



Changes in Spatial Diversity of the Standard of Living of Poland's Population in 2003-2012¹

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Abstract

Objective

The standard of living of individual countries and their regions is largely conditional on the level of socio-economic development represented by the country concerned. For the majority of developed and developing countries the general standard of living has been improving. At the same time, the distance between the countries and regions with the lowest and highest level of economic development has been growing. In Poland, the standard of living varies across different regions (voivodships) due to, for example, cultural, historical, social and economic reasons. Like the other EU Member States, Poland has been taking measures aimed at eliminating the disparities in the standard of living amongst the country's population, and has been striving for its improvement. Those measures are taken, inter alia, within the framework of the EU cohesion policy.

The focus of the study, whose results are presented in this paper, was to verify the hypothesis on the improvement of the standard of living and the decline of disparities in this respect across different voivodships at the time before and after Poland's accession to the European Union. Moreover, the study was also concerned with the assessment of interrelations existing between the location of a given voivodship and its standard of living.

Research method

In the study, statistical and econometric methods were applied. In order to compare the standard of living in the voivodships across Poland in the years 2003-2012, a modified version of Hellwig's measure of development was used. To determine the nature and degree of spatial dependencies of the standard of living across the country, global Moran's spatial autocorrelation statistic was employed. Next, based on the original set of diagnostic features, an analysis of similarity was conducted and homogenous groups of voivodships were determined. For this, Ward's method was used based on a variance analysis to estimate the distances between individual clusters. Data of the Central Statistical Office in Warsaw, covering the year 2003 and 2012, provided the basis for the analyses.

¹ Adopting the time frame 2003-2012 implies in this case the change of spatial diversity of the standard of living in 2012 compared to 2003.

Conclusions

The studies presented in the paper suggest that in the period under discussion there was an improvement in the standard of living of the population across all voivodships, and simultaneously their polarization occurred in terms of the category investigated. What also emerged was a new growth pole – Dolnośląskie (Lower Silesian) voivodship. The rejection of the hypothesis on the declining disparities amongst Poland's population across individual voivodships implies that the measures our country have been implementing have not met their objectives entirely, thus providing the need for discussing their relevance and efficiency.

Originality/ value of the paper, contribution to science development

The paper employs the tools of spatial econometrics which enhance the analysis of the spatial diversity of people's standard of living, and facilitate the drawing of correct and important conclusions as regards the issue under discussion.

Keywords: the level of living, spatial diversity, econometric analysis

History: Otrzymano 2016-01-07, poprawiono 2016-05-31, zaakceptowano 2016-06-01

Introduction

For years now we have been witnessing changes in the living standard of entire societies worldwide. For the large majority of the developed and developing countries the general standard of living has been improving. However, at the same time, we have seen a trend towards the increase of distance between the countries and regions with the highest and lowest level of social development. The growing scale of poverty has the effect that the leaders of the world economy and those who govern groups of countries or/and economies of individual countries are setting as their objective to eradicate the disparities existing amongst the people living in different countries and regions worldwide.

Efforts to equalise the disparities in the standard of living are included, for example, in the scope of interest of the cohesion policy of the European Union, whose member Poland has been since 2004. The measures involved in this policy are based on three key objectives. One of them is striving for the

convergence of member states. This goal covers the countries and regions which do not reach the level of at least 90% of the EU average of the Gross National Income (GNI), and where the development has been lagging behind the rest of the regions².

The convergence is a key priority of the cohesion policy. The measures aimed at the acceleration of the convergence process of the least developed countries and regions of the EU include, among others: improvement of the conditions for growth and employment through the intensification of the processes of investment in physical and human capital; seeking to increase innovation and development of the knowledge-based society; enhancing the adaptability to economic and social changes; preservation and

² Regulation of the Council (EC) no 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, Social Fund and Cohesion Fund, and repealing Regulation (EC) no 1260/1999 (Dz.U. [Journal of Laws] .UE.L.2006.210.25).

improvement of the natural environment, as well as an increase in the efficiency of public administration³. Improvement and equalisation of the living standard of residents in different locations of the EU should be a natural consequence of the implementation of those measures.

In the programming period 2007-2013, Poland, received roughly EUR 67 billion from the EU budget in current prices, of which EUR 66,6 billion was allocated for the implementation of the objective Convergence⁴. Over the years 2014-2020, Poland is to receive further EUR 68,7 billion under the cohesion policy. The funds financing the measures within the framework of the Convergence objective come, to a considerable extent, from the Cohesion Fund and such funds as: European Regional Development Fund (ERDF), European Social Fund (ESF), or European Investment Bank (EIB)⁵.

The Concept of the Level of Living and its Measures

The recent years have seen a significant increase of interest in such categories as: the standard of living and quality of life viewed as the measures of social development of a particular population. The meanings of these two terms, although similar, do not fully overlap with each other. The first one refers to the material aspects of human life with the second referring to the non-material ones. Since the interest of the authors of the paper focuses specifically on the analysis of the standard of living, the definitions of this concept which are most frequently quoted in literature will be referred to further on.

³ Ibid.

⁴ http://ec.europa.eu/regional_policy/sources/docgener/informat/country2009/pl_pl.pdf (as of: 17 August 2015).

⁵ Ibid. Article 3(2).

In 1954, a UN commission composed of experts defined the standard of living as actual conditions of living of a people, and the extent to which their material and cultural needs were satisfied through payable goods and services, and through deployment of social funds [Zeliaś (ed.), 2004, p. 16]. This is the definition that provided the basis for many other definitions of the category under discussion. It does not only emphasize what the standard of living is (the level of having one's needs satisfied), but it also indicates what means and sources are involved in order to achieve this level.

In the UN report, there were 40 indicators included, useful for the performance of the measurements of the standard of living of a given community, which were divided into several groups: health conditions together with demographic conditions, nutrition, education together with literacy and professional qualifications, work conditions, the state of and employment opportunities, transport, housing including household equipment, general consumption and accumulation, clothes, leisure time and entertainment, social security [Zeliaś (ed.), 2004].

The extension of the UN definition was given by A. Luszniwicz, who in his discussion adopted the proposal advanced by J. Drewnowski which emphasized that the standard of living was measured in a particular location and a particular moment in time [Johann, 2005, p. 12]. In 1982, he established seven basic categories of the population's needs, i.e. nutrition; housing; health care; education; recreation; social security and material development [Zeliaś (ed.), 2004, p. 14]. Numerous elaborations of the concept emerged in the last decade of the XX century. One of them was suggested by T. Ślaby in 1990. The definition which she proposed saw the standard of living as a state in which one's material

needs were satisfied, with the state referring to the elemental aspects of human life, that is, to its physiological needs [Słaby, 1990, p. 25].

In 1991, C. Bywalec showed that the standard of living was the degree to which the human needs, arising from the consumption of goods and services, were satisfied. He suggested that the standard of living was neither an action nor a social process nor a resource of goods. It is an abstract category which determines the relation of human needs towards the goods used in order to satisfy those needs. In his definition, Bywalec further underlines that the standard of living does not include satisfying all human needs but only those whose satisfaction requires material goods and services [Bywalec, 1991, p. 25].

A year later the same author together with S. Wydymus expanded the aforementioned definition by specifying that in order to satisfy their needs, people used goods and services which they created and resources of the natural and social environment [Bywalec, Wydymus, 1992]. It is worth noting that thus expanded definition introduced the issue of the preservation of the natural environment.

A slightly different explanation provided T. Śmiłowska in 1995, who suggested that the standard of living reflected the measurable predispositions and conditions of the budget of specific individuals or households to acquire sufficient amount of goods and services [Śmiłowska, 1995, p. 5]. In her definition, the author focuses on the financial aspect of this category. The abundance of definitions presented in the literature on the standard of living is evidence of how difficult it is to interpret this category unequivocally, and even more so to carry out its quantification.

Bearing in mind the quantitative nature of the study, the authors of this paper decided on the application of

the proposal by A. Zeliaś, in whose view the standard of living referred mainly to quantitative phenomena, being “depicted in the numbers of goods, services and benefits (broadly understood – from bread, to soap, clothes, education, health, telephone, waterworks and to air and leisure and the sense of security) necessary to live a full and dignified life” [Zeliaś (ed.), 2004, p. 16].

Objective, Methods and Research Stages

The primary objective of the studies was to investigate the spatial diversity and to assess the trends of the standard of living across Poland's voivodships in 2012 compared to 2003. The analysis enabled us to provide answers to the following questions:

1. Is the standard of living in Poland diversified spatially?
2. Which voivodships were characterised by the highest and which by the lowest standard of living of their population in 2003 and 2012?
3. How has the standard of living changed for Poland's population since the country's accession to the EU?

Moreover, the studies allowed us to verify two research hypotheses:

1. In 2012 the standard of living of the inhabitants of Poland's voivodships increased compared to 2003.
2. In 2012, compared to 2003, the disparity in living standards of the inhabitants of Poland's voivodships declined.

The basis for the analysis was the data of the Central Statistical Office in Warsaw, covering the years 2003 and 2012. As the set of issues addressed in the study refers mainly to the quantitative aspects of life of the population, variables commonly recognized as quantitative measures of the standard of living and other

closely linked to them variables have been adopted as the foundation for the analysis. For measuring the level of living, more than a dozen diagnostic variables were applied, representing 10 different dimensions, of which 9 are mentioned by A. Zeliaś in his publications. These include: health care and social care, job market, working conditions and safety at work, wages and income, housing conditions, education, recreation, culture and leisure, communication and transport, public safety, degradation of the natural environment and its preservation [Zeliaś (ed.), 2000, pp. 103-105]. The tenth dimension represents the economic level and the variables included in it represent the determinants of the standard of living (see Table 1). We should underline that the choice of the variables included in the individual categories was also dictated, besides content-related considerations, by the availability and comparability of the statistical data. The variables adopted for discussion should be viewed as general characteristics of the standard of living, reflecting merely its selected aspects from the meso- and macro-economic perspective. The study is therefore illustrative in nature and should be treated as input to other in-depth research for which the data produced by the CSO research on households budgets could provide a basis. In the study, the statistical and econometric methods were used, including Hellwig's development measure, spatial autocorrelation coefficient and Ward's method.

In order to compare the standard of living across Poland's voivodships in the year 2003 and 2012, a modified version of Hellwig's development measure was applied. The modification consisted in establishing a common model of development for the two years under study. On this basis, by having created voivodship ranking, spatial diversity of the standard

of living in Poland was assessed and four classes of voivodships were singled out. The construction of the model based on the data from both years made it possible to observe the changes occurring over time, while the synthetic measure itself served as a variable in the further stages of the study. The next step involved specifying the nature and degree of spatial dependencies of the standard of living across the country. For this purpose, global Moran's spatial autocorrelation statistic was used [Suchecky, 2010, p. 107]. As a weight matrix, the binary neighbourhood matrix $W=[w_{ij}]_{n \times n}$ was adopted. Then the Moran's I for the variable X with observed values x_i in n various localizations ($i = 1, 2, \dots, n$), and the non-standardized weight matrix W is given by the following formula [Suchecky, 2010, p. 112]:

$$I = \frac{1}{\sum_{i=1}^n \sum_{j=1}^n w_{ij}} * \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2}$$

where:

I – coefficient of global spatial autocorrelation,

w_{ij} – neighbourhood weight between the i -th and j -th object of the analysis ($i, j=1, 2, \dots, n$),

x_i, x_j – values of the X variable, respectively for i -th and j -th object ($i, j=1, 2, \dots, n$),

\bar{x} – mean value of the variable X

The value obtained is then compared to the critical value I^* computed from:

$$I^* = -\frac{1}{n-1}$$

which defines one of the following possibilities:

1. $I \approx I^*$ – autocorrelation does not occur
2. $I > I^*$ – non-negative autocorrelation,
3. $I < I^*$ – negative autocorrelation.

Next, based on the original set of diagnostic features, a similarity analysis

Table 1. The standard of living dimensions and their quantitative measures.

<p>1. Health care and social care</p> <ul style="list-style-type: none"> • fertility rate • live-birth per 1000 population • number of people using social benefits • number of hospital beds in general hospitals per 10 thousand population • number of people per hospital bed in general hospitals • number of physicians per 10 thousand population • number of nurses and midwives per 10 thousand population • voivodship budget expenditures on health care and social care per capita 	<p>2. Job market, working conditions and safety at work</p> <ul style="list-style-type: none"> • dependency rate per 100 population • unemployment rate (5) • number of occupational accidents per 1000 population
<p>3. Remuneration and income</p> <ul style="list-style-type: none"> • average gross monthly remuneration (PLN) • average monthly disposable income per 1 person of the household (PLN) 	<p>4. Housing conditions</p> <ul style="list-style-type: none"> • number of dwellings completed per 1000 population • average usable floor space per 1 person
<p>5. Education</p> <ul style="list-style-type: none"> • percentage of secondary schools equipped with computers with the Internet access available for pupils • number of places in nursery schools per 1000 population • voivodship budget expenditures on education per capita 	<p>6. Recreation, culture and leisure time</p> <ul style="list-style-type: none"> • number of cultural centres per 10 thousand population • average monthly spending on culture and recreation per 1 person of the household (PLN) • voivodship budget expenditures on culture and the conservation of national heritage per capita
<p>7. Communication and transport</p> <ul style="list-style-type: none"> • hard-paved roads per 100km² • hard-paved public roads per 10 thousand population (km) • percentage of households equipped with personal computer with the Internet access (%) 	<p>8. Public safety</p> <ul style="list-style-type: none"> • number of identified offences per 1000 population
<p>9. Degradation of the natural environment and its preservation</p> <ul style="list-style-type: none"> • carbon dioxide emission produced by particularly harmful plants (t/year) per capita • percentage of population using sewerage network (%) • percentage of population using water supply network (%) 	<p>10. Economic level</p> <ul style="list-style-type: none"> • investments per capita (PLN) • GDP per capita (PLN) • retail sale per capita (PLN) • where investments represent the measure of entrepreneurship and retail sale determines consumption level

Source: Authors' own study.

was performed and homogenous groups of voivodships determined. For that the Ward's method was employed, which is based on the analysis of variances with a view to estimate the distances between individual clusters. In this method, the basis for the analysis is provided by matrix D of Euclidean distances between the units examined:

$$D = \begin{bmatrix} 0 & d_{12} & \dots & d_{1k} \\ d_{21} & 0 & \dots & d_{2k} \\ \dots & \dots & \dots & \dots \\ dk1 & dk2 & \dots & 0 \end{bmatrix}$$

where:

d_{ij} ($i, j = 1, 2, \dots, k; i \neq j$) is the distance between i -th and j -th diagnostic variable [Stec et al., 2005, p. 136].

Such pairs of objects are looked for (in the further stages of such clusters) among those distances for which the distances are the smallest ($\min\{d_{ij}\}$). Every object is regarded as a one-element group which then combines with two-element groups [Stec et al., 2005, p. 136].

The next stage of this method involves the determination the distance of a newly-formed group from the rest of the groups (by using the variance analysis). This value, in the distance matrix, takes the place of the distance of the first of the two objects, whereas the row and column of the second object are deleted. These actions keep being repeated until all objects form one group [Stec et al., 2005, p. 136].

The Ward's method is recognized as very effective, most frequently leading to the formation of small clusters. As the result of the analysis, a dendrogram is produced, being a graphical representation of the results produced [Stec et al., 2005, p. 137].

Diagnostic Variables of the Standard of Living of Poland's Population

During the first stage of the study, after having selected the quantitative measures of the standard of living,

a statistical analysis of variables was conducted. So called quasi-constant variables were eliminated from the original set of the potential diagnostic variables (see Table 1). In order to do so, variation coefficient was used. In adopting the critical value at the level of 10% for the coefficient, 9 variables were excluded from the further analysis. In the next step, while investigating the correlation degree⁶ of the individual features, a further reduction of the variables was carried out and the final form of the set of the diagnostic variables was determined. As the result, in building Hellwig's dynamic measure of development, the 20 following quantitative characteristics were used:

- number of people using social benefits (de-stimulant);
- number of people per hospital bed in general hospitals (de-stimulant);
- number of physicians per 10 thousand population (stimulant);
- number of nurses and midwives per 10 thousand population (stimulant);
- voivodship budget expenditures on health care per capita (stimulant);
- unemployment rate (%) (de-stimulant);
- number of occupational accidents per 1000 population (de-stimulant);
- average monthly disposable income per 1 person of the household (PLN) (stimulant);
- number of completed dwellings per 1000 population (stimulant);
- number of places in nursery schools per 1000 population (stimulant);
- voivodships budget expenditures on education and upbringing per capita (stimulant);
- number of culture centres per 10 thousand population (stimulant);

⁶ It was arbitrarily assumed that Pearson's coefficient values at the level below 0,9 signify statistically insignificant relations.

- voivodship budget expenditures on culture and conservation of national heritage per capita (stimulant);
- hard-paved roads per 100 km² (km) (stimulant);
- hard-paved public roads per 10 thousand population (km) (stimulant);
- percentage of households equipped with personal computer with the Internet access (%) (stimulant);
- number of identified offences per 1000 population (de-stimulant);
- carbon dioxide emission produced by particularly harmful plants (t/year) per capita (de-stimulant);
- percentage of people using sewerage network (%) (stimulant);
- retail sale per capita (PLN) (stimulant).

Changes of the Standard of Living in Poland by Voivodships – an Analysis Covering 2003-2012

The Hellwig’s development measure of the Standard of living across Poland’s voivodships was determined for two years: 2003 and 2012. The distance from the model determined on the basis of the observations for the two time frames examined was calculated using the root Euclidean distance. Table 2 demonstrates the results thus obtained.

The last column of the table shows how the values of Hellwig’s measure changed in 2012 compared to 2003. The study has found that in all the objects examined the standard of living improved. The greatest increase of the development measure occurred for the following voivodships:

Table 2. Trends of values of Hellwig’s synthetic measure of development of people’s standard of living across Poland’s voivodships in the years 2003 and 2012.

No.	Voivodship	Hellwig’s measure 2003	Hellwig’s measure 2012	Difference
1	Dolnośląskie	0,1508	0,4223	0,2716
2	Kujawsko-pomorskie	0,0812	0,2597	0,1784
3	Lubelskie	0,1228	0,2957	0,1729
4	Lubuskie	0,0826	0,1810	0,0984
5	Łódzkie	0,1550	0,2971	0,1421
6	Małopolskie	0,2056	0,3868	0,1811
7	Mazowieckie	0,2327	0,4390	0,2063
8	Opolskie	0,1072	0,2558	0,1485
9	Podkarpackie	0,0784	0,3029	0,2244
10	Podlaskie	0,1699	0,3536	0,1837
11	Pomorskie	0,1160	0,3317	0,2157
12	Śląskie	0,1498	0,3082	0,1584
13	Świętokrzyskie	0,1040	0,2536	0,1496
14	Warmińsko-mazurskie	0,0422	0,2054	0,1633
15	Wielkopolskie	0,1264	0,2914	0,1650
16	Zachodniopomorskie	0,1136	0,2882	0,1745

Source: Authors’ own calculations.

Table 3. Ranking of Poland's voivodships in terms of the standard of living of the population in the years 2003 and 2012.

Place in the ranking	Ranking 2003	Ranking 2012
1	Mazowieckie	Mazowieckie
2	Małopolskie	Dolnośląskie
3	Podlaskie	Małopolskie
4	Łódzkie	Podlaskie
5	Dolnośląskie	Pomorskie
6	Śląskie	Śląskie
7	Wielkopolskie	Podkarpackie
8	Lubelskie	Łódzkie
9	Pomorskie	Lubelskie
10	Zachodniopomorskie	Wielkopolskie
11	Opolskie	Zachodniopomorskie
12	Świętokrzyskie	Kujawsko-pomorskie
13	Lubuskie	Opolskie
14	Kujawsko-pomorskie	Świętokrzyskie
15	Podkarpackie	Warmińsko-mazurskie
16	Warmińsko-mazurskie	Lubuskie

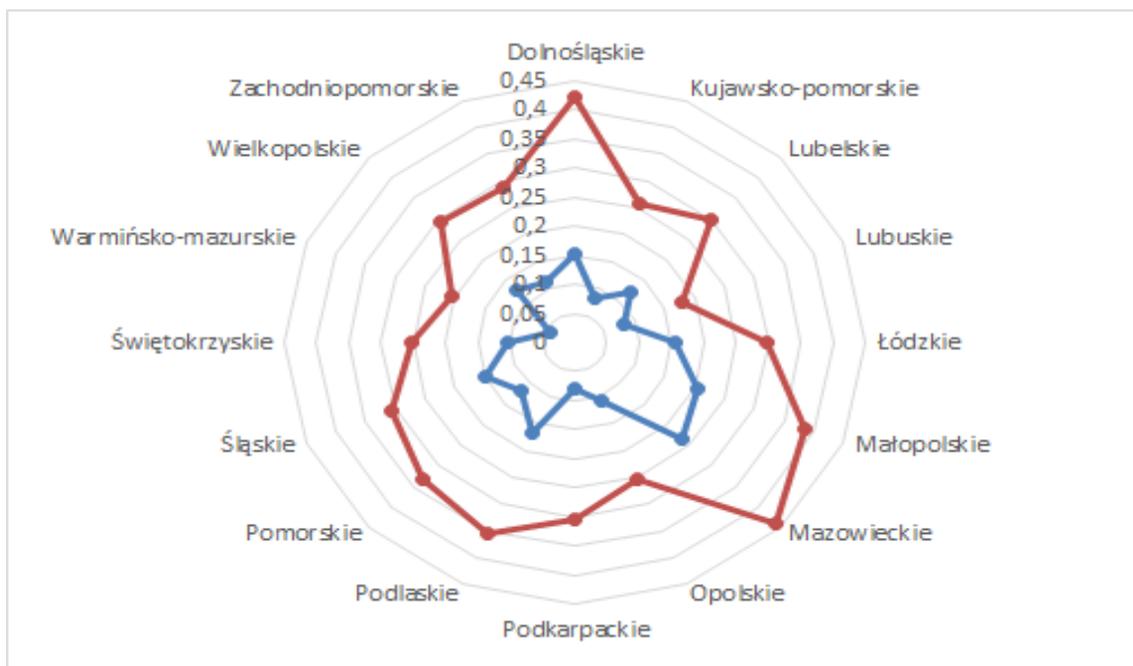
Source: Authors' own study.

Dolnośląskie (0,2716), Podkarpackie (0,2244), Pomorskie (0,2157) and Mazowieckie (0,2063). The smallest improvement was recorded for Lubuskie voivodship (an increase by only 0,0984). The results obtained provided the basis for the voivodship ranking in terms of the standard of living (see Table 3).

Mazowieckie voivodship retained its position in the ranking. Dolnośląskie voivodship, at place 4 in 2003, moved on to the 2 place in 2012. Podkarpackie as well as Pomorskie voivodships stood out considerably in the ranking. Lubuskie voivodship fell down in the ranking, taking the last place in 2012.

Graph 1 illustrates the disparity present among the voivodships as to the standard of living. The blue line represents the year 2003 and the red one the year 2012. Their arrangement indicates that the standard of living improved during those nine years, yet the disparities remained the same or increased. Only in Podkarpackie voivodship and Pomorskie voivodship can we see a positive impact of the measures aimed at reducing the disparities among the voivodships.

The changes pertaining to the standard of living occurring in individual voivodships can also be observed on maps 1-4. In preparing maps 1 and



Graph 1. Trends of the value of the development measure of the standard of living across Poland's voivodships in the years 2003 and 2012.

Source: Authors' own study.

2, a division into four classes, common for both years, was used. These classes are equal in terms of the span of the development measure. Map 1 demonstrates the voivodships as assigned to the individual classes in 2003, while map 2 refers to 2012. We can observe that there is a general improvement in the standard of living. Each voivodship moved on to a better class at the later time frame, and, in addition, the lowest class is no longer present.

Maps 3 and 4 illustrate the division of the voivodships into 4 classes established separately for 2003 and 2012. This kind of grouping allows the disparities in the standard of living among the voivodships to be highlighted. Also, what can be gleaned from the maps is that the voivodships with a higher standard of living are

coming increasingly more to the fore on the background of the adjacent voivodships.

To determine the type and degree of the spatial dependencies in terms of the standard of living in the voivodships, global Moran's I was calculated. Hellwig's synthetic development measure was used as a variable with the spatial weights representing the binary neighbourhood matrix.

The value of global Moran's statistic, both for 2003 and 2012, is significant and it indicates that there is a moderate negative autocorrelation (-0,18 for 2003 and -0,32 for 2012). Moreover, an increase in the absolute value of the coefficient shows that there is greater spatial dependence. A tendency occurs in that the voivodships displaying different

Equal Intervals: MRH_2003

- [0,0422; 0,1414] (10)
- [0,1414; 0,2406] (6)
- [0,2406; 0,3398] (0)
- [0,3398; 0,4390] (0)

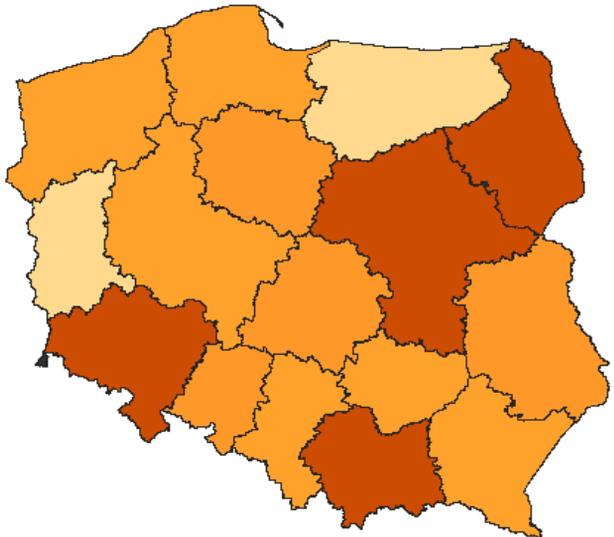


Map 1. The standard of living in Poland in 2003 – a class division common for 2003 and 2012.

Source: Authors' own study.

Equal Intervals: MRH_2012

- [0,0422; 0,1414] (0)
- [0,1414; 0,2406] (2)
- [0,2406; 0,3398] (10)
- [0,3398; 0,4390] (4)



Map 2. The standard of living in Poland in 2012 – a class division common for 2003 and 2012.

Source: Authors' own study.

Equal Intervals: MRH_2003

- [0.0422:0.0898] (4)
- [0.0898:0.137] (6)
- [0.137:0.185] (4)
- [0.185:0.233] (2)

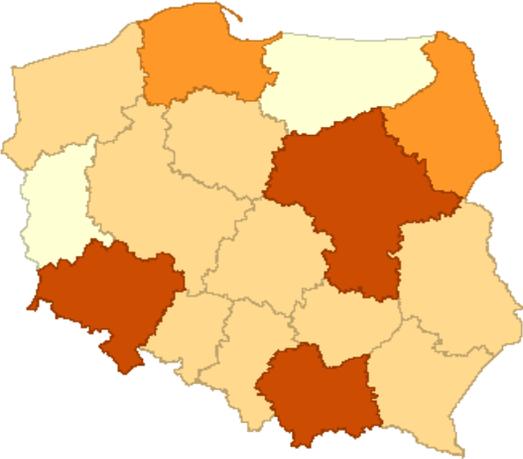


Map 3. The standard of living in Poland in 2003 – a class division based solely on the data for 2003.

Source: Authors' own study.

Equal Intervals: MRH_2012

- [0.181:0.246] (2)
- [0.246:0.31] (9)
- [0.31:0.375] (2)
- [0.375:0.439] (3)



Map 4. The standard of living in Poland in 2012 – a class division based solely on the data for 2012.

Source: Authors' own study.

standard of living are neighbouring with each other. The location of points in the dispersion graphs of the Moran's statistics where the majority of the objects is located in quarters LH and HL shows progressive divergence of the standard of living which is reflected by a greater

dispersion of the objects in figure 1 and 2. This development arises from the polarization of the voivodships and the separation of growth poles – such as Mazowieckie voivodship and Dolnośląskie voivodship which absorb human capital and investments from their neighbours.

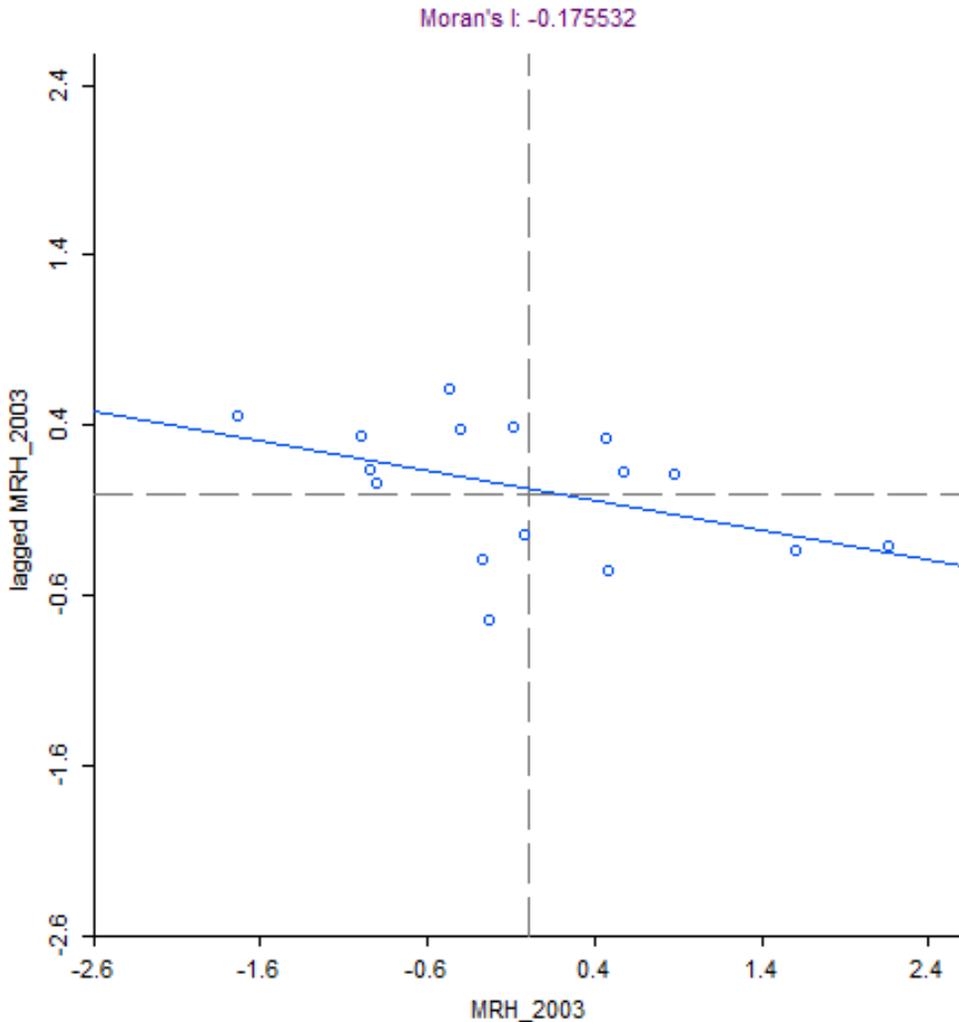


Figure 1. The results of spatial autocorrelation for 2003

Source: Authors' own study.

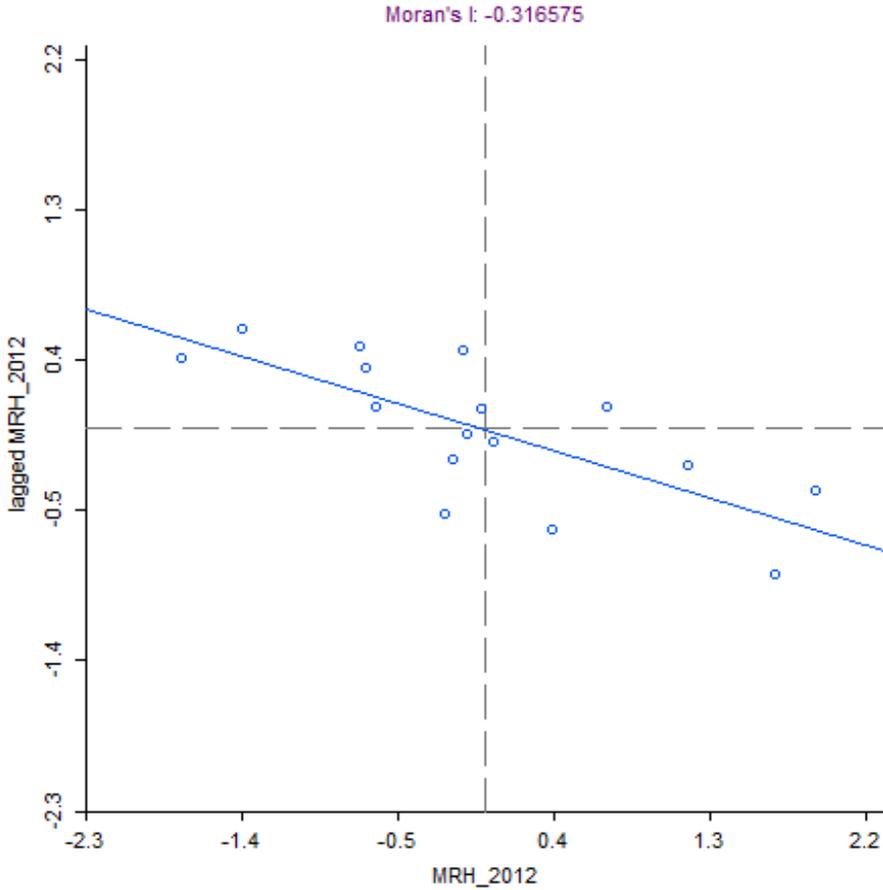


Figure 2. The results of spatial autocorrelation for 2012

Source: Authors' own study.

Two dendrograms for the year 2003 and 2012 illustrate the Ward's method (see Figure 3 and 4). The number of clusters is conditional on the linkage distance considered.

For the year 2003, we obtain 3 clusters⁷. for the distance exceeding sev-

en. The following voivodships concentrated in the first cluster: Dolnośląskie, Wielkopolskie, Śląskie, Łódzkie, Mazowieckie, Pomorskie. These were the voivodships where the determinants of the standard of living took on the

⁷ In the two cases examined (i.e. 2003 and 2012) the optimum number of clusters was determined following the criterion of the first clear increase of the aggregation distance on the basis of the relevant linkage distance graphs in relation to the

linkage stages. For more information on the determination of the number of segments on the basis of the aggregation analysis see A. Sokołowski, *Empiryczne testy istotności w taksonomii*, Akademia Ekonomiczna w Krakowie, Zeszyty Naukowe, Kraków 1992.

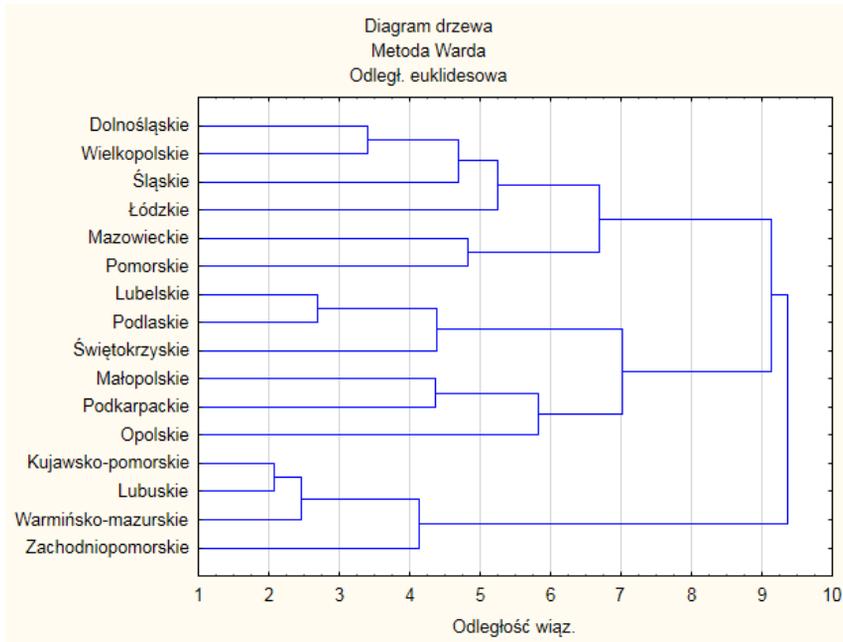


Figure 3. The results of the aggregation method (the year of 2003)

Source: Authors' own study.

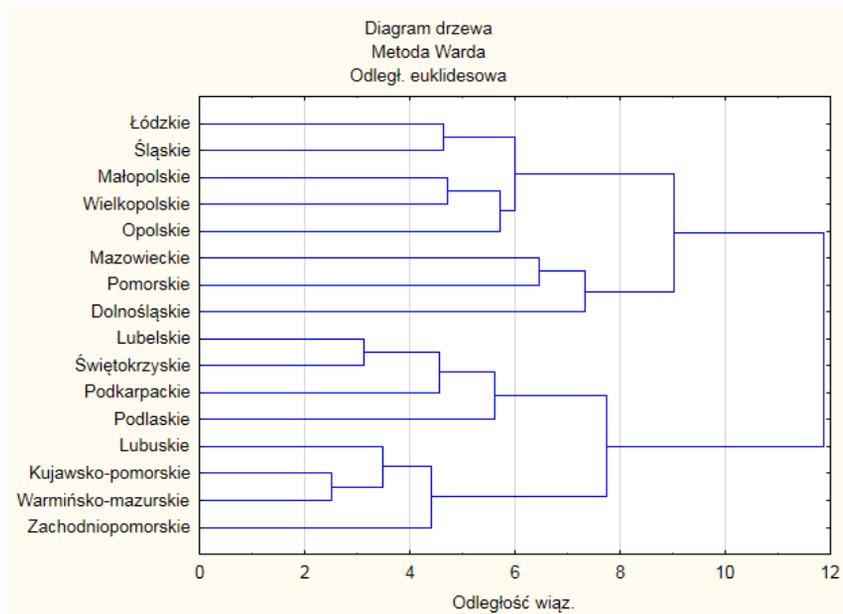


Figure 4. The results of the aggregation method (the year 2012)

Source: Authors' own study.

highest values. The next two clusters were characterized by a certain geographic cohesion. The second group, which was made up of the voivodships: Lubelskie, Podlaskie, Świętokrzyskie, Małopolskie, Podkarpackie and Opolskie, covers predominantly the southern and eastern region of Poland. Moreover, another homogenous group encompassed the voivodships located in the north: Kujawsko-Pomorskie, Lubuskie, Warmińsko-Mazurskie and Zachodniopomorskie.

The division into three clusters for the year 2012 differed significantly. The first group was made up of the following voivodships: Łódzkie, Śląskie, Małopolskie, Wielkopolskie and Opolskie. The second, a three-element cluster consisted of such voivodships as Mazowieckie, Pomorskie and Dolnośląskie. These voivodships distanced themselves considerably from the rest, showing clearly better values as regards the measures of the standard of living. The last group included: Lubelskie voivodship, Świętokrzyskie voivodship, Podkarpackie voivodship, Podlaskie voivodship, Lubuskie voivodship, Kujawsko-Pomorskie voivodship, Warmińsko-Mazurskie voivodship.

Analyzing the dendrograms, we can notice that the level at which the clusters emerge as well as their number increases. This may indicate that the voivodships continue to differ and diverge in terms of the standard of living.

Conclusions

The studies have found that since 2003, the year preceding the year in which Poland joined the European Union, the general standard of living of the population across all the voivodships improved. This is reflected in the non-negative values of the increase of Hellwig's measure of development determined for all the voivodships in relation to 2003 and 2012. It is worth emphasizing here that in 2012 the

highest increase of the measure, and thus relatively greatest improvement of the standard of living, could be observed for the following voivodships: Dolnośląskie, Podkarpackie, Pomorskie and Mazowieckie. On the other hand, Lubuskie voivodship saw the smallest betterment of the living standard. In 2012, the highest place in the ranking in terms of the category under discussion was retained by Mazowieckie voivodship, as compared to 2003. Dolnośląskie voivodship, which was ranked 4 in the first period investigated, in the year 2012 was ranked 2. Furthermore, Podkarpackie and Pomorskie voivodships stood out considerably in the ranking. In 2012, the already mentioned Lubuskie voivodship fell in the ranking, since its measure of development was insignificant, and took the last place.

Unfortunately the positive development in the general standard of living of the population across all the voivodships was accompanied by an adverse increase in their disparities in terms of the category under discussion. This is reflected, among other things, in the outcome of the spatial correlation analysis. The increase as regards the absolute value of Moran's spatial correlation coefficient indicates that the spatial dependence has grown and that there is a trend in that voivodships with different levels of living are neighbouring with each other. The location of points in the dispersion graphs of the Moran's statistic where the majority of the objects is located in quarters LH and HL shows progressive divergence of the standard of living which is shown by a greater dispersion of the objects in Figure 1 and 2. This arises from the polarization of the voivodships and the separation of growth poles – such as Mazowieckie voivodship and Dolnośląskie voivodship, which absorb human capital and investments from their neighbours

To sum it up, we suggest that accepting the hypothesis on the improvement of the standard of living of people across Poland's voivodships while rejecting the hypothesis on the declining disparities amongst Poland's population

across individual voivodships implies that the measures our country have been implementing have not met their objectives entirely thus providing the need to discuss their relevance and efficiency.

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Legal acts

Regulation of the Council (EC) no 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, Social Fund and Cohesion Fund, and repealing Regulation (EC) no 1260/1999 (Dz.U [Journal of Laws] .UE.L.2006.210.25).

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Zmiany przestrzennego zróżnicowania poziomu życia ludności w Polsce w latach 2003-2012

Abstrakt

Cel

Osiągany w poszczególnych krajach i ich regionach poziom życia ludności w dużej mierze zależy od poziomu rozwoju społeczno-gospodarczego jaki prezentuje dane państwo. W przypadku większości krajów rozwiniętych i rozwijających się ogólny poziom życia społeczeństw ulega poprawie. Jednocześnie wzrasta dystans pomiędzy krajami i regionami o najniższym i najwyższym poziomie rozwoju społecznego. W Polsce m.in. ze względów kulturowych, historycznych, społecznych i ekonomicznych poziom życia ludności zamieszkującej różne regiony (województwa) jest odmienny. Polska, podobnie jak inne kraje członkowskie Unii Europejskiej (UE), podejmuje działania, których celem jest zniwelowanie różnic w poziomie życia ludności naszego kraju oraz dążenie do jego poprawy. Działania te podejmowane są m.in. w ramach polityki spójności UE.

Przedmiotem przeprowadzonego badania, którego wyniki zaprezentowano w artykule była weryfikacja hipotezy o poprawie oraz malejącym zróżnicowaniu poziomu życia mieszkańców poszczególnych województw w okresie przed i po przystąpieniu Polski do Unii Europejskiej, a także ocena występowania współzależności pomiędzy położeniem zamieszkiwanego województwa a osiąganym poziomem życia.

Metoda badawcza

W badaniach zastosowano metody statystyczne i ekonometryczne. W celu porównania poziomu życia w województwach Polski w latach 2003 i 2012 zastosowano zmodyfikowaną wersję miary rozwoju Hellwiga. Do określenia charakteru i stopnia zależności przestrzennych poziomu życia na obszarze całego kraju wykorzystano statystykę globalnej autokorelacji przestrzennej Morana. Następnie w oparciu o pierwotny zbiór cech diagnostycznych dokonano analizy podobieństwa oraz wyznaczono homogeniczne grupy województw. Wykorzystano do tego metodę Warda, która opiera się analizie wariancji w celu oszacowania odległości pomiędzy poszczególnymi skupieniami. Podstawę analiz stanowiły dane Głównego Urzędu Statystycznego w Warszawie, obejmujące lata 2003 i 2012.

Wnioski

Z przedstawionych w artykule badań wynika, że w analizowanym okresie we wszystkich województwach kraju nastąpiła poprawa poziomu życia ludności i jednocześnie wzrosła polaryzacja województw pod względem rozważanej kategorii. Pojawił się również nowy biegun wzrostu – województwo dolnośląskie. Odrzucenie hipotezy o zmniejszającym się dystansie pomiędzy poziomem życia ludności województw Polski oznacza, że realizowane przez nasz kraj działania nie do końca spełniają swoje zadanie i potrzebna jest dyskusja na temat ich zasadności i skuteczności.

Oryginalność / wartość artykułu, wkład w rozwoju nauki

W artykule wykorzystano narzędzia ekonometrii przestrzennej, które wzbogacają analizę przestrzennego zróżnicowania poziomu życia ludności oraz ułatwiają wyciąganie prawidłowych i istotnych w przypadku rozważanego zagadnienia wniosków.

Słowa kluczowe: poziom życia, przestrzenne zróżnicowanie, analiza ekonometryczna