Impact of social innovation on population change in Borsod-Abaúj-Zemplén County

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SUMMARY

Technological and economic innovations cannot respond to all social challenges. Natural and material resources are becoming ever scarcer, so it is necessary to use investment assets, maximizing social and economic efficiency. It is a major task to address the backwardness originating from regional disparities and to create opportunities for catching up in peripheral regions. The study, based on the process-oriented model defined in our previous studies and the determination of the social innovation potential, tries to determine the relationship between social innovation potential, the spatial position of developmental image, and regional differences and population change in Borsod-Abaúj-Zemplén County.

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INTRODUCTION

In line with social changes, the European Union is paying more attention to the context of social innovation than before. There is a need for a paradigm shift (Veresné Somosi et al., 2019); besides the R&D activities in technical and natural sciences, which require more and more investment, there is a need for new, innovative solutions to address the social and economic problems of a given community (settlement or region).Social innovation highlights community development as an objective over regional development, and meeting needs over the exclusiveness of profitability and marketability (Katonáné Kovács et al., 2017).

Today, society faces many challenges. Insecurity, crises, unforeseeable technological changes and globalization make the future unpredictable (Ionescu, 2015). The conceptualisation of social innovation is an important task that also contributes to addressing societal challenges. The process of social innovation makes societies more sustainable and cohesive through inclusive solutions, collaborations and proactive bottom-up initiatives (Grimm et al., 2013). However, this does not only mean bottom-up efforts but also a process based on civic engagement, since social innovation, which can be found in new approaches to cooperation and structural transformation of society, is often created from the top by macro-level measures (Nemes & Varga, 2015). The concept of social innovation focuses on meeting the needs of the community, which is the process through which the quality of life is improved and well-being is realized (Hazel & Onaga, 2003; Mulgan et al., 2007; Pol & Ville, 2009; Kocziszky et al., 2017). Well-being, in addition to income status determining welfare, and the needs of subsistence, is associated with a sense of security, self-esteem and fulfilled relationship needs (Kocziszky et al., 2017). When examining social innovation initiatives, emphasis is put on the social benefits of innovative ideas that can be interpreted locally at community level and the role of community involvement in raising living standards. Social innovation means new (or new-approach) solutions that at the same time meet the needs of society and enhance the capacity of society to act (Czakó, 2000). Social

innovation is a process of change that responds to social challenges through a creative, reconsidered combination of available resources and solutions (Manzini, 2014). Social innovation initiatives are new combinations of social practices (Hochgerner, 2011) that, through new or novel coupling, result not only in a paradigm shift in innovation but also in a new category of innovation. New social practices and solutions aim at social change based on comprehensive, pre-planned, goal-oriented activities (Cajaiba-Santana, 2014).

Our study focuses on the social innovation potential of the settlements in Borsod-Abaúj-Zemplén County. After calculating the complex indicator measuring the social innovation potential, we examined how the most important territorial processes in the county are related to the processes defined by the indicator. In our study, we considered it important to analyse the extent to which social innovation potential can modify basic spatial structure conditions. As Nemes Nagy (2005) points out, territorial processes are basically unchanged in the short run. Modification of the basic structure can be achieved mainly in the medium term (10–15 years) as well as in the longer term.

EXAMINATION OF SOCIAL INNOVATION POTENTIAL IN BORSOD-ABAÚJ-ZEMPLÉN COUNTY

Borsod-Abaúj-Zemplén county is located in the northern part of Hungary. It is the second largest county in the country in terms of both area (7247.17 km²) and population (684,793 people). In Borsod-Abaúj-Zemplén county, the number of settlements is 358, and can be characterized by a high density of settlements and a high proportion of small villages.

Out of the 16 districts of Borsod-Abaúj-Zemplén county, 8 districts are among the most disadvantaged districts in the country.

There is a correlation between the economic capacity of the given region and its capability for innovation (Kocziszky et al., 2017). However, innovation (the search for new and innovative solutions) needs to be interpreted more broadly than before. Social innovation can be interpreted as a concept that results in meeting the needs of society, along with new or novel cooperation and structures. Social innovation efforts lead to the renewal of society while encouraging members of society to act.

Social innovation efforts can be proposed solutions for meeting social needs and handling the challenges of peripheral regions. Social needs and challenges facing the community can be grouped in three ways:

Table 1.
Social needs and challenges facing the community

Social		**Economic**		**Political**	
Needs	**Challenge**	**Needs**	**Challenge**	**Needs**	**Challenge**
involving citizens, social services, mobility, community	emigration, ageing, disadvantaged groups, inequality between levels of education	security, stability, employment, sustainability, trust	housing conditions, unemployment, financial resources, expertise	awareness, mobilizing power, political participation	government transparency, independence of decisions, commitment

Source: Veresné Somosi et al., 2019

Relationship between social innovation and spatial pattern

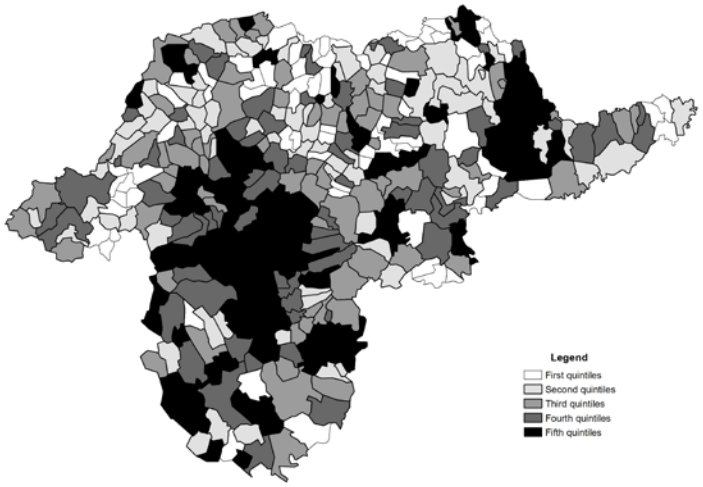
Based on Benedek et al. (2015), we developed an indicator system for measuring social innovation potential[i]. The indicator system consists of three parts: input, output and impact indicators. We calculated a complex indicator measuring social innovation from the average of the three indicator sets and using cartographic methods for the regional comparative analysis (in the first part of the study – Varga et al. 2020 – we dealt with the in-depth analysis of regional inequalities in the social innovation indicators, using cartographic methods for the regional comparative analysis).

We examined the extent to which the settlement classification determined by the complex indicator reflects developmental conditions and is responsible for the development differences. To this end, the settlements were ranked in quintiles according to the order set by the complex indicator and the per capita income of the quintiles and the county was calculated.

Table 2.
Per capita income according to the classification developed by the complex indicator of social innovation, 2017

Innovation quintiles	Per capita annual income, thousand HUF
First	751
Second	789
Third	855
Fourth	930
Fifth	1249
County average	*1083*

Source: own calculation



Source: own compilation

Figure 1. Quintiles according to the classification developed by the complex indicator of social innovation

To measure regional inequalities, we used the Hoover index, which measures the maximum vertical distance between the Lorenz curve and the diagonal (Major & Nemes Nagy, 1999).

$$H = \frac{1}{2} \cdot \sum_{i=1}^{n} |x_i - f_i| \quad (1)$$

where $\sum f_i = \sum x_i = 100$

In this case, x_i is the income and f_i is the proportion of the population by district. It was subdivided according to a previously developed procedure (Kincses, 2015) to find out the extent to which the grouping of settlements (quintiles) determined by the complex indicator of social innovation is responsible for the territorial disparities within the county.

$$H = \frac{1}{2} \cdot \sum_{i=1}^{n} |x_i - f_i| = \frac{1}{2}\left(\sum_{j=\text{First quintile}} |x_j - f_j| + \sum_{k=\text{Second quintile}} |x_k - f_k| + \sum_{l=\text{Third quintile}} |x_l - f_l| + \sum_{m=\text{Fourth quintile}} |x_m - f_m| + \sum_{n=\text{Fifth quintile}} |x_n - f_n|\right) \quad (2)$$

Table 3.
Hoover index according to the classification developed by the complex indicator of social innovation, 2017

Innovation quintiles	Hoover index, %
First	9.2
Second	9.3
Third	6.1
Fourth	5.6
Fifth	4.0
County total	*34.2*

Source: own calculation

It can be stated that the level of development, simplified by the per capita income, increases as the complex indicator measuring social innovation potential increases. In the case of territorial differences, the opposite is true. The lower the complex indicator within the county is, the greater the extent of the territorial differences attributed to the given group of settlements.

Impact of social innovation on population change (1999–2018)

The purpose of our study was to examine the characteristics of the impact of social innovation on spatial processes based on the demography data of the settlements of Borsod-Abaúj-Zemplén County. Our analysis focuses on how the distribution of the complex social innovation indicator relates to the change in population of the county's settlements. A shift share analysis was used for this. Several territorial statistics books highlight this method (e.g. Sikos T., 1984; Nemes Nagy, 2005; see a similar application in Nemes Nagy et al., 2001) detailing Hungarian applications (Tóth, 2002). This methodology is a somewhat different methodological approach to the basic method (Houston 1967, Stevens & Moore 1980), but with the same basic questions.

The applied method, which is essentially a double standardization, needs data in at least two structural – territorial and sector – dimensions. Sector indications actually may cover optional disjunctive distributions: economic sectors, age groups, settlement size groups. The territorial dimension also may have subgroups: e.g. settlements, regions, countries, specific spatial aggregates (in this case always the analysed counties). Concerning certain phenomena, chronological growth components may be analysed in the same way as specific data, e.g. per company revenue, or by differentiated structural patterns. This research applies the first type. In this case, the calculation is presented in relation to the first case. Two matrices are starting points to calculate:

$$K = \begin{pmatrix} k_{11} & k_{12} & \dots & k_{1j} & k_{1m} \\ k_{21} & k_{22} & \dots & k_{2j} & k_{2m} \\ \dots & \dots & \dots & \dots & \dots \\ k_{i1} & k_{i2} & \dots & k_{ij} & k_{im} \\ k_{n1} & k_{n2} & \dots & k_{nj} & k_{nm} \end{pmatrix}$$

$$V = \begin{pmatrix} v_{11} & v_{12} & \dots & v_{1j} & v_{1m} \\ v_{21} & v_{22} & \dots & v_{2j} & v_{2m} \\ \dots & \dots & \dots & \dots & \dots \\ v_{i1} & v_{i2} & \dots & v_{ij} & v_{im} \\ v_{n1} & v_{n2} & \dots & v_{nj} & v_{nm} \end{pmatrix}$$

The following values may be calculated (by adding up matrix lines as well as columns) from the basic data:

$$k_{i0} = \sum_{j=1}^{m} k_{ij} \text{ as well as } v_{i0} = \sum_{j=1}^{m} v_{ij} \quad (3)$$

Concerning the first (1999) and the final year (2018) of analysis population of the settlements at the different population size category.

$$k_{0j} = \sum_{j=1}^{m} k_{ij} \text{ as well as } v_{0j} = \sum_{j=1}^{m} v_{ij} \quad (4)$$

Concerning the first and the final year of analysis population for the different categories of complex social innovation indicator.

$$k_{oo} = \sum_{i} \sum_{j} k_{ij} \text{ as well as } v_{oo} = \sum_{i} \sum_{j} v_{ij} \quad (5)$$

Concerning the first and the final year of analysis population of Borsod-Abaúj-Zemplén County.

The first effective step of this procedure is to calculate the $M(m_{ij})$ matrices of population growth indices, which means to divide V matrix elements by the proper K matrix elements.

$$M = \begin{pmatrix} m_{11} & m_{12} & \dots & m_{1j} & m_{1m} \\ m_{21} & m_{22} & \dots & m_{2j} & m_{2m} \\ \dots & \dots & \dots & \dots & \dots \\ m_{i1} & m_{i2} & \dots & m_{ij} & m_{im} \\ m_{n1} & m_{n2} & \dots & m_{nj} & m_{nm} \end{pmatrix}$$

Similarly the total (Borsod-Abaúj-Zemplén County) growth index (m_{oo} – matrix/matrix) as well as the sectors (which are in this case population size categories) (m_{io} – quotient of matrix lines) and territorial (which are in this case the categories of the complex social innovation potential indicator) (m_{io} – quotient of territorial columns) growth indices may be also calculated:

$$m_{00} = v_{00} / k_{00}$$

$$m_{i0} = v_{i0} / k_{i0}$$

$$m_{0j} = v_{0j} / k_{0j}$$

By using these relations for all area units, given-period specific – above or below county average population growth generated – population surpluses and shortages (S_i) may be broken down into two components, in our case into the regional (S_r) and sectoral structure (S_a) impacts:

$$(S_i) = (S_r) + (S_a) \quad (6)$$

where

$S_i = v_{oj} - (m_{00} * k_{oj})$ i.e. the population column amount in the last analysed year – (county average growth* the population column amount in the first analysed year,

$S_r = \sum_j (v_{ij} - m_{i0} * k_{ij})$ i.e. population data in a given population size category of the county in the last analysed year – (sectoral average growth in given population size category * population data in a given category of social innovation potential indicator in the first analysed year).

$S_a = S_i - S_r$ i.e. the difference of the two impacts.

This method is suitable for separating regional and sectoral (i.e. other, non-territorial based) factors of economic development.

Between 1999 and 2018, the population of the county decreased by about 15%. For all changes in Table 3, the settlement size categories received + 100% where the population decline was below the county average (or possibly even population increase occurred). Those groups where the opposite happened were given -100%. The territorial dimension in this study refers to the categories of the complex social innovation potential indicator. (This was obtained by ranking the settlements in ascending order according to this indicator and dividing the data series into five equal categories). Sectoral impact refers to the dimension according to the size of the population by size category. Our question is, therefore, to what extent the size is responsible for the change in the population of the settlements and to what extent it is due to reasons derived from social innovation potential.

We can see a greater decline than the county average in the category below 500 inhabitants and the two categories over 5,000 inhabitants. In three out of five settlement size categories, the population size of the settlements is more responsible for the population change (bigger in absolute terms), and the territorial dimension, i.e., the social innovation potential situation is more important only in two cases. In the case of the latter, in both settlements with less than 500 inhabitants and between 5,000 and 20,000 inhabitants, population change is fundamentally negatively affected by the social innovation potential situation.

Table 4.
Population surplus/shortage and its components, (%)

Population size categories	Total (%)	Territorial (%)	Sectoral (%)
-499	-100	-69	-31
500–1,999	100	38	62
2,000–5,000	100	-45	145
5,000–19,999	-100	-4939	4839
20,000-	-100	179	-279

Source: own calculation

Taking a closer look at the results of the analysis (Table 4), we can see that the demographic trends that are more favourable than that of the county are in the two population size categories between 500 and 5,000 inhabitants. With the negative trends in the two extreme population size categories, it is surprising that the share of those over 20,000 inhabitants in the unfavourable process is slightly higher.

Favourable territorial factors, i.e. a favourable social innovation situation, is identified for settlements with more than 20,000 inhabitants, while unfavourable territorial factors are predominantly for cities between 5,000 and 20,000 inhabitants.

The positive impact of sectoral effects, i.e. population size, is most pronounced in the category of 2,000 to 5,000 inhabitants, while a negative impact is found for cities above 20,000 inhabitants.

Table 5.
Country shares in revenue surpluses/shortages and related components, (%)

Population size categories	Population surplus	Population shortage	Favourable territorial assets	Unfavourable territorial assets	Positive sectoral impacts	Negative sectoral impacts
-499	–	43.9	–	26.2	–	8.2
500–1,999	44.9	–	14.9	–	16.7	–
2,000–5,000	55.1	–	–	21.7	48.0	–
5,000–19,999	–	1.2	–	52.2	35.3	–
20,000-	–	54.9	85.1	–	–	91.8
Total	*100*	*100*	*100*	*100*	*100*	*100*

Source: own calculation

SUMMARY

A number of fundamental problems of the economy and society – such as the decrease in population, unemployment, migration, or lagging regions – require long-term solutions that need new forms of cooperation between social actors, the direct voluntary participation of citizens in decision-making processes, and the pursuit of social innovation efforts (Veresné Somosi et al., 2019).

Our research questions in this area are the relationship of income distribution and territorial development disparities to social innovation potential and the relationship between population change and social innovation potential. These issues, in addition to the previous studies (Nagy-Tóth, 2019, Varga et al., 2020), are presented in this paper.

Firstly, we pointed out that income distribution and regional development disparities are closely related to the extent of social innovation potential in Borosd-Abaúj-Zemplén County. Secondly, our study examined the relationship between population change and social innovation potential in the county. We found that the size of the settlements is slightly more important in the population change of the county than the social innovation potential situation of the given settlement. The state of social innovation potential can only change or strengthen the fundamentally visible spatial structures.

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[i] *The input indicators:*

1. *Number of non-governmental organizations (NGOs) per 10,000 inhabitants*
2. *Number of active companies per 1,000 inhabitants*
3. *Number of non-profit organizations per 1,000 inhabitants*
4. *Proportion of children in the population*
5. *Number of elderly per 100 children*

6. *Dependency ratio: children (aged zero to 14) and elderly (age 65 and above) as a percentage of the total population aged 15 to 64)*
7. *Activity rate (taxpayers/population * 100)*
8. *Average number of completed years of education, 2011*

The output indicators:

1. *Payout per capita (2007–2013)*
2. *Proportion of the public employees compared to the population aged 15–64*
3. *Number of participants in cultural events per thousand persons 1,000 inhabitants*
4. *Proportion of people living in segregation*
5. *Number of persons receiving social catering service per 1,000 inhabitants*
6. *Number of recipients of home care assistance per 1,000 inhabitants*
7. *Unemployment rate*
8. *Average patient turnover per GP and pediatrician*

The impact indicators:

1. *Annual average income per capita (thousand HUF)*
2. *Percentage of population with primary education over 7 years (including early school leavers)*
3. *Proportion of one-person households*
4. *Proportion of families with three or more children*
5. *Number of registered crimes per 1000 inhabitants*
6. *Number of beds in institutions providing long-term residential care per 1000 inhabitants*
7. *Proportion of taxpayers earning in the 0 HUF to1 million HUF income band*
8. *Proportion of regularly cleaned public areas.*