamental in the examined period but rather focused on only a few areas. These areas are parts of the Bunch of Grapes fields, which may show the increasing importance of this theory. However, there are fewer nodes or 'grapes' than the model predicts.

Regarding the analysis of change, the closest connection is to the Red Octopus model, as most gravity nodes were directly affected by the octopus arms. The analysis confirms the favourable position of certain regions, e.g. the Sunbelt zone and the Blue Banana. The results do not confirm the existence of the Central European Boomerang (Gorzelak 2012), and hence this area is not considered a favourable region at European level.

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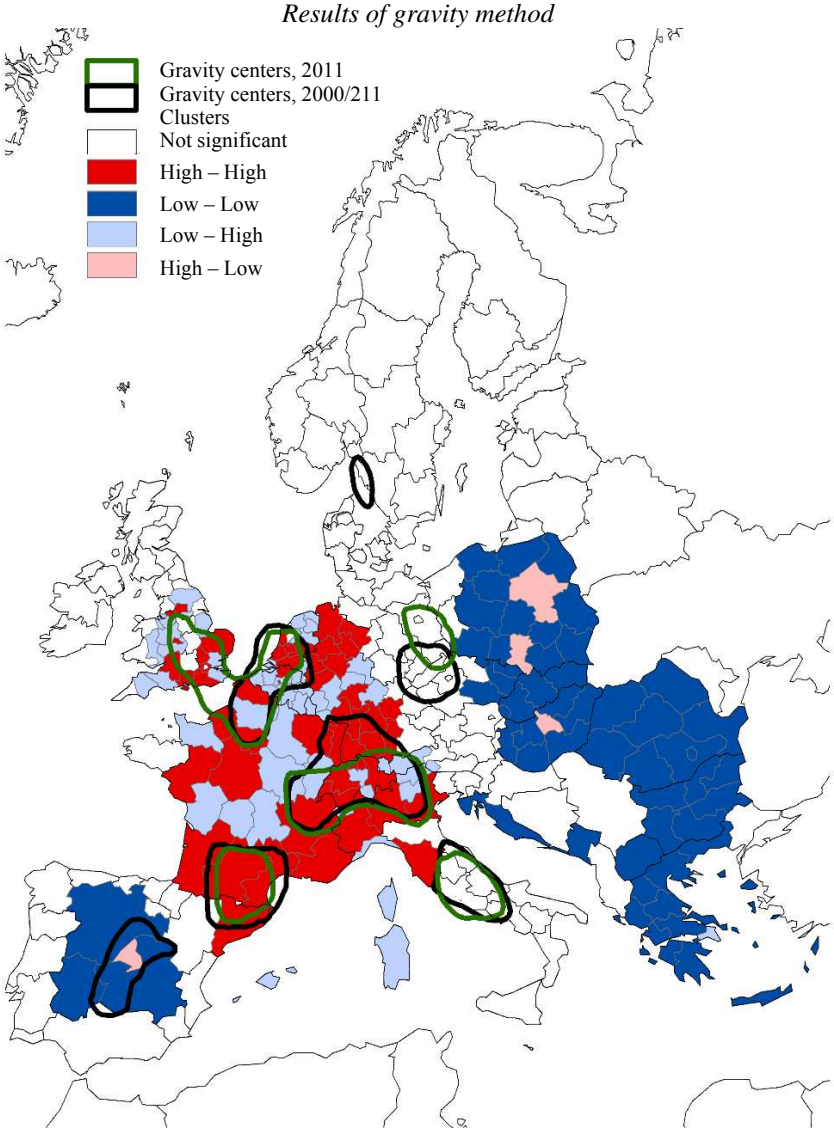
Figure 6

Results of gravity method



Source: own compilation.

The European Commission's NUTS classification is utilised (Nomenclature des unités territoriales statistiques=Nomenclature of Territorial Units for Statistics) on NUTS 2 level (Eurostat 2012). Note is taken that NUTS regions – although defined within minimum and maximum population thresholds at each level – vary considerably in geographical size, with the result that in many cases the use of this system (e.g. in the case of Nordic regions) raises the modifiable area unit problem (Openshaw 1983). This study makes use of the official system, despite its imperfections.

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In order to treat problems and to analyse the results from another aspect, it was also felt necessary to map spatial autocorrelations. Luc Anselin (1995) developed the Local Moran's I statistic, which is one of the most commonly used methods to quantify and visualise spatial autocorrelation; in this article, it is used to explore the spatial economic relations of large cities. Using the designation (1996) of Getis and Ord, I is defined as (Eq. 15):

$$I_i = \frac{(Z_i - \overline{Z})}{S_z^2} * \sum_{j=1}^{N} \left[W_{ij} * (Z_i - \overline{Z}) \right], \qquad (15)$$

where Z is the average of all units, Z_i is the value of unit I, S_z^2 is the dispersion of variable z for all observed units and W_{ij} is the distance weighting factor between units i and j, which comes from the W_{ij} neighbourhood matrix (basically $W_{ij} = 1$ if i and j are neighbours and 0 if they are not). The neighbourhood matrix approach applied in this study examined the straight line distance between the geometrical centres of regions. The smallest threshold distances were used that ensured each region had at least one neighbour. All regions within this are neighbours, while those outside this are not.

If the Local Moran's I value is utilised, the negative values mean a negative autocorrelation and the positive ones a positive autocorrelation. At the same time, the function has a wider range of values than the interval of –1; +1. The indicator also has a standardised version, although currently, this paper is not concerned with this. The Local Moran's statistic is suitable for showing the areas that are similar to or different from their neighbours. The greater the Local Moran's I value, the closer the spatial similarity. However, in case of negative values, it may be concluded that the spatial distribution of the variables is close to a random distribution. Concerning Local Moran's I, the GDP per capita at NUTS 2 level for 2011 was calculated were performed. During the work, the results of the Local Moran's statistic were compared with the initial data in order to examine whether the high degree of similarity is caused by the concentration of the high or low values of the variable (Moran Scatterplots). As a first step, on the horizontal axis of a graph the standardised values of the observation units were plotted, while on the y-axis the corresponding standardised Local Moran's I values (average neighbour values) were plotted. The scatterplot puts the regions into four groups according to their location in the particular quarters of the plane:

1. High–High: area units with a high value, where the neighbourhood also has a high value.
2. High–Low: area units with a high value, where the neighbourhood has a low value.
3. Low–Low: area units with a low value, where the neighbourhood also has a low value.
4. Low–High: area units with a low value, where the neighbourhood has a high value.

The odd-numbered groups show a positive autocorrelation, while the even-numbered groups a negative one.

Of the local spatial autocorrelation indices, it is appropriate to choose a Local Moran's I to search for spatially outlying values. Namely, on the one hand, it shows where the high/low values are grouped in the space (HH–LL) and, on the other hand, it shows where those territorial units are that are significantly different from their neighbours (HL–LH).

Because of the modifiable areal unit problem (Openshaw 1983) it was important when delimiting clusters to consider not only the level of development, i.e. income per capita, but also the population size of the regions where the particular value of GDP per capita could be observed. So with this, it is possible to treat the differences between regions with differing size, and point within the European spatial structure at the most developed zones, which belong to the High–High cluster. The calculations were carried out with GeoDa software, by applying the LISA with EB rates method.

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Our results are identical with those referred to earlier on in many respects, but also differ somewhat from them. Specifically, this model reflects the results of the Sunbelt zone, the Blue Banana and the German hump, with the difference that Île de France as well as Centre, Upper Normandy and Pays de la Loire can all be classified in this among the regions in the best position. These regions are considered central ones only in the European Bunch of Grapes model, though many elements of this model are not supported by the present analysis.

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The measurement of territorial differences in the information infrastructure in Hungary and the South Transdanubian Region*

Abstract

The information society has become a crucial area of the socio-economic processes over the last two to three decades, yet it was unable to reduce the differences between the development levels of different regions. The developed regions perform better and poorer regions have weaker performance in the development of info-communication technologies. It can be assumed that the lack of the info-communication tools may broaden the divide between the developed and underdeveloped regions. Therefore, it is important to measure and mitigate these differences. The results of such measurements may contribute to the formation of the regional development policy issues.

This paper focuses on the analysis of the factors that play a role in the information society. These factors can help to characterize the information society on both the national and the sub-national level. Our goal is to investigate the territorial inequalities in the information society on a highly disaggregated level since the article studies the relative development of the settlements in the South Transdanubian Region. As a methodological background, we introduce a new and composite index referred to as "the territorial index of information society", which relies on settlement and micro-regional level data collected by the Central Statistical Office of Hungary and other private institutions.

Our results indicate that the best performing settlements are in micro-regions with advantageous positions and that they are the more populated towns or locate within their agglomeration. The less populated settlements in an underdeveloped micro-region have a more disadvantageous position in the information society. Therefore, the information readiness may create differences in a similar way to economic development.

Keywords: information society, territorial differences, infrastructure, regional development.

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Introduction

The information and info-communication technologies have a central role in the socio-economic processes of the last two to three decades through the permanently developing technology and faster communication opportunities. The growing scale of the information and technological innovations has increasingly determined the social and economic environment. The accelerated communication between organizations and individuals has led to an increased volume and more rapid exchange of information (Lengyel 2010). The diffusion of information has opened new opportunities in the business and economic processes, as well as in social life and communication (for example, social media). Information has added to the economic processes, and has become a crucial factor. Thus, the phenomenon of information society has become an important research question for social sciences scholars in recent decades. This research, which is a part of a broad scientific project at the University of Pécs, intends to capture the territorial differences of the information society. Additionally, the project attempts to give some suggestions for development policy based on the information society analysis. The theoretical findings regarding the information society have been already summarized, and an indicator system that may help to determine these differences will be created. The first results of the indicator system are interpreted in this paper.

First, it should be briefly clarified as to what "information society" precisely means. There have been many attempts in the literature to determine "information society", generating much debate. Farkas (2001), Z. Karvalics (2005) and also Ropolyi (2006) attempted to clarify what does mean the "information society", because this expression was also used for determining various conceptions (like knowledge-based society). The information society has six different aspects: technology, occupational change, economy, space (spatial dimension), social and cultural (Webster 1995). According to *Masuda*, one of the first scholars dealing with this concept, information society is such kind of society that has been built on the exploitation of information resources, and this kind of society progressively replaces the model of industrial and mass-production society. The information society also possesses a high-level intellectual creativity (Masuda 1980, Szépvölgyi 2008). Farkas (2002) has stressed the handling and application of information in his approach. The definition of OECD also underlines that many employees deal with handling, production and distribution of information in the information society (OECD, 1996). The infrastructural aspect can be observed, for example, in the description of the information society by Fodor (2000)[1] or Erdősi (2002). They have emphasized that a new lifestyle and, the accelerated stream of information have been realized through the technological development and innovations in info-communication technologies. Ropolyi (2006) claims that regular use of information technologies (especially the internet) has created a new organizing form of community. However, it is not worth to term this organizing form as society, but it may be designated as "network entity". According to Z. Karvalics (2005), the real dimensions of information society should not be looked for

[1] The approach of Fodor (2000) is accepted by most of those Hungarian researchers who deal with socio-economic aspects of information society (Jakobi 2007).

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only in telecommunication or computerization, but might be found through education, science, innovation, content and culture. Therefore, information society is a complex phenomenon that includes many factors (Karvalics 2005). Approaches like "knowledge society" or "post-industrialist society" relate more or less to the information society (Jakobi 2007). The networks and the use of technologies play an important role in territorial inequalities of information society. The lack of adequate infrastructure may exclude the underdeveloped territories from the stream of information and knowledge, which may result in significant differences between the centre and peripheries. Graham (2000) provided some examples on how the development of information and communication technology (ICT) extends the digital divide among different regions or cities within a country. He claims that a close connection can be observed between ICTs, global urban polarization, and the extending power of transnational corporations. Thus, it "can compromise and erode the social, economic and cultural powers of those groups and spaces that are rendered off-line or marginal" (Graham 2000, p. 27.). Similar observations have been made by van der Meer and his colleagues (2003) about the territorial differences in the ICT sector.

The territorial analyses of the information society are determined by the approach that researchers use (Jakobi 2007). The information society is characterized by many indexes, which measure the info-communication technologies, attitudes or infrastructure globally. These indexes have been created by different organizations like the International Telecommunication Union (ITU). There are indexes that indicate the available infrastructure (for example, networks, phone lines, tools) and where people use this infrastructure (at home, public places or the workplace). The so-called readiness indexes (like E-readiness index) measure the preparedness of individuals and society (Vajkai 2008). There are indicator systems that focus on the digital literacy. Other indicators measure the attitudes that characterize the use of the ICT tools. One of the most common indexes in use, to measure the information society, is the ICT Development Index (IDT). This indicator captures three sub-indexes: the Access sub-index (ICT readiness – infrastructure, access), the Use sub-index (intensity) and the Skills sub-index (ICT capabilities). Thus, the ICT Development Index characterizes the dimensions of information society in the countries of the world. The IDT has been computed for 157 countries in the 2013 edition (ITU 2013).

Several measurements about the information society have already been carried out by Hungarian academics in recent years. Rechnitzer (1990, 1993) already investigated the territorial system of innovation at the beginning of the 1990s. This study was repeated some years later in order to observe the changes since the former investigation (Lengyel–Rechnitzer 2000). Bakonyi and Bálint (1996) investigated the research and development networks (knowledge bases and education), which were named as the first step in the innovation chain after invention (Bakonyi–Bálint 1996). Nagy and his colleagues analysed statistical data, guidelines, national and regional strategies concerning the information society. The county level dispersion of the domain names have also been involved in the analysis (Kanalas–Nagy 2002). Some studies have investigated the existence of info-communication infrastructure and institutions, and their role in configuration of the urban system in Hungary (Dőry–Ponácz 2003, Rechnitzer–Grosz–Csizmadia 2003). Jakobi (2007) has analysed the national competitiveness of information

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society and the regional footprint of information society in Hungary. Szépvölgyi (2008) composed an indicator system that characterized the information attributes of Hungarian micro-regions. A recent analysis of the territorial differences of a Hungarian social network website (iWiW) has carried out by Lengyel and Jakobi (2014). This paper is a good example for the use of new types of data to characterize the territorial differences in the information society.

This research analyses either general measurement regarding the performance of information society of Hungarian territories or special processes regarding the use of information society or the attitudes of people. Therefore, the applied indicators have depended on the type of measurement. This research focuses on the infrastructural approach of the information society, as infrastructure is mostly measured by statistical data, which is readily available for households. We have two goals:

– determining the territorial disparities of information society within the South Transdanubian Region;
– creating an index that involves the statistical measured factors regarding information society, and analysing the "information readiness" of South Transdanubian settlements.

In the next section, the territorial disparities of information society in the South Transdanubian Region are presented. The methodology of the created index is introduced in the third section. Following this, the results and main findings of the index are explained prior to drawing the conclusions.

Territorial differences of information infrastructure in the South Transdanubian region

The information society in the South Transdanubian Region was chosen for two reasons. One is that it corresponds to the framework of the large-scale research project conducted by the University of Pécs. Secondly, similar surveys at a disaggregated territorial level have been made in other regions of Hungary, but, to date, are lacking in the South Transdanubian region.

The Hungarian Central Statistical Office and a private research institution (eNET Internet Research and Consulting Ltd.) collect data in relation to information society on the micro-regional or settlement level, which can be accessed through TEIR (Hungarian Settlement Information System). These data are "hard" data, since they are related to the technological aspects of information society. Although they may be useful to provide insight into some important, infrastructure related territorial characteristics of information society, ideally, a database would also contain "soft" data. At this time, it is not possible to overcome these limitations, since, for example, survey data or more detailed information about internet service providers and local market environment, as well as the use of information technology, are not available at the micro-regional or settlement level.

Concerning the South Transdanubian region, the following data was analysed on settlement and micro-regional level (Table 1):

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Table 1

Information technology indicators used in the analysis

Indicator	Territorial level	Period	Source
Number of telephone lines including ISDN lines	settlement	2004 to 2012	CSO
of which:			
– number of ISDN lines			
– number of individual telephone lines			
– number of service telephone lines			
– number of business telephone lines			
Number of cable television subscribers	settlement	2001 to 2011	CSO
Number of houses subscribing cable television	settlement	2001 to 2012	CSO
Number of people having at least 30 Mbps internet access	settlement	2010 to 2013	eNET
The level of electronic government client service	settlement	2003 to 2010	eNET
0 – no website			
1 – information			
2 – interaction			
3 – bilateral interaction			
4 – transaction			
Number of internet subscriptions	settlement	2003 to 2010	eNET
Number of internet users	micro-region	2003 to 2010	eNET
Number of mobile phone subscriptions per 1000 people	micro-region	2003 to 2010	eNET
Number of PCs per 1000 people	micro-region	2003 to 2010	eNET

Source: authors' elaboration.

As the fourth column of Table 1 indicates, the availability of the data is quite variable for the different time periods. Hence, the possibility of analysing the dynamics of the data is limited – it would enrich the research, however, currently, this is not the primary aim. For this reason, the study covered the most recent period for which the maximum data are available.

In certain cases, it is reasonable to compute and analyse (instead of the raw numbers) the number of telephone (ISDN) lines per 1000 people, or the ratio of houses subscribing to the telephone, internet or cable television in order to get an insight into the relative development of a settlement. The data covering ISDN lines may draw a somewhat distorted picture about the development of information infrastructure since ISDN technology is becoming outdated.

From the data, we generally see that in terms of the information society development measures, the settlements of Baranya and Somogy County are below the national level, while the settlements in Tolna County are above that (Table 2).

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Table 2

Main indicators of information society in the South Transdanubian region, 2012

County	Number of telephone lines (including ISDN lines) per 1000 people	Ratio of telephone lines (including ISDN lines) to the number of houses, %	Number of ISDN lines per 1000 people	Ratio of ISDN lines to the number of houses, %	Ratio of houses connecting to cable television network, %	Ratio of houses having at least 30 Mbps internet access, %	Ratio of internet subscriptions to the number of houses, 2010, %
Baranya	197.09	45.39	11.22	2.69	22.42	6.69	73.43
Somogy	192.90	40.74	11.60	2.48	23.06	9.21	60.59
Tolna	272.65	61.10	15.11	3.44	55.13	30.45	58.28
National average	*214.95*	*47.50*	*12.46*	*2.89*	*28.02*	*11.59*	*66.11*

Source: authors' elaboration based on TEIR data.

There are marked differences in the indicator values in terms of the size (or status) of the settlements. As expected, all the indicators are the highest in the three county seats, while the lowest values are in the villages. In general, information society is more developed in larger settlements. Perhaps, this is one of the reasons behind the high relative development of the settlements in Tolna County – since the average size of the towns and villages is larger than that in Baranya and Somogy County.

Around half of the settlements (which are all villages) are regarded as backward from social, economic and infrastructural points of view[2] in the South Transdanubian region (143 of 341 settlements in Baranya County, 122 of 245 in Somogy County and 50 of 109 in Tolna County). This kind of backwardness is also reflected by the values of the main information society development indicators (Table 3). For example, the ratio of houses having a telephone line subscription is 54.4 in the more developed settlements and only 37.5 in the backward ones. Concerning cable television access, these ratios are 17.4 (backward villages) and 37.9 (developed settlements). Broadband (at least 30 Mbps) internet access is even more scarce in the backward settlements (8.3 per cent of the houses compared to 14.6 percent in the developed settlements). Furthermore, 72.9 percent of houses have internet subscription in the more developed settlements contrasting with only 58.8 percent of houses in the backward villages.

In Baranya, there are no cable television subscriptions in 119 settlements and no broadband internet connections in 233 settlements (out of 301 settlements). The corresponding figures are 88 and 177 in Somogy County (out of 245 settlements), and only 1 and 10 (out of 109 settlements) in Tolna County, respectively.

[2] According to the classification of the Government Decree No. 240/2006. (XI. 30.)

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Table 3

Some important indicators of information society with regard to the backwardness of settlements, 2012

(%)

County	Ratio of telephone lines (including ISDN lines) to the number of houses		Number of houses having access to cable television		Ratio of people having at least 30 Mbps internet access		Ratio of internet subscriptions to the number of houses, 2010	
	not backward	backward	not backward	backward	not backward	backward	not backward	backward
Baranya	53.81	36.08	31.16	12.77	8.24	4.98	78.73	67.57
Somogy	48.28	33.14	34.34	11.68	13.72	4.67	67.11	54.02
Tolna	68.64	52.21	63.87	44.81	33.64	26.69	69.43	45.11
National average	*53.01*	*36.46*	*33.70*	*16.64*	*9.34*	*4.86*	*75.31*	*53.17*

Source: authors' elaboration based on TEIR data.

Some additional indicators are measured at the micro-regional level, which may also give some insight into the features of information society of the South Transdanubian region (Table 4 and Table 5). In contrast to the above data, these measures are quite similar across the three counties of the region (partly, due to the higher level of aggregation). However, in terms of relative development (disadvantageous situation)[3], the indicators differ across the micro-regions.

Table 4

Some important micro-regional level indicators of information society in the South Transdanubian region, 2010

County	Mobile subscriptions per 1000 people	Provision of PCs per 1000 people	Percent of internet users, %
Baranya	1005.7	462.1	33.28
Somogy	1009.9	464.7	32.47
Tolna	1035.8	470.1	33.21
National average	*1059.5*	*469.3*	*34.32*

Source: authors' elaboration based on TEIR data.

[3] According to the classification of the Government Decree No. 311/2007. (XI. 17.)

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Table 5

Some important indicators of micro-region level information society with regard to the disadvantaged situation of the settlements, 2010

County	Backwardness[a)]					Average
	NHH	ÁTM	HH	LHH	LHHK	
Provision of PCs per 1000 people						
Baranya	524.0		454.0		451.3	462.1
Somogy	457.0	453.1	479.7	452.0	452.0	464.7
Tolna	483.2		456.0		452.0	470.1
National average	*492.0*	*452.7*	*458.0*	*460.4*	*452.1*	*469.3*
Mobile subscriptions per 1000 people						
Baranya	1224.0		985.7		955.3	1005.7
Somogy	1158.0	987.1	1057.2	961.0	945.4	1009.9
Tolna	1092.3		990.0		951.0	1035.8
National average	*1186.3*	*1079.5*	*1000.9*	*942.3*	*941.4*	*1059.5*
Percent of internet users, %						
Baranya	45.19		30.33		33.19	33.28
Somogy	34.04	29.84	34.24	34.55	29.90	32.47
Tolna	38.01		29.46		25.93	33.21
National average	*40.08*	*34.76*	*31.60*	*29.63*	*29.00*	*34.32*

Source: authors' elaboration based on TEIR data

[a)] Legend: NHH – micro-regions not in a disadvantageous position, ÁTM – transitionally supported micro-region, HH – micro-region in a disadvantageous position, LHHK – micro-region in the most disadvantageous position

The micro-region of the county seat of Somogy County (Kaposvár micro-region) is regarded as disadvantageous (HH). Due to this, the values of the information society indicators are reasonably good in this category. Otherwise, the indicators reflect the backwardness of the micro-regions relatively well.

Telehouses and eHungary Points,[4] as public internet access points, are important parts of information society in remote settlements where information infrastructure is underdeveloped (Table 6 and 7).

[4] A part of the telehouses are regarded as eHungary Points in the settlements.

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Table 6

Number of eHungary Points and Telehouses in the counties of Hungary, 2014

County	Number of settlements	Number of eHungary Points	Number of Telehouses
Bács-Kiskun	119	71	11
Baranya	301	78	34
Békés	75	73	15
Borsod-Abaúj-Zemplén	358	98	28
Budapest	1	21	9
Csongrád	60	72	30
Fejér	108	43	13
Győr-Moson-Sopron	183	55	15
Hajdú-Bihar	82	57	26
Heves	121	60	6
Jász-Nagykun-Szolnok	78	38	8
Komárom-Esztergom	76	25	9
Nógrád	131	44	8
Pest	187	52	28
Somogy	245	72	18
Szabolcs-Szatmár-Bereg	229	113	25
Tolna	109	54	19
Vas	216	59	11
Veszprém	217	61	13
Zala	258	80	33
Total	*3,154*	*1,227*	*359*

Source: authors' elaboration based on KSH and State Secretary for Infocommunications data.

According to the most recent data (June 2014), there are 78 eHungary Points and 34 telehouses in Baranya County. Altogether, 78 settlements are provided with these facilities, which are lacking in the remaining 223 settlements. In Somogy County, there are 72 eHungary Points and 18 telehouses. These services are available in 69 settlements, while in 176 of the settlements, they are not accessible. Tolna County has 54 eHungary Points and 19 telehouses. These services are present in 53 settlements, and absent in 56 others. In Pécs, the most developed city and the county seat of Baranya, there are nine eHungary Points (of which one is a telehouse). There are only two in Szekszárd, and no eHungary Points are available in Kaposvár.

Table 7

eHungary Points and Telehouses with regard to the settlement status, 2014

County/Status	Village	Large village	Town	County seat	Total
Number of settlements provided with eHungary Points or Telehouses					
Baranya	66	2	9	1	78
Somogy	58	0	11	0	69
Tolna	39	4	9	1	53
Total	*163*	*6*	*29*	*2*	*200*
Number of settlements without eHungary Points or Telehouses					
Baranya	218	1	4	0	223
Somogy	169	2	4	1	176
Tolna	54	1	1	0	56
Total	*441*	*4*	*9*	*1*	*455*

Source: State Secretary for Infocommunications.

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The data indicate that more than 84 percent of the settlements that are provided with eHungary Points or Telehouses are villages (or large villages), and around 15 percent of them are towns or cities. From the 200 settlements that are provided with eHungary Points or Telehouses, 59 are located in a most disadvantaged micro-region (21 settlements in Baranya, 22 in Somogy and 16 in Tolna County), 88 are located in a disadvantaged micro-region (48 settlements in Baranya, 36 in Somogy and 4 in Tolna County), and 53 can be found in micro-regions not (or temporarily) considered as disadvantaged (9 settlements in Baranya, 11 in Somogy and 33 in Tolna County).

The methodology of the "territorial index of information society"

This paper introduces a new and composite index for measuring territorial disparities of information society. A similar index has already been used for determining the differences among European regions regarding information society. The statistical variables that were introduced in the second section have been used. They can be divided into two groups: the settlement level indicators and the micro-regional level data. Altogether eight indicators were used at first (five on the settlement level and three on the micro-region level), and five leading indicators were created by transformation and aggregation of the original indicator (Table 8).

Table 8

Indicators for measuring territorial differences of information society

Indicators	Main indicators	Territorial level
Number of private phone lines	The rate of the number private and ISDN phone lines in the flats (houses) of the settlement	settlement
Number of ISDN lines		settlement
Number of cable TV subscriptions	The rate of cable TV subscriptions in the flats (houses) of the settlement	settlement
Number of internet subscriptions	The rate of internet subscriptions in the flats (houses) of the settlement	settlement
Number of internet users	Micro-regional indicator – multiplication of the three original indicators	micro-region
Number of mobile phone subscriptions per 1000 capita		micro-region
Number of PCs per 1000 capita		micro-region
E-administration level	Quantified version of this indicator	settlement

Source: authors' elaboration.

The number of flats (houses) was used for computing rates, based on the assumption that there is generally one subscribed phone line, cable TV and/or internet connection per household, and this connection may be used by other family members. The e-administration level is a qualitative measure, which indicates this level at settlement level. It represents the "e-readiness" of a municipality. As data was available for 2005 to 2012, the analysis was also applied to each year.

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After creating the main indicators,[5] the descriptive and correlation statistics were checked. Extraordinary attention was paid to the skewness values because the lack of normal distribution might mar the final values. If the skewness of an indicator has fallen out of the [-1;1] range, then it should be transformed. We have used Box-Cox transformation for transforming these values (1).

$$y_i = \begin{cases} \text{if } \lambda \neq 0, \text{then } \phi(y_i) = \dfrac{y_i^{\lambda} - 1}{\lambda} \\ \text{if } \lambda = 0, \text{then } \phi(y_i) = \ln(y_i) \end{cases} \qquad (1)$$

The application of this method was as per the EU Regional Competitiveness Index (*Annoni–Kozovska*, 2010) and the REDI Index (Regional Entrepreneurship and Development Index) (Szerb et al., 2014). According to these, λ=2, if skewness is negative, left-handed ($\kappa < -1$) and λ=(-0.05), if skewness is positive, right-handed ($\kappa > 1$). The indicators of phone lines, cable TV and internet subscriptions should not be transformed, while the micro-regional indicator was transformed in almost every year. The next step was the normalization of the pillars. The min-max normalization technique was applied. The original min-max technique computes the indicator values to a scale from 0 to 1. This technique was applied but on a scale from 0 to 100 (2). Therefore, the maximum value of each indicator in each year was 100.

$$z_i = \frac{x_i}{\max(x_i)} * 100 \qquad (2)$$

After normalization, the territorial index of information society was computed by averaging the four main indicators for each settlement of the South Transdanubian region. Index values for every year were available; hence an average value was computed for the analysed period. The e-administration of the settlements was also represented. The qualitative indicator had five levels, which depended on the level of interaction between the municipality and users through the website of the settlement: 0 – no website, 1 – information, 2 – interaction, 3 – bilateral interaction, 4 – transaction. In order to use this indicator, new values[6] were calculated for the different levels, and the index score was multiplied by this new indicator value.

A sensitivity analysis was conducted on the new index, as well. Weights were applied to the calculation of the main index values. Thus, the four main indicators received different weights: phone lines – 20%, cable television subscription – 30%, internet subscription – 40% and the micro-regional indicator – 10%. The qualitative indicator of e-administration was not weighted, it was multiplied by the index value in the same way. The main index values were calculated again, and the difference between the normal average and weighted average computed index values were analysed by Spearman's rank correlation coefficient. The coefficient values represented a very strong relationship (average $\rho = 0.952$)[7] in the examined years. The index was analysed in a different way; a main indicator was randomly eliminated in each year, and the index values calculated in

[5] We checked the descriptive statistics of the original, and created indicator in the case of micro-regional indicator. If the original values should be transformed because of the excessive skewness, we computed further with the transformed version of the indicators. For the detailed description of transformed indicators see Appendix 1.

[6] Level 0 = 1.00, level 1 = 1.01, level 2 = 1.02, level 3 = 1.03 and level 4 = 1.04

[7] The ρ values spread between 0.949 and 0.967 in the examined years except 2005 when it was 0.926.

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this way. The Spearman's coefficient values were also relatively strong (average $\rho = 0.9$) in this case, although, it was slightly weaker than in the other analysis[8]. According to these results, the index is relatively robust and the shift or elimination of indicators did not cause significant changes in the ranking.

The results of the index

Altogether, 655 settlements from the three counties of the region were analysed. The ranking of settlements was investigated to try to find a connection between the index values, the status of the settlement and the development stage of the micro-region. It can be observed that the best performing settlements are towns or those villages that are located in the agglomeration of a more populated town (like Dunaszentgyörgy or Györköny in the neighbourhood of Paks) or a county seat (like Keszü, Pogány or Pellérd in the neighborhood of Pécs). All three county seats are among the ten best performing settlements (Table 9).

Table 9

The ten best and worst performing settlements in the region

Settlement	County	Micro-region	Development stage of the micro-region	Index value
Paks	Tolna	Paksi	NHH	78.47
Keszü	Baranya	Pécsi	NHH	68.53
Szekszárd	Tolna	Szekszárdi	NHH	68.22
Pogány	Baranya	Pécsi	NHH	66.61
Dunaszentgyörgy	Tolna	Paksi	NHH	65.94
Pellérd	Baranya	Pécsi	NHH	65.64
Orfű	Baranya	Pécsi	NHH	65.59
Pécs	Baranya	Pécsi	NHH	65.29
Györköny	Tolna	Paksi	NHH	62.76
Kozármisleny	Baranya	Pécsi	NHH	62.65
…				
…				
…				
Hencse	Somogy	Kadarkúti	LHHK	13.85
Old	Baranya	Siklósi	HH	13.70
Hedrehely	Somogy	Kadarkúti	LHHK	13.24
Siklósnagyfalu	Baranya	Siklósi	HH	12.74
Rinyabesenyő	Somogy	Nagyatádi	HH	11.39
Kisasszond	Somogy	Kadarkúti	LHHK	11.07
Alsószentmárton	Baranya	Siklósi	HH	8.25
Visnye	Somogy	Kadarkúti	LHHK	7.28
Kőkút	Somogy	Kadarkúti	LHHK	6.56
Pálmajor	Somogy	Kadarkúti	LHHK	4.97

Legend: NHH – micro-region not in disadvantageous position, HH – micro-region in disadvantageous position, LHHK – micro-region in the most disadvantageous position

Source: authors' computation and elaboration

[8] For detailed values see Appendix 2.

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Paks is the best performing settlement from the aspect of information society and information infrastructure over the investigated period. All settlements among the best 10 locate in micro-regions not in a disadvantageous position. Two of the three County seats (Pécs and Szekszárd) are among the ten best settlements. Contrarily, most of the ten worst performing settlements are small villages. Only one settlement among the ten most underdeveloped has a population greater than 1000 people; in the other villages, live only a few hundreds of people. These settlements are located in micro-regions with a disadvantageous position. It can be observed that the economic situation of a micro-region may influence the performance of information society, as well.

The relationship between the index and the measured development stage for micro-regions was analysed. On checking the strength of this relationship by Spearman rank correlation, there is significant, but relatively weak relationship ($\rho = 0.22$) among these factors. The settlements were then grouped according the development stage of the micro-regions, creating five groups (NHH, HH, ÁTM, LHH and LHHK – for the meaning of acronyms, see in the legend of the table) (Table 10).

Table 10

Main results of the development stage analysis

Denomination	NHH	HH	ÁTM	LHH	LHHK
Average index value	50.74	33.96	30.96	29.68	27.82
Range	50.3	53.99	25.77	26.93	46.53
Maximum value	78.47	62.24	48.94	49.32	51.5
Minimum value	28.17	8.25	23.17	22.39	4.97
Number of towns	11	13	4	1	12
Number of villages	99	267	20	23	205
Proportion of regional population, %	40.9	36.7	3.6	1.4	17.4
Number of socioeconomic underdeveloped settlements	2	121	5	16	152

Legend: NHH – micro-regions not in a disadvantageous position, ÁTM – transitionally supported micro-region, HH – micro-region in a disadvantageous position, LHH – micro-region in the most disadvantageous position, LHHK – micro-region in the most disadvantageous and complex position

Source: authors' computation and elaboration

It can be observed that the average index value correlates with the development stage; hence those micro-regions that are not in a disadvantageous position have higher scores on average than the supported micro-regions. However, the relatively high difference between the maximum and minimum values refers to the relatively high dispersion of the scores within the different groups (especially in NHH, HH and LHHK). Therefore, it may prove the relatively weak result of Spearman rank correlation analysis in the development stage and the index values.

The NHH group has the highest average values index value. It has the highest proportion (almost 41%) from the regional population, involving five micro-regions, some of the bigger towns and mostly those villages located in the agglomeration of these towns. The above average performing micro-regions are Paks, Szekszárd and Pécs micro-regions, while the lowest performance includes the Siófok micro-region. Its score lags 10 points behind the group average. The HH group includes slightly more than one-third

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of the whole regional population (36.7%). According to the average index values, this group has the second highest scores but it significantly lags behind the score of the NHH group. It comprises altogether nine micro-regions. The biggest town of this group is Kaposvár, which micro-region has the highest score in this group. Relatively good performances include Mohács and Dombóvár micro-regions, but the peripheral micro-regions (like Nagyatád, Siklós or Marcali) perform below the group average. There are two smaller groups according the development stage: ÁTM and LHH groups, which include altogether three micro-regions (Balatonföldvár, Fonyód and Tab) and 48 settlements. These groups represent similar values in the index values. The most underdeveloped micro-regions (LHHK) have the worst scores. However, it should be noted that the high range of the index values within the group represent a high heterogeneity concerning the information infrastructure. The better performing micro-regions within this group are Barcs and Sellye micro-regions, while half of the eight micro-regions are around the average. The worst scores are the Lengyeltóti and Kadarkút micro-regions, which lag significantly behind the group average.

Conclusion

The study had two goals: determining the territorial disparities of information society within the South Transdanubian region and creating an index to help analyse the "information readiness" of South Transdanubian settlements.

The data indicates that, just like in other areas of socio-economic development, the settlements of the South Transdanubian Region are relatively underdeveloped concerning information society indicators. The settlements of Tolna County have an advantage both in comparison to the other two counties in the region and to the national average in almost all aspects of information society. This fact can mostly be attributed to the relatively large average size of the settlements in Tolna. In general, the development of information society is increasing with the size of the settlements.

The introduced statistical indicators were used to create a new index, which can measure the existence and use of information infrastructure in Hungarian settlements. The index values have shown that the best performing settlements are in micro-regions without disadvantageous position and that they are more populated towns or located within their agglomeration. The less populated settlements in an underdeveloped micro-region have a more disadvantageous position in information society. Therefore, the information readiness may create differences in a similar way to the economic development. It means that the central and most populated territories and their agglomeration have the best performance, and those settlements, which are far from the centre, are in a disadvantageous position regarding information readiness. Furthermore, as the index values represented, there may be a correlation between the economic development and information readiness of a settlement. Therefore, the next stage would be to expand the study to analyse the relationship between the information readiness and stage of economic development.

There are some limitations in the analysis, which mostly result from the accessibility of data. These are the first results of the index. Further research would include developing the index with new data. Indicators that measure the economic and social

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inequalities (like income or higher educated people) would also be involved to explain what could cause the measured territorial differences in the information society. The intention would be to expand the research to other parts of Hungary, in order to compare the different territories. However, from the work it can be assumed that the optimal level of a nationwide analysis is the micro-regional level; therefore, the intention would be to modify the database in further research.

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Appendices

Appendix 1

Transformation of the indicators

Year	Transformed indicators and main indicators (skewness values were higher than 1)
2005	Micro-regional main indicator (after multiplying the original indicators)
2006	Number of PCs per 1000 capita and micro-regional main indicator, which was created from two original indicators and transformed PC indicator
2007	Number of mobile phone subscriptions per 1000 capita and number of PCs per 1000 capita
2008	Number of PCs per 1000 capita and micro-regional main indicator, which was created from two original indicators and transformed PC indicator
2009	Number of PCs per 1000 capita and micro-regional indicator, which was created from two original indicators and transformed PC indicator
2010	Number of mobile phone subscriptions per 1000 capita and number of PCs per 1000 capita
2011	Number of mobile phone subscriptions per 1000 capita and number of PCs per 1000 capita
2012	Number of mobile phone subscriptions per 1000 capita and number of PCs per 1000 capita

Appendix 2

Spearman's rank correlation coefficient values

	2005	2006	2007	2008	2009	2010	2011	2012
First sensitivity test	0.926	0.960	0.967	0.955	0.949	0.952	0.954	0.954
Second sensitivity test	0.863	0.896	0.963	0.896	0.897	0.955	0.895	0.851
Eliminated main indicator in the second test	micro-regional indicator	cable TV sub-scription	phone lines	internet sub-scription	micro-regional indicator	phone lines	internet sub-scription	cable tv sub-scription

Notes: First sensitivity test refers to the examination comparing the values of normal and weighted average calculations. Second sensitivity test is the analysis when we eliminated a main indicator and calculated the index value without this main indicator.

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First results in modelling objective well-being in Hungary at lower territorial level*

Abstract

Developing complex indicators measuring economic output, added value and indicators relying on an entirely different basis, researchers worked on the assumption that economic output does not correlate strongly with people's happiness or quality of life. Most measurements relate to countries and federal states. Only a few seek to present or model differences at lower territorial levels. This study discloses the first results of pilot calculations that have been performed as part of Hungary's Social Renewal Programme. These explore differences at the level of Hungarian districts (LAU1) with the proviso, that the spatial structure presented only reflects what is called objective well-being. A more comprehensive picture can be obtained only if the subjective well-being dimensions incorporating and weighted by the results of a large-scale sample survey, conducted in the meantime, are also taken into account.

Keywords: well-being, spatial structure, model-calculation, weighting process, districts.

Preface

Developing complex indicators measuring economic output and added value (HDI, UNDP Millennium Development Goals), and indicators relying on an entirely different basis (the National Happiness Index and well-being indexes with various content) (see e.g. Constanza 2009, Diener–Biswas-Diener 2002, Booysen 2002, Beyond GDP 2009, Stieglitz 2009, Atlas… – The World Bank 2013, CIW 2012, Kovacevic 2010, Marks et al. 2006), researchers worked on the assumption that economic output does not correlate strongly with people's happiness or quality of life. Most measurements relate to countries and federal states. Only a few seek to present or model differences at lower territorial levels (see e.g. CIW 2009, OECD 2011, Boelhouwer–Stoop 1999, Diefenbacher–Zieschank 2008, Blanchflower–Oswald 2004, NEF 2012, and based on the example of Nottingham, NEF 2004).

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In recent years, there have been similar research projects involving new methods for measuring the changing spatial structure of Hungary from the viewpoint of innovation potential (Bajmócy–Lengyel–Málovics (eds.) 2012, Gébert–Málovics–Fáskerti 2012). Alternatively, following on from an extensive range of published research, complex indexes imported from another post-soviet country (the Latvian Territory Development Index, used by Németh–Verce–Dövényi 2014), have been applied. In this case, the standard approach was to sidestep the GDP/capita based regional differences.

This study discloses the first results of pilot calculations that have been performed as part of Hungary's Social Renewal Programme (TÁMOP), which explores differences at the level of Hungarian districts (LAU1). It carries the proviso that the spatial structure presented reflects what is called objective well-being. A more comprehensive picture can be obtained only if the subjective well-being dimensions incorporating and weighted by the results of a large-scale sample survey, conducted in the meantime, are also taken into account.

The Stiglitz-Sen-Fitoussi Report

In February 2008, the then French President, Nicholas Sarkozy, who was highly unsatisfied with the amount of reality the content of statistical information on economic growth and societal development reflected, mandated Joseph Stiglitz (chair), Amartya Sen (adviser) and Jean-Paul Fitoussi (co-ordinator) to establish a committee that later came to be known as "Committee on the Measurement of Economic Performance and Social Progress". The purpose of establishing such a committee was to assess the limits of GDP as an indicator of economic performance and social progress, including the issues associated with such assessment. Also, to identify further information that might be needed for indicators better-reflecting social progress, and analyse and discuss the reliability of alternative assessment methods (Stieglitz–Sen–Fitoussi 2009).

The report differentiates between *current well-being* and *sustainable well-being*, i.e. whether this can last over time. Current well-being relates to both economic resources, such as income, and with non-economic aspects of peoples' life (what they do and what they can do, how they feel, and the natural environment they live in). Whether these levels of well-being can be sustained over time depends on whether stocks of capital that matter for our lives (natural, physical, human, social) are passed on to future generations.

Another key message and unifying theme of the report is that the time is ripe for our measurement system *to shift the emphasis from measuring economic production to measuring people's well-being*. Emphasising well-being is important because there appears to be an increasing gap between the information contained in aggregate GDP data and what counts for "common people's well-being".

The three authors put forward 11 recommendations for a new measurement methodology, according to which, the following areas (dimensions) should be considered simultaneously:

I. Material living standards (income, consumption and wealth);
II. Health;
III. Education;
IV. Personal activities including work;

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V. Political voice and governance;
VI. Social and personal connections and relationships;
VII. Environment (present and future conditions);
VIII. Insecurity, of an economic as well as a physical nature.

A system of indicators and a methodology for model-based measurements in Hungary

In designing the model, the authors relied on the recommendations in the Stiglitz–Sen–Fitoussi Report as a starting point. Although we strove to bear the recommendations in mind in engineering a Hungarian indicator of well-being, we faced a severe shortage of information in a number of areas, including environmental sustainability, material well-being and the household perspective. Such data are, as a rule, available at a national or even a regional level, but not at lower levels including settlements, small regions, districts and urban agglomerations.

Aware of this, in determining well-being factors, we assigned the indicators used into two categories. The core component of a well-being indicator is the fundamental data that can be easily generated from the data regularly supplied by the Hungarian Central Statistical Office (e.g. 2011 census data and the HCSO's System of Territorial Statistical Data from 2011). Another class of variables includes auxiliary or ad hoc indicators whose data requirements can be satisfied only by targeted data collection. Thus, the repeat determination of the value of such indicators and the capture of changes over time requires a rather expensive repeated collection of data.

The underlying reasons for such separation of the indicators used are as follows:

- The calculation of a well-being indicator by means of basis indicators does not require a time-consuming and costly collection of data by researchers. The data requirements for a well-being indicator, thus calculated, can be satisfied. Its value can be established over a broad time horizon, i.e. for earlier dates. It follows that such an indicator is also suitable for capturing processes as they evolve over time.
- Indicators based on data collected by researchers themselves help follow the recommendations in the SSF Report; however, due to their specific nature, they are not valid for earlier dates, and their validity for future dates depends fundamentally on external factors (i.e. whether there are data sources available for repeated data collection).
- Separating basis indicators from ad hoc ones enables us to analyse the degree to which variables calculated from target data modify the value of well-being indicators calculated from basis indicators. As a result, proxy variables adequately similar to the indicators that are hard to determine, owing to their data requirements, can be delineated.
- In order that areas that need to be included can be captured, the starting point for designing the dimensions of well-being were the recommendations of the Stiglitz Report (2009). In addition, also included were the dimensions (variables) of the models that we thought bore relevance on the basis of our review of international literature. The benchmarks considered were the Canadian Index of Well-Being (CIW 2009), Wachstum, Wohlstand, Lebensqualität (WWL 2013), and OECD's

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Your Better Life Index (OECD BLI 2011 and 2013). The models found to be of relevance exhibited strong similarities in terms of the dimensions studied, which is attested to by the fact that income, employment, education, qualification, environmental characteristics, democratic values, participation and healthcare feature in all models. Furthermore, there are also other shared dimensions, which emerge in at least in three models. They are housing, socialising (social and community-level connections), public security and leisure.

– We complemented shared well-being dimensions with two specific areas that are likely to affect well-being in Hungary. These are the availability of public services and the sustainability of local demography. These two dimensions were included to capture the issues specific to Hungarian settlements and the small villages in their vicinity as they are fundamental determinants of the quality of life, well-being and future of local residents.
– Government and municipality debt was intentionally left out. Although including the sustainability of government/municipality operation in the model could be a major component, a recent remodelling in Hungary (rearrangement of the tasks of municipalities and the resultant transformation of funding) has rendered the analysis of historical data meaningless. That notwithstanding, facilitating a Hungarian well-being model to include this area in some way is a key future challenge.

Determination of an objective well-being model

The well-being dimensions and variables surveyed enable us to describe objective well-being by using one value for each, and to generate one single well-being index value based on the values of these dimensions. In determining the value of the well-being index, the aim was to rank the territorial unit in question with a national (average) ranking. Although a well-being index determined in this manner is suitable for keeping track of changes over time, it is not for international comparison.

In determining a composite well-being index, we first stabilised (standardised) variables by using standard deviation measured at the appropriate territorial level (i.e. at the level of settlements, small regions, districts, urban agglomerations, counties and regions) and the national value (serving as mean value):

$$Z = \frac{x - \mu}{\sigma}$$

where x is the value to be stabilised (standardised), σ is standard deviation and μ is an expected value (mean value).

A standardised variable with a high value just means that it significantly differs from the average. Whether this affects objective well-being favourably or unfavourably cannot be established. In order to enable it to do so, we need to interpret values, i.e. assign a direction to the values of standardised variables, so as to ensure that a negative value reflects – for all 30 variables – a level of well-being level that is lower than the national one; conversely, a positive value indicates a better-than-national level of well-being.[1]

1 Technically speaking, identical direction means a change in the signs of the variables concerned.

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Constructing these well-being dimensions indices for Hungary, we can calculate one complex well-being indicator, which contains the relative position of subjects in different areas of well-being. It is possible to characterize a spatial unit with only one number, but only by losing a high proportion of information, as a favourable position in one well-being dimension should be counterbalanced by a poor situation in another. This is why this method is very useful to identify the extreme valued territorial units, with the best or worst position in most well-being dimensions.

After we calculate the values of certain dimensions, we have to find a 'suitable' weight to create one complex index of well-being. Choosing the proper weight is one of the most important steps of the calculation, as it defines the conversion rate among dimensions (for example: what rate of increase in income would counterbalance higher levels of uncertainty in a family's existence?) In practice, most calculations neglected the weighting; they give equal importance to all well-being dimensions. If there is any kind of weighting, three primary methods can be used (see: Decancq–Lugo 2010): the experts' opinion, based on interviews, statistical data concentration methods (e.g. principal component analysis), or questionnaire-based weight. In our research, we have the results of a 2000 panel, representing age, sex, education and settlement types of Hungary. This allows the calculation of a weighted model of well-being indicators (Table 1.) based on the population's opinion of the relative importance of such dimensions.

In the process, we re-calculate the objective well-being index using the median value, instead of simple average, as in three of the ten dimensions, the individual opinions were highly heterogeneous in the areas of education, work and safety. (i.e. the quality of education was quite unimportant for elderly people, but one of the most important factors for students and their parents.) Hungarians who replied to the questionnaire feel employment, and health and safety are the most important fields, followed by incomes and housing. All the other dimensions, such as education, politics, environment, demographic factors and accessibility of public services seemed to get less weight in our model calculation.

The results of principal component analysis suggest that all the ten dimensions cannot merge into one index. It is important to see in this calculation, that the goal was not presenting the variables the variables with low level communalities, but to identify all the spatial units with favourable or less favourable positions in the majority of the well-being dimensions. According to all these points, we calculated the scores of certain dimensions with the weights obtained from the questionnaire and created the transformed objective well-being index.

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Table 1

Results of the weighting process and principal component analysis, using the Decancq-Lugo-method

	Employment (Personal activeties)	Health	Safety (Insecurity)	Income	Housing	Education	Political participation	Environment	Access to basic public services	Demography
Questionnaire based weight	1.15	1.15	1.15	1.03	1.03	0.92	0.92	0.92	0.92	0.8
Equally weighted	1	1	1	1	1	1	1	1	1	1
Principal component analysis	0.84	0.48	*0.17*	0.85	0.83	0.87	*-0.21*	0.49	*0.5*	0.48
Communalities	0.763	0.384	*0.025*	0.619	0.763	0.814	*0.003*	0.422	*0.208*	0.421

Source: own calculation.

The first results of calculations at actual LAU1 (district) level

While calculating, for example, the index of objective well-being or any other territorial values, we noticed that the difference between extreme values grew as we moved from larger territorial units towards a lower level of aggregation. However, what is truly surprising is that there is a higher concentration of increased deviation mainly in the negative domain, i.e. districts with a lower well-being index are greater in number. Nevertheless, county and regional averages can counterbalance such lower indexes effectively because the number of the population in districts is lower than in county seats and regional centres.

We use the differences identified on map charts to analyse differences at a district level. Our analysis focuses on internal territorial inequalities at a LAU1 level, and compares the differences between the weighted and unweighted values of the objective well-being model. The results of the analyses use the traditional categories "developed–undeveloped" and "backward–advanced", the interpretation of which is restricted to the level of small regions.

The traditional spatial structure of ***Bács-Kiskun County*** is characterised by a bipolar structure, with Kecskemét at one end and Baja at the other, as well as the stable position of the cities and towns in the Kiskun area. Surprisingly, only Kecskemét and its environs are above the national average according to the objective well-being model. The values for Baja and its environs are similar to those for the Kiskőrös, Kalocsa, Kiskunfélegyháza average. Kiskunhalas is at a level one mark lower, at the level of Tiszakécske, Kiskunmajsa and Kunszentmárton, at least according to the basic model. (A relatively high value of the index for Kunszentmiklós is also attributable to the indirect appeal of the capital city due to its proximity.) The income weighting rearranges spatial structure only inasmuch as the edge of Kecskemét, over other places in the county, continues to become more distinct, a trend that is realistic over the longer term in light of a Mercedes-Benz capital project and the related development projects. The latter only seem to be targeting Kiskunfélegyháza

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(along the M5 motorway), however, the overweighting by questionnaire results reduced the value of the well-being index (–0.3). What is surprising, is that the overweighting by questionnaire results reduces the well-being index of the Kiskőrös district, also dubbed "the golden triangle". The likely cause of this is that the untaxed income of the 1980's and 1990's narrowed to a trickle in response to the global crisis. There are substantial absolute differences between the lowest and the highest well-being indexes of the county. They are around 11 points in both cases.

Concerning ***Békés County***, based on social and economic indicators, besides Békéscsaba (the county seat), Gyula, Orosháza and Szarvas rank relatively higher. The economically most disadvantaged areas are South Békés County (Mezőkovácsháza) and North Békés County (Sarkad). Objective well-being indicators also corroborate the favourable ranking of Békéscsaba (–0.08 and –0.00) and Gyula (–0.58 and –0.60). The well-being index for Szarvas is more favourable than that of the Orosháza district despite the fact that more significant industrial organisations have survived and been set on a new development trajectory in the latter. The differentiation that has occurred over the past decade in the traditionally backward regions is also reflected in their economic and social indicators. Absolute differences were similar to those in Bács-Kiskun County: an overweighted indicator slightly improved the indicator of the county seat's environs and moderately upgraded Szarvas and Orosháza. It resulted in the worst indicators for the diverging regions.

In ***Csongrád County***, as had been expected, five cities and their environs[2] formed a series according to their size and level of development. Compared with this, indicators for the Kistelek and Mórahalom districts, once part of the farmstead area of Szeged, were considerably lower. Major well-thought out development, mainly in Mórahalom, over the past two decades coincided with a cycle of suburbanisation in the county seat. Development in Kistelek was facilitated by the construction and putting into service in 2003 of the M5 motorway and suburbanisation in Szeged. With the exception of Szeged district, what is striking about Csongrád County, relative to the other undeveloped counties, is that the weighting process hardly affects well-being indexes, i.e. labour market and income position are roughly in line with other indicators. Szeged, Hódmezővásárhely and Szentes ranked according to our calculation as they had ranked previously. Both Mórahalom and Csongrád fared better than Makó's environs, even on the basis of the model applying an economic weight. Although absolute differences were substantial (11 points), this followed from the favourable position of the regional centre and its environs rather than the deficiencies of Kistelek district with the highest well-being deficit. In the Southern Great Plain, according to the traditional order of development, Hódmezővásárhely ranks lower than Baja among the second-tier cities, based on the 'traditional' development rankings. However, when considering the well-being index, the town, along with Gyula, ranks 4th–5th just behind the county seats.

The traditional structure of space and slope development in ***Hajdú-Bihar County*** is similar to those in Csongrád County, insomuch, as Debrecen and its environs standout from the other regions in the county. We found that, regarding medium-sized cities, only Hajdúszoboszló has relatively good indicators. The objective well-being indicator also

2 Szeged, Hódmezővásárhely, Szentes, Makó and Csongrád (in this order).

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reflects this order: Debrecen with its well above the national value ranks first (although it falls behind Szeged). Hajdúszoboszló is roughly similar to Szarvas. The main engine of the local economy is tourism, and the overweighting by questionnaire results again slightly reduces the value of the well-being index in this city. Diverging spaces, such as Derecske and Hajdúhadház, and their respective environs, negatively stand out in terms of their well-being indexes. Indicators for the Berettyóújfalu and the Püspökladány districts are hardly any better. The application of the weighting leads to a lower well-being indicator for the majority of the districts in the county. Absolute differences are significant (11 points) similar to the former counties.

The spatial structure of ***Jász-Nagykun-Szolnok County*** is fundamentally affected by its distance from and the accessibility of Budapest. The excellent transport geography of Szolnok and its role as a county seat combined to achieve a favourable well-being index and an increase in the index during income weighting. Szolnok is in a better situation than Békéscsaba and Kecskemét, though the difference is not striking. Although the well-being index of the Jászság part of the county, attached to a wider catchment area of the capital city with numerous ties, is favourable within the county, it falls behind the national average considerably. Its favourable geographical location is reflected when the weighting is applied, because the value of the index increases in the second model calculation. The weighting leads to a further significant lowering of an already low well-being indicator in the Trans-Tisza districts of the county. No significant changes were observed in ranking relative to the traditional indicators of inequality. Kunhegyes, a core area of the inner periphery of the Central Tisza Region, exhibited the highest well-being deficit in the county; however, the situation in the other districts is hardly any better. Nevertheless, absolute differences are over 12 points higher than in the other counties in the Great Plain, as a consequence of the lower indicator for the county seat district and worse situation in spaces with well-being deficits.

The sharpest territorial differences were identified in ***Szabolcs-Szatmár-Bereg County*** in terms of its objective well-being indicator. The dichotomy between the county seat and the county is nearly as wide as between the capital city and the rural areas. The value of the indicator for the Nyíregyháza district is roughly the same as the one for Békéscsaba (and slightly lower than the one for Kecskemét with a similar population); however, if added, the weight reduces the value of the index significantly (–0.4), which is quite an exception among county seats. The other districts of the county trail Nyíregyháza to an extreme degree.

The Mátészalka district, fairing relatively well in terms of its traditional indicators, was found to be outright poor as far as its well-being indicator was concerned (–9). Kisvárda, the other city representing major attraction fared slightly better (–7), however, it only managed to rank second under the model where questionnaire results were weighted. Under the basic model, it was preceded by the Ibrány district, which is one of the most disadvantaged spaces within the county according to all traditional rankings for measuring development. What sets the county apart from other counties in Hungary is that weighting reduces the value of the well-being indicator for all regions to a dramatic extent (over –0.4). The absolute difference within the county is essentially the same as the average for other counties in the Great Plain.

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In ***Baranya County***, with the exception of the Pécs district, the well-being index was negative for all regions, with values suggesting well-being far below the national average. Sellye and its LAU1 region ranked last in Hungary; the Hegyhát, Szigetvár and Szentlőrinc Regions fared somewhat better. Weighting slightly changed the value of the indexes in most cases (a modest increase for the Pécsvárad, Mohács, Bóly districts) suggesting employment, health and security imbalances. A difference of nearly 16 points between the most and the least economically advantaged regions indicates strong spatial divisions within the county.

In ***Somogy County***, it is not the county seat where the well-being value is the highest (exceeding the national level), rather, in the environs of Siófok, which is a secondary centre in the county. The districts along the Lake Balaton (Fonyód, Siófok) and the county seat offer better living conditions; however, this did not seem to have exerted any impact on the Marcali, or Tab districts (–6, –10 points). More distant areas, with a few exceptions, ranked similar to the latter group in terms of their well-being indicators. The weighting process in some cases lowered indicators or did not improve them significantly.

In ***Tolna County,*** even the relatively advantaged Szekszárd district had well-being values below the national average. Under the weighted model, Paks and its environs had a relatively better position. Here, the employment dimension improves the index spectacularly. By contrast, it did not affect the county seat's well-being indicator at all. Although the Tamási district, a periphery in the county's ranking, had an extremely low well-being indicator, especially under the equally weighted model, it fared much better than did the most disadvantaged regions in Somogy and Baranya Counties. The overall differences are far below that in Baranya, Somogy, or the counties of the Great Plain.

Borsod-Abaúj-Zemplén County is one of the Hungarian counties where the well-being index was below the national average in all its districts; even the index for the regional centre was 1.5 points lower. It is here and not in Szabolcs County that three districts with the highest well-being deficits were identified among the country's last five: Cigánd, Gönc, Encs; however, Mezőcsát, Szikszó, Putnok are also in the last 15! Thus, Borsod seems a NUTS3 region with the highest absolute well-being deficit in Hungary. Relative to the county's general position, Miskolc's and Tiszaújváros's LAU1 units (TVK and Jabil Circuit) had favourable well-being indicators. There were only two districts where the weighting process improves the index moderately (Mezőkövesd and Tokaj). By contrast, we identified three districts where weighting reduces an already low well-being factor by 0.3 points. Although absolute differences are not extremely high (12 points), the negative well-being values of the county seat make internal differences look less severe than they are in reality.

The traditional spatial structure of ***Heves County*** can be characterised by a favourable situation in Eger, Gyöngyös and Hatvan, and backwardness in the southeastern and northern peripheries. Our well-being model corroborated this territorial divide. Similar to Szeged, Eger's environs is one of the most advantaged small regions in East Hungary, although weighting led to a lower value of the index as in Szeged. Gyöngyös's secondary role is clearly substantiated by the fact that its level of well-being is only slightly lower than the national average and is somewhat improved by the weighting process. Accordingly, it is only one level lower than county seats. Relative to the population of the county seat, Hatvan has an outrightly favourable well-being indicator, especially under the

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model with a weighting (–1.46), that is similar to Paks's corresponding indicator. It is relatively safe to say, that in the case of Hatvan, and to a lesser extent, Gyöngyös, the relative proximity of and easy access to the capital city exert a favourable impact on trends in the index. Absolute differences were high in the county (13 points). Trends were influenced by a positive indicator – well above the national average – the LAU1 unit of the county seat.

Nógrád County is another county where the objective well-being index had no positive value at a regional level. The bipolar character of the county (with Balassagyarmat, the former county seat at one end and Salgótarján, the current centre at the other) is also reflected in our models: Although the Balassagyarmat district has a slightly better indicator, compared with the county seat, the value of its well-being indicator is extremely low (–3.16 and –2.86). What is specific to the spatial structure of Nógrád County is that the districts of the small towns Pásztó, and Bátonyterenye, rank not too far behind the county seat. Even Rétság district has a slightly better level of well-being comparing to Balassagyarmat. The application of the weighting increases the index of these districts (except Szécsény), suggesting a weak local economy, and hence, an unfavourable labour market situation. Although, spatial inequalities are moderate in the inner areas: the difference between the highest and the lowest value under the basic and the weighted model is around five. Unlike Bács-Kiskun and Heves Counties, where the impact of the capital city could be assumed, this county did not seem to benefit from such influence, partly because access to the county is difficult.

What we could not avoid noticing that the well-being indicators in ***Fejér County*** were places with values above, or close to the national average: in Székesfehérvár, the county seat; Dunaújváros, the secondary centre; Gárdony, a major tourist destination; Mór, undergoing re-industrialisation and Bicske, becoming a logistics centre. Based on the relevant data, the well-being indicator of the latter three rank only slightly lower than that of the regional centre with a population of 100,000, and is significantly higher than Dunaújváros, a traditional industrial centre. Another notable feature of Fejér County is that – at least in comparison with the counties in South and East Hungary, with the exception of Mór – weighting generally raises the value of the objective well-being indicator even in regions with a well-being deficit (Polgárdi, Enying and Sárbogárd). These clearly delineable units, with a minor well-being deficit in the national comparison, are a manageable problem, in terms of both their number and population. Absolute differences are also not conspicuous (11 points), and more attributable to high well-being values in more advantaged districts than the indexes of those diverging.

With reagrd to the ratio of LAU1 units with a favourable well-being factor, to those with an unfavourable one, ***Komárom-Esztergom County*** is in an even more advantaged situation than Fejér County. Except for the Kisbér district, which is in effect, not in the lowest quartile in a national comparison, no disadvantaged space can be identified. A typical phenomenon is that, compared with Miskolc, the Oroszlány district, also long considered an area of industrial depression, had a higher indicator, especially when the weighting is applied. Spatial inequalities calculated on the basis of traditional indicators are usually moderate, and owing to a reliable urban structure, there are a number of advantaged areas in the county. This is also reflected in well-being indicators: the Komárom, Tata and Esztergom units have higher indicators than the county seat. The

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weighting process improves the indexes of all regions, and in some cases, to a marked extent. This is clearly attributable to a favourable economic structure and related good labour market opportunities. Absolute differences are very low (around 7.5 points) suggesting more moderate territorial inequalities in the county.

The spatial structure of ***Veszprém County*** is profoundly affected by Lake Balaton. Regarding traditional income and social indicators, the county's general indicators measuring development were improved by the advantaged position of the county seat and the areas along the lakeshore. Under the well-being model, the Veszprém, Balatonalmádi and Balatonfüred districts are well above the national average. Only in the Sümeg and Devecser districts, the traditional peripheries of the county, did we identify low and very low well-being indicators. The limitations of the Balaton phenomenon is confirmed by the fact that the well-being index of the Ajka and Zirc units, and to a lesser extent, even the Várpalota and Pápa districts are higher than that of Tapolca's values. Although, the Ajka and Várpalota LAU1 units were areas of industrial depression, they are affected by larger poles capable of development; the Zirc and Pápa districts should be able to boost their large surroundings with its numerous small villages. The weighting process also improved indexes throughout the county. Absolute differences are significant (approx. 13 points); however, this is due to Veszprém's outstandingly high well-being index (the highest in the Central Transdanubian Region) rather than the relatively low value for the Devecser unit.

The traditional spatial structure of ***Győr-Moson-Sopron County*** is tripolar. Indicators for Győr, Sopron and Mosonmagyaróvár, are high, while other districts are in a less advantaged situation. Under the objective well-being model, the above three cities and their environs fare well (Győr has the highest well-being indicator in the provinces in general, Sopron the third). Indicators for the Kapuvár and Csorna districts are also above the national average. Even the Tét and Pannonhalma units on the southern periphery barely fall behind. Overall, the weighting process boosted well-being indicators markedly (with the exception of Győr, where there had been some decline). Absolute differences are moderate in the county, barely exceeding 6 points, suggesting inner inequalities are even fewer than those in Komárom-Esztergom. In other words, the dominant features of the urban structure can – through their attraction – mitigate territorial inequalities in the county.

Objective well-being indicators are high for most of ***Vas County***. Indicators for the traditional peripheries (particularly the Vasvár district) modify this rosy picture, however. Szombathely has the highest indicators comparable with Győr, Sopron and Veszprém. It is followed by five regions with indexes slightly above or below the national average. It should be noted that the Szentgotthárd unit, the automobile hub, ranks rather low (which, we think, is attributable to a special settlement structure in the Őrség). Calculations showed that Kőszeg, which did not fare well in the economic transformation, had higher values. The weighting process increased the well-being indicators in all LAU1 units, in some cases over 0.6 points. Absolute differences are relatively large (12 points), which is mainly due to the favourable situation in Szombathely and its environs, rather than a particularly disadvantaged Vasvár district.

Of the three West Transdanubian Counties, ***Zala County*** has the 'least impressive' economic and social indicators. Although it has three traditional centres (Zalaegerszeg, Nagykanizsa and the conurbation of Keszthely and Hévíz), they do not seem to be able to

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boost their surroundings as was the case in Győr-Moson-Sopron. Concerning the objective well-being indicator, of the three poles, only Keszthely and its environs are the most advantaged, on a par with, for instance, Komárom. We measured barely higher well-being indicators for the Keszthely LAU 1 unit compared to the Zalaegerszeg district. The difference is wider under the standard model, compared to the weighted one. Further strengthened by weighting, the indicator for Nagykanizsa and its environs falls somewhat behind the national average. Of the regions with small towns as their centres, Lenti had outright favourable indicators (–1.53 and –0.97). By contrast, although their indicators were similar, the Letenye and Zalaszentgrót districts fell considerably behind, demarcating the county's spaces with a well-being deficit. The weighting process increased the indicators for all units, most of them by over 0.6 points. The absolute difference is close to the average (10 points). The real issue is how strongly polarised the districts are, and how rare are mean values approximating the national average.

Pest County cannot be interpreted on its own. Budapest's inclusion always has to be borne in mind with all examined trends in well-being indexes. The proximity of the capital city has a favourable impact on the county. Nevertheless, there are peripheries with indicators falling well (Nagykáta and Nagykőrös districts) or moderately (Dabas Cegléd, Ráckeve and Aszód units) behind the national average here as well. At the other extreme, are regions with higher-than-national average objective well-being indicators(Budakeszi, Dunakeszi, Pilisvörösvár, Szentendre, Gödöllő, Érd and Szigetszentmiklós). These all fare better than Győr's LAU1 area, the "champion of out of the metropolitan areas". The indicators of the seven districts are equal, or even higher, than the capital city, justifying the large-scaled suburbanisation[3] process around Budapest. These formerLAU1 units, completed with Vác (North) and Ráckeve (South) are small regions forming from the primary influence zone of the capital city. The overweighting of the questionnaire result dimensions did not have a uniform effect: it increases the values of the indicators for a smaller group of regions, triggers no change worth mentioning and decreases the index for approximately one-third. The absolute difference is one of the highest in the counties; the underlying reason for this is the extremely high values of the leading districts rather than the condition of the spaces with a deficit (as their index values are in the mid-third section of the national list).

A few territorial interconnections of the objective well-being model

The spatial structure under the standard and the weighted models does not differ fundamentally from either that outlined on the basis of the traditional indicators of territorial inequalities or the complex indexes measuring progress and backwardness (Nemes Nagy 1996, Koós et.al. 2006, Csatári 2010, Rechnitzer 2010, Tánczos 2010), or even several other recent approaches (Nagy 2006, Csite–Németh 2007, Garami 2009, MKIK GVI 2013).

The model responds to the characteristics of settlement networks and settlement hierarchy rather sensitively. The existence of large cities and mid-size towns with a number

3 In this case we use the 'classical' definition of suburbanisation, namely, the relative deconcentration of high-class and middle-class inhabitants of the city.

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of functions can raise the well-being index of districts significantly, and owing to the feed-through effect, their proximity may even affect the index of neighbouring units. Higher-level well-being indexes benefit outright from a multiple pole settlement hierarchy with strong urban centres. By contrast, the existence of an unbalanced urban structure with few functions affects the indexes adversely (Figure 1 and 2).

The impact of Budapest goes far beyond the city limits, and in some cases, the boundaries of Pest County. Such an indirect effect is rare in the case of other centres (Figure 1 and 2).

Nor can the size of a city or the regional centre role guarantee a high-value well-being indicator. Likewise, the county seat status alone does not automatically mean that cities with this status and their environs are considered as the most prestigious places or spaces in terms of well-being in the county in question (Figure 1 and 2),

Spaces with a well-being deficit are clusters, and in essence, coincide with spaces of backwardness. (Figure 1 and 2) Such concentration suggests that there is/can be strong correlation between the quality of local economies and societies and well-being. In order to test it, a set of interviews needs to be conducted with local actors.

Several dimensions of material wealth are strongly reflected, either directly or indirectly, in the model. The reason for the overweighting of both groups of indicators is that Western literature on post-socialist space emphasises the role that these three dimensions (Table 1) have played in local and personal/private/familial successes after the transition (Stenning et al. 2011).

Compared to the traditional model measuring progress and backwardness, differences were only identified at the level of districts; however, these differences signified no radical change in the position of the district concerned, rather, a shift of one or two categories. As some of the components of well-being take rather long to change, a spectacular transformation of the current spatial structure over the medium term is hardly a likely scenario.

It is important to note that this paper only studied ‘objective’ well-being indicators as either no data was needed for the study of the dimensions suggested by the Stiglitz-Sen-Fitoussi model, or the data available was not comprehensive. Additionally, the results of the questionnaire survey were indispensable for definitive re-calculations and the re-weighting of the model.

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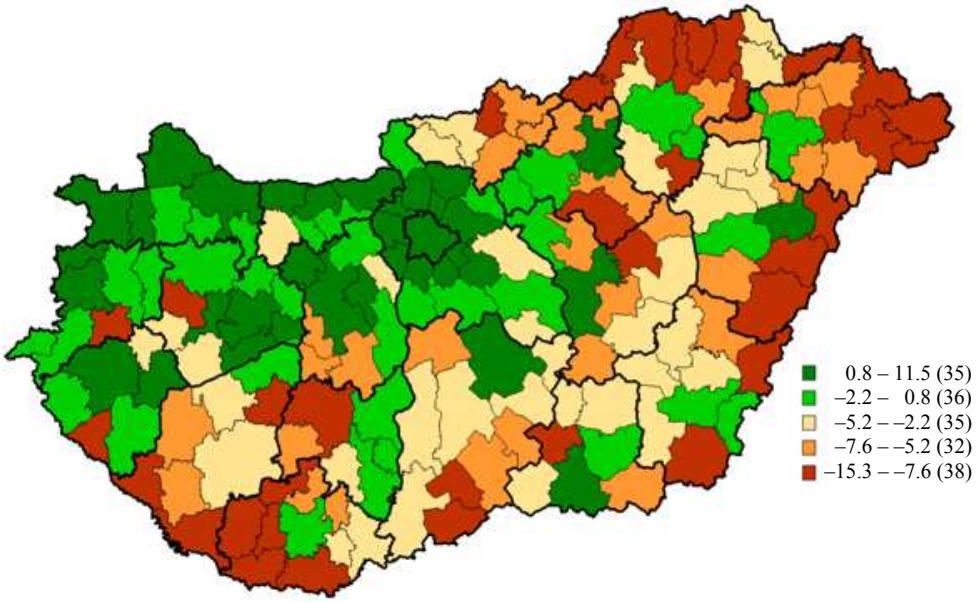
Figure 1

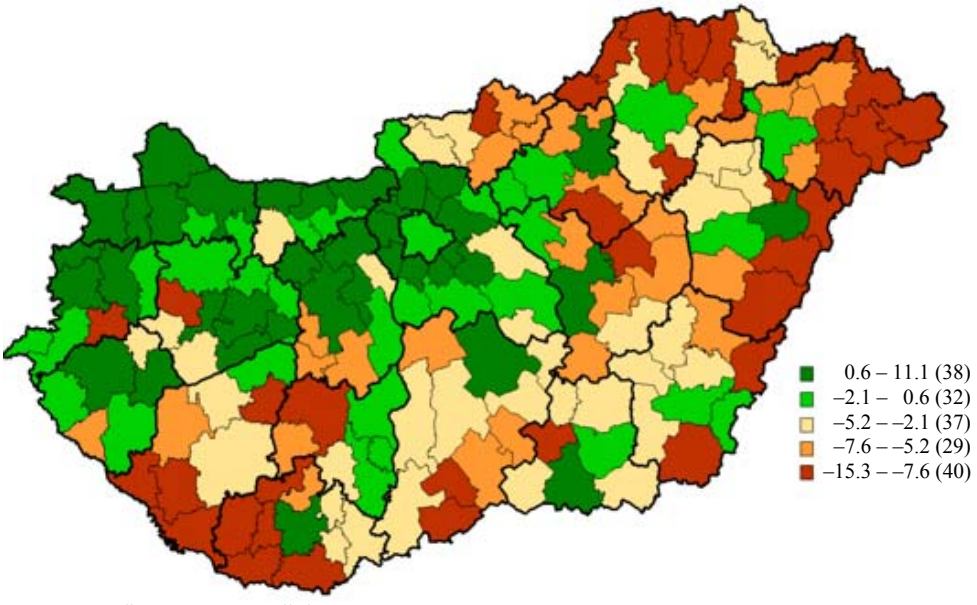
The objective well-being index of Hungarian districts (LAU1 units) – Unweighted model, 2011



Source: Bálint Koós' own compilation.

Figure 2

The objective well-being index of Hungarian districts (LAU1 units) – Weighted model based on the results of questionnaire, 2011



Source: Bálint Koós' own compilation.

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Regional Development in Croatia from the turn of Millennium to the EU accession*

Abstract

Researching territorial development in the independent Croatia is an interesting subject for research from many aspects. Unique developments – state formation, war, spatial restructuring of population – have been taking place up until the turn of the millennium, which have also been accompanied by several significant regional impacts. The historical differences have been escalated by the time of transition, the process of Euro-Atlantic integration, and eventually, by the world economic crisis. This study takes into account the most important spatial forming factors and developments on a county level, focusing on the time frame, at the end of which Croatia became a full member of the European Union.

Keywords: Croatia, regions, territorial inequalities, demography, urban network.

Introduction

Despite its relatively small territory, Croatia is composed of regions, which can be characterized by striking differences (Klemenčić 1994). This is mainly due to the country's unique geographic location and the particular shape of the state's territory. The area of the country integrates regions, whose relations are different in many aspects and which partly overlap. The natural, social, historical factors' space forming effect is rather strong; however, there is no one determining spatial shaping force. Research on regionalization and spatial subdivision carried out from the 1950s has not resulted in full compromise (because the borders of macroregions cannot be delimitated by lines), however, the acceptance of delineations synthesized by Josip Roglič (1955) and Veljko *Rogič* (1962, 1973, 1983) is relatively high, thus, they have been incorporated in both research and education, and consequently are publicly acknowledged (Vresk 1995, Magaš 2003, Pavić 2008). The country is composed of three main (topographical) units: the Pannonian and Adriatic regions and the Dinaric region separating them. All three macro regions can be further subcategorized (Magaš 2011). Croatia's shape is rather specific; it is very different from the compact state shape concept established by politic geography. The country not only has a long coastline, but it is also rich in rivers. River Sava forms an internal axis and is a border river, while the Danube and Drava are border rivers of great importance.

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Territorial administration, statistical regions

The new system of territorial administration was established by the 1992 Law on Local governments: when creating the independent Croatian government, they returned to the historic system of counties from the era before 1918. Based on this, the territory of Croatia is organized in counties (županija), towns/cities (grad) and municipalities (općina), with the latter two forming the statistical subcategory of settlements. The counties, besides being the middle level of the local government system, also act as territorial representatives of the state administration. Mainly historical, transport and economic spatial links prevailed throughout the process of delineations. County borders have been modified only to a minimal extent over the last two decades. The basic units of the local government system are cities and towns. At the time of the 2011 census, the country was organized into 6,756 settlements, from which there were 127 towns/cities (including the capital city) and 429 municipalities. The number of counties was 21 (including Zagreb, a city with county rights).

Figure 1

Counties, county seats and regions in Croatia, 2013

Source: author's compilation.

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Considering the European spatial categories, there is no NUTS2 local government level in Croatia; NUTS3 is the level of counties, while LAU2 can be identified with the level of local governments (cities and towns). The question of NUTS2 units, which can be considered the most important from the viewpoint of EU resources, was a debate until the EU accession. Following much discussion (five, four, three and two region models), three NUTS2 regions were delineated in 2007: Adriatic region, Pannonian region and Central Croatia. Thus, due to the rather underdeveloped Slavonian territories, the region of the capital city – as well as the whole country – can receive higher EU funds in the 2014-2020 programming period. This dual categorization can also be considered adequate from a geographic-functional viewpoint (Figure 1).

Demographic trends

The spatial structure of Croatia's population is very heterogeneous due to the extremely diverse topography. Demographic differences have increased since the end of WW II, and this trend is a result of several factors besides the changes in its population retaining ability. Although the developments leading to significant population flows ended in the 20th century, several trends – e.g. loss of the rural population, migration towards large city regions – carried on. Despite all these, the high number of small settlements has remained a specificity of the Croatian settlement network.

The population's territorial structure is reviewed in a county dimension since the regional values cover significant internal differences. At the time of the 2011 census, the counties of large cities were the most populous (the region of the capital city had 1.1million inhabitants, the population of Split's county was 455 thousand, while the counties of Osijek and Rijeka had respectively 300 thousand inhabitants each). The average population of the other counties was 133 thousand, and in the least populated mountain regions, this number was 51 thousand. Population density on a national average was 75.71, this is 65% of the EU27; mainly the geographical segmentation and the topographical conditions limiting the population retaining ability are responsible for this phenomenon (Figure 2).

The population of Croatia had been increasing until the time of the Balkan conflict (the increase rate was 3.96% between 1971 and 1981 and 3.97% between 1981 and 1991). However, demographic trends changed throughout the decade of war, and due to the significant population flows there was a substantial population decline (6.11%) between 1991 and 2001. The loss of population continued on into the new millennium: in the 2001–2011 period, Croatia's population declined by 2.67% (the census definition of population changed in 2001).

The traditional migration trends (towards the capital and coastline) were augmented after the turn of the millennium. The population of the Adriatic region decreased by 1.1% (15,073 people) while the losses of the continental area reached 10% (124,417 people). The population of Zagreb (10,872 people, 1.4%), Zagreb county, Istria and Zadar (7,972 people, 4.9%) increased. In the littoral counties, the pace of population loss was lower than the national average. The loss was above 10% in Vukovar, Slavonski Brod and Bjelovar. The population loss of Osijek and Vukovar counties combined was more than 50 thousand. Regarding the past four census rounds, only three counties (the city and

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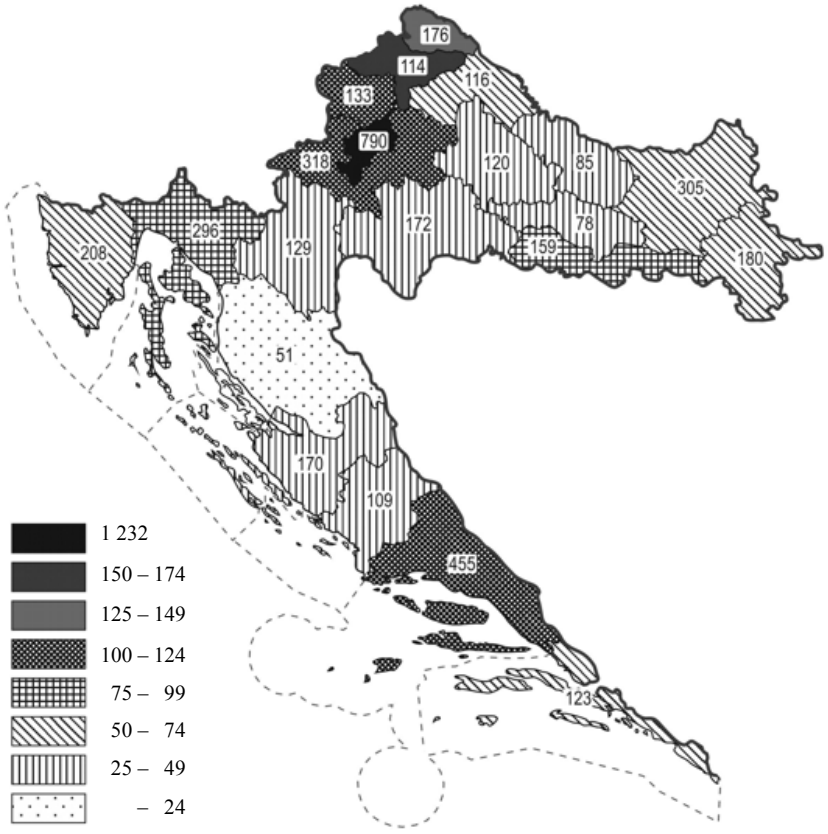
county of Zagreb and Istria county) have maintained their positive population change balance, while in seven counties (Krapina surrounding the capital city, Koprivnica, Bjelovar, Sisak, Karlovac, Lika and Virovitica) there have been only negative values (DZS 2001, 2011a, 2013a).

Figure 2

Population density (people/km^2) and population (thousand people) in the counties, 2011



Source: author's compilation based on census data.

Life expectancy at birth has been increasing in Croatia since the Second World War. At the same time, the proportion of seniors has been growing at the expense of the younger generations (the proportion of people of working age has been relatively steady). Therefore, the average age of the population has been increasing, and in a European context, it is one of the highest. The national aging index is 115%; its disadvantageous social, economic and budget consequences are well known. Dependency shows an advantageous picture in comparison to the European average. The county rankings of average age and aging show a similar picture, which might be translated into trend-like developments and long-term consequences (in the counties with higher average age the ageing index is also higher).

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Life expectancy at birth for males in the Adriatic region is two years higher than in the continental part of the country, for females, the difference is somewhat lower. Based on the thirty years foresight, this difference will keep on increasing in case of males: in contrast to the Adriatic territories, Central Croatia will lag behind by 2 years, and Slavonia by 3 years; for females, the gap will be less: 1 and 2 years respectively. Considering the internal differences of macro-regional statistics, in the Adriatic region Lika, and the capital city show significant divergence. The longest life expectancy, 2.5 years higher than the Croatian average both for men and women, can be expected in Dubrovnik county. The county with the lowest life expectancy for boys is Krapina (average –3.8 years) and for girls it is Bjelovar county (average –1.93) (DZS 2011b).

Population changes are determined by reproduction and migration. Throughout the last decade, the number of births was between 40 and 45 thousand, while mortality fluctuated (steadily since 1980) between 50 and 55 thousand. The number of deaths has persistently exceeded the number of live births since 1998; which phenomenon has caused the drastic drop in the birth figures (this trend has been continuous since the late 1970s), and has resulted in an aging population and natural population decline. Table 1 shows the county level data of the natural population decline. Only three counties have a positive balance: Split, Dubrovnik and Međimurje županija. In the case of Zadar and the capital city, there were years with a positive figure. The decline in the counties of Zagreb, Istria, Slavonski Brod and Vukovar was lower than the national average. The natural loss was highest in the ring around the capital city region (Krapina, Koprivnica, Bjelovar, Sisak and Karlovac) and the mountains. Migration balance mainly worked in the same direction as natural productivity (Table 1).

Table 1

Natural productivity (per thousand people) in Croatian counties, 2001–2011

County	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bjelovar-Bilogora	–4.8	–5.3	–6.3	–5.5	–4.8	–4.8	–5.5	–5.0	–5.5	–4.6	–5.5
Slavonski Brod-Posavina	–0.6	–2.0	–2.1	–2.2	–1.3	–1.5	–2.1	–1.9	–1.3	–2.8	–2.2
Dubrovnik-Neretva	0.8	–0.3	–1.3	0.4	–0.0	1.0	0.6	1.1	1.1	1.1	–0.1
Osijek-Baranja	–1.8	–2.4	–3.8	–2.8	–2.8	–3.1	–3.9	–3.1	–2.8	–3.8	–3.5
Istria	–2.7	–2.5	–3.2	–2.0	–2.1	–1.7	–1.5	–0.7	–1.4	–2.0	–1.9
Koprivnica-Križevci	–4.1	–4.5	–4.9	–5.2	–3.7	–4.7	–4.6	–4.3	–4.4	–4.2	–4.3
Karlovac	–6.7	–6.9	–7.7	–7.7	–7.4	–6.4	–6.7	–6.6	–7.1	–6.6	–7.7
Krapina-Zagorje	–5.8	–5.3	–6.5	–5.4	–4.9	–5.1	–5.2	–5.2	–5.2	–4.8	–5.2
Lika-Senj	–7.8	–7.9	–8.1	–7.3	–7.6	–8.9	–9.6	–9.9	–7.8	–8.5	–8.8
Međimurje	0.9	–0.6	–0.2	–0.3	–0.2	–0.6	–0.1	0.1	0.4	0.4	–0.0
Požega-Slavonia	–1.6	–1.8	–2.2	–2.7	–1.8	–3.0	–3.3	–2.2	–3.4	–3.7	–4.5
Šibenik-Knin	–2.5	–3.8	–4.8	–4.6	–4.7	–5.0	–4.6	–4.1	–4.2	–4.7	–4.6
Split-Dalmatia	0.9	1.2	0.0	1.6	0.9	1.2	0.8	0.4	0.5	0.8	–0.2
Sisak-Moslavina	–4.7	–5.6	–6.0	–5.6	–5.7	–5.8	–6.8	–5.8	–5.6	–6.2	–6.3
Primorje-Gorski kotar	–3.4	–3.8	–4.0	–2.9	–3.5	–3.2	–3.7	–3.0	–2.7	–3.3	–3.4
Varaždin	–2.6	–3.5	–4.4	–2.8	–2.0	–2.0	–3.3	–3.5	–2.8	–3.1	–3.4
Virovitica-Podravina	–3.8	–4.0	–4.7	–4.1	–3.9	–4.3	–4.7	–4.7	–4.3	–4.5	–5.1
Vukovar-Srijem	–0.3	–1.5	–1.7	–1.0	–1.4	–1.5	–1.8	–1.7	–2.0	–2.7	–3.2
Zadar	1.0	–0.4	–1.2	–0.3	0.5	0.2	–0.7	0.0	–0.2	0.1	–0.2
Zagreb	–1.6	–1.8	–1.7	–1.3	–1.2	–0.7	–0.8	–0.3	–0.3	–0.5	–0.2
City of Zagreb	–1.3	–1.5	–1.6	–0.9	–1.1	–0.8	–0.9	0.0	0.4	0.4	0.0
Croatia	*–1.9*	*–2.4*	*–2.9*	*–2.1*	*–2.1*	*–2.0*	*–2.4*	*–1.9*	*–1.8*	*–2.0*	*–2.3*

Source: author's calculation based on the data of the Croatian Bureau of Statistics.

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From the aspect of net migration, three regions can be clearly separated: the coastal areas and the capital city can be characterized by immigration; in the mountains long term migration can be seen. In Slavonia, as well as the Northern counties – Međimurje županija, Varaždin, Krapina, Koprivnica – migration plays an insignificant role in population changes. Between 2002 and 2011, the population of the capital city and Zagreb county increased by 20 thousand. The counties of Zadar, Split and Istria, had a positive balance above 10 thousand people. The population in the other three coastal counties increased by 2.6–7 thousand people. The population of Varaždin (+167 people) and Krapina (–85 people) was not substantially affected by migration. Međimurje županija and Koprivnica suffered a slight loss of 700 people. In the mountains, long characterized by emigration, 1,237 people left Lika. The migration output was more significant in the Slavonian counties (3–5 thousand people), while more than 8 thousand people left the counties of Vukovar and Sisak. Considering the indicators per thousand people in the 2002–2011 time frame, net migration was positive in the capital city region and the Adriatic counties: 2.2–6.6 on an average (the 8.4 average of Zadar county was outstanding). Migration slightly affected Varaždin and Krapina counties; however, the population loss in the other two Northern counties did not exceed 0.6. The –1.5 value of Osijek county was the best in Slavonia. The mountain areas and the other Pannonian counties suffered more significant losses: 2.3–5.0 per thousand annually on an average. Until 2003, it was Zagreb county, then the region of Zadar that attracted the most migrants. Šibenik (16.3) and Lika (13.3) showd the highest values when considering the differences between the single years.

When studying the internal structure of migration, it is necessary to explore both international and national migration (Mežnarić–Stubbs 2012). Immigrants from abroad chose the two large cities (Zagreb and Split), adding respectively 14 and 11 thousand people to the population. The coastal areas and the capital city agglomeration have been the traditional targets of international immigrants. From among the Slavonian counties, it was only Slavonski Brod that had a net positive balance, which was presumably due to immigration from the Southern neighbouring country (statistics publish only county-level data on the citizenship data of international immigrants). The net migration balance of Croatia was +66,682 for the 2001–2011timeframe. Some 88.9% of the immigrants and emigrants were Croatian citizens. The greatest number of non-nationals had passports issued by Post-Yugoslav states (4% of the immigrants and 2.6% of the emigrants had Bosnian passports). Up until the global economic crisis, the positive balance of international migration had been above 1.3 thousand (in 2003, all counties were net receivers). From 2008 on, this trend has reversed (between 2010 and 2012 emigration of one thousand had been measured). Considering a broader timeframe, from 1998 (restoration of sovereignty) up until 2008, the migration balance was +163,443 people: 93.5% of the 254,068 immigrants were Croatian, 2.5% Bosnian and 1.3% had Serbian-Montenegrin citizenship. Of the 90,625 emigrants 79.7% were Croatian, 6.7% Bosnian, 3.4% Serbian-Montenegrin with 8.6% unknown. The 14,430 migration loss of Croatians between 2009 and 2012 was determined to a lower extent by regional trends (e.g. returning refugees). From the 45,376 emigrants 85.1% were Croatian, 4.3% Bosnian, 0.8% Serbian, 0.4% Macedonian and 4.6% unknown. In case of the 30,946 immigrants, the picture is more varied: 67% had Croatian, 11.3% Bosnian, 3.2% Serbian,

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2% Slovenian, 1.9% German, 1.7% Macedonian, 1.5% Chinese, 1.1% Italian and Russian passports. Between 2002 and 2011, three counties were net receivers in every year (Zadar, Varaždin and Zagreb). As a whole, the population of 13 counties was increased by international migration. Based on data per thousand people, we can say that the population in four Adriatic counties (Zadar, Dubrovnik, Split, Istria) increased annually on average by 2.7–4.4 people per thousand, while this figure was 1.4–1.8 in the other coastal counties and the capital city's region. The annual average was +0.3 in all four Northern counties. The +1.1 value in Slavonski Brod can be considered significant. From among the seven Slavonian donor counties, the losses of Osijek were the lowest (–0.1), and the decline in Sisak the highest (–2.4). Lika, considered a net sending county from 2005, was characterized by the most severe emigration (average –2.7 people); the trend reached its peak with –9.3 people in 2009.

Table 2

Migration balance (per thousand people) in Croatian counties, 2002–2011

County	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bjelovar-Bilogora	–1.8	–2.2	–3.0	–3.3	–3.3	–4.1	–2.2	–2.9	–5.2	–6.4
Slavonski Brod-Posavina	–0.9	–1.8	–1.5	–0.9	–1.9	–1.1	–1.1	–5.7	–4.1	–4.3
Dubrovnik-Neretva	2.7	2.1	4.4	4.0	4.3	4.1	5.8	3.9	–1.7	–1.3
Osijek-Baranja	0.0	0.1	–1.3	–1.9	–2.6	–3.3	–1.0	–1.8	–2.0	–1.8
Istria	7.7	8.5	7.0	6.8	6.8	6.4	6.5	3.2	0.4	–0.4
Koprivnica-Križevci	–0.4	–0.7	–0.2	–0.6	–1.4	–0.2	0.3	–0.8	–0.9	–1.3
Karlovac	–2.3	–0.5	–0.2	–1.5	–2.6	–1.9	–1.7	–5.3	–4.0	–4.5
Krapina-Zagorje	–0.9	0.5	0.2	0.9	–0.4	–0.3	0.3	0.4	–0.4	–0.9
Lika-Senj	0.4	3.1	1.6	–1.0	–1.5	–3.3	–1.9	–10.2	–6.2	–5.8
Međimurje	0.1	0.2	–0.5	–0.6	–1.1	–1.0	–0.9	–0.1	–0.7	–1.3
Požega-Slavonia	–2.4	–3.7	–2.8	–3.8	–4.5	–4.2	–4.1	–7.6	–6.3	–8.8
Šibenik-Knin	6.3	5.6	6.2	6.3	8.1	3.7	4.2	–3.0	–6.7	–8.2
Split-Dalmatia	4.9	4.8	6.4	3.9	2.4	1.5	1.8	0.3	–0.9	0.1
Sisak-Moslavina	–1.2	–1.6	–1.7	–3.5	–4.0	–6.6	–5.5	–8.9	–7.8	–9.0
Primorje-Gorski kotar	3.0	3.4	2.9	3.3	3.1	2.5	2.1	1.0	0.8	0.8
Varaždin	–0.3	–0.2	–0.4	0.0	–0.2	0.8	0.7	0.3	–0.2	0.4
Virovitica-Podravina	–1.5	–2.1	–7.1	–3.2	–4.9	–4.6	–2.5	–8.3	–5.1	–3.8
Vukovar-Srijem	–4.2	–4.7	–3.9	–3.6	–3.5	–1.0	–1.2	–5.1	–7.1	–6.9
Zadar	9.3	9.9	10.6	11.5	12.1	9.4	8.3	4.3	3.8	4.4
Zagreb	10.0	10.6	8.5	8.2	6.9	6.5	5.6	4.0	2.7	2.7
City of Zagreb	–0.1	3.5	3.9	1.4	2.8	3.1	3.0	2.7	1.7	2.7
Croatia	*1.8*	*2.6*	*2.5*	*1.7*	*1.5*	*1.3*	*1.6*	*–0.3*	*–1.1*	*–1.0*

Source: author's calculation based on the data of the Croatian Bureau of Statistics.

In the case of county level migration, during the research period, the main target areas were Zagreb county (15,510 people) and the capital city (8,154 people). Further beneficiaries of the internal migration were the Northern region of the Adriatic Sea (15,374 people) and with only 88 people, the mountain area (Lika). It is interesting that despite international migration trends, Split and Dubrovnik are net senders in the case of county-level migration (–3,728 people). The internal migration affects the Pannonian region the most: the four Northern counties lost approximately 3,000 people, and circa 35 thousand inhabitants have left the Slavonian counties over the last ten years. The

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ability to retain population was weakest in Vukovar and Slavonski Brod. Throughout the last 10 years, the 10 Pannonian counties have constantly been donor counties, while four counties (Zagreb, Zadar, Istria, Primorje županija) have played the role of receiver. The relative indicators exceeded 4 per thousand only in the case of Zagreb and Zadar counties; the capital city rate was +1.0 annually on average. It has to be noted, that Lika, showing the least favourable demographic features had a positive value. The number of emigrants per thousand people was 0.2-1.4 in case of the four Northern counties, as well as in Split, Dubrovnik, Karlovac and Osijek counties, while in the six Slavonian counties, it was 2.6–3.8 (Table 2).

From the aspect of age structure, macro-regional specificities can be to some extent traced. The weight of the young generation is reflected in the relative values of natural productivity; however, there are also exceptions, (e.g. Istria, capital city), which are mainly explained by the large scale migration of people of working age. In the long run, the population pyramid is determined by the fact that there are only two counties (Međimurje, Zagreb), where the number of people under 15 years of age exceeds that of people above 65 years of age. By 2011, the young-elderly proportion was 86% country-wide, which majorly shifts towards the seniors in case of mountain area territories. The nation-wide rate of people of working age and dependents is 203.7%. Respective values of the capital city region, Istria county with a high GDP per capita level, the four Northern counties and the three regional centres, are better than 2:1, which is a result of the increased working opportunities. Dependency ratios are higher than this in the Slavonian counties and the Adriatic region, which can be characterized by a higher life expectancy.

Ethnic developments

Over recent decades, the proportion of people who consider themselves Croats has decreased in Croatia both in absolute and relative terms. At the time of the 1971–1991 censuses, the proportion of those of Croatian nationality was below 80%, which increased to 89.63 after the war and continued rising to 90.42% by 2011. This phenomenon was mainly due to the drastic drop in the Serbian population. There are eight populous nationalities in Croatia. The majority, the indigenous national minorities (Serbs, Italians, Hungarians, Slovenians and Czechs) can be characterized by a continually declining population due to various reasons: natural decline, assimilation and emigration. Three national minorities show an opposite trend: the number of Bosnians, Albanians and Roma not only increased because of the high fertility rate, but also as a consequence of immigration and weak assimilation. Based on their demographic specificities, the single minorities can be classified in clearly separated groups; their spatial location (despite their relatively small proportion) explains certain county level demographic specificities. Considering their average age, larger ethnic groups can be classified as follows: the Roma (21.9 years of age) and the Albanians (32.4 years) can be considered the youngest, while the oldest are the Slovenians (59.7 years), Serbians (53.1), Hungarians (50.7) and Italians (50.3). These features are reflected in the data of the population pyramid and the dependency indicators. The outstanding values of the

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working age population (75.8% and 71.3%), show that mainly Bosnians and Albanians of working age have moved to the country during the last two decades.

From among the counties in Istria, where regional identity's census affiliation has been favoured for a long time (12.11% of the population of Istria county indicated in 2011 as well their regional identity), the proportion of Croatian nationals (68.33%) is the lowest, while Krapina county is inhabited almost only by Croats (98.84%). The proportion of Croats is 89.3% in towns (with extreme values varying in the interval 1.78–100.0%), in cities the respective value is 90.1% (48.73–99.31%), while in districts of the capital city, it is 93.14% (87.0–97.3%). There are only 22 towns and one small town (Buje, Istria) in Croatia, where the proportion of Croatian nationals is below 50%. These are relatively small settlements; their average population is below 3,000 people. Mainly Serbians and in unique cases Italians, Hungarians and Czechs form the most populous ethnic groups. Considering the extreme values in the counties, the Serbian population of Vukovar, Lika, Sisak, Šibenik and Karlovac exceeds 10% (the maximum is 15.5%), while their proportion is below 1% in Varaždin, Međimurje županija, Krapina and Zagreb counties. The geographical situation of Bosnian, Albanian and Slovenian nationalities are explicitly dispersed. The Roma population lives mainly in Međimurje županija and the capital city, Hungarians in Osijek-Baranja županija, Czechs in Bjelovar county and Italians in Istria.

Settlement network, urbanization

The settlement network has reflected spatial consequences of natural, demographic, historic, social, economic and political developments at all times, while it is forming the basis for future efforts that can only hardly be changed in the short run (e.g. by planting new industrial or administrative funcions). The settlement network, as a system synthesizing the impacts of different factors, is relatively stable, and is mainly formed over the long term. However, certain elements (e.g. administrative system) can be modified by an individual decision (e.g. by the introduction of a new territorial administrative system). There were three groups of factors that affected the Croatian settlement network significantly, although, not to the same degree: the complex physical geographical environment, the "empire chaining space" character (state borders, frequent changes of power centres, continuous rearrangement of the core territory) and the ethnic-cultural specificities. By the time of Croatia's independence, from 1991, new, nation state-like developments were unfolded relating both to urban policy and urban development. These changes could be seen first in the capital city; later, cities and towns along the new state borders also had to face a new situation. The developments, after the breakup of Yugoslavia, have unfolded in an entirely different way and political framework than previously; the socio-spatial, economic, political, and development aspects were presented in a new manner. Consequently, we will examine the changes in the settlement network compared to the 1991 status quo.

When, in 1992, Croatia returned to its historical traditions, it brought 70 municipalities with city rights into its new administrative system. In 1995, the number of cities rocketed and the number of municipalities with city rights increased to 122. Thus, the set of cities was established, and by 2011, it had grown to 127 (Figure 3).

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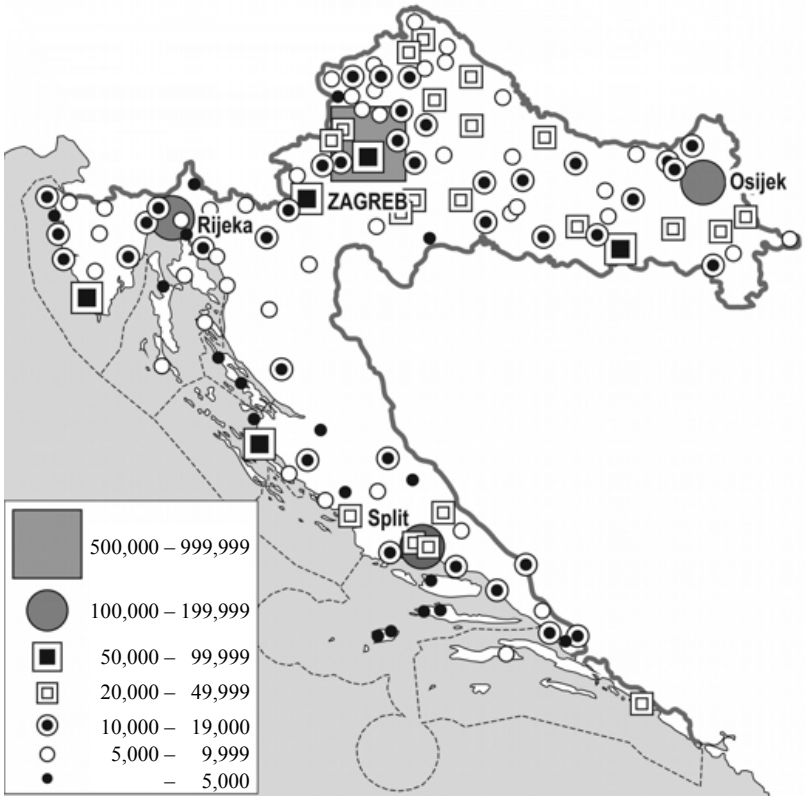
Figure 3

Croatian cities in 2011



Source: author's compilation based on census data.

A specificity of the Croatian settlement network is the disparity of the population and the high number of small settlements (Strategija 1997). Around one third of the population lives in settlements below 1,000 people, however, as many people live in cities above 50 thousand. The proportion of the urban population is around 55% (the national statistics publish slightly lower, the UN statistics slightly higher data) and the trend is slowly increasing. From among the Western Balkan countries, Montenegro and Macedonia precede Croatia in this aspect; however, even their indicators are lower than the EU average. When studying the structure of the settlement network, initially it can be concluded that the number of settlements has barely changed over the last 20 years. The distribution of the population according to settlement size shows the following trend in the 1991–2011 timeframe. Depopulation is a characteristic feature of the Balkans including Croatia. The number of depopulated settlements continues to rise: while in 2001 there were 105 such settlements, 150 settlements (2.22% of the total number of settlements) were uninhabited by 2011. The proportion and population of settlements under 100 people is increasing. This is one of the settlement sizes, which represents an

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opposite trend to the county level population decline. A parallel process is the weight loss of settlements between 100 and 1,000 people, both in relative and absolute terms, i.e. both their proportion in the urban network and their population are decreasing. The 2,653 settlements with a population below 100 are mainly located on the Istrian peninsula, the 30–80 km radius of the capital city, the Slavonian Mountains and in the islands and peninsulas of Kvarner and Central-Dalmatia. The 3,424 settlements between 100–1,000 people form the primary structure of the settlement network, meaning, that they are relatively evenly distributed across the country, with one-fourth of the population living in such settlements. According to national trends, the proportion of the settlement category s between 1,000 and 10,000 can be considered stable. The population of settlements between 1,000 and 5,000 has been declining. The group of settlements of 5–10 thousand has barely changed over the last twenty years.

The number of settlements below 10 thousand (39) – with only one exception – has also not changed in the 1991-2011 timeframe. The population of settlements fulfilling the formal criteria of cities by themselves – in light of the national demographic features – has been decreasing. Within the larger settlement categories (notwithstanding whether they are catagorised at 20, 25 or 30 thousand inhabitants) there has been only a slight shift, due to the category change of 1 or 2 settlements. Zagreb, as a settlement (the capital city's local government integrates 70 settlements) provides home for an increasing proportion of the population. In 1991, Zagreb incorporated 14.77% of Croatia's population; twenty years later the respective value was 16.06%. Despite the phenomena of natural population decline and suburbanization, this means that the population of "inner" Zagreb, in absolute terms has barely changed.

There are significant differences between the counties considering both the urban network and urban population. While, in Adriatic counties, we have 5–16 cities, in Slaviona, the number of cities per county varies between 2 and 7.

Economic development

Regional disparities can be considered normal in case of a country whose territorial features are as diverse as Croatia's. This versatility facilitating different income opportunities can be considered an asset from an economic viewpoint. Physical geographic features basically determine the spatial structure of an economy, however, this relationship is not always deterministic. Agriculture is the traditional field of activity in the Pannonian territories; whereas cities serve as industrial and service centres (the plain facilitates larger population concentrations). The service sector is dominant in the Adriatic region; the most important business branch is tourism (its weight is very considerable within the national economy). The principal port cities' significant activities are shipbuilding, fish processing and energetics, the role of agriculture is secondary. A specificity of the urban network is that the population (and business) is concentrated in two large cities on the coastline, while small villages are characteristic of the surrounding countryside and islands. Forestry, animal husbandry, and to a limited extent, industrial activities are most characteristic of the Dinaric mountains. The mountains are scarcely inhabited; they are in a demographically unfavourable situation: the settlement network is scarce and the population of towns does not reach ten thousand (Figure 4).

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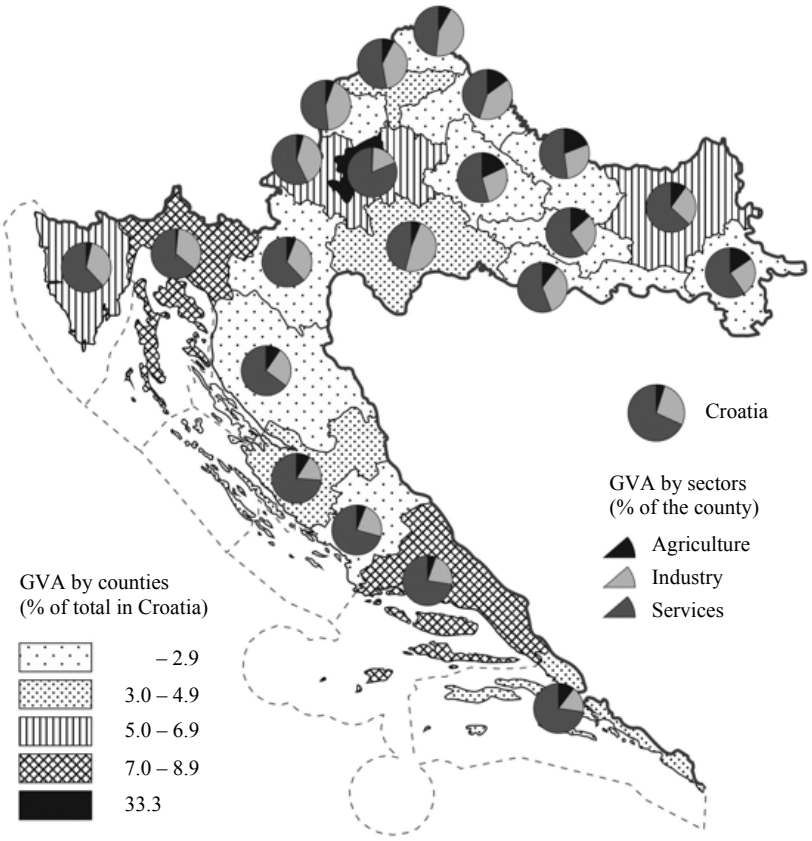
Figure 4

Proportion of Gross Value Added in the main economic sectors in Croatian counties, 2010



Source: author's compilation based on the data of the Croatian Bureau of Statistics.

Historical regional differences that were accentuated by the transition period (Sić 2003, Lovrinčević–Mikulić 2012) and the damage caused by the Balkan war were of different extent and character. The developments after the turn of millennium, the Euro-Atlantic integration (Karaman Aksentijević–Ježić 2011, Koči-Pavlaković–Pejnović 2005, Puljiz–Maleković 2007, Škuflić et al. 2010), the increasing FDI inflows (Škuflić–Botrić 2009), and eventually the economic crisis were all factors that necessarily caused the deepening of (social and economic) development borderlines within the country that can be interpreted on several territorial levels.

Just as in other countries of the region, the economic controlling role and power of the capital city and its region are outstanding; they attract both population and business. Zagreb is the only metropolitan area in the country; it is an economic, intellectual and transport centre. The capital is Croatia's most important growth pole: 18% of the population, 19% of the employees, 25% of industrial output, 33% of GDP, 53% of university students and 67% of new investments are concentrated here.

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The three developed macro-regional centres – Split, Rijeka and Osijek – form the second line of the urban network; their features are different due to their geographic location. Split is one of the determining factors in Dalmatia's development (its contribution to GDP is 8.8%) and there are several towns in its agglomeration. Its industrial capacities are significant; the development of tourism is beyond average. In its hinterland, Bosnia might be a potential link; it is also the city that provides the major part of the Croatian ferry service towards the Italian Ancona on the other side of the Adriatic Sea. Rijeka is the traditional centre of the nation's maritime economy (port industry, international freight transit). Its performance could be ameliorated significantly by the formation of a potential Serbian or Bosnian link; however, from a transport geographical perspective, its situation is less favourable than those of Trieste or Koper. This region is the leading tourist region in Croatia with its features well exploited. This is underlined by the fact that for decades – besides the capital city – only the GDP per capita of Istria and Primorje županija has exceeded the national average. The respective contribution of these counties to the GDP is 8.4 and 6.2%. While the two large Adriatic cities open windows towards several regions of the world, Osijek is a window towards the Carpathian Basin. Onthe edge of the war, the economic and intellectual centre of Slavonia suffered severe damage. Following the geopolitical reorientation, the region become a periphery, and in its development lags behind (in 2010, 5.4% of Croatia's GDP was produced here), especially in contrast to the capital city and the littoral cities that "reinvented" themselves (Faragó–Rácz 2011).

From the time of the millennium, Croatian territorial GDP data has been available. The NUTS2 level statistics cover significant internal differences, especially in case of continental Croatia, which is inhabited by almost 3 million people and includes the capital city (DZS 2012a, 2013b). Considering the trends, the GDP production of Zagreb is becoming increasingly more significant in a national context; at the turn of millennium it was 29.2%, at the beginning of the crisis 31.4%, while it reached 33.33% by 2010. The Adriatic NUTS 2 region had been increasing its economic weight by a growth rate of annually 9% up until the time of the crisis; from the 31.1% of 2000, it grew to 32.5% by 2007, and this level was also maintained after the drop. The areas of Zadar, Split, Šibenik and Dubrovnik played a catalyst role in GDP growth. From 2001 until the beginning of the crisis, Rijeka's growth reflected the national average, a phenomenon which was due to the city's relative underdevelopment; the other counties started their development from a substantially lower level. In the 2000–2008 period, the Pannonian counties – except for Osijek – had shown a GDP growth below the national average. The crisis augmented the development disadvantages; the drop back in the continental counties was 8–18% between 2008 and 2010 (except for Sisak). Considering the whole time period of 2000–2010, we can conclude that the GDP growth in the capital and the five Adriatic counties was above the national average, while Dubrovnik, Zadar, Šibenik counties and Zagreb doubled their gross product despite the crisis. From among the Pannonian counties, the performance of Zagreb was the highest; it was somewhat higher than in Međimurje županija and (Primorje županija). The nominal growth in the other continental counties (including Lika) was between 133.3 and 168.6%. The Pannonian territory without the capital city had suffered severe damage within one decade, and the pace of development was lagging behind the Croatian average. The crisis hit this region harder than most, therefore its contribution to the Croatian GDP continued to decrease (2000 – 39.5%, 2010 – 34.1%).

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The GDP per capita throughout the last decade has more than doubled, with the growth in Zadar, Šibenik and Split above the national average. Compared to the national average, Zagreb has also increased its lead above this this indicator (despite the population growth): from 166.5% (2000) it has grown to 185.4% (2010). Dubrovnik can be considered the only convergence county that could keep up with the capital city; this is mainly due to the rapidly prospering Southern Dalmatian tourism. Slavonski Brod and Vukovar had been the poorest counties for years; they are lagging behind even after the post-war reconstruction, they barely exceed the half the Croatian GDP/capita or the 30% of the EU27. It is only the capital city that exceeds the average development level of the EU member states *(*Table 3*)*.

The most competitive counties (Singer–Lenardić 2011) are the capital city, Zagreb, Varaždin, Međimurje županija and Istria. In a national context, Virovitica, Požega, Slavonski Brod, Vukovar, Sisak and Lika were uncompetitive before the crisis and in 2010. When considering the net average wages, the position of Varaždin and Međimurje županija are outstanding in the competitiveness ranking. The average salary is significantly higher in the coastal region than in the continental counties. Zagreb ameliorates the national average substantially; practically, the capital city is the only county where the average income exceeds the national level.

Table 3

Economic information on Croatian counties

(%)

County	Per capita GDP, 2000	Per capita GDP, 2010	Registered unemployment rate, 2011	Gross investment in fixed assets, 2011	Export, 2011	Import, 2011
Bjelovar-Bilogora	75.0	66.8	150.8	0.8	1.0	0.7
Slavonski Brod-Posavina	61.0	53.3	177.0	0.8	1.3	1.1
Dubrovnik-Neretva	89.9	104.0	98.4	1.3	0.3	0.3
Osijek-Baranja	77.9	75.0	149.2	5.4	4.9	2.6
Istria	131.1	128.2	60.2	4.9	10.0	4.5
Koprivnica-Križevci	101.7	80.4	97.9	1.0	2.6	1.1
Karlovac	78.7	73.6	130.9	1.7	2.1	1.1
Krapina-Zagorje	75.7	60.5	95.3	1.0	3.2	1.5
Lika-Senj	83.9	82.3	116.8	0.4	0.1	0.1
Međimurje	82.2	78.4	88.0	1.1	4.1	1.9
Požega-Slavonia	72.9	60.2	137.2	0.5	1.0	0.4
Šibenik-Knin	71.7	78.4	122.0	1.2	2.2	1.4
Split-Dalmatia	79.3	80.3	125.7	4.7	6.3	3.8
Sisak-Moslavina	94.1	83.1	161.8	1.1	5.6	1.8
Primorje-Gorski kotar	129.4	122.7	82.2	5.9	6.1	4.7
Varaždin	91.5	81.6	78.5	2.2	7.6	3.4
Virovitica-Podravina	73.8	58.4	170.2	0.5	1.0	0.5
Vukovar-Srijem	58.6	54.9	168.6	1.7	1.6	1.1
Zadar	74.3	81.4	109.9	2.2	1.8	0.9
Zagreb	79.6	71.2	94.2	3.5	3.1	7.7
City of Zagreb	166.5	185.4	49.2	57.9	33.2	58.3
Croatia	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Croatian Bureau of Statistics.

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Labour-market trends

Yugoslavian labour had been characterized by a relatively higher proportion of professionals than in the other socialist countries, this applied to the major part of the population in the more developed member states. The percentage of high school and university graduates is continually increasing in Croatia. In 2011, the proportion of people with at least secondary education was 69% (Babić et al. 2006). According to the statistics, the chance of getting a job is higher with a higher level of education both in Europe and Croatia. The level of employment – barely exceeding 50% – is significantly lower than in other EU member states in the region, and currently it is the lowest in the EU28. As a consequence of the economic crisis, the employment rate, following a short catch up period at the time of the millennium, dropped back significantly. Some 38.7% of those with primary level education, 59.7% of secondary school graduates and 76.9% of tertiary education were employed in 2012. The employment rate of the age group 25–39, just like in the other European countries, exceeds the respective indicators of the 40–64 age group; in Croatia this difference is twice as high as the European average: this can be considered a kind of Central and Eastern European specificity.

Macro-regional specificities of education are shown by the fact that the education level in the continental counties (including Lika) is typically lower than in the coastal region. The capital's position is unique from this point of view: this is the only region, where the number of university graduates exceeds the number of people with maximum primary education; a phenomenon which reflects Zagreb's leading position and development potential. Regarding Ph.D. holders, 86% are concentrated in the regional centres, in the regions of the four university cities. The proportion of people with a doctoral degree in smaller university cities (Zadar, Dubrovnik, Pula) is also significant. The number of people without even primary education on a national level is 171 per ten thousand people. The respective data in the Slavonian counties are lower (Vukovar 348 people), as in certain Adriatic counties (Šibenik 397, Zadar 290, Lika 249, Split 198 people). The four Northern counties, the capital city's area and the more developed Adriatic counties form the other extreme (Zagreb 73, Istria 72, Primorje županija 67 people).

The impacts of the economic crisis can be clearly traced when looking at the development of the unemployment rate. The number of job seekers had been continuously decreasing until 2008; by 2009, Croatia approximated the EU average. However, by the 4^{th}–5^{th} year of the crisis, unemployment doubled. In contrast to the European average, the impacts of the crisis on Croatia were stronger and more continuous. Currently, only Spain and Greece precede Croatia regarding the unemployment rate. The situation is the same when considering the ranking by long-term unemployment and the unemployment of people below 25 years of age.

The county data show macro-regional co-movement, which is consistent with the education and economic development. Unemployment is highest in the seven Slavonian counties: it is around 130–180% of the Croatian average. The Capital and Istria are the most developed territories traditionally; the unemployment rate in these regions is half the national average. The indicators of the four Northern counties and Zagreb county (Central Croatia), are below the national average. Dispersal of the coastal counties' data

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is significant, besides Istria and Primorje županija, the indicators of Dubrovnik showed rather favourable developments, while the unemployment rate in Lika, Zadar, Šibenik and Split is continuously above the Croatian average. In contrast, the Slavonian counties lag behind these favourable developments. Those counties have been worst affected by the financial crisis, where the proportion of industries exposed to the world market (tourism, export-oriented activities) was higher, i.e. Zagreb and its region in a broader sense (Central Croatia), Istria and Primorje županija. There were only two counties where the increase in unemployment due to the crisis was not continuous; at this time, there are no signs of long-lasting recovery. Presumably, a lasting decrease in the unemployment rate will only follow in the most developed regions.

Development of priority sectors

Croatia developed its highway network with unprecedented speed throughout the last decade (1998 – 330 km, 2009 – 1244 km), in order to strengthen both its tourist and transit potential, and its internal cohesion (the passenger transport "modal split" in passenger kilometres: 85.4% car, 9% bus/trolleybus, 5.6% train). The network is Zagrab focused; however, it facilitates fast transportation around the whole country. The Adriatic A1 highway – which currently ends by Ploče – has already had some visible results: both tourist arrivals and the value of real estate has increased in Dalmatia (Sić 2009). The Adriatic Highway's layout helped to open up several peripheral areas, for example, the scarcely inhabited županija of Lika, and in addition, it provided connections to the national network for the coastal resorts of Zadar and Šibenik, so they could improve their positions in the national ranking. From among the transport modes – due to the country's location – maritime and coastal water transport can be considered relatively healthy. Goods traffic in tons transported is concentrated in the following ports: Omišalj, Split, Rijeka, Ploče, Bakar. In 2011, the ports with the highest traffic were Split, Dubrovnik and Zadar. Due to the post war tourist conjuncture, air passenger traffic doubled between 2001 and 2008, then, after a brief drop, it has stabilized around 5-6 million passengers; one fifth of the flights are domestic. In 2011, the airports with the highest passenger traffic were Zagreb (2.2 million people), Dubrovnik and Split (1.3 million people). The above quarter-million passenger traffic of Pula and Zadar is also significant (DZS 2012b). The proportion of low-cost flights is noteworthy in the coastal towns. Tourism has been a traditional key area of Croatia's national economy. Throughout recent years, according to the satellite accounts of tourism, this industry has provided nearly one fourth of the GDP and employs 27-29% of all employees. Although the country's features are very diverse (national parks, cultural heritage sites, medicinal waters), tourism is still concentrated in the Adriatic region (95% of the overnight stays). Tourism in Central Croatia is linked to the capital city.

Croatia, after the internal political turnaround, trod the path to Euro-Atlantic integration only after the turn of millennium. Consequently, foreign investments showed a significant lag in comparison to Slovenia and the Visegrád countries. Both war reconstructions and competitiveness investments were facilitated by the newly opened support opportunities. Nine- tenths of Croatia's foreign trade is carried out with European countries. Traditionally, the main foreign trade partners of Croatia are Italy, Germany,

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Slovenia, Austria, Bosnia-Herzegovina and Hungary. Considering imports, Russia and China are the most important players. A continuous problem of Croatian foreign trade is the significant deficit; the value of imports is more than double that of exports. The export weakness is due to the omitted and belated investments, the relative lack of capital and the (overvalued) exchange rate of the Kuna. The foreign trade balance is only positive in two product groups - beverages and tobacco, and crude materials except fuels. Similarly in the case of services, (mainly travel, transport and business services. The foreign trade deficit is the highest in the high value added industries, apart from some successful sectors (Lux 2013). This is also supported by the county level export trade data. The most significant corporations operate with Zagreb headquarters (one third of all active companies were registered with capital city head office), the Capital "produces" more than nine tenths of the foreign trade deficit. Only counties of some successful industrial centres (Sisak – petrol chemistry, Istria – ship building, tourism, Varaždin – light and food industry) can ameliorate the trade balance to a significant extent.

Conclusion

Croatia, despite its relatively small territory, is composed of counties that can be characterized by striking differences. This is mainly due to the country's unique geographic location and the particular shape of the state territory. The state territory integrates regions, whose relations are different in many aspects and which partly overlap. The natural, social and historical factors' space forming effect is relatively high; although, there is no one determining spatial shaping effect. However, certain regional differences can be considered normal in the case of Croatia. The historical differences have been accentuated during the transition period (state forming, Balkan war). The developments after the turn of millennium, the Euro-Atlantic integration, the increasing FDI inflows, and eventually the economic crisis were all factors that inevitably caused the deepening of development (social, economic etc.) borderlines within the country that can be interpreted on several territorial levels.

This study reviewed the most important factors, based on which it can be determined whether individual counties and cities were winners or losers of the different social and economic developments of the last decade. On a macro-regional level, we can conclude that Croatian development has undergone a partial orientation shift, this has led to the coastal territories and the capital city region forging ahead, while the Eastern part of the country, Slavonia, has benefited least from the regional processes. Just like the neighbouring Post-Yugoslav and Central European countries, the role and development of the capital city is becoming increasingly more dominant.

This research could be further developed by an examination of the "new era". This time frame is characterized by European Union membership, as well as by the post World economic crisis situation. It is a question as to how individual, corporate and inter-state relations will be shaped within the framework of protectionism (nationalism) and European territorial cooperation. What are the consequences of the different responses to the challenges? The in-depth examination of trans-border cooperation might provide an answer to the question that on what level and to what extent did territorial relations start to reorganize. In the 2007–2013 programming period, Croatian trans-border cooperation

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with EU members represented more than 85% of the CBC programmes. Strengthening of the bilateral programs with non-EU members was constrained by a number of factors (EU integration and institutional circumstances, socio-economic potential, mistrust), and raises the question regarding the possible timeframe for further significant changes.

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Socio-cultural Cleavages in Europe*

Abstract

This paper investigates socio-cultural differences among European countries. The theoretical roots of our defined socio-cultural dimensions are elaborated in a multidisciplinary field. According to the considerable scientific literature, various socio-cultural aspects such as trust, tolerance, civic norms and social networks have a serious impact on the development potential of a country or a region. We empirically tested the characteristics of these socio-cultural aspects on the European Social Survey database. The main conclusion of the paper is that there is a definite socio-cultural cleavage between the northern/western and the Central and Eastern European countries.

Keywords: Socio-cultural differences, Europe.

Introduction

The paper examines whether socio-cultural differences are discernible among various areas of Europe. The question has an interdisciplinary relevance, as much cited publications with economics, sociological, historical, political science or regional science approaches have also dealt with this topic (for example: Fukuyama 2007, Hofstede et al. 2010, Huntington 2005, 2014, Inglehart–Norris 2003, 2004, Inglehart et al. 2004, Knack–Keefer 1997, Norris 2012, North 1990, Putnam 2000). These studies revealed positive correlation between the analysed countries/nations socio-cultural development and their progress in economic, democratic issues. From one perspective, because of the general correlation, it would be easy to embed the research question theoretically, however, the issue is complicated by the many different approaches that exist. The motivation behind the work was to empirically test if there are any socio-cultural gaps between the selected European countries. It could be argued that this paper simply aims to justify "old evidence", as there are well-known differences between the European countries, mostly between the "western" and the "post-

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socialist ones" (e.g. Adam 2007, Fidrmuc–Gërxhani 2005, Halman–Voicu 2010). However, Popper's "falsificationism" epistemology warns us that a scientific statement has to stand the probe of testability again and again. Thus, if this paper does not reveal any, so far unknown results, the findings themselves necessarily have to be new because of the research's own methodology and dataselection. Consequently, instead of an in-depth theoretical explication, the focus was more on the task of elaborating an adequate approach to the analysis of the national socio-cultural environment on as broad scale as is possible, relying on the European Social Survey's (ESS) latest, 6th wave data. The results of recent Hungarian papers on this research topic also support our belief that disparities in Europe, and Hungary's characteristics regarding these trends, constitute an important issue requiring thorough study (Albert–Dávid 2012, Boda–Medve–Bálint 2012, Giczi–Sik 2009, Hajdu 2012, Keller 2010, 2013, Tóth 2009).

Prior to covering the methodological and empirical details, the choice of title requires clarification. Instead of 'social capital', the term chosen is 'socio-cultural', although it has a root in psychology (Vygotsky 1978, Cole 1996, Wertsch 1991, 1998). Socio-cultural theory explains how the mental functioning of the individuum is related to a complex cultural, institutional, and historical context. This perspective focuses on the roles and effects that participation in social interactions and culturally-based activities have on individual psychological development. Based on this approach, it is important to emphasize that the socio-cultural environment is not just determinative, but barely changeable. A point that is often doubted by some social capital researchers.

For a similar reason, 'cleavage' is used as a key phrase, despite the term's attachment to political science (for example: Inglehart 1977, Lijphart 1984, Lipset–Rokkan 1967, Neto–Cox 1997, Rae–Taylor 1970). If it is true that cleavages between a given state's communities have an influence on electoral behaviour, affiliation (which school, union, club, or newspaper to choose) as well on societal identity-creation, then major socio-cultural gaps between different societies could have broad economic and politically related consequences. Thus, the meaning of our 'socio-cultural cleavage' is not disharmonious with the original phrase comes from political science.

Dimensions to Be Examined

We have specified nine dimensions essential for describing socio-cultural characteristics. These are not without scientific antecedents, as most of them are frequently used in different areas of research. However, the following dimensions are not typically used together in one analysis. We chose this approach for two reasons. First, we would like to examine the socio-cultural characteristics on a wide scale, to ensure that the outcomes are more in accordance with reality. If we accept that these well-known dimensions are equally relevant, then to leave out any of them would be a mistake. Secondly, we agreed that if these socio-cultural characteristics are harmonising, then they strengthen each other, and by this, the measured outcome of a given country. However, if they are disharmonising, it is also a significant result as it confirms the authors belief that with just one or two aspects, it is precarious to conclude a comprehensive finding in the socio-cultural environment.

The dimensions, which based on previous studies' methods, are the following: 1) generalised trust, 2) institutional trust, 3) political participation, 4) civic participation,

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5) relational capital, 6) tolerance, 7) happiness and life satisfaction, 8) satisfaction with public affairs, 9) personal freedom of choice over fate. A brief overview of their meaning here is outlined.

Generalised trust (social or interpersonal trust) is a frequently used indicator to measure socio-cultural characteristics. It refers to our expectations about the behaviour of any member of a community or society. How an individual can have trust in another, what people think about others, are they fair in any interactions, or do they care about more their own interests (see for example: Bjørnskov 2006, Hooghe et al. 2009, Kim 2014, Kuovo 2011, Reeskens–Hooghe 2008).

Institutional trust is another term often used in describing socio-cultural contexts. It gauges the confidence of individuals in various institutions, including political (parliament, government, local self-government, president of the republic), judiciary (constitutional court, courts of justice), law enforcement agencies (police, military), and supranational co-operations (European Union, United Nations, NATO) (see: Bäckström–Edlund 2012, Boda–Medve-Bálint 2014, Dekker 2012, Halapuu et al. 2014, Hutter–Braun 2014, Newton–Norris 1999).

We believe social cooperation to be a socio-cultural aspect of similar importance. To describe this we use the following three dimensions. *Political participation* means here the activities of individuals intended to safeguard their interests at a political level or to accomplish a political goal. Hence, it is about the intention to take part individually in a politically motivated collective action, and by this, how people are ready to take a share in collective responsibility (e.g. Alesina–Giuliano 2009, Norris 2003, Stolle et al. 2005).

Civic participation differs from it in the non-political character of the activity. The general meaning behind this indicator is the similar to the previous one; however, the nature of the activity slightly differs. It is more about voluntary "sacrifice" for the community, about individual commitment and engagement for the collective good, about solidarity, and joint efforts for non-political common goals (see: Angermann–Sittermann 2010, Howard–Gilbert 2008, Staetsky–Mohan 2011, Stolle–Howard 2008).

Relational capital is also a dimension of importance. It expresses the density and intensity of social interactions and the cohesion of a given society. It is not just about individual's social network and how extensive these links are, but more about the primary purpose of these relationships. Are these interactions frequent and intimate, do they contribute to the cohesion and collective strength of the community; or are these relations more for individual interests and to gain different benefits? (Giczi–Sik 2009)

Tolerance is also an important dimension in the research. Although it has been rarely researched empirically in Hungary, it is not without antecedents (Florida 2001, 2002, 2005, Florida et al. 2007, Florida et al. 2009). If we accept the view that the level of openness and the acceptance of others can be deduced from the level of generalised trust, then tolerance might become an important factor in refining the picture. The term usually refers to social norms like equal rights for men and women; the level of acceptance of ethnic, national and religious minorities; accepting homosexuals and lesbians; attitude towards immigrants; acknowledging the freedom of various subcultures and respecting the views and opinions of those in political opposition.

The indicator of personal freedom of choice over fate has been used as a relevant socio-cultural aspect in the Hungarian literature by Tóth (2010) and Keller (2010). Sharing their

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views, we also apply this term, meaning here the subjective perception of individuals about their opportunities for shaping their life. Specifically, their chances for self-education, promotion, happy relationships, a secure financial background and achieving their goals. We shall use this socio-cultural dimension as a "self-confidence indicator".

Although satisfaction cannot be regarded as a social value, norm or attitude, if we combine it with the dimensions listed, it can be very useful. Namely, satisfaction with one's private life or with public affairs (economy, politics) can be considered as a social resource, since higher levels evidently contribute to the efficacy of a society (Bureekul et al. 2011, Pedersen–Schmidt 2009, Rodríguez-Pose–von Berlepsch 2012, Tichy 2013).

Methodology

We shall analyse our dimensions with regard to the recent 6th wave of the European Social Survey (ESS), on the basis of its national data from 29 participating countries. From its official website, the ESS "is an academically driven cross-national survey that has been conducted every two years across Europe since 2001". The survey measures the attitudes, beliefs and behaviour patterns of different European societies. It contains standard and regularly changing questionnaire blocks, with altogether usually more than 200 questions, among them detailed ones about the interviewee's socio-demographic characteristics.

Our dimensions have been created using the method of principal component analysis (PCA) on individual level data. This methodology allows us to summarize the relevant information regarding socio-cultural indicators. Measuring the differences between the societies, we use the country PCA mean scores. To verify the significance of the observable differences in country scores, we applied the analysis of variance method (ANOVA) and its post hoc test. Values indicated in the figures are the original values of indicators transformed to a common scale within the dimensions.

The sum of the question-values represents the value of the dimensions in case of all countries. According to the methodology of the ESS, we used the weighted sum value.[1] In accordance with the requirements of additivity, we used the scale-transformation. The formula of the scale-transformation is: y=minB+(x-minA)*(maxB-minB)/(maxA-minA), where minA and maxA are the original scale minimum and maximum value; minB and maxB are the new scale minimum and maximum value. We used scale-transformation in case of the first question of tolerance (original scale was 1–5; new scale is 0–10), the second question of relational capital (original scale was 0–6, new scale is 1–7), the first question of civic participation (original scale was 1–2, new scale is 1–6), the third, 4th, 5th, 6th and 7th questions of happiness and life satisfaction (original scale was 1–4, new scale is 0–10), the 8th and 9th questions of happiness and life satisfaction (original scale was 1–5, new scale is 0–10).

The scale of generalized trust, where 0 – the minimum value – is low trust (a degree of passivity) and 10 – the maximum value – is high trust (active participation), was the base for cases where we had to change the question's minimum/maximum value for common

[1] Weighting European Social Survey Data(2014)
http://www.europeansocialsurvey.org/docs/methodology/ESS_weighting_data_1.pdf

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orientation. Thus, in our analysis the low values always refer to negative/passive, while the high ones to positive/active aspects.[2]

Forming Groups of Countries

All twenty-nine countries in the 6th round of the ESS survey have been included in our study, forming 5+1 categories. Three Scandinavian EU member countries (Denmark, Finland and Sweden) and two northern non-EU members (Iceland and Norway) have been classified as the "*northern group*". Based on their similar historical, political and cultural characteristics, they can legitimately be placed in the same group.

Seven countries are labelled as the "*western group*", of which six are EU members. Switzerland, the only non-member, belongs to this group due its French–German linguistic and cultural bonds and its embedded nature in continental Western Europe. The other six countries actually form three "pairs": Belgium and the Netherlands constitute the core of the three "Low Countries"; Ireland and the United Kingdom are in a kind of unity despite or because of their tense historical relationship; whereas, France and Germany are two dominant countries of continental Europe.

The "*Mediterranean group*" has been based on factors that include cultural bonds, similar historical, political and economic development paths, however close coherence among Cyprus, Italy, Portugal and Spain was not presupposed.

The Central and Eastern European (CEE) countries have been divided into two categories, based on EU membership and its presumable Europeanisation effects. The first one is "*CEE EU members*" including Bulgaria, Czech Republic, Hungary, Poland, Slovakia, Slovenia as well as two Baltic countries, Estonia and Lithuania. The other is the "*CEE non-EU members*" consisting of Russia and the Ukraine plus two Balkan countries, Albania and Kosovo.

Israel constitutes the +1 category, which is not European, but there are several and strong cultural, historical and social bonds between them. Most of its population has European roots in both the west and east, leading to a socio-cultural divide; although, the development path of both the country and its society is clearly "western".

Besides analysing the socio-cultural characteristics, the validity of the above classification based on the assumptions will be either justified or refuted.

Analysis of the Empirical Data

Generalised Trust

The ranking of countries based on generalised trust (Figure 1) clearly shows that trust toward people is the strongest in the northern group of countries, but is also strong in the western one. Most of the countries belonging to these two groups are ranked high. Two CEE EU members reach the threshold of the western group: Estonia closely follows Ireland, and Lithuania is not significantly behind Germany. At the same time, Belgium and

[2] We did this transformation related to some questions of the following dimensions: political participation, civic participation, tolerance, happiness and life satisfaction, and personal freedom of choice over fate.

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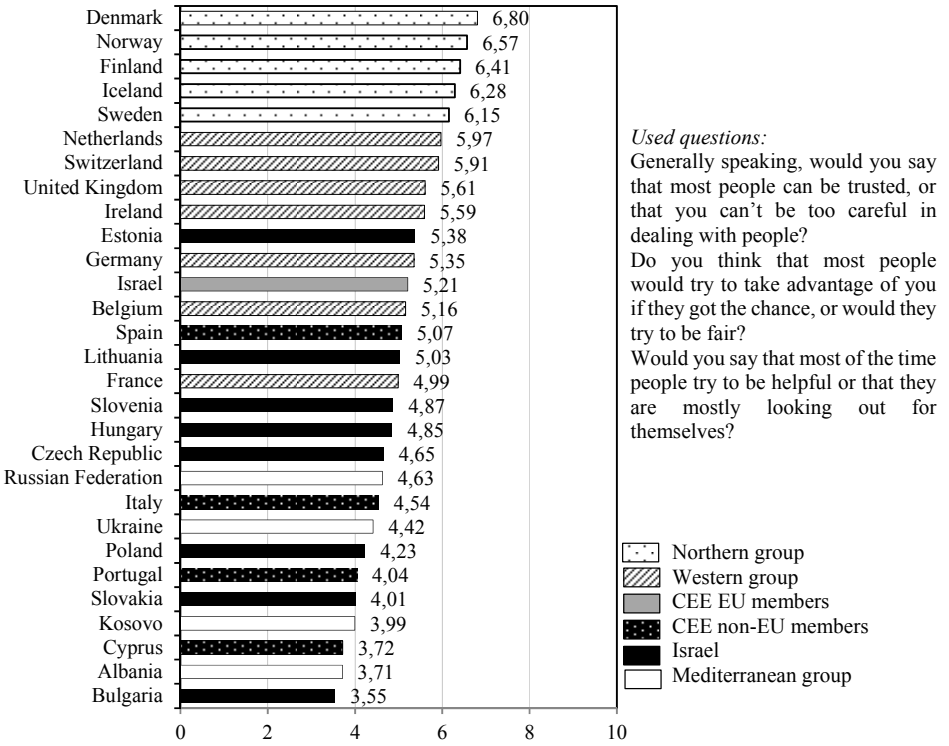
France are lagging behind the northern–western block with their values considerably lower than even that of Germany, which undoubtedly belongs to this block.

Figure 1

Countries ranked based on generalised trust (dimension values converted to 0–10 scale)



Source: compiled by the authors based on data from the 6th ESS round.

From among the Mediterranean group, only Spain is close to the western block, the others – that is Cyprus, Italy and Portugal – can be found among the Central and Eastern European countries having lower levels of trust. In the lower half of the ranking, the already mentioned Mediterranean countries are together with two from Central and Eastern Europe. Russia's value does not differ significantly from those of Czech and Hungary, but it is higher than the level of trust in Poland and Slovakia.

Based on the level of generalised trust, Israel is located between the northern and western groups, plus two Central and Eastern European countries.

Institutional Trust

Similarly to generalised trust, this indicator also ranks the northern and then the western countries at the top of the chart. However, France and Ireland do not belong to this block. They are closer to the CEE EU members, ranking relatively high, primarily to Estonia and Hungary, but they are not far from Lithuania and the Czech Republic either.

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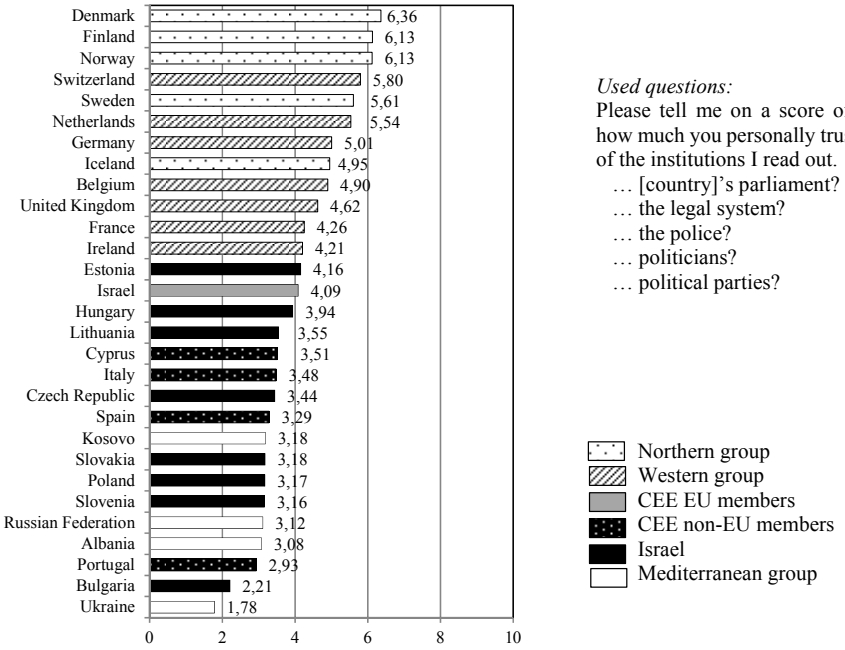
Figure 2

Countries ranked based on institutional trust (dimension values converted to 0–10 scale)



Source: compiled by the authors based on data from the 6th ESS round.

At the same time, the rest of the EEC EU members – namely Poland, Slovakia and Slovenia and particularly Bulgaria – are more like the countries belonging to the CEE non-EU members.

Institutional trust is not uniform in the Mediterranean group, although all these countries can be found in the lower half of the ranking. The values of Cyprus and Italy are significantly higher than that of Spain, while Portugal is behind all of them.

Israel's place is similar to the one it had in the case of generalised trust.

It can be concluded that in respect of both generalised trust and institutional trust, the citizens of the northern and the western, i.e. the "old", democracies have more trust in their fellow citizens and institutions than have those living in countries belonging to the other three categories. In spite of this, on the basis of the 6th round ESS data, we can find no substantial gap between various groups of European countries in these two dimensions, since the values of some western countries are similar to those of the CEE EU members. At the same time, it is also true that, except for "Mediterranean" Portugal, all other countries with low trust levels are "new democracies" from Central and Eastern Europe, some EU members, some not. Compared to its group members, Hungary has a relatively high level of trust.

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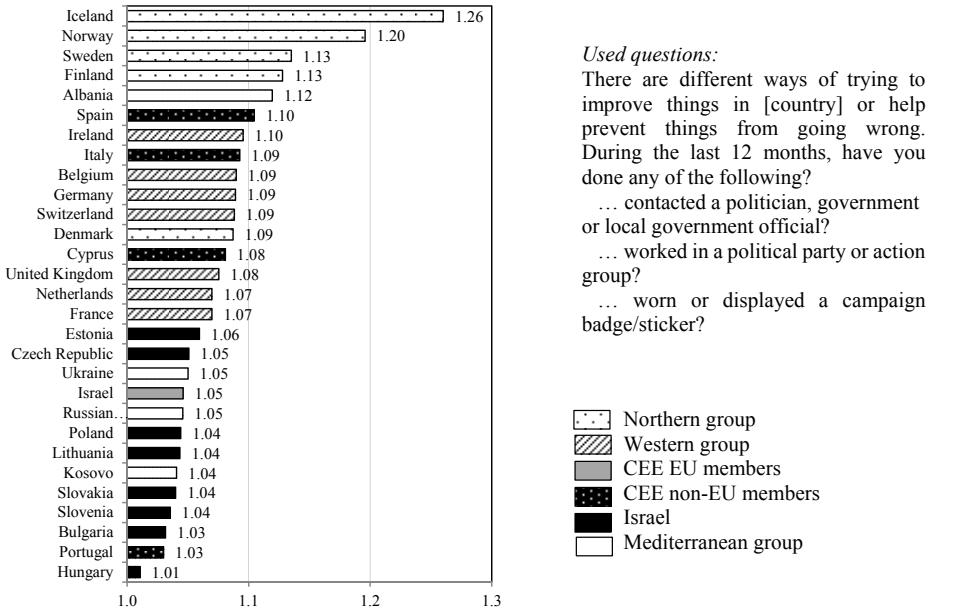
Political Participation

To measure political participation, – instead of the usually applied voter turnout – another indicator gauging "more active participation", namely, contacts with politicians, involvement in political organisations and in campaigns, has been applied.

Figure 3

Countries ranked based on political participation (dimension values converted to 1–2 scale)



Source: compiled by the authors based on data from the 6th ESS round.

The pattern here is similar to that found in the case of the two dimensions of trust, i.e. the top northern group is followed by the western one. Albania's high ranking, preceding almost all of the western countries, was a surprise. The values of this indicator in the Mediterranean countries (with the exception of Portugal) are much higher than in the case of trust, approaching the northern and the western groups.

The two Central and Eastern European groups of countries belong to the passive political participation category, with only small differences. Israel and already mentioned Portugal also belong here.

Civic Participation

Two aspects of civic participation were studied. The first includes active participation in civil society organisations and voluntary work. In this respect, the situation is similar to the previous one. Citizens of the northern and western countries are the most active, followed by the Mediterranean Spain and Italy. Israel can be found between the northern/western and the two Central and Eastern European groups.

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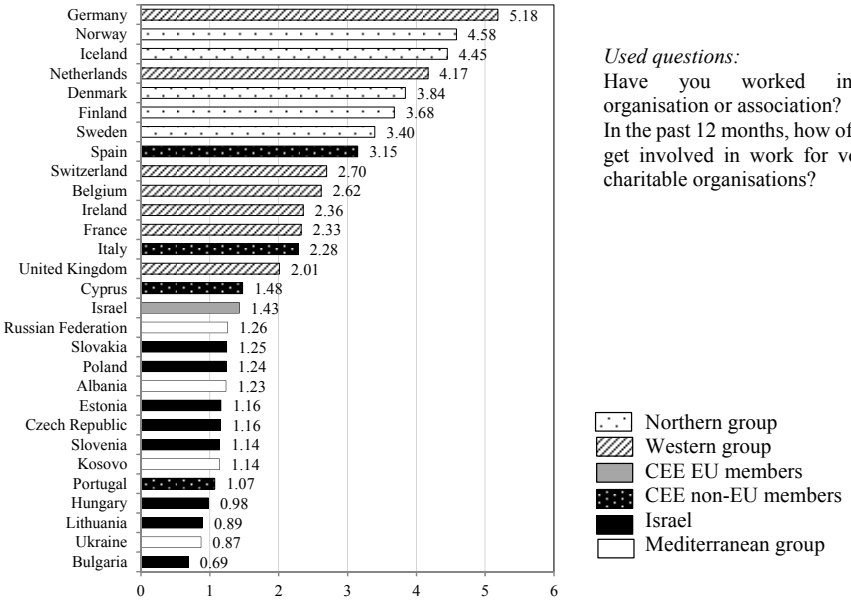
Figure 4

Countries ranked based on civic participation I. (dimension values converted to 0–6 scale)

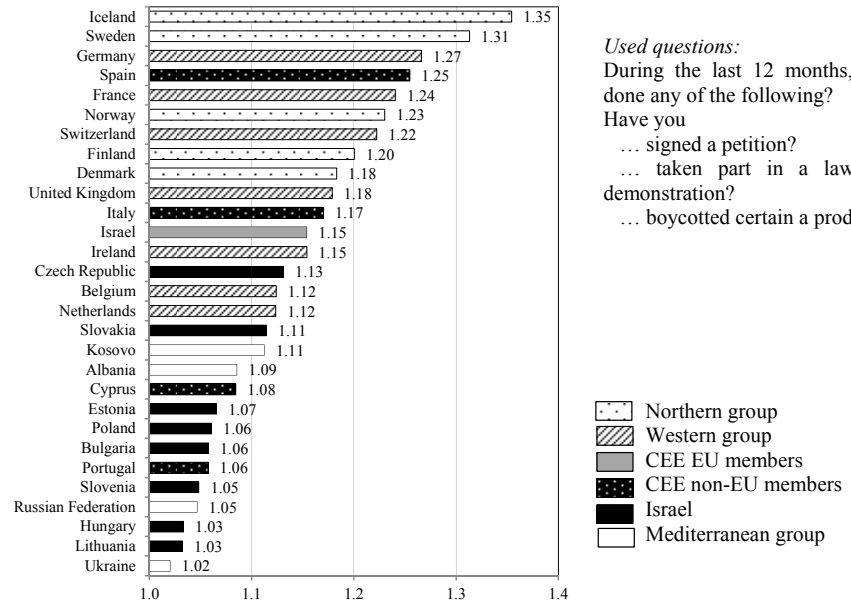


Used questions:
Have you worked in another organisation or association?
In the past 12 months, how often did you get involved in work for voluntary or charitable organisations?

Source: compiled by the authors based on data from the 6th ESS round.

Figure 5

Countries ranked based on civic participation II. (dimension values converted to 1–2 scale)



Used questions:
During the last 12 months, have you done any of the following?
Have you
… signed a petition?
… taken part in a lawful public demonstration?
… boycotted certain a products?

Source: compiled by the authors based on data from the 6th ESS round.

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Similarly to political participation, the lower half of the ranking includes the two Eastern and Central European groups of countries plus Portugal. The cleavage is clear here: there is significant difference between the last western country (United Kingdom) and the first CEE-group country (Russian Federation). Countries in the two Central and Eastern European groups show very little differences, indicating that the level of civil participatory activity and voluntary work is equally low in all of them.

The other studied aspect of civic participation also relates to active involvement, namely, writing protest letters, taking part in demonstrations, and boycotting certain goods.

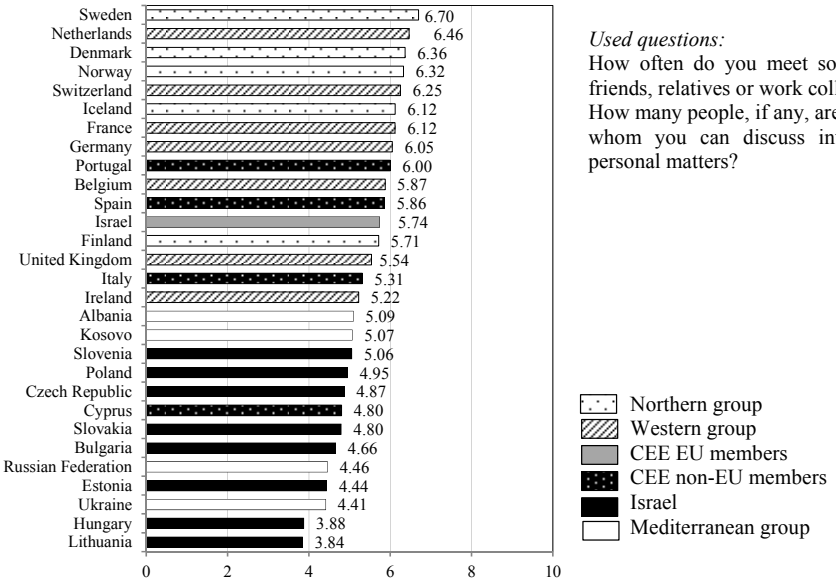
The distribution of countries is similar to the former indicators. In addition to the northern and the western nations, we can also find Mediterranean Spain and Italy in the first half of the ranking. However, the dividing line between the northern/western and the two Central and Eastern European groups is less distinct here; the Czech values are very close those of the Irish, Belgian and Dutch. Again there is little difference between the countries in the two Central and Eastern European groups. Hungary – as in the case of the other aspect of civic participation – is located in the lower half of this block and is last in relation to the whole of Europe (with no significant difference compared to Ukraine and Lithuania).

Relational Capital

Two aspects of relational capital have also been examined. The first relates to the frequency of meeting friends, relatives and colleagues, as well as to the size of the personal, intimate social network.

Figure 6

Countries ranked based on relational capital I. (dimension values converted to 0–10 scale)



Source: compiled by the authors based on data from the 6th ESS round.

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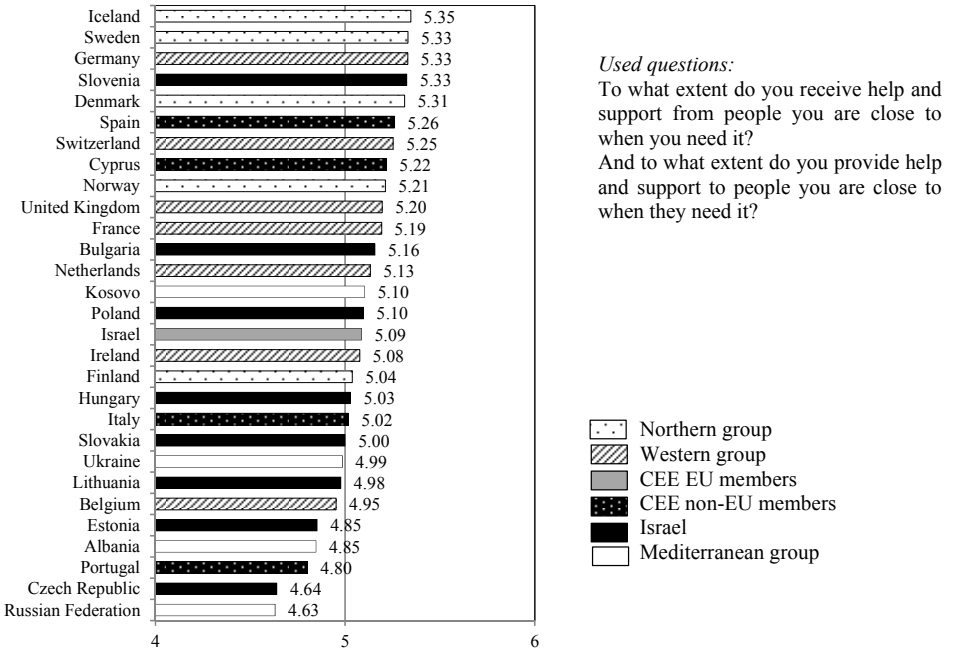
Here again, the northern and the western countries occupy the first half of the ranking. It is interesting to note that from this aspect, Finland's position worsens and differs significantly from the other northern countries. At the same time, the Mediterranean countries' position improved, taking higher rankings, as is the case with Portugal, which has so far been in the lower third.

A dividing line between the northern/western and the Central and Eastern European countries can be found here too, but it is not distinct. The best ranking Central and Eastern European countries (Albania, Kosovo, Slovenia, and Poland) do not significantly differ from Ireland and Italy.

The Central and Eastern European countries form a rather homogeneous group; however, Hungary at the bottom of the list is considerably lagging behind the others.

Figure 7

Countries ranked based on relational capital II. (dimension values converted to 0–6 scale)



Source: compiled by the authors based on data from the 6th ESS round.

The other aspect of relational capital was measured by answers given to questions about providing and accepting help within the social network.

Contrary to what has been experienced so far, here we can see real heterogeneity. Although the northern and western countries still have some dominance, the picture is not as unequivocal as it was earlier. For instance, the CEE EU members Slovenia and Mediterranean Spain are almost at the top of the list, and the so far lagging Bulgaria has a value here similar to some western countries and Finland. Hungary is positioned with Finland in this respect.

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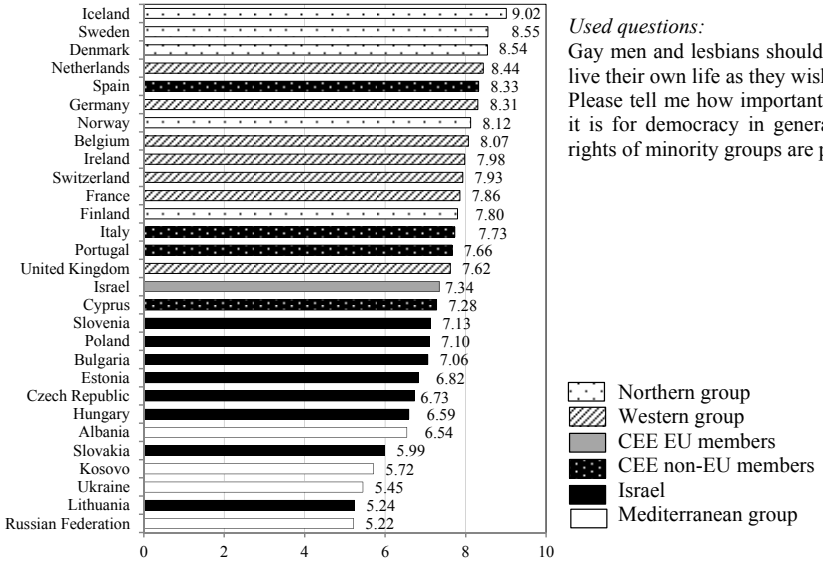
Tolerance

In respect of tolerance, there is again a divide between the northern/western and the two Central and Eastern European groups of countries. Even Slovenia, the highest ranking country in the Central and Eastern European groups, has a significantly lower value than the western countries (except the United Kingdom).

Figure 8

Countries ranked based on tolerance (dimension values converted to 0–10 scale)



Source: compiled by the authors based on data from the 6th ESS round.

The Mediterranean countries – with the exception of Cyprus – are closer to the northern and western groups than earlier. Spain, for example, ranks significantly higher than two northern countries, namely, Finland and Norway. With its value significantly higher than Slovenia, Israel belongs to the western group.

Happiness and Life Satisfaction

The dividing line between the northern/western and the two Central and Eastern European groups of countries can also be found in the case of personal satisfaction. The only "irregularity" is produced by Slovenia where happiness and life satisfaction is high, reaching the German, Belgian and Irish values, thus having a rightful place in the northern–western block in this respect. In addition to Slovenia, Poland also differs here from the "dissatisfied" societies in Central and Eastern Europe. Except for Portugal, the Mediterranean group is relatively uniform and its countries' data only fall slightly behind those of the Central and Eastern European countries. Hungary, however, does not belong to the block of these latter countries, it can be found at the lower end of the list together with Lithuania, Albania, Russia, the Ukraine and Bulgaria.

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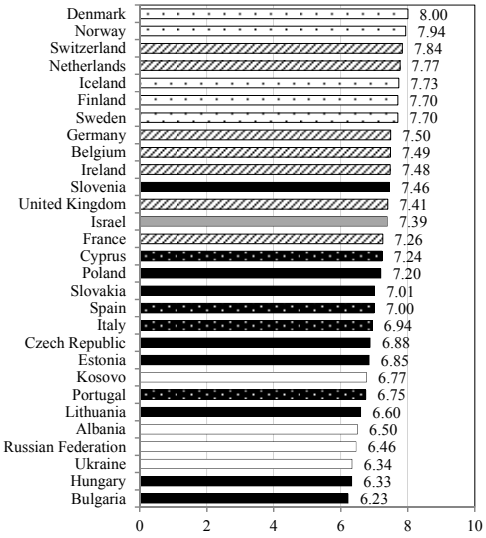
Figure 9

Countries ranked based on happiness and life satisfaction (dimension values converted to 0–10 scale)



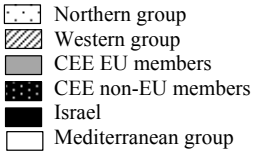
Used questions:

All things considered, how satisfied are you with your life as a whole nowadays? Taking all things together, how happy would you say you are? Please say how much agree or disagree with each of the following statements:

… you felt depressed?
… you were happy?
… you felt lonely?
… you enjoyed life?
… you felt sad?

Most days I feel a sense of accomplishment from what I do. I generally feel that what I do in my life is valuable and wortwhile.

There are people who tend to be towards the top of our society and people who tend to be towards the bottom. Where would you place yourself on this scale nowadays?

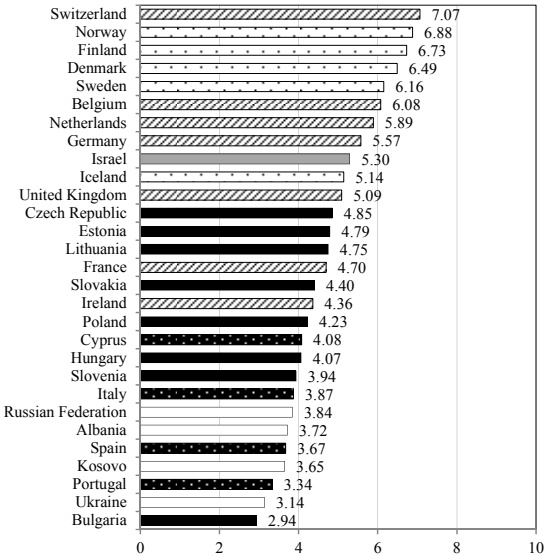


Source: compiled by the authors based on data from the 6th ESS round.

Satisfaction with Public Affairs

Figure 10

Countries ranked based on satisfaction with public affairs (dimension values converted to 0–10 scale)



Used questions:

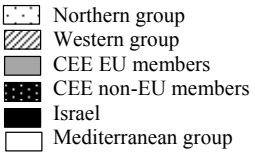
How satisfied are you with the present state of the economy in [country]?

Now thinking about the [country] government, how satisfied are you with the way it is doing its job?

How satisfied are you with the way democracy works in [country]?

Please say what you think overall about the state of education in [country] nowadays?

Please say what you think overall about the state of health services in [country] nowadays?



Source: compiled by the authors based on data from the 6th ESS round.

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In general, citizens of the northern and western countries are more satisfied with public affairs than those of all other countries. The values of the Mediterranean countries are quite similar to those of the countries in the two Central and Eastern European groups.

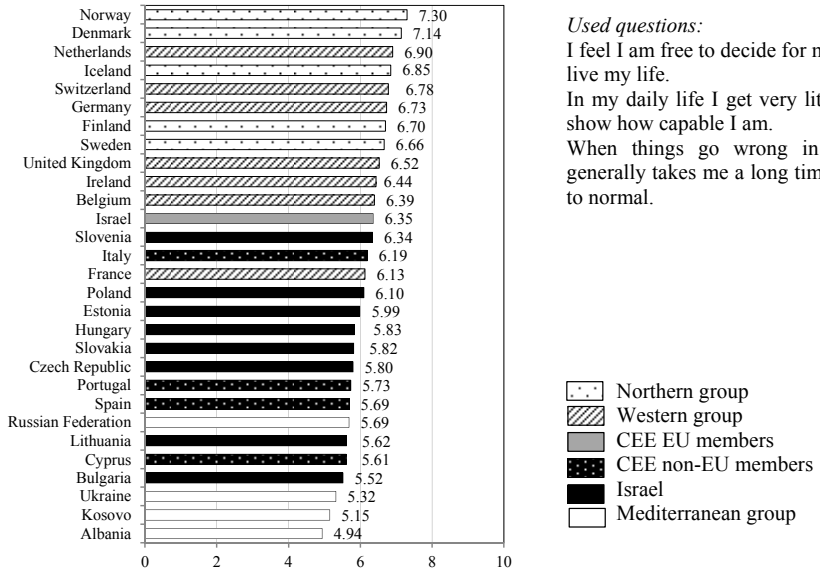
The already mentioned dividing line can also be found here, as there is a significant difference between the data of the Czech Republic and the United Kingdom. From this aspect, France and Ireland do not belong to the northern–western block. Except for Ukraine and Bulgaria, the countries in the two Central and Eastern European groups do not show much difference. The Mediterranean countries seem to be coherent in this respect as all of them are in the lower half of the ranking.

Personal Freedom of Choice over Fate

Similarly to the dimension of personal satisfaction, Slovenia again reaches the level of the northern–western societies in this aspect. Just as in the case of satisfaction with public affairs, France, having data similar to those of Poland or Estonia, can be ranked among the countries of the two Central and Eastern European groups.

Figure 11

Countries ranked based on personal freedom of choice over fate



Source: compiled by the authors based on data from the 6th ESS round.

From among the Mediterranean countries, Italy belongs to the western group, while the others to the two Central and Eastern European groups. There is some difference between these two groups of countries about their perception of personal freedom of choice over fate. Except for Lithuania and Bulgaria, the CEE EU members have higher values than the CEE non-EU members.

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Conclusions

Following our main finding, we shall present our results relating to the chosen dimensions, groups of countries, individual countries, and specifically to Hungary. Instead of a summary we would rather attempt to give possible explanations for the results, raise questions about them and initiate a discussion.

Our primary conclusion is that there is a definite socio-cultural cleavage between the northern/western and the Central and Eastern European countries. This "divide" is most conspicuous with regard to the following dimensions: tolerance; and within relational capital: the frequency of meeting friends, relatives and colleagues, and the size of the personal, intimate social network. The cleavage mentioned is also relevant when related to the other dimensions, which is visibly illustrated as none of the northern and western countries have been ranked in the lower third in respect of any dimension.

It might be misleading that the Mediterranean countries come between the Central and Eastern European ones in several aspects, thus seemingly lessening the importance of the cleavage. However, this is not the case, because, in respect of tolerance and relational capital, the Mediterranean countries are not at all "eastern", but are rather close to the northern and western groups. This is all the more important, as the studied aspects of tolerance and relational capital are crucial, since if citizens of a society seem to prefer exclusion to acceptance, they are weakly co-operating and strongly atomized, as well as passive in the primary forms of collective activities, like meeting relatives and close acquaintances, well, in such a society, there are problems with the foundations of collective mentality.

As to the dimensions applied, it is worth noting that the clear and many times tested indicators of trust, often used in economic development policy research, also proved to be reliable here. Still, it may be misleading to derive complex socio-cultural characteristics solely from the various aspects of trust, as is clearly shown by the dimension of tolerance also used by us. Namely, the cleavage in the case of tolerance is much more marked than in that of trust. Of course, less tolerance in a society does have its impact on interpersonal trust. Therefore, we have to amend our former statement about the level of Russian generalised and institutional trust being significantly higher than the Portuguese, since Portuguese society is much more tolerant than the Russian.

The results support our hypothesis that the dimension of personal freedom of choice over fate can be interpreted as a kind of "self-confidence indicator". Fine tuning them, it is in harmony with the two indicators of trust. We deem it worth comparing the dimension of personal freedom of choice over fate with the indicators of generalised trust and institutional trust, as individuals can only trust their institutions if they live in an atmosphere of trust in their community. At the same time, they can only trust others if they can trust themselves.

Satisfaction with public affairs can complement institutional trust. The results of these two dimensions are in harmony, which is not accidental. Since the level of institutional trust is often volatile in many countries, it may be worth regularly comparing it with that of satisfaction with public affairs. The latter is also volatile, but studying them together may provide a more comprehensive picture.

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When we compare the two indicators of satisfaction, we get an interesting outcome. Generally, the two data series are in harmony, that is, a high level of personal satisfaction goes together with a similar level of satisfaction with public affairs, and vice versa; when personal satisfaction is low, so is satisfaction with public affairs. It is interesting to note that the countries where personal satisfaction is significantly lower than satisfaction with public affairs all belong to Central and Eastern Europe, while it is just the opposite, that is, personal satisfaction is greater than satisfaction with public affairs, in those countries from the northern, western or Mediterranean group (the only exception is Slovenia). This is relevant, as it draws a clearer picture about the dimension of personal freedom of choice over fate, and through this, the dimensions of trust. Where citizens of a society are more satisfied with public affairs than with their own life, there must be something wrong with believing in the possibility of shaping one's own life and prosperity, i.e. self-confidence.

As already mentioned, we have not used the usually applied voter turnout to measure political participation, but instead, some other indicators gauging more active involvement. This proved to be correct, since the chosen indicator made the distinction between the northern/western and the Central and East European countries very clear, which would not have come out so unequivocally on the basis of voter turnout. Our indicators express the differences in political participation in the community more effectively. If we combine this dimension with the two indicators of civic participation, the cleavage is even more marked, the gap in relation to acting collectively and taking responsibility becomes significantly wider.

The two dimensions of relational capital call attention to a contradiction. The indicator relating to the frequency of meeting friends, relatives and colleagues and that measuring the size of the personal, intimate social network both presuppose real social activities, that is, active participation in social interactions, from which some conclusions can be drawn regarding the coherence of the community.

In the case of the other relational capital indicator, namely, providing/accepting help within the social network, the intensity of interactions is not measured, as it might simply be doing a favour for someone and/or asking for it. Hence, it is important to compare these two indicators, since where the value of the former is low while that of the latter one is high, we may justifiably suppose interrelations based on interests. This situation is not characteristic of many countries, but for us it is relevant, as Hungary is one of those countries (we shall return to this below).

As regards the groups of countries, we find it justified to create two groups, namely, the northern (the Scandinavian "five") and the western one (the countries of "core Europe") as these countries form heterogeneous groups. Although the concerned countries are quite similar from a socio-cultural aspect, and there is no sharp dividing line between these two groups, it is necessary to separate them as there are some differences. These "old democracies" dominate the first third, sometimes even first half, of the ranking in all dimensions.

Coherence within the Mediterranean group is insignificant. In the case of most dimensions, two countries are positioned in the first half of the ranking, with two in the second one. Although Portugal lags behind the northern and the western countries the most, based on its values in tolerance and relational capital (friends, relatives and colleagues, the

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size of social network), it definitely does not belong to the Central and Eastern European block. Italy approaches the western countries, but it significantly behind in respect of trust.

On the basis of our results, the two Central and Eastern European groups do not exist as separate categories. EU membership and the ensuing "accession" to the Europeanisation mainstream have not brought pronounced changes in the socio-cultural environment of the ex-communist countries. These two groups form one block as regards political and civic participation, relational capital as well as trust. A few countries may stand out in one or other aspect, coming somewhat closer to the western countries, but this is not characteristic of any of them in general.

Some countries should be mentioned separately. The Scandinavian nations are on the "leader board" in all dimensions. However, it should, be noted that Iceland in institutional trust and Finland in tolerance are a little behind the others. In the first case, this situation could be explained as an aftermath of the national bankruptcy a few years ago, whereas explanation of the latter would need thorough investigation.

In the western group, France, Belgium and Ireland lag slightly behind the others in a few dimensions. Although not a cleavage, it would still be worth examining the old issue as to whether or not there exists a kind of socio-cultural Protestant–Catholic "dividing line" within the northern–western–Mediterranean groups.

From the Central and Eastern European group, Bulgaria requires comment – with the exception of providing and accepting help – it figures in the lowest third of the ranking in all dimensions. The exception is not necessarily a positive social phenomenon, as we have already mentioned. Estonia approaches the western countries in the dimensions of trust and satisfaction with public affairs; however, it is deeply embedded in the eastern block from every other aspect. The same holds true for Slovenia and the Czech Republic; only the dimensions are different. Consequently, our research has refuted the everyday assumption that "westernisation" has typically progressed – including the socio-cultural field – in those ex-communist countries, which are close to the "western border", have a more developed economy and infrastructure, and also higher living standards.

The intensively developing Russia, which is playing an increasing role in the world economy and international politics, is definitely "eastern" from a socio-cultural aspect. It is not located in the first half of the ranking in any dimension, while in respect of both tolerance and providing and/or accepting help, it falls behind the others.

The data of Israel, additionally included in our European analyses, has supported our hypothesis that its western as well as eastern immigrants and their descendants cannot be clearly classified on the basis of our concluded socio-cultural cleavage. At the same time, several data suggest that it has been approaching the west.

Finally, the conclusions for Hungary are not very promising. From a socio-cultural point of view, Hungary has not been affected by the Europeanisation process that has had a heterogeneous effect on Slovenia, Estonia and the Czech Republic. Moreover, in respect of several indicators, it undeniably belongs to the "core countries" of the "eastern" block.

It seems warranted to comment on some of the dimensions. We would like to emphasise that while relational capital in Hungarian society is weak as regards the frequency of meeting friends, relatives and colleagues, and the size of the personal, intimate social network, it is nonetheless strong in the field of providing and/or accepting help. It is reasonable to suppose that this phenomenon is the reflection of the "relation sensitive

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culture" described by Endre Sik (2012), in which the most important issue in interpersonal relations is doing favour and requiting it.

In addition, both political and civic participation is very weak in Hungary. It follows from this that Hungarian citizens' propensity for participating in community affairs, taking responsibility and acting collectively is modest; that is, it is a factious, atomised society not willing to co-operate in collective matters. If we also take into account the conclusions regarding relational capital, it can be stated that personal lobbying prevails over community interests and collective thinking in Hungary.

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Upper Silesia: The revival of a traditional industrial region in Poland*

Abstract

This paper provides an insight into the transformation processes that have affected Upper Silesia, a Polish border region with long traditions of industrialisation, autonomous structures and volatile historical changes. It shows how the region, profoundly affected by the structural crisis of mining and heavy industry and experiencing unfavourable demographic processes, has managed to recover and prosper under new conditions. In a fragmented space characterised by strong urbanisation, industrial restructuring has been based on the renewal of traditional branches and the creation of new development paths through reindustrialisation and service-based development. The size of Upper Silesia, and particularly the conurbation surrounding Katowice, has also led to attempts at establishing effective metropolitan governance, a challenge whose success depends as much on harmonising internal interests as finding a compromise acceptable by both the region and the central government.

Keywords: Upper Silesia, industry, industrial restructuring, regionalism, metropolitan regions.

Introduction

As one of Poland's six historical regions (Koter–Kulesza 2003), Silesia[1] has changed ownership multiple times since the formation of the Polish state, not least due to its position along the border. After Poland's final partition in 1795, it became a borderland among three empires – Prussia, Russia and the Habsburg Monarchy. After World War One, the western part of Upper Silesia was awarded to Germany, while its eastern part came to be divided between the newly independent Poland and Czechoslovakia. The

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[1] The western part within Silesia, Lower Silesia and the eastern part, Upper Silesia have been distinguished since the 15th century (Malloy 2005).

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territorial administrative unit belonging to Poland, named the Silesian Voivodeship, was the most developed, most industrialised[2] and most culturally diverse region of the country. Its autonomy was guaranteed by the Polish state – *de facto* until 1939, but nominally until 1945.[3] With the shifting borders after World War Two, the remaining areas of Upper Silesia and the majority of Lower Silesia were also annexed by Poland.

The present Silesian Voivodeship, in existence since 1999, is now one of the smallest, although, after the capital region of Masovia, the second most populous region in Poland (4.6 million inhabitants as of 2011). The high population density is mainly due to the region's degree of urbanisation, the development policy of state socialism, and the associated migration processes. The Katowice conurbation[4] has a population over 2 million, and along with the Voivodeship's sub-centres, has an urbanisation ratio of 77.7%, significantly outstripping the national average (60.7%). The Voivodeship belongs to the most developed regions of the country; third by per capita GDP, and fifth by per capita investments. It is also ranked high by statistics related to economic development and competitiveness; second after Masovia according to the number of employees and gross incomes and third according to the level of unemployment. It is in demographics where its situation is less favourable: it is in eleventh place by both natural population growth and the balance of migration.

This paper seeks to review the contemporary transformation processes and development issues of the Upper Silesian Voivodeship. As one of the most populous and highly urbanised regions in post-socialist Central Europe, with an economy that has been emerging from a deep structural crisis, Upper Silesia presents both enormous development potential and significant challenges. The region is slowly re-establishing itself as one of Poland's leading industrial and commercial hubs, and an integrating city-region, which can compete on the European level. In the paper, some of the main aspects of the region's territorial development have been summarised, with regards to its unique socio-economic characteristics, urbanisation patterns, economic restructuring processes and the challenges of polycentric governance. To this end, the authors have relied on literature review, extensive field research within the region (undertaken in 2007, 2013 and 2014), as well as the regional statistics. These highlight the Voivodeship's special position with respect to Poland and broader Central Europe. Attention is also payed to its significant and persistent internal differences.

Demographic characteristics

The Voivodeship has significant intra-regional differences in the realm of demographics and social indicators. Population is the highest in the conurbation and regional sub-centres; the most prominent is Katowice, the centre of the Voivodeship (310,764

[2] The area, formerly belonging to Prussia, underwent rapid modernisation, with the first steelworks being erected in 1794 (Davies 2006), followed by the emergence of an industrial region, which was the second in Germany after the Ruhrgebiet (Szczepański–Śliz 2012).

[3] The Silesian voivodeship had an independent parliament, representing a legislative and fiscal autonomy disposing over ca. one half of local tax revenues through its own treasury (Szczepański–Śliz 2012, Bialasiewicz 2002).

[4] The Polish Statistical Office delineates the conurbation as a group of 19 cities in the centre of the region, while the government of the Silesian voivodeship considers it to consist of 14 cities.

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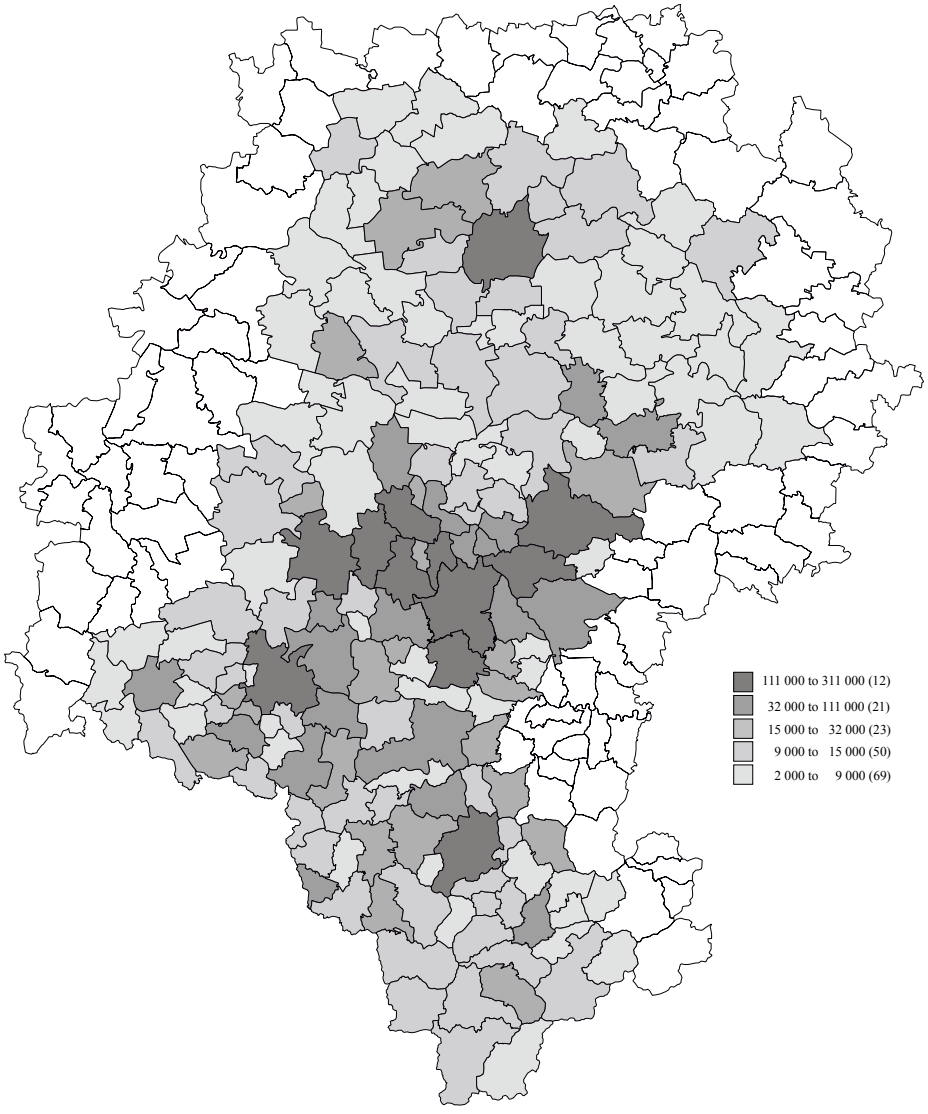
inhabitants), followed by Częstochowa (236,796), Sosnowiec (216,421), Gliwice (187,475), Zabrze (181,128) and Bytom (176,902). The region's least inhabited territory is the broader Częstochowa area, occupying the northern part of the Voivodeship (Figure 1). The population density (375 p/km^2), more than three times the national average, conceals significant regional differences, since the value is 510 per km^2 in the core area, while only 175 per km^2 around Częstochowa. The record of the conurbation is held by Świętochłowice with 4165 p/km², occupying first place in the entire country.

Figure 1

Population level in the gminas of the Silesian Voivodeship, 2011 (inhabitants)



Source: author's construction based on GUS.

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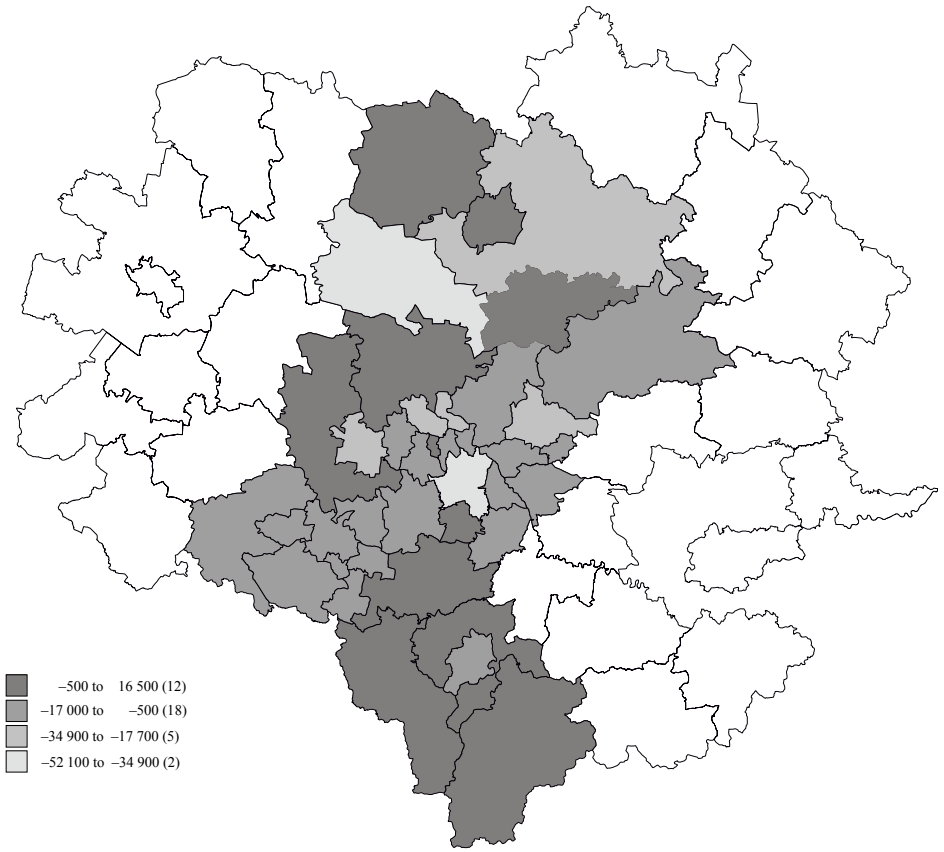
Unlike other states in post-socialist Central Europe, Poland has experienced a population increase in recent decades, although this process is reversed in two old industrial regions, the Łódź and Silesia voivodeships. According to the processes of industrial restructuring, there has been a continuous and severe population decline in the area since 1989. All cities within the voivodeship have been losing population, but not in equal measure – while the figure is 15–17% in the conurbation, it is only about 2% in the sub-centres (Rechlowicz–Tkocz 2013). The largest decline at the powiat level can be seen in Bytom, struggling with significant socio-economic problems: between 2002 and 2011, almost 17 thousand people, or 8.6% of the population has been lost. In some rural areas (e.g. the Bielskie and Gliwicki powiats), increasing population can be observed due to suburbanisation processes (Figure 2). In the case of the conurbation and Częstochowa, the target of migrations is not the immediate surroundings of the city, but more distant areas such as the Bielskie powiat – representing a process of "external suburbanisation" (Runge–Klosowski 2011).

Figure 2

Population change in the gminas of the Silesian Voivodeship, 1995–2012 (inhabitants)



Source: author's construction based on GUS.

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The declining population of the voivodeship, and particularly the cities, is based on the joint effects of natural decrease and negative migration balance. The region is characterised by ageing, with less and less births and children. Intra-regional differences are shown by the rapid decline of the central and northern areas, as well as the natural growth of the southern and western powiats. A negative migration balance is mainly found in cities, particularly in the conurbation while a positive net outcome can be observed in the rural north and south. The negative results can only be partially explained by the suburbanisation process, as economic restructuring plays a role which is at least as relevant. Migration to former hometowns and emigration to find work abroad has become commonplace (Rechlowicz–Tkocz 2013*)*. Therefore, the voivodeship has a negative migration balance in both the domestic and international sense: favoured targets include the neighbouring Małopolska Voivodeship as well as Germany and Great Britain. The problems related to demographics are compounded by the fact that migration occurs most often among the young, which accelerates the natural decline; this is forecasted to be 12.4% population loss by 2035 according to the GUS (Strategia…2013). Although the Silesian Voivodeship remains a target of migration from other Polish regions, especially from the centre and western part of the country (Łobodzińska–Zbiorowski–Soja 2012), this process cannot counteract the basic declining trend.

In the last decade, the number of children has significantly decreased in the voivodeship (–2.7%), while there was an increase in the number of elderly (+2.3%). The ageing index shows that the processes pose a problem for Katowice and the cities in particular while south of the conurbation, including suburbanised areas, the ratio of the two generations is more balanced. Meanwhile, the population of the voivodeship has improved its educational levels since 2002: the ratio of people with only basic education has fallen from 28.7% to 16.7%, while there has been an increase in the number of graduates,improving from 8.9 to 15.9% of the population. Higher education shows territorial concentration in the cities, while basic education is more prevalent in rural areas.

Fragmented metropolis

Silesia's early industrialisation, followed by its uncontrolled growth in the 19th century and multiple layers of urban planning in the 20th, has created a highly urbanised spatial structure. In the European context, it is closest to the Ruhr and (to a lesser extent) coal-and-steel regions in Great Britain. Urban development was simultaneously characterised by traditional city growth (with some centres such as Bytom, Gliwice, Cieszyn or Racibórz having an urban past going back to the 12th century); conscious urban development policy following Prussian, Polish and later socialist ideas (Katowice, Dąbrowa Górnicza, Tychy), and sprawl around the sites of mining and industry, consisting of very heterogeneous, often functionally poor and spatially isolated workers' colonies. The main quality of space is strong fragmentation: settlement components with widely divergent origins, physical quality and level of maintenance are found haphazardly in each other's proximity. The conurbation, emerging from constituting cities but also bearing some traits of a single metropolis, carries this heterogeneity on all

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territorial scales. We can speak of fragmentation in the following dimensions of spatial differentiation:

- Despite large-scale population movements, historical tragedies and homogenisation attempts, Upper Silesia is still characterised by the legacies of Poland's threefold imperial division. The different cultural and socio-economic attributes of the Prussian, Austro–Hungarian and Russian zones of influence are in evidence even today. They can be seen in the weaker institutional endowment but higher formal education in the conurbation's eastern population (e.g. the Dąbrowa basin), or the more advanced technological competencies of the western, formerly Prussian parts.
- The Silesian Voivodeship itself is sharply differentiated: the conurbation, Częstochowa, Rybnik's coal mining district and Bielsko-Biała are three disparate poles within a single voivodeship (Klasik–Heffner 2001), and a source of both structural and political divisions. The disproportionate scales are in a sense similar to the Hungarian urban network: the conurbation's 2.7 million inhabitants are scarcely counter-balanced by the smaller cities, which have a population of 176–240 thousand inhabitants. It is this difference in magnitude that unequivocally tips the balance of power towards the urbanised core.
- The differences that subdivide the conurbation originate from the cities' different development paths, as well as the socio-economic and institutional changes taking place on the level of the conurbation after the change of system. Despite multiple integration attempts, the conurbation remains politically divided, and the independent policies of local governments lead to parallel developments, overlapping competencies and constant conflict.
- The cities are fragmented by the mining and industry-driven urbanisation process, leading to a non-standard urban morphology characterised by very diverse housing stock. This was further differentiated by the later processes of social breakdown, industrial crisis, environmental and mining damage, and followed by market-led and community-based revitalisation initiatives). Radical differences are found even on the level of individual housing blocks, making for a mosaic-like spatial pattern.

The fragmentation of the urban fabric is not merely a phenomenon of space, but one which is also embedded in the temporal dimension. The rapid succession of empires, external dependencies and ideologies have oriented decision-makers towards radical urban planning. Development and destruction (city-building and intentional city-demolition) have been based on the free overwriting of symbolic spaces, and sometimes entire urban functions. Even today, city morphology remains influenced by the outcomes of previous decisions (Murzyn–Kupisz–Gwosdz 2011, Chmielewska 2012), including

- the time of the threefold imperial division, particularly the city architecture and urban planning of the German Empire, embodied by the period's modern housing estates and city centres, and representing the "civilising power" of Teutonic culture within the idea of the "little big city"[5];

[5] „Berlin – Eine große Großstadt! Breslau – eine große Kleinstadt! Kattowitz – eine kleine Großstadt!" (cited by Murzyn-Kupisz–Gwosdz 2011, p. 115.)

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- the German–Polish division between the world wars, where the Polish side saw fit to construct an independent, modern Polish identity on the basis of renouncing "Germanness" through adapting contemporary architecture on the basis of the American ideal;
- the Nazi occupation, consciously demolishing the Polish built landscape, followed by the "de-Germanisation" of the conurbation's architectural heritage;[6]
- state socialism, linking the spaces of production to representative, monumental building complexes (housing estates, processional squares and sport halls) while other central elements of urban space became "emptied-out", stripped of their former relevance with the downsizing of consumption and trade, or in the case of living areas, "overwritten" by newly erected living complexes;
- modern Upper Silesia, where the re-formed spaces of consumption, business services and finance have led to the emergence of a Central Business District in Katowice, while other urban centres in the conurbation have contributed to this reclaiming of the city with the rise of representative shopping centres and malls.[7]

The present development of the city-region shows a dual trajectory: on one hand, individual cities undergo specialisation; on the other, there are attempts by governance at setting down common goals at a metropolitan level, transforming the legacy of fragmentation into the modern European virtue of polycentric development. From the cities competing for leadership, Katowice has proven to be the strongest, gradually establishing itself as the *de facto* centre of not just the region, but the conurbation as well. Other significant cities (particularly Gliwice, Sosnowiec and Tychy) take on the role of sub-centres in this configuration. There are signs that this polycentric urban entity might return to the "traditional" path of city development, transforming itself into a monocentric agglomeration, then Poland's largest city – although this possibility is made harder by Katowice's small population weight within the conurbation, with only 15% of all inhabitants (Mikołajec 2008).[8]

The renewal of central urban spaces continues to show a lopsided picture. In Katowice, only the last few years have seen the regeneration of the historical city centre, based on the conversion of spaces formerly used by transportation or industry, and attempting to create a functional city centre. The underlying consumption-oriented model relies on private capital as well as European Union funding, and fits into the mainstream of European urban policies. Pedestrian zones, bicycle paths and shopping streets, reconstructed with the aid of EU money; the renewal of the central railway station of

[6] It would be difficult to find a better symbol here than the Silesian Parliament (today the Marshall's office and the seat of the voivodeship government): constructed as a counterpoint to the "German Gothic", its massive neo-classical complex was seen to be representative of the voivodeship's wealth and power in 1929, it was almost naturally converted into a centre of the Reich administration during the Nazi occupation by removing the traces of Polishness. Later, it once again came to be a centre of the Polish state apparatus, but a rival, equally impressive building was erected across the square as the headquarters of the Polish Workers' Party. After 1989, the symbolic space was reclaimed once again – by constructing monumental statues for two great interwar statesmen, Józef Piłsudski and Wojciech Korfanty.

[7] The first representative of the enormous shopping complexes, Silesia City Centre has been constructed by the Hungarian TriGránit group on the site of the former Gottwald mine as a brownfield project, preserving and rejuvenating certain symbolic elements of the mine's architectural ensemble as a reminder of the city's heritage.

[8] It must be mentioned, however, that Katowice concentrates ¼ of the conurbation's employment and ½ of its high value-added services.

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Katowice and the building of a connected shopping mall; or the currently emerging new cultural quarter on former mine sites (a concert hall, exhibition space, university library and conference centre) enrich the city with previously missing metropolitan-scale infrastructure and new public spaces. The transformation contributes to economic diversification and has positive consequences for socio-economic resilience (Polko 2012). However, the projects also carry basic contradictions. Local ambitions require the building of large shopping centres in every city (Polko 2013) – symbols of modern urban pride – but the development of the central city is not followed by organic renewal and functional enrichment throughout the broader conurbation. Rather, renewed urban areas almost always border on smaller or larger areas of segregation, functional hollowing-out and brownfields that remain unintegrated. Entire cities (e.g. Bytom) are affected by mining damage to the housing stock or migration losses. The allocation of public funds for urban renewal, as well as its overall distribution within the conurbation, becomes a matter of strategic significance. The most important problem of development might in fact be an opportunity cost on the level of ideas – in the future ambitions of the conurbation, formerly existing bold and innovative ideas of economic development have given way to the schematic copying of mainstreamed European urban policies. The objectives and funding of common development policy uniformise thinking as much as action, and the example of the cultural quarter in Katowice shows that these ideas are often identical to those found in any other large city in Europe – while local conditions would prescribe an entirely different way of development.

The space-forming effects of the old and new economy

As a prime example of Old Industrial Regions (Lux 2009), the economic structure of Upper Silesia was characterised by the excess weight of traditional industrial branches and the underdevelopment of services at the time of systematic change. In 1990, the Voivodeship (then divided among three territorial units) had 1.2 million inhabitants employed in industry, of whom 415 thousand (35%) had been working in coal mining, and 103 thousand (8.7%) in the steel industry. In contrast, the entire tertiary sector had only 814 thousand employees or 34.5% of total employment. Over recent decades, the direction of restructuring has been towards the tertiary patterns commonly found in Central Europe (Figure 3), although, the process proved to be less thorough than in other industrial regions. Similar to the agglomeration of Ostrava-Karviná on the Czech side of the border, services could only absorb a limited number of the workforce that suddenly appeared on the labour market (Sucháček et al. 2012). The continuing significance of industry demonstrates the enormous weight of Upper Silesia's industrial legacy – but apart from the magnitude of the crisis, it also showcases its unexpected resilience in finding new, innovative paths of adaptation.

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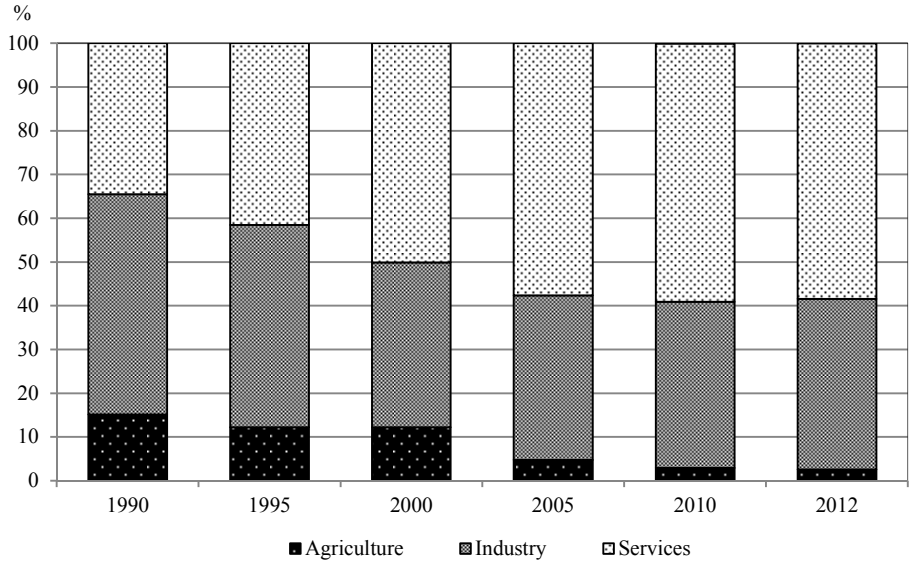
Figure 3

Labour market restructuring in Upper Silesia, 1990–2012



Source: author's construction based on regional statistical yearbooks.

The pace (and limits) of restructuring are shown by the trend lines of workers in coal mining and students in higher education: the first had shown monotonous decline, the second a continuous increase, crossing each other at 135 thousand people in 2002. However, no significant shift has taken place since: the differences between the two groups remain small, and during the crisis, coal mining has even improved its attractiveness. The quality of higher education could not keep up with the development of the city; therefore, the Gliwice Technical University is the best in Upper Silesia, but only the 20th in a national comparison (Gwosdz 2014). De-industrialisation ran its course between 1990 and 2000; since then, its share in employment has been stable around 38% (21% in Poland), with its share in value added at 35% (25% in Poland). The Voivodeship concentrates 17% of industrial sales, which is only outstripped by the central region of Mazowieckie, which benefits from a strong headquarters effect. Nonetheless, these three core statistics conceal substantial structural renewal on the level of both industries and territorial units.

Miners, helped by strong unionisation and their political capital after 1990, could protect their collective interests and the dominance of public ownership over multiple restructuring programmes (Zientara 2009), while the steel industry adopted a model of relatively more rapid privatisation, and downsizing through early retirement packages and (less successful) retraining schemes (Trappmann 2011) – with more divergent outcomes than coal mining. Traditional branches kept their role in the Upper Silesian economy, but in a different spatial structure. Both coal and steel have undergone organisational and territorial consolidation; retreating from large urban centres and smaller, less economic or technologically obsolete sites. Four state-owned companies

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have remained in coal mining, operating 30 pits, and one private enterprise with one more. In mining, the agglomeration of Rybnik (and particularly the city of Jastrzębie Zdrój) has become prominent, and in the last few years, there have been attempts to reopen mining in Moravian Silesia. In Czechia and Slovakia, the decline of mining was much more radical, but the workforce and capital of Polish enterprises created new opportunities for coal production.

The stronger marketisation of the steel industry has taken place under significant fluctuations on the world market. Unlike coal mining, representing one-half of EU-level production and responsible for 95% of power generation in Poland, steelmaking only has an EU market share of 5%. This results in a more competitive business environment from both European companies, and increasingly, from the BRICs group. Transformation took place over multiple waves of buyouts; first through domestic consolidation (during which the number of employees decreased to 42% of its original value by 1997), and later with the involvement of professional investors from abroad. The largest investment involved the sale and modernisation of the largest steelmaker, Huta Katowice in Dąbrowa Górnicza. With this sale, the investing ArcelorMittal group acquired two-thirds of Polish steel industry revenues and employment. The shock of the 2008–2009 downturn had shaken the industry, culminating in a new consolidation process involving further downsizing (Katarzynat–Ślusarczyk 2010, Ślusarczyk–Kot 2011, Pałucha 2012).

The knowledge and human capital that had been developed in coal mining, heavy and chemical industries also led to the exploration of new development paths, especially new industries on the basis of coal or metalworking. Examples include innovative cluster development on the basis of clean coal technologies; modern environmental industry drawing on the results of land reclamation efforts and chemical industry (Smoliński–Pichlak 2009); or Dąbrowa Górnicza's steel industry cluster, focusing on highly processed, high value-added production. The role of proximity is dominant in these new initiatives, and they are often organised as the spin-offs of larger companies, entering the market by exploiting their capital, business connections and production traditions.

Restructuring also has also led to the strengthening of new industries. Former traditions of vehicle manufacturing (Chorzów–Alstom Konstal 1864, Bielsko Biała–Polski Fiat 1971, Tychy–Polski Fiat 1975) and expertise accumulated in the metal industry have been converted into modern know-how through the inflow of Foreign Direct Investment. Special Economic Zones, founded through a local initiative and developed into a country-wide network by being adapted as national development policy, have played a crucial role in attracting and organising investment activity. The zones, resembling industrial estates with multiple sites, first provided generous tax benefits, but due to EU pressure, have gradually switched to direct incentives. The attractiveness of SEZ sites is also based on their location, professional investment promotion, and the quantitative and qualitative advantages of the labour market (Gwosdz–Jarczewski–Huculak 2008, Lux 2008, Mezei–Schmidt 2013). The Katowice Special Economic Zone, which extends to the territory of Opole Voivodeship, has been successful in all respects: with 232 companies, an investment volume of € 5 billion and employment of over 51 thousand people, it has shown vigorous growth even under the current crisis (in 2007, capital investments amounted to € 2 billion, and employment to 25 thousand people).

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With a broad spectrum of industries, the dominant branch is the vehicle industry with 62% of invested capital, - companies mainly from the USA and Italy (GM, Fiat, Isuzu and their suppliers; www.paiz.gov.pl). Through capital investments, the integration of Katowice and Kraków has become the centre of the Polish automotive industry, relevant not just because of its territorial concentration (concentrating 32% of domestic employment), but also the increasing diversity of companies and activities (end product manufacturers, suppliers, integrators, linked industries and R&D). Supplier networks were originally based on the privatisation of former state-owned FSM subsidiaries or brought in by foreign investors. However, there is an improving tendency of local added value, and the orientation of domestic suppliers, originally dependent on a single company, has also shown diversification as the industry shows increasing territorial embeddedness. The automotive industry, similarly to other regions in Central Europe, has shown strong resilience in the last years, and was able to improve its performance even during the recession – although the advantages were mainly captured by foreign companies. The relatively high development level, high wages and organised labour of Upper Silesia makes it less vulnerable to the *lock-in* of low value-added specialisation; and through industrial upgrading, it can weaken the centre-periphery relationships of FDI-dominated industrial development. These relatively high-road strategies also carry some risks: the delocalisation of cost-sensitive manufacturing activities may develop into a more serious issue over time (Domański–Gwosdz 2009, Domański–Lung 2009, Gwosdz–Micek 2010, Domanski et al. 2013).

In post-socialist Central Europe, the development prospects of the high value-added post-industrial economy tend to be limited outside national capitals and their surroundings (Lux 2010). Katowice and its conurbation represent an exception, offering a scale where it can compete in the field of developed business services on a European level. This is shown by the relatively fast growth of the region's banking and services sector. Although the employment share of modern service activities puts Upper Silesia in Poland's middle rankings, its size gives it the largest mass after the Masovian Voivodeship. Some 11% of employment in finance and insurance, and 10% of infocommunication activities are located in the region, encompassing both international and domestic actors. Commercial and cooperative banks have settled in the region not merely as the branches of national networks, but have developed significant central functions, or operate as independent subsidiaries (e.g. ING Bank Ślaski, with deep roots within the region even before being acquired by ING). In addition to a large residential market, growth in banking is spurred on by the business sector. In the last decade, local companies' needs for sophisticated financial services had also been supplemented by the opportunities of business process outsourcing. The champions of this branch are Warsaw and Kraków (Gál–Sass 2009, Micek–Działek– Górecki 2011), but BPO centres have also proliferated in Katowice, becoming successfully representatives of the new service sector (Drobniak–Kolka–Skowroński 2012). Even under state socialism, Katowice was a host to trade fairs (and before the war, it had an American-style skyscraper), but it is in these years that it can fully realise its ambitions as a new Central European business centre.

Higher education in the conurbation is divided among four large universities (University of Silesia – 32 thousand students; Gliwice University of Technology – 28 thousand students; University of Economics in Katowice – 15 thousand students;

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Silesian Medical University – 9 thousand students) and numerous private colleges mainly focused on business studies. Demographic change has oriented the sector towards institutional consolidation: the three largest universities have lost 16 thousand students over a decade, reversing the boom of the 1990s and early 2000s, and many of the colleges must face a dearth of applications. In the same picture, we can speak of the expanding role of university–business cooperation. Knowledge transfer institutions, sectoral cooperative programmes and business incubators (e.g. Technopark Gliwice, Sosnowiec Science and Technology Park) have extended the role of universities beyond providing skilled labour, playing a role in the local embedding of automotive and machine industry, and upgrading towards higher value-added forms of competitiveness. The relevance of corporate (mostly applied) research is shown by the fact that with the exception of the Podkarpackie Voivodeship (whose values are a statistical anomaly due to few publicly funded research positions), it was Upper Silesia which had reached the highest share of private contribution to R&D expenditures in Poland (45%).

The location of traditional and new branches reconfigures the conurbation's economic centres of gravity (Figure 4). Katowice has been particularly successful in the development of modern business services; in addition to the spaces of consumption, we are witness to the formation of an American-style central business district (CBD), integrating surrounding cities through commuting links. In the broader conurbation, evidence can be seen of both successful and failed restructuring. Outside Katowice, it is mainly not the highly tertiarised centres (Bytom, Chorzów, Świętochłowice, Piekary Śląskie) that have managed to keep or improve their positions, but rather cities, which have successfully transformed their former industries or benefitted from reindustrialisation (Tychy, Gliwice, Sosnowiec and Dąbrowa Górnicza; Drobniak–Kolka–Skowroński 2012, Goczoł 2012, Gwosdz 2014). This situation – like in many other cases across Central Europe – shows that systematic adaptation tends to be a more successful development path than radical restructuring strategies. The emerging functional differentiation of the conurbation appears to support the unification hypothesis. Here, it is not the parallel development paths of the individual cities that will be most important (as it was the case before 1989), but the common framework of an emerging city-region, where the administrative and business centre of Katowice will integrate other cities with varied forms of restructuring, including hubs of strong industrial specialisation.

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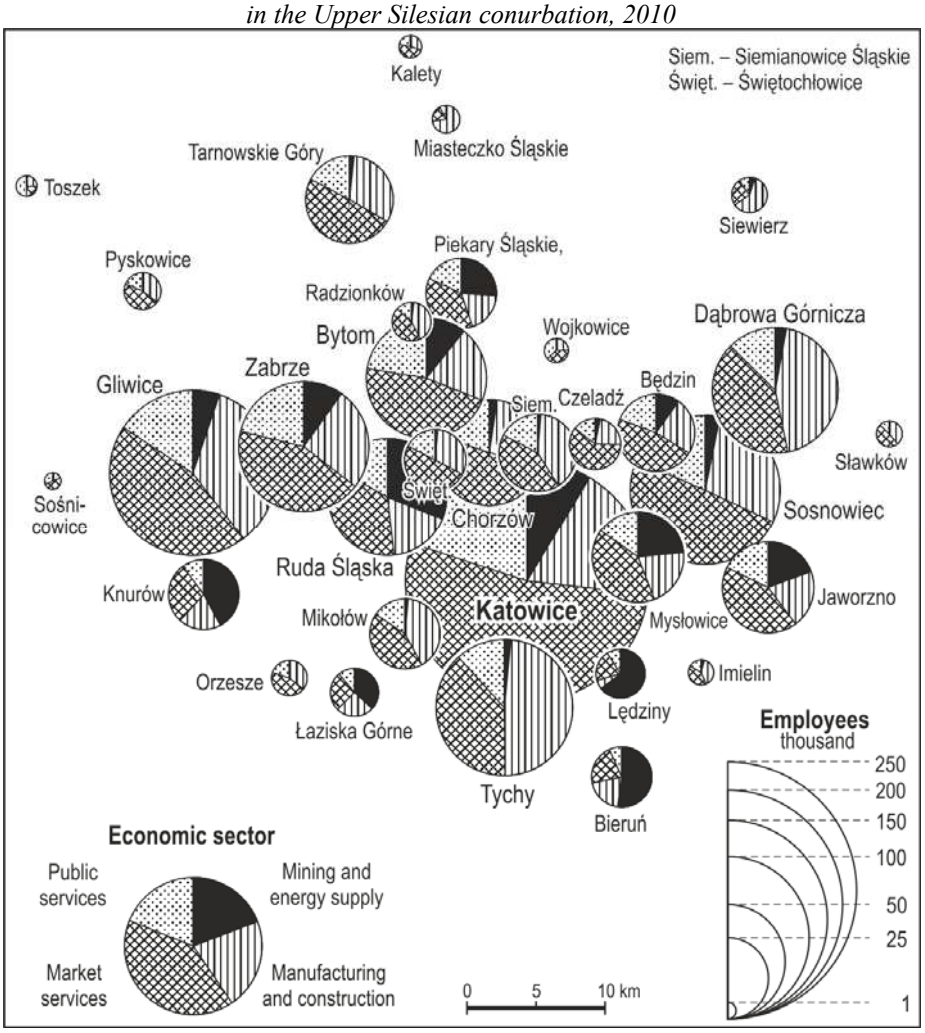
Figure 4

The branches and territorial structure of the economy in the Upper Silesian conurbation, 2010



Source: Gwosdz 2014, p. 92.

Regional policy structures: a region in search of its governance

After systematic change, with local governments created in 1990, Poland preserved its two-tiered administrative system, which had been in existence since 1975[9]; it was only in 1998, when a comprehensive administrative reform could be carried out. Detailed

[9] In fact, a third tier, districts had already appeared by this time, although this was not a ”genuine” tier of public administration due to its supplementary nature. Created to reduce the administrative burden of voivodeships, districts were disbanded in 1999.

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legislation on territorial governance was set down in the ”Small Constitution” of 1992, followed by the Constitution of 1997, declaring municipalities to be the basic units of territorial governance, and delegating the establishment of further units to the level of laws (Const. 1997 Art.70.4.). Accordingly, the 16 voivodeships and 380 powiats created since that time are not named in the Constitution, and do not enjoy its protection.

The Silesian Voivodeship was established in 1999 by merging the former Bielsko-Biała, Częstochowa and Katowice voivodeships. The Voivodeship has a dual structure in the administrative sense, forming a single NUTS 2 region and encompassing eight NUTS 3 statistical sub-regions, 17 administrative districts (powiats) and 19 cities with district rights (LAU 1), as well as 167 municipalities (LAU 2) – of which 49 are urban, 96 are rural and 22 are mixed local governments. In addition to the Katowice conurbation, three more agglomerations are found in the voivodeship: Bielsko-Biała, Częstochowa and Rybnik. There have been two rather different concepts for the transformation of the existing voivodeship structure.

Upper Silesian Metropolitan Association (Górnośląski Związek Metropolitalny)

The delineation and creation of metropolitan areas were made possible by the 2003 act on land-use planning and regional development, defining them as the sum of large cities and their functional areas. The ten metropolitan areas[10] were set down according to specific criteria, but no concrete borders were identified in either the concepts or national legislation, leaving this task to the representatives of the individual regions.

The Upper Silesian Metropolitan Association was created as an organisation based on polycentric foundations and a common system of administration and development, with a main task focused on coordinating development activity (Gorzelak 2005). The charter of the Association, accepted in 2007, was passed by the common action of 14 cities with district rights. The development strategy, building on the socio-economic diversity of the constituting cities, as well as the region’s resources (human capital, natural assets, infrastructure and finances), aimed at establishing a metropolitan area which would be competitive on a European scale.

Cooperation was made more difficult by the fact that local governments found it hard to give up their legally guaranteed independence and broad competencies, and the association was burdened by the inevitable conflicts of resource distribution and internal competition. The region’s heterogeneity, and the resulting lack of accord was well demonstrated in the debates concerning the name of the future metropolis. Naming it after ‘Katowice’, the most socially and economically important city, was unacceptable by the other member cities, while ‘Silesia’ was opposed by the Silesian territories outside the region and the Dąbrowa basin (Szczepański et al. 2013). The compromise, which had emerged by 2009 (*Górnośląsko–Zagłębiowska Metropolia “Silesia”*) was respectful of every party, but clearly unsuitable for its intended purpose.

Furthermore, the establishment of a functional metropolitan association (e.g. in the field of administration) is also opposed by the voivodeship government, and similar

[10] Warsaw, the Upper Silesian Agglomeration, Kraków, Łódź, the Three Cities (Gdańsk – Sopot – Gdynia), Poznań, Wrocław, the dual pole of Bydgoszcz and Toruń, Szczecin and Lublin.

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concerns are voiced on the national level, wary of strengthening rivalry between Warsaw and Upper Silesia, where Katowice and its surroundings, according to size, traditions and contemporary opportunities, might as well prove triumphant. In the battle between rational and emotional reasoning, the latter seem to dominate, and cooperation – which would mean a step forward particularly in solving common problems, especially in infrastructure – is only functioning on the level of a few communal services (Chmielewska – Szajnowska-Wysocka 2010).

Silesian Autonomous Voivodeship (Śląskie Województwo Autonomiczne)

The multi-ethnic character of the Silesian region remained, but while previously the German nationality was significant throughout Upper Silesia, it is no longer legally recognised[11] Silesians form the largest group (Silesian is also the largest community with a non-Polish identity – 846,719 people in 2011 – at the national level). With 722,143 people (15.6% of the region's population), the Silesian identity is most remarkable in the Silesian Voivodeship (USK 2013). In 1990, one subgroup of Silesians founded the Movement for Silesian Autonomy (*Ruch Autonomii Śląska*) in Rybnik. Since its foundation, the RAŚ has been demanding the restoration of the region's former autonomous status and governance on the basis of the decentralised model of 1920–1945 (*de facto* 1920–1939). The background of the initiative is the "unjust" allocation of public funds, namely that Upper Silesia produces 35% of the national income, but only receives back 2-3% (Majcherkiewicz 2005). In 2010, the year of its political breakthrough[12], the RAŚ changed its platform in favour of modernising the Polish state through full decentralisation. On the twentieth anniversary of local government reform, they advocated the creation of a regionalised state consisting of autonomous voivodeships. The initiative set 2020 as the target date to achieve further decentralisation and the autonomy of Upper Silesia.

The proposed constitutional amendment prepared by the party follows the Spanish model: the statutes containing the organisation, tasks and competences of the autonomous voivodeships are based on the principle of asymmetric decentralisation, creating an opportunity for different degrees of devolution for different regions. The plan would repair the missed opportunity of the 1997 constitution, providing a constitutional status not just for municipalities, but powiats and autonomous voivodeships. In addition to reorganising the regional distribution of power, RAŚ would also transform the upper chamber of the bicameral legislature, turning it from a party-dominated organ into an assembly based on the territorial principle. The constitutional plan identifies the tasks of autonomous voivodeships on a much broader basis but does not dictate general responsibilities: individual regions could define their tasks according to their capabilities and circumstances. However, the plan provides a list of tasks remaining under exclusive

[11] In the Act of Minorities (2005), Silesian is not mentioned either as a national, ethnic minority or as a regional language.

[12] On the 2010 voivodeship elections, the RAŚ won 8.62% of the vote and gained three seats in the voivodeship sejmik, making it the fourth strongest political formation after the three large national parties, PO, PiS and SLD. PO, the victorious party, governs together with PSL, its national coalition partner and RAŚ. In April 2013, RAŚ left the coalition.

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national jurisdiction and declares that the Sejm and the Senate can delegate further tasks to all, or specific autonomous voivodeships.

In addition to the general rules of the planned constitution, the RAŚ has also prepared an outline for the statute of the Silesian autonomous voivodeship. This document discusses the voivodeship's institutions, administrative system and symbols, but does not define its borders, remarking only that *"the Silesian Autonomous Voivodeship's territory is composed of districts which form the territory of the region on the basis of historical, cultural and economic unity"* (Statut 2010, Art.3.). That these plans would bisect the current administrative borders is made clear by a previously unveiled statute plan (Gazeta Wyborcza 2010), as well as the planned headquarters for various institutions. The older plan set concrete western and eastern borders for the Voivodeship, while the current document would make Opole[13] the seat of the Silesian Administrative Court, pointing at the picture of an Upper Silesian Autonomous Voivodeship which would, in theory, include the territories around Opole, but exclude the current Częstochowa area.

Discussion

The development of Upper Silesia during post-socialism represents the case of a re-emerging historical region and the exploration of its newfound potential. Although hit by a structural crisis due to its reliance on traditional industries, and experiencing adverse socio-economic processes, the weight and dynamics of Upper Silesia make it one of Central Europe's most interesting and most vibrant regions. It is fair to say that no other region except national capitals have as much potential to play a prominent role in European competition, or to establish new structures of self-governance as Upper Silesia. Further advantages could be achieved through the region's cooperation with its neighbours – Kraków in Poland and Ostrava-Karvina in Czechia. Improving infrastructural connections (the A4 and A1 motorways) and enhanced economic and political cooperation can create a cross-border cluster of development poles with outstanding potential for development and further integration.

The extent of the process, which has led to Upper Silesia's increased significance will hinge on two issues: the ability to continue its economic renewal through the balance of traditional and new approaches, and how it can find viable solutions for developing effective regional governance with a higher degree of subsidiarity. The risks of the project are also apparent. The model of competitiveness, which characterises the region, is still reliant on relatively low wages, and this might pose barriers to the development of human capital, the most important resource in modern knowledge-based societies. Path-dependent development processes have been more favourable than might be expected in an old industrial region, and exploiting virtuous legacies have met with success. However, the socio-economic consequences of restructuring still remain; new external shocks in the coal and steel sector, or long-term shifts in the automotive industry may pose new risks. Furthermore, the political pressures of centralising states and internal conflicts of interest may prevent, or even lead to the disintegration of bottom-up

[13] Opole was the historical capital of Upper Silesia, now it is the centre of the Opole Voivodeship.

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decentralisation initiatives, reversing years of progress. These systematic setbacks are nothing new in the wider region.

Nevertheless, Upper Silesia can be expected to re-emerge as a key player among Central European regions. New forms of economic adaptation and administrative integration are being explored, and it is precisely this innovative character that imbues the region with its resilience and ability to reinvent itself in an ever-changing economic, social and political landscape.

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