

# The level of living of population in the EU countries

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## **Abstract:**

The article deals with differentiation of living standard of population in the European Union countries. The study was based on the data collected by the Central Statistical Office of Poland, the Statistical Office of the EU and the OECD. In order to estimate level of living methods of multivariate statistical analysis were applied. On the basis of the synthetic variable, created during the study, a ranking of countries was constructed.

## **Key words:**

level of living, multicriterial estimation of objects, normalisation method, zero unitarization method;

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## Introduction

The social and economic development and the improvement of level of living of population are considered the most important tasks that national economies are to face within the forthcoming years. The membership in the European Union evokes hope of the European countries for achieving these goals. The financial support of European funds<sup>1</sup> is expected to enhance developmental possibilities of the economies.

No doubt, the countries – members of the European Union – differ with the extent of the social and economic development as well the living standard of population. The important question is to estimate the level of living and to indicate differences and similarities among the countries.

The article deals with differentiation of the living standard of population in the European Union countries. The aim of the paper is:

- to estimate the level of living of the EU countries,
- to create a ranking of objects,
- to compare the living standard of population in Poland to other countries of EU,
- to verify the hypothesis that the living standard of population in the EU countries depends on the period of their membership.

The study is based upon the data, concerning years 2006÷2007, collected by the Central Statistical Office of Poland, the Eurostat and the OECD. In order to estimate the living standard of population methods of multivariate statistical analysis are applied.

### 1. The notion of level of living

Level of living, also called living standard, is not an unequivocal notion. There's no one, precise definition, combining all aspects of the phenomenon being analysed. Sometimes, level of living is comprehended solely as an extent of consumption of goods and services. In other cases, it's defined very widely and identified with quality of life.

According to the definition of the United Nations, "level of living covers the whole of the real living conditions of population and also the extent of satisfying their material and cultural needs by means of goods, paid services and public funds"<sup>2</sup>.

Drewnowski defines level of living as an extent of supplying needs, which is a combination of goods, services and living conditions. His definition covers the following

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<sup>1</sup> See: MAŁUSZYŃSKA E., GRUCHMAN B. (ed.): *Kompendium wiedzy o Unii Europejskiej*. Warszawa: Państwowe Wydawnictwo Naukowe PWN, 2007, ISBN 978-83-01-15164-5, p.245.

<sup>2</sup> JOHANN M.: *Polska – UE. Porównanie poziomu życia ludności*. Warszawa: Difin, 2005, ISBN 83-7251-515-8, p. 11.

determinants: food, clothing, housing conditions, health, education, safety, the environment and social surroundings<sup>3</sup>.

Living standard analysis, based on the a.m. definition, requires a selection of measures, describing all aspects of a phenomenon, and a method of their aggregation.

## 2. Methodological aspects

Level of living is a complex phenomenon. It means that it's described with wide set of determinants. Each of the variables characterizes only one feature of the phenomenon. In that case, comparing objects requires an application of multicriterial estimation methods.

The estimation is made on the basis of the synthetic variable, created as a result of aggregation process of the diagnostic variables. Since the determinants can be expressed in different units of measure and they can belong to the different intervals, all the diagnostic variables must be normalised before the aggregation.

During the study, in the normalisation process the method of zero unitarization<sup>4</sup> was applied. The set of determinants was divided into stimulants (S) and destimulants (D). The variables were transformed according to the formulas:

$$z_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}, \quad X_j \in S \quad (1)$$

$$z_{ij} = \frac{\max_i x_{ij} - x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}, \quad X_j \in D \quad (2)$$

The values of all the diagnostic variables obtained by the method of zero unitarization belong the closed interval [0;1].

Since the diagnostic variables were normalised, had no units of measure and belonged to the same interval, they could be easily aggregated. The synthetic variable was constructed as follows:

$$q_i = \frac{1}{n} \sum_{j=1}^n z_{ij} \quad (3)$$

On the value of the synthetic variable the ranking of countries was created.

Then, the whole group of objects was divided into three subgroups: "the best", "average" and "the worst". The values of the synthetic variable for the subgroups belonged to the following intervals:

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<sup>3</sup> See: PISZ Z. (ed.): *Zadania społeczne*. Wrocław: Wydawnictwo Akademii Ekonomicznej im. O. Langego, 2002, ISBN 83-7011-587-X, p.48.

<sup>4</sup> See: KUKUŁA K.: *Metoda unitaryzacji zerowanej*. Warszawa: Wydawnictwo Naukowe PWN, 2000, ISBN 83-01-13097-0, p.152.

$$- \text{ the best objects: } q_i \in \left[ \max_i q_i - h; \max_i q_i \right] \quad (4)$$

$$- \text{ the average one: } q_i \in \left( \max_i q_i - 2h; \max_i q_i - h \right) \quad (5)$$

$$- \text{ the worst objects: } q_i \in \left( \min_i q_i; \max_i q_i - 2h \right) \quad (6)$$

The limits of the intervals were estimated on the basis of constant  $h$ , calculated according to the formula<sup>5</sup>:

$$u = \frac{\max_i q_i - \min_i q_i}{3} \quad (7)$$

In order to estimate interdependence of phenomena, the Spearman rank correlation coefficient<sup>6</sup> was calculated:

$$r_s = 1 - \frac{6 \cdot \sum_{i=1}^n d_i^2}{n \cdot (n^2 - 1)} \quad (8)$$

where:  $d_i$  means the difference between ranks

Its statistical significance was verified on the basis of the test statistic<sup>7</sup>  $u$  calculated as follows:

$$u = r_s \sqrt{n-1} \quad (9)$$

### 3. Empirical results

The process of estimation of the living standard of population in the European Union countries consisted of the following stages:

- the selection of the set of determinants, describing all aspects of the phenomenon being analysed,
- the verification of the potential variables,
- and the aggregation of diagnostic variables.

The starting point was to choose the set of potential variables. Firstly, thirty-one factors, describing the level of living of population, were selected. Since the lack of statistical data the set of potential variables was reduced to twenty-six determinants. All of them were verified.

During the verification process, differentiation and correlation of variables were analysed. Upon the results, the set of the potential variables was reduced to nineteen diagnostic

<sup>5</sup> See: KUKUŁA K. (ed.): *Badania operacyjne w przykładach i zadaniach*. Warszawa: Wydawnictwo Naukowe PWN, 2002, ISBN 83-01-12828-3, p.289.

<sup>6</sup> See: PIŁATOWSKA M.: *Repetitorium ze statystyki*. Warszawa: Wydawnictwo Naukowe PWN, 2007, ISBN 978-83-01-15040-2, p. 96.

<sup>7</sup> *ibidem*, p. 104.

variables. All of them met the postulates of maximum spatial differentiation and the lack of multicollinearity.

The diagnostic variables covered the following aspects of the living standard: social and economic development, economic situation of households, education, healthcare and the environment. There were among the others: gross domestic products per capita, harmonised unemployment rate, households food expenditure, motorisation rate, harmonised index of consumer prices, live births, hospital beds, number of students, emission of sulphur and nitrogen oxides.

The value of the diagnostic variables were normalised with application of zero unitarization method and aggregated according to the formula no. 3. On the value of the synthetic variable the ranking of EU countries was constructed (see tab.1).

Tab.1 The ranking of countries upon the value of synthetic variable

<b>no.</b>	<b>countries</b>	<b>code</b>	<b>year of joining</b>	<b>synthetic variable</b>
1	United Kingdom	UK	1973	0,680
2	Austria	AT	1995	0,666
3	France	FR	1957	0,661
4	Luxembourg	LU	1957	0,649
5	Ireland	IE	1973	0,642
6	Cyprus	CY	2004	0,632
7	Germany	DE	1957	0,631
8	Finland	FI	1995	0,620
9	Spain	ES	1986	0,616
10	Netherlands	NL	1957	0,612
11	Sweden	SE	1995	0,611
12	Denmark	DK	1973	0,584
13	Italy	IT	1957	0,582
14	Slovenia	SI	2004	0,578
15	Czech Republic	CZ	2004	0,570
16	Portugal	PT	1986	0,566
17	Belgium	BE	1957	0,564
18	Greece	EL	1981	0,535
19	Malta	MT	2004	0,530
20	Estonia	EE	2004	0,517
21	Lithuania	LT	2004	0,510
22	Poland	PL	2004	0,473
23	Hungary	HU	2004	0,464
24	Slovakia	SK	2004	0,459
25	Bulgaria	BG	2007	0,457
26	Latvia	LV	2004	0,451
27	Romania	RO	2007	0,425

Source: Own calculations.

The value of the synthetic variable, which can be observed among the countries, belongs to the interval [0,425;0,680]. The lowest level of living was attained by Romania, the value of the synthetic variable amounted only 0,425. The United Kingdom achieved the highest standard of living of population.

Upon the results, the countries were divided into three subgroups. The first one, with the value of the synthetic variable amounted to 0,595÷0,680, consisted of eleven countries: the United Kingdom, Austria, France, Luxembourg, Ireland, Cyprus, Germany, Finland, Spain, the Netherlands and Sweden. These countries achieved the living standard higher than average. The further ten countries, i.e.: Denmark, Italy, Slovenia, Czech Republic, Portugal, Belgium, Malta, Estonia and Lithuania, attained the average level of living. The value of synthetic variable of the second group belonged to the half-closed interval [0,510;0,595). The lowest living standard was observed in the third group, consisted of: Poland, Hungary, Slovakia, Bulgaria, Latvia and Romania. The half-closed interval [0,425;0,510) covered the values of the synthetic variables of the last six countries.

In order to estimate interdependence between the living standard of population and the period of the membership, the Spearman rank correlation coefficient was calculated. The value of the coefficient amounted to 0,689. It meant the strong interdependence of phenomena.

The test, for the significance of the rank correlation coefficient, yielded an observed  $u$ -value of 3,511. This was distributed as  $u_{0,05} = 1,96$  under the null hypothesis of the lack of interdependence. The null hypothesis was rejected. It meant, the rank correlation coefficient is statistically significant and the level of living of population depended on the period of the membership in the EU.

## Conclusions

The article doesn't cover all aspects of living standard. It's only an attempt at estimating the differentiation of the level of living of the EU countries. However, the results that have been attained, can be helpful to draw the following conclusions:

1. No country of the European Union has achieved the maximum value of the synthetic variable ( $q_i = 1$ ). It means that the standard of living of population in every country still can be improved, in any aspects of the phenomenon being analysed.
2. The standard of living of "the old Union" (EU-15) is higher than the new members (joined in 2004 or later). Only Cyprus, Slovenia and Czech Republic, joining the EU for three years<sup>8</sup>, achieved at least the average level of living. Amongst the new

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<sup>8</sup> The study is based on data from years 2006 and 2007.

members of the EU, only Cyprus belongs to “the best countries” group. The countries that joined the European Union in 2007 attained the lowest level of living.

3. Estimation of the position of Poland against the background of the EU countries falls out badly. The value of the synthetic variable indicates that the standard of living of population in Poland is lower than average.

There's no question that the level of living of population depends on the social and economic development of country. But it's also a result of geographical, historical and cultural conditions. An interaction between all these factors makes process of integration so difficult.

The expansion of the European Union contributes to emphasizing the differentiation of living standard of population. It reveals the differences among the countries, but it's also a chance for their elimination.

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