

## COMPARISON OF THE LIFE STANDARDS OF INHABITANTS IN EASTERN AND WESTERN POLAND

Anna Tatarczak, PhD<sup>1</sup>; Anna Makuch<sup>2</sup>

Faculty of Economics, Maria Curie-Skłodowska University

### ABSTRACT

The main aim of the study is to analyse and compare the quality of life of the inhabitants of eastern and western Poland. This is accomplished by investigating whether the division of Poland into 'Poland A' and 'Poland B', which has been the norm for years, is valid. The spatial scope applies to all voivodeships. The criterion for the division of eastern and western Poland was adopted based on the historical division along the Vistula river. The characteristics used in the analysis described: education, access to medical care, health, safety, housing, the labour market, culture, and material resources. The period examined in the study covers the years 2005–2015. The study used Ward's and taxonomic methods, in particular the Hellwig's method.

**Key words:** living standard, multi-dimensional statistical analysis, Hellwig's synthetic measure

**JEL codes:** O11, R11, R58

### INTRODUCTION

The study aims to analyse and compare the quality of life of the inhabitants of eastern and western Poland. This should confirm whether or not the division of Poland into 'Poland A' and 'Poland B', which has been applied for years, is valid. The research covers the years from 2011 to 2016. This study makes several contributions to the existing knowledge base in the following ways. Firstly, it is important to determine the differences between the regions in terms of certain aspects of social development, as well as grouping the regions according to the quality of life of their inhabitants. Secondly, the results of the study may be a useful starting point for the performance of feedback analyses and the foundation for decision-making in the economic field. Finally, given that the

data are internationally comparable, we provide evidence concerning international differences in living standards.

At present, research concerning quality of life began after the Second World War. During this time, a transformation occurred in many areas. From the 1950s onwards, quality of life was considered at an interdisciplinary level, i.e. in various scientific fields. In the 1960s and 1970s, the concept was for the most part defined quantitatively. This was mainly applicable to research dealing with the satisfaction of both individual and non-individual needs. In the 1970s and 1980s, the main emphasis was placed on certain scientific fields such as sociology and psychology. Observations were initiated examining how certain lifestyles could affect the overall quality of life. Since then, for example, initial studies have been conducted

<sup>1</sup> Corresponding author: Plac Marii Curie-Skłodowskiej 5, Lublin, Poland, [anna.tatarczak@poczta.umcs.lublin.pl](mailto:anna.tatarczak@poczta.umcs.lublin.pl)

<sup>2</sup> Corresponding author: Plac Marii Curie-Skłodowskiej 5, Lublin, Poland, [aniaamakuch@gmail.com](mailto:aniaamakuch@gmail.com)

to determine the relationships influencing the overall health condition and the standard of living experienced by the examined population. Even though for many years it has been a topic that has been studied by scientists and its popularity is constantly growing, it is still not possible to adopt an unambiguous definition of quality of life (Kowalewska et al., 2017).

It is important to note that there are many factors by which we can measure the level of the quality of life. There are many types of scales with which we can study these relationships. Some of the main factors that may influence the quality of life are material situation, health, material stability and security, family life, community life, climate and geography, employment security, political freedom, gender balance (Grzegza, 2012).

## **THEORETICAL BACKGROUND**

Typological procedures and taxonomic methods are used in almost every field of science (Balan and Jaba, 2011; Lee and Willcox, 2014; Löster, 2017; Al-Nofli, 2018). Quality of life in the work process is defined as the effects of the service conditions on the workshop cows. It is very important in this team whether they are perceived as permitting and producing effects, and authorization for management participatory (Skrzypek, 2001). Determining the standard of living of given individual units is possible by determining the ratio of its needs to the state of resources to satisfy them. The quality of human life is evidenced by the accompanying mental states in the process of satisfying needs, as a result of the cognitive assessment of the relationship between with oneself and the environment, assessment of own achievements, failures and the assessment of action of one's aspirations, desires, and life goals (Chudzicka, 1995). In practice, one of the most commonly used discrimination methods of features based on a correlation coefficients matrix is a parametric method, as proposed by Zdzisław Hellwig (Nowak, 1990) this was based on a method that was originally proposed by Hellwig (Hellwig, 1968. The research was conducted in the following stages (Pomianek, Chrzanowska and Bórawski, 2013): Stage 1: A set of variables was chosen and defined; Stage 2:

A taxonomic development measurement was created using the Hellwig method; Stage 3: A ranking of the voivodeships was established and they were divided into classes. The levels of the voivodeships will be determined and compared using Ward's method and the method of determining the taxonomic measure of development (TMD) by Hellwig (Pawlas, 2013). The implementation of Hellwig's taxonomic measure of development is widely used in comparative research (Pawlas, 2017). Cluster analysis is one of the multidimensional methods that allows for observations to be classified. Ward's method is one of the agglomeration grouping methods. It was applied using the square of the Euclidean distance. This is a classic method and one of the most widely used methods in cluster analysis. This method is the most highly recommended one due to the applied efficiency criterion of presenting the actual data structure.

## **MATERIALS AND METHODS**

The work adopts the territorial division of Poland based on the established division of the country into Poland 'A' and Poland 'B'. The genesis of this division probably arose during the partitions. There were clear differences between the Prussian territories and the Austrian and Russian territories (Bukowski et al., 2017). The study aims to conduct a comparative analysis of the living standards of the inhabitants of eastern and western Poland, using the data from 2005–2015 from the Central Statistical Office and with the help of taxonomic methods a grouping procedure of the districts has been carried out concerning the similarity of the level of the features under investigation. We focus on the period 2005–2015 because Poland is just after joining the European Union, and in the middle of the period, we are dealing with an economic crisis that could have had a significant impact on the lives of the inhabitants of Poland.

## **RESEARCH RESULTS AND DISCUSSION**

To group voivodeships with similar values in their standard of living, the SPSS Statistics program was used. This allows for the results to be grouped into different levels, so it is possible to evaluate the results

and choose the best combination. A combination was selected that divides the data of individual voivodeships into four clusters. The following variables were adopted (Grzegea, 2012; Table 1).

**Table 1.** Selected variables

Education	
X1	Graduates of studies at the master's level
X2	Number of people who passed matura exams
Access to medical care	
X3	Number of pharmacies
X4	Beds in general hospitals per 10 000
Health	
X5	Number of tuberculosis cases
X6	Infant mortality rates per 1 000 live births
Security	
X7	External causes of illness and death – total number of accidents
Housing	
X8	Average usable floor space per dwelling
X9	Average usable floor space per person
X10	Number of dwellings per 1 000 inhabitants
The labour market	
X11	Average salary
X12	Number of unemployed
Culture	
X13	Radio subscribers
X14	TV subscribers
X15	Viewers in permanent cinemas per 1 000 inhabitants
Material resources	
X16	Total number of passenger cars
X17	Total number of phones

Source: own study.

Hellwig's development measurement, i.e. a synthetic development measurement, is used for the linear ordering of selected diagnostic variables. The synthetic variable replaces the selected diagnostic variables. Table 2 shows the calculated TMD value in 2005 and 2015 for individual provinces. For the names of voivodeships arranged alphabetically, successive ordinal numbers have been assigned: Dolnośląskie

– 1, Kujawsko-pomorskie – 2, Lubelskie – 3, Lubuskie – 4, Łódzkie – 5, Małopolskie – 6, Mazowieckie – 7, Opolskie – 8, Podkarpackie – 9, Podlaskie – 10, Pomorskie – 11, Śląskie – 12, Świętokrzyskie – 13, Warmińsko-mazurskie – 14, Wielkopolskie – 15, Zachodniopomorskie – 16.

Over 10 years, we may observe that in the groups created, the composition of voivodeships has not changed significantly. The Mazowieckie Voivodeship is significantly different from the others, so we may conclude that the standard of living in the highest there. The first cluster includes voivodeships with an average standard of living, while the Śląskie Voivodeship changed its position from the fourth cluster to the first over the previous 10 years. In 2015, the Łódzkie Voivodeship increased its standard of living, while in the Podkarpackie and Zachodniopomorskie Voivodeships, we can observe slight changes in the contents of clusters. Based on the research presented, we may conclude that it is difficult to determine unambiguously whether there is a visible division in the living standards of the inhabitants between eastern and western Poland. Based on belonging to certain clusters, we can see that in the third cluster there are voivodeships only from the eastern part of Poland, while as far as the first cluster is concerned, voivodeships from western Poland prevail.

Ward's method is a hierarchical agglomeration method that is used to classify objects. The main criterion by which we choose a pair of linked sets becomes the value that is optimal for a certain objective function. Choices are abundant for the target function. The most frequently used method is the 'sum of the squared deviations of the individual elements of concentration from the centre of gravity of this cluster'. The basic idea of the described method is to combine, at each step of the agglomeration, two such subsets for which the objective function given by the equation is the lowest.

In the following case, a division into four clusters was used (Table 3):

- First voivodeship cluster: Dolnośląskie, Łódzkie, Małopolskie, Wielkopolskie;
- Second voivodeship cluster: Kujawsko-pomorskie, Lubelskie, Pomorskie;
- Third voivodeship cluster: Lubuskie, Opolskie,

**Table 2.** The taxonomic measure of development values

Specification	Number of voivodship															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TMD1 2005	0.64	0.42	0.31	0.38	0.44	0.5	0.86	0.31	0.46	0.35	0.51	0.67	0.28	0.4	0.51	0.37
TMD1 2015	0.54	0.4	0.45	0.14	0.39	0.3	0.53	0.23	0.3	0.25	0.46	0.34	0.23	0.39	0.57	0.42
TMD2 2005	0.55	0.37	0.25	0.78	0.72	0.4	0.75	0.33	0.59	0.39	0.49	0.54	0.47	0.38	0.29	0.53
TMD2 2015	0.43	0.44	0.31	0.38	0.37	0.7	0.65	0.34	0.43	0.28	0.57	0.28	0.29	0.38	0.71	0.95
TMD3 2005	0.67	0.54	0.5	0.64	0.63	0.5	0.77	0.21	0.31	0.56	0.37	0.53	0.5	0.45	0.46	0.82
TMD3 2015	0.51	0.46	0.5	0.38	0.65	0.3	0.63	0.4	0.49	0.42	0.44	0.98	0.41	0.38	0.5	0.36
TMD4 2005	0.07	0.71	0.93	0.77	0.73	0.6	0.82	0.52	0.79	0.8	0.54	0.81	0.72	0.57	0.66	0.31
TMD4 2015	0.9	0.76	0.95	0.62	0.94	0.8	0.03	0.6	0.76	0.84	0.9	0.34	0.68	0.7	0.83	0.82
TMD5 2005	0.22	0.55	0.63	0.24	0.42	0.6	0.51	0.41	0.39	0.79	0.58	0.71	0.62	0.54	0.75	0.56
TMD5 2015	0.33	0.72	0.54	0.6	0.32	0.7	0.17	0.46	0.89	0.42	0.6	0.47	0.67	0.73	0.59	0.46
TMD6 2005	0.39	0.4	0.46	0.23	0.53	0.2	0.24	0.39	0.37	0.16	0.35	0.25	0.36	0.41	0.26	0.53
TMD6 2015	0.71	0.55	0.44	0.42	0.59	0.6	0.95	0.36	0.37	0.39	0.61	0.86	0.36	0.4	0.75	0.51
TMD7 2005	1	0.53	0.62	0.57	0.63	0.4	0.44	0.39	0.36	0.39	0.35	0.52	0.64	0.71	0.38	0.76
TMD7 2015	0.71	0.55	0.44	0.42	0.59	0.6	0.95	0.36	0.37	0.39	0.61	0.86	0.36	0.4	0.75	0.51
TMD8 2005	1	0.44	0.53	0.57	0.63	0.4	0.49	0.37	0.38	0.47	0.38	0.48	0.64	0.69	0.4	0.95
TMD8 2015	0.6	0.47	0.47	0.37	0.52	0.7	1	0.37	0.46	0.36	0.52	0.76	0.37	0.38	0.66	0.36

Source: own study.

**Table 3.** Affiliation of voivodeships to clusters in 2005

Voivodeship	Number of clusters 4		Number of clusters 3		Number of clusters 2	
	Year of observation					
	2005	2015	2005	2015	2005	2015
Dolnośląskie	1	1	1	1	1	1
Kujawsko-pomorskie	2	2	2	2	2	2
Lubelskie	2	2	2	2	2	2
Lubuskie	3	3	2	3	2	2
Łódzkie	1	2	1	2	1	2
Małopolskie	1	1	1	1	1	1
Mazowieckie	4	4	3	1	1	1
Opolskie	3	3	2	3	2	2
Podkarpackie	3	2	2	2	2	2
Podlaskie	3	3	2	3	2	2
Pomorskie	2	2	2	2	2	2
Śląskie	4	1	3	1	1	1
Świętokrzyskie	3	3	2	3	2	2
Warmińsko-mazurskie	3	3	2	3	2	2
Wielkopolskie	1	1	1	1	1	1
Zachodniopomorskie	3	2	2	2	2	2

Source: own study.

Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-mazurskie, Zachodniopomorskie;

- Fourth voivodeship cluster: Mazowieckie, Śląskie.

For 2015, the results are as follows:

- First voivodeship cluster: Dolnośląskie, Małopolskie, Śląskie, Wielkopolskie;
- Second voivodeship cluster: Kujawsko-pomorskie, Lubelskie, Łódzkie, Podkarpackie, Pomorskie, Zachodniopomorskie;
- Third voivodeship cluster: Lubuskie, Opolskie, Podlaskie, Świętokrzyskie, Warmińsko-mazurskie;
- Fourth voivodeship cluster: Mazowieckie.

The general situation in terms of the living standards of the inhabitants of Poland is improving. In some cases, such as education or access to health-care, the situation has changed significantly in a favourable way. This is a very beneficial phenomenon. Our country strives to equalize the standard of living so that the differences in the standard of living between the Western and Scandinavian countries are as small as possible. Another conclusion produced by the research is the significant increase in the standard of living of the inhabitants of Poland in the analysed years. Over the decade, one may observe how the level of education and access to medical care has improved. The standard of living of the inhabitants of Poland in 2005–2015 may have been additionally influenced by Poland's recent accession to the European Union in 2004 and the financial crisis that took place in 2008.

## CONCLUSIONS

The empirical study covers the period of 2005–2010. The specified period includes a global financial and economic crisis. In the analysis, the phenomenon of the regional life standard of the average inhabitant was considered as a multivariate problem. Thus, a taxonomic measurement of development and Cluster analysis was applied. The taxonomic measurement of the development of Hellwig shows a significant differentiation between the various standards of living for the inhabitants of Poland in

individual voivodeships at individual levels. To create a synthetic measurement, 17 variables were used. Then the variables were divided into eight groups: education, access to medical care, health, safety, housing, labour market, culture, material resources. Based on two rankings made for 2005 and 2015, we can conclude that no justifiable division of Poland into eastern and western parts exists. The differentiation of voivodeships presented in Table 3 shows that despite the slight advantage of certain western provinces, the division into 'Poland A' and 'Poland B' is only a stereotype. Poland aims to equalize the standard of living in all voivodeships, so that the differences in living standards of individual inhabitants were as low as possible.

## REFERENCES

1. Al-Nofli, M.A. (2018). An analysis of geography content about geography for living standards in Oman. *International Research in Geographical and Environmental Education*, 27 (1), pp. 56-68.
2. Balan, C., Jaba, E. (2011). Statistical analysis of the determinants of life expectancy in Romania. *Romanian Journal of Regional Science*, 5 (2), pp. 25-38.
3. Bukowski, M., Koryś, P., Leszczyńska, C., Tymiński, M. (2017). Rozwój regionalny ziem polskich pod zaborami. Porównanie poziomu produktu brutto per capita na dzisiejszych terenach Polski na przełomie XIX i XX w. (wyniki pierwszych estymacji). *Roczniki Dziejów Społecznych i Gospodarczych*, 78, pp. 163-198.
4. Chudzińska, A. (1995). Subiektywny obraz świata i obraz siebie jako kategorie pomiaru jakości życia osób bezrobotnych oraz ich oczekiwania wobec pracy. In: A. Bańka, R. Derbis (Eds) *Pomiar i poczucie jakości życia u aktywnych zawodowo oraz bezrobotnych. Środkowoeuropejskie Centrum Ekonomii Działania Społecznego*, Poznań, pp. 87-96.
5. Grzeża, U. (2012). *Poziom życia ludności w Polsce: determinanty i zróżnicowania*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice.
6. Hellwig, Z. (1968). *Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr*. *Przegląd Statystyczny*, 4, pp. 307-327.
7. Kowalewska, B., Jankowiak, B., Rolka, H., Krajewska-Kułak, E. (Eds) (2017). *Jakość życia w naukach medycznych i społecznych*. Vol. 1. Uniwersytet Medyczny, Białystok.

8. Löster, T. (2017). Comparison of results of selected clustering methods on real data set. In: The 11<sup>th</sup> International Days of Statistics and Economics. Conference Proceedings. Libuše Macáková, Melandrium, Prague, pp. 886-896.
9. Nowak, E. (1990). *Metody taksonomiczne w klasyfikacji obiektów społeczno-gospodarczych*. Polskie Wydawnictwo Ekonomiczne, Warszawa.
10. Pawlas, I. (2013). Zastosowanie wielowymiarowej analizy porównawczej do oceny potencjalnej atrakcyjności inwestycyjnej polskich województw. *Studia Ekonomiczne*, 172, pp. 162-176.
11. Pawlas, I. (2017). Regional disparities in development based on taxonomic research: A case of Poland. *Regional Formation and Development Studies*, 23 (3), pp. 86-101.
12. Pomianek, I., Chrzanowska, M., Bórawski, P. (2013). Zróżnicowanie poziomu rozwoju społeczno-gospodarczego obszarów wiejskich województwa warmińsko-mazurskiego na tle kraju według miernika Hellwiga. *Zeszyty Naukowe Ostrołęckiego Towarzystwa Naukowego*, 27, pp. 442-456.
13. Skrzypek, E. (2001). Ekonomiczne aspekty jakości życia. *Problemy Jakości*, 1, pp. 8-14.