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**EFFECTIVENESS OF POLISH LABOUR MARKET:
TAXONOMETRIC ANALYSIS
OF EUROPEAN UNION COUNTRIES IN THE YEARS 2004-2007**

1. Introduction

The effectiveness of labour market is an important object of economic policy in every country. The lack of successes in that field always results in many social problems of an economy and restricts its growth potential. It means that obtaining high effectiveness of labour market should be considered as a key determinant of social and political stability of a country and it always influences welfare of the country. As a result the problem of effectiveness of labour market is the object of interest for politicians and it is a field intensively explored by academic economists.

Governments and especially politicians tend to concentrate on unemployment as the most socially and politically unpleasant consequence of ineffectiveness of labour market. Unfortunately, this often influences the empirical studies in that field. There are not many studies that use wide range of indicators which could give a better picture of effectiveness of labour market. Besides, the researchers usually concentrate on a profound analysis of labour market in a given country. As a result there are not many analyses that enable comparisons between countries, based at the same time on greater number of indicators.

The lack of wider range of used indicators and international comparisons can result in false or at least incomplete picture of changes in a given labour market.

A common opinion concerning Polish labour market in the years 2004-2007 makes a good example of this problem. During this period the level of unemployment was reduced almost by a half, which was a sign of great improvement of Polish labour markets for public opinion and political class. However, one should ask whether this achievement can be considered as a result of great improvement of effectiveness of labour market in international perspective? This question presents a scientific problem of the paper. Thus the aim of the analysis is to conduct the empirical study of effectiveness of labour market in European Union countries based on a vector of indicators in a dynamic approach.

2. The method of taxonomic analysis

The effectiveness of labour market has not one specific definition in economic theory. As a result there are many approaches to this problem [Galecka 2007; Kwiatkowski, Tokarski 1997]. In this study it is defined as a macroeconomic effectiveness of joining demand and supply side of labour market with an equilibrium price that is the result of requirements of demand side and offer of supply side concerning the type of work and qualifications of an employee and not the result of other socio-cultural factors such as sex or age of potential employee.

The effectiveness of a labour market defined in that way is undoubtedly a multidimensional phenomenon. It means that its complex analysis should be based on some tools of multivariate statistical analysis. It is especially necessary in case of analysis in international dimension [Balcerzak, Rogalska 2008, pp. 290-296; Bartosiewicz 2009, p. 45; Górka, Kubiczek 2004, pp. 255-266; Tokarski 2005, pp. 161-194]. In this paper a taxonomic method of synthetic measure of development was used. The method enables measuring the effectiveness of labour market in every country that is based on a wide range of indicators, it also enables creating a ranking of countries and grouping these countries into four typological subsets: a) countries with the highest effectiveness of labour market; b) countries that can be characterized with high effectiveness of labour market; c) countries with medium effectiveness of labour market; d) countries with low effectiveness of labour market.

The data gathered by Eurostat for the period 2004-2007 for twenty seven countries of the European Union were used [Eurostat 2008].

The first stage of the analysis was the building the set of potential diagnostic variables. In the beginning a set of sixteen variables which fulfil the definition of macroeconomic effectiveness of labour market was chosen:

- x_{1t} – unemployment rate in the group of females,
- x_{2t} – unemployment rate in the group of males,
- x_{3t} – employment rate in the group of females,
- x_{4t} – employment rate in the group of males,

- x_{5t} – employment rate in the group of female workers aged 55-64 years,
 x_{6t} – employment rate in the group of male workers aged 55-64 years,
 x_{7t} – employment growth in case of females,
 x_{8t} – employment growth in case of males,
 x_{9t} – average exit age from the labour force in case of females,
 x_{10t} – average exit age from the labour force in case of males,
 x_{11t} – gender pay gap in unadjusted form in case of females and males,
 x_{12t} – dispersion of regional employment rates – the dispersion of regional (NUTS level 2) employment rates of the age group 15-64 shows the regional differences in employment within countries and groups of countries,
 x_{13t} – implicit tax rate on labour – ratio of taxes and social security contributions on employed labour income to total compensation of employees,
 x_{14t} – tax wedge on labour cost,
 x_{15t} – life-long learning in case of females – percentage of the adult female population aged 25 to 64 participating in education and training,
 x_{16t} – life-long learning in case of males – percentage of the adult male population aged 25 to 64 participating in education and training.

These potential diagnostic variables were verified with regard to availability of data for the panel of countries in the whole period of the analysis. As a result x_{9t} , x_{10t} , x_{11t} , x_{12t} were eliminated from the set of diagnostic variables.

In the next stage of the analysis the remaining diagnostic variables were assessed with regard to criteria of information importance. The diagnostic variables should be characterized by high space variation, information significance and relatively low correlation.

High space variation means that diagnostic variables should not bear a strong resemblance to themselves in the sense of information about objects. In order to assess space variation, a variation coefficient is used. When a variable has a lower value than accepted $V = \varepsilon$, it is eliminated from the set of diagnostic variables. In the study the accepted value was $V = 15\%$.

The variable fulfils the criteria of importance when it usually assumes low values. In order to assess the importance, the skewness coefficient is used which in case of stimulants for an important variable has positive values. When the distribution of a variable is characterized with left asymmetry it means that the variable weakly differentiates the analyzed objects as most of them assumes high values of a given feature.

When there is a high correlation between the variables it can lead to duplication of information. In case of high correlation between the variables some representative variables are selected with an accepted frontier value of correlation coefficient $r = r^*$. In this analysis $r^* = 0.8$ was set as the frontier value [Ostasiewicz (ed.) 1998, pp. 115-117, 120-121; Zeliaś (ed.) 2000, pp. 40-45].

It should be also stressed that the sets of diagnostic variables that fulfilled these three criteria were different in some years of the analyzed period. The final criterion for the classification of variables in the set of final diagnostic variables was the frequency of their classification for accepted sets in every year for the whole period 2004-2007 [Zeliaś (ed.) 2000, p. 133]. On this basis the final set of diagnostic variables was selected. It included $x_{1t}, x_{2t}, x_{5t}, x_{6t}, x_{7t}, x_{8t}, x_{15t}$.

The next stage of the analysis was the process of normalization of diagnostic variables. Zero unitarization method was used here. The literature on multivariate statistical analysis provides a great variety of normalization methods which quite often influence the results obtained. Zero unitarization method was used as it fulfils all postulates of effective normalization procedure. In case of this analysis the most important feature of zero unitarization method is that it can be used in normalization process of variables that have positive, equal to zero or negative value. It applied to x_{7t} and x_{8t} . Beside this normalization procedure results in normalized variables that are always positive and belong to the equal intervals $[0, 1]$ [Kukuła 2000, p. 81]. In this analysis a dynamic approach was taken. As a result a fixed pattern of development for the whole period of analysis. The transformation formulas were as follows:

1) in case of variables that were classified as stimulants:¹

$$z_{ijt} = \frac{x_{ijt} - \min_{it} \{x_{ijt}\}}{\max_{it} \{x_{ijt}\} - \min_{it} \{x_{ijt}\}} \quad (1)$$

$$(i = 1, 2, \dots, n); \quad (j = 1, 2, \dots, m); \quad (t = 1, 2, \dots, l); \quad z_{ij} \in [0, 1];$$

2) in case of variables that were classified as destimulants:²

$$z_{ijt} = \frac{\max_{it} \{x_{ijt}\} - x_{ijt}}{\max_{it} \{x_{ijt}\} - \min_{it} \{x_{ijt}\}} \quad (2)$$

$$(i = 1, 2, \dots, n); \quad (j = 1, 2, \dots, m); \quad t = (1, 2, \dots, l); \quad z_{ij} \in [0, 1].$$

¹ The variable is a stimulant when for every two of their values x_{ij}^S, x_{kj}^S of objects A_i, A_k the following condition is fulfilled $x_{ij}^S \succ x_{kj}^S \Rightarrow A_i \succ A_k$, where \succ means that object A_i is preferred to object A_k [Walesiak 2002, p. 17].

² The variable is a destimulant when for every two of their values x_{ij}^D, x_{kj}^D of objects A_i, A_k the following condition is fulfilled $x_{ij}^D \succ x_{kj}^D \Rightarrow A_i \prec A_k$, where \succ means that object A_k is preferred to object A_i [Walesiak 2002, p. 16].

The variables x_{5t} , x_{6t} , x_{7t} , x_{8t} , x_{15t} were classified as stimulants and the variables x_{1t} , x_{2t} , were normalized as destimulants.

Classification of x_{1t} , x_{2t} , as destimulants does not need to be commented.

In the socio-economic and sociological literature it is quite often stressed that the employment rate in the group of females should be treated as a nominal value as rate of employment in that group that is too high can lead to long term negative social consequences. However, the analysis of data showed that in most of the European Union countries the rate of employment among females was significantly lower than the target which was set by European Council in Lisbon in the year 2000 [Lenian 2005; Royuela-Mora et al. 2005]. Sweden made an exception in this field, where this rate was higher than 60%. In case of demographical problems of Europe an increase of employment rate even in the group of females aged 55-64 seems a reasonable policy. As a result the variable x_{5t} was considered as a stimulant. The variable x_{6t} makes a similar case.

The variables x_{7t} and x_{8t} were normalized as stimulants as a result of negative consequences for welfare relatively low rates of employment in many European Union countries and the demographical problems of Europe, which was also mentioned above.

The variable x_{15t} is a stimulant as according to current growth theory – especially endogenous growth theory – and many empirical studies on the main sources of economic growth in case of highly developed countries, investments in education and training improve significantly the quality of labour. This results in higher effectiveness of labour market and is one of conditions that lead to higher growth potential. This factor is especially important in reality of globalized knowledge-based economy of the XXI century [OECD 2000, pp. 44-47, 78-79; OECD 2001, pp. 19, 56-64].

Finally the synthetic variable was constructed as follows:

$$SMR_{it} = \frac{1}{m} \sum_{j=1}^m z_{ijt} \quad (3)$$

$$(i = 1, 2, \dots, n); (j = 1, 2, \dots, m); (t = 1, 2, \dots, l); SMR_i \in [0, 1]; z_{ij} \in [0, 1].$$

This synthetic measure was the basis for creating typological subsets of countries with different levels of effectiveness of labour markets. A method based on arithmetic mean and standard deviation was used. As a result, the countries were grouped in four subsets:

a) the subset of countries with very high effectiveness of labour market that fulfil the following condition:

$$SMR_{it} \geq \overline{SMR_{it}} + S(SMR_{it}) \quad (4)$$

$$(i = 1, 2, \dots, n), (t = 1, 2, \dots, l),$$

b) the subset of countries with high effectiveness of labour market that fulfil the following condition:

$$\overline{SMR}_{it} \leq SMR_{it} < \overline{SMR}_{it} + S(SMR_{it}) \quad (5)$$

$$(i = 1, 2, \dots, n), \quad (t = 1, 2, \dots, l),$$

c) the subset of countries with average effectiveness of labour market that fulfil the following condition:

$$\overline{SMR}_{it} - S(SMR_{it}) \leq SMR_{it} < \overline{SMR}_{it} \quad (6)$$

$$(i = 1, 2, \dots, n), \quad (t = 1, 2, \dots, l),$$

d) the subset of countries with low effectiveness of labour market that fulfil the following condition:

$$SMR_{it} < \overline{SMR}_{it} - S(SMR_{it}) \quad (7)$$

$$(i = 1, 2, \dots, n), \quad (t = 1, 2, \dots, l),$$

where: $\overline{SMR}_{it} = \frac{1}{n} \sum_{i=1}^n SMR_{it}$

$$S(SMR_{it}) = \sqrt{\frac{1}{n} \sum_{i=1}^n (SMR_{it} - \overline{SMR}_{it})^2} \quad (8)$$

$$(i = 1, 2, \dots, n), \quad (t = 1, 2, \dots, l).$$

The final results of the analysis are presented in Table 1.

In the end the test of stability of the result was conducted with the application of Spearman rank correlation coefficient. It was constructed as follows:

$$R_{yx} = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n^3 - n} = R_{xy}, \quad (9)$$

where: R_{yx}, R_{xy} – Spearman rank correlation coefficient,

d_i – denotes $x_t - x_{t+1}$ (the difference between the ranks of corresponding values X_t and X_{t+1}),

n – denotes the number of values in each data set.

Table 1. The results of taxonomic analysis of effectiveness of labour markets in European Union countries in the years 2004-2007

2004			2005			2006			2007		
Very high			Very high			Very high			Very high		
1	Sweden	0.6981	1	Sweden	0.7170	1	Sweden	0.7662	1	Sweden	0.8069
2	Great Britain	0.6926	2	Great Britain	0.7003	2	Denmark	0.7539	2	Denmark	0.7435
3	Cyprus	0.6609	3	Ireland	0.6978	3	Estonia	0.7150	3	Cyprus	0.6916
4	Denmark	0.6378	4	Denmark	0.6969	4	Ireland	0.6922	4	Netherlands	0.6737
5	Ireland	0.6270	5	Cyprus	0.6375	5	Great Britain	0.6721	5	Ireland	0.6726
High			High			6	Latvia	0.6617	6	Latvia	0.6668
6	Finland	0.5332	6	Finland	0.5792	High			High		
7	Netherlands	0.5124	7	Estonia	0.5596	7	Cyprus	0.6187	7	Finland	0.6513
8	Portugal	0.4812	8	Spain	0.5537	8	Finland	0.6172	8	Great Britain	0.6444
9	Spain	0.4758	9	Netherlands	0.5507	9	Netherlands	0.6144	9	Lithuania	0.6431
10	Luxemburg	0.4752	10	Lithuania	0.5398	10	Spain	0.5649	10	Estonia	0.6103
11	Latvia	0.4606	11	Latvia	0.5075	11	Lithuania	0.5566	11	Luxemburg	0.5524
12	Estonia	0.4458	12	Luxemburg	0.5041	12	Luxemburg	0.5426	Average		
Average			Average			Average			12	Czech Rep.	0.5443
13	Czech Rep.	0.4290	13	Czech Rep.	0.4663	13	Austria	0.5083	13	Spain	0.5434
14	Austria	0.4235	14	Austria	0.4650	14	Czech Rep.	0.5022	14	Austria	0.5417
15	Slovenia	0.4194	15	Portugal	0.4548	15	Portugal	0.4774	15	Slovenia	0.5371
16	Greece	0.4104	16	Slovenia	0.4202	16	Slovenia	0.4682	16	Germany	0.5227
17	Lithuania	0.3988	17	Malta	0.4185	17	Bulgaria	0.4680	17	Bulgaria	0.5065
18	Germany	0.3980	18	Bulgaria	0.3998	18	Greece	0.4528	18	Malta	0.4751
19	Italy	0.3685	19	Greece	0.3923	19	Germany	0.4438	19	Romania	0.4624
20	France	0.3631	20	Belgium	0.3893	20	Italy	0.4402	20	Portugal	0.4603
21	Belgium	0.3608	21	Germany	0.3887	21	Romania	0.4316	21	Greece	0.4357
22	Hungary	0.3546	22	France	0.3849	22	France	0.3955	22	Italy	0.4334
23	Bulgaria	0.3458	23	Hungary	0.3679	Low			Low		
24	Malta	0.3310	24	Italy	0.3661	23	Belgium	0.3905	23	Belgium	0.4294
25	Romania	0.3125	25	Romania	0.3512	24	Malta	0.3888	24	France	0.4239
Low			Low			25	Hungary	0.3846	25	Slovak Rep.	0.3864
26	Slovak Rep.	0.1378	26	Slovak Rep.	0.2440	26	Slovak Rep.	0.3353	26	Poland	0.3849
27	Poland	0.1068	27	Poland	0.1717	27	Poland	0.2784	27	Hungary	0.3604

Source: based on own calculations and [Eurostat 2008].

In case of the rankings for the pair of years the coefficients were as follows: $R_{2004/2005} = 0.92$, $R_{2005/2006} = 0.95$, $R_{2006/2007} = 0.93$, $R_{2004/2007} = 0.85$. It means that the results obtained are very stable. The effectiveness of labour markets was not changing significantly in case of most of the countries. This result is coherent with economic theory as it is only possible to improve the effectiveness of labour market after a process of deep institutional reforms which usually face strong political opposition.

3. Conclusions

This dynamic taxonomic analysis should be placed among works that confirm the dominant role of institutional framework of labour market, which guarantee its relatively high elasticity, in determining the effectiveness of labour markets. In case of the first subset grouping the countries with the highest effectiveness of labour market in almost all years one can find mainly economies that have deregulated their labour markets and have improved its elasticity. There is Great Britain that started the process of deregulation in the eighties of XX century. There are also Scandinavian countries that deregulated their labour markets in the nineties of the previous century. On the other hand, such countries as Germany, France and Italy, where in spite of some deregulation efforts labour markets are still relatively rigid and controlled by government institutions, obtained quite low rankings and were classified in the third subset.³ In the last year France was even classified among the countries with the lowest effectiveness of labour markets.

The main aim of this paper was to verify the changes of effectiveness of Polish labour market in the international perspective. Poland was classified in the last place of the ranking in the years 2004-2006 and was the last but one in 2007. The analysis of individual diagnostic variables, which were finally used as a base for synthetic variable, shows that in spite of improvement in case of unemployment rate Poland was not able to implement reforms discouraging employees from early retirement. This results in very low level of employment in Poland, which is the main reason for distant positions of the country in the ranking. This means that Polish government's main priority should be creation of incentives and institutional rules that would result in increasing the rate of employment. A success in this field is a condition of improving relatively low effectiveness of Polish labour market. It is also worth to remember that inability of the government to solve this problem in medium run will result in decreasing growth potential of the country due to demographic structure of society and growing tax burden on active labour force.

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³ A profound study of deregulation process of labour markets in Europe can be found in the work by Z. Wiśniewski [2001].

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