COMPETITIVENESS OF THE ECONOMY AND THE SITUATION IN THE LABOR MARKET – ANALYSIS BASED ON THE EXAMPLE OF POLISH VOIVODSHIPS DURING THE YEARS 2003–2008[*]

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K e y   w o r d s: competitiveness of the economy, regional labor market, unemployment, unemployment rate.

Abstract

Determination of the influence of the competitiveness of economy on the situation in the voivodship labor markets in Poland during the years 2003–2008 was the goal of the work.

In this paper, in addition to the theoretical part attempting at presenting the influence of competitiveness on the situation in the labor market we also undertake an attempt at statistical-econometric verification of the influence of the competitiveness level on the situation in the voivodship labor markets.

The analyses conducted indicate that the competitiveness level influences the situation in the voivodship labor markets positively during the analyzed period. The voivodships representing the highest competitiveness levels (i.e. Lower Silesian, Silesian and Mazowieckie voivodships) were characterized by the lower average unemployment rate levels and higher average employment rate indicator levels as compared to the voivodships with the lowest level of competitiveness (that group includes Podkarpackie, Świętokrzyskie and Podlaskie voivodships). In the voivodships where the competitiveness level increased the most during the period covered the situation in the labor market (measured by the unemployment rate and employment rate) improved more significantly than in the voivodships in which the level of competitiveness decreased the most. Econometric analyses also confirmed the positive influence of the improvement in the competitiveness level on the situation in the voivodship labor markets.

KONKURENCYJNOŚĆ GOSPODARKI A SYTUACJA NA RYNKU PRACY –
ANALIZA NA PRZYKŁADZIE POLSKICH WOJEWÓDZTW W LATACH 2003–2008

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A b s t r a k t

Celem opracowania jest określenie wpływu konkurencyjności gospodarki na sytuację na wojewódzkich rynkach pracy w Polsce w latach 2003–2008. Oprócz części teoretycznej, w której przedstawiono wpływ konkurencyjności na sytuację na rynku pracy, podjęto również próbę weryfikacji statystyczno-ekonometrycznej wpływu poziomu konkurencyjności na sytuację na wojewódzkich rynkach pracy.

Z przeprowadzonych analiz wynika, że poziom konkurencyjności w analizowanym okresie wpływał pozytywnie na sytuację na wojewódzkich rynkach pracy. Województwa o najwyższym poziomie konkurencyjności (tj. województwa: dolnośląskie, śląskie i mazowieckie) charakteryzowały się niższym przeciętnym poziomem stopy bezrobocia oraz wyższym przeciętnym poziomem wskaźnika zatrudnienia w porównaniu z województwami o najniższym poziomie konkurencyjności (do tej grupy należą województwa: podkarpackie, świętokrzyskie i podlaskie). W województwach, w których poziom konkurencyjności wzrósł najsilniej w badanym okresie, sytuacja na rynku pracy (mierzona poziomem stopy bezrobocia i wskaźnika zatrudnienia) poprawiła się w większym stopniu w porównaniu z województwami, w których poziom konkurencyjności obniżył się najbardziej. Analizy ekonometryczne również potwierdziły pozytywny wpływ poprawy poziomu konkurencyjności na sytuację na wojewódzkich rynkach pracy.

Introduction

During the era of globalization, the problem of competitiveness gains particular importance for all the economies. To be able to increase its share in the international trade, Polish economy must, period by period, increase its competitiveness. It should also be highlighted that improvement of the competitiveness level allows a given economy achievement of a higher production growth rate and a higher level of development in long-term.

In Polish economic literature numerous works concerning labor market and competitiveness of the economy can be found. However, there are no studies attempting at verification of the influence of competitiveness on the situation in the labor market.

Determination of the influence of the competitiveness of economy on the situation in the voivodship labor markets in Poland during the years 2003–2008 was the goal of the work.

Data of the Regional Data Bank presented at the Central Statistical office website: www.stat.gov.pl was used for empirical analyses.

The paper consists of five parts. In part 2 the theoretical hypotheses concerning competitiveness influence on the labor market are presented. Part three consists of two sub-points. Sub-point 3.1 discusses the methodology for computing competitiveness indicators used in this study while sub-point 3.2 is devoted to the analysis of the situation in the labor markets in the voivodships with the highest and the lowest level and dynamics of competitiveness. Part 4 presents the results of econometric analyses concerning the influence of the competitiveness level on voivodship labor markets. Part 5 contains the conclusions drawn from the conducted considerations.

Competitiveness of the economy and labor market – theoretical hypotheses

Undertaking the issue of the influence of economy competitiveness on the labor market at the theoretical level it is worth noticing two circumstances that hinder clear and univocal presentation of the problem first.

First, a number of ambiguities related to the notion of economy competitiveness itself that are found in the literature should be highlighted. Without getting into considerations concerning the notions it is worth drawing attention to three aspects of economy competitiveness highlighted in the literature that is differentiation between the competitive ability, actual competitiveness and competitive position of the economy (MISALA 2008, WZIĄTEK-KUBIAK 2003). The first aspect focuses on the ability to compete for economic benefits, that is the sources of competitiveness determining the future position of the economy; the second highlights the current status and directions of changes in competitiveness while the third highlights the achieved economic results and the position gained in rankings. In the theoretical analyses undertaken here we will consider competitiveness understood as the competitive ability and actual competitiveness because such focus allows more reasonable analysis of the influence of competitiveness on the labor market.

This approach also seems justified from the perspective of the analysis of the influence of competitiveness on economic development, which is discussed in another fragment of the text. The economy competitive position covers numerous elements convergent with the economic development level and as a consequence considering the measures of the competitive position of the economy in the analysis of the influence of competitiveness on economic development would mean partly tautological analyses.

Second, analyzing the influence of economy competitiveness on the labor market one must be aware that the relations between them are of feedback nature. Also the labor market can contribute to the economy competitiveness improvement, in particular when the employment structures are modern, the labor is skilled and mobile and the real wages and demand for labor are highly flexible. In this study, however, we are interested in the influence the other way round, i.e. the influence of competitiveness on the labor market. In particular, we are interested in the question of how the higher level and improvement of economy competitiveness influence two key variables of the labor market, i.e. employment and unemployment.

Analysis of the influence of economy competitiveness on the labor market concerns processes taking place over time. As a consequence the role of time in the mechanisms of competitiveness influence on the labor market should be highlighted. In the theory of economy the short- and long-term effects resulting from various economic events have been identified already a long time ago. We believe that differentiating of the short- and the long-term time perspective is also helpful in analysis of the economy competitiveness influence on the labor market. As a consequence, it is worth referring to two key economic theories in which short-term and long-term mechanisms are highlighted, i.e. the Keynesian theory and the neoclassical theory. The demand and supply effects of investments as well as mechanisms of short-term and long-term economic growth highlighted in those theories also define promising directions for consideration in the analysis of the influence of competitiveness on the labor market.

Considering the short-term effects of economy competitiveness on the labor market it is worth referring to the Harrod's growth model in which the increase in labor productivity is one of the factors determining growth in production (TOKARSKI 2001, pp. 20–45). Assuming that the level and growth of production in short-term are determined by the demand factors, the dynamics of labor productivity plays an important role in determining employment, and indirectly the unemployment. Labor productivity is obviously a category dependent on numerous factors but its links with competitiveness of the economy are many as factors such as increase of labor education, improvement of technical support of labor, modernized employing structures and increased investments, that is factors that are also of major importance for labor productivity increase are important for competitiveness improvement. It can be said that labor productivity increase is an important symptom of improvement in the competitiveness of the economy.

Labor productivity increase may have negative, short-term consequences for the labor market, i.e. it may decrease the employment and increase unemployment. For employers performance of given production orders with

a smaller number of employees might be profitable when the productivity of labor increases. This is presented in Figure 1 that shows the short-term mechanism of the economy competitiveness increase on employment and unemployment. As can be seen in Figure 1, over a short-term perspective, negative consequences of competitiveness increase in employment and unemployment in that economy are possible.
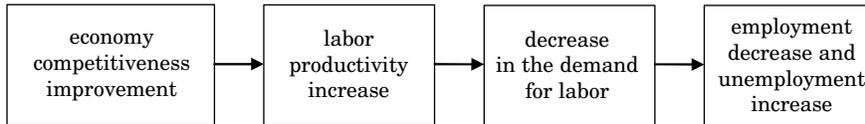
economy competitiveness improvement	→	labor productivity increase	→	decrease in the demand for labor	→	employment decrease and unemployment increase

Fig. 1. Competitiveness of the economy and the labor market – short-term effects
Source: own work.

In the long-term perspective, the consequences of economy competitiveness increase for the labor market seem to be different. Over that period the supply mechanisms of the economy play the dominating role as highlighted in the neoclassical theory. In this case the importance of economy competitiveness for the costs of production in enterprises, prices of manufactured products and financial results of enterprises as well as their significance for investment processes and employment effects of the supply consequences of the investments must be considered. The most probable long-term mechanism initiated by economy competitiveness increase looks as follows (Fig. 2). Competitiveness increase means an increase in effectiveness of means of production management, which leads to a decrease in the unit costs of labor and capital. Lower production unit costs result in improvement of production profitability and increased capacity for investments that should increase production as a result of generating the supply effects of investments. The volumes of production may also be increased thanks to the increased demand for products that may appear as a result of a decrease in the prices of products caused by the decrease of the unit costs of production. Increase of production is highly probable as a consequence of the improved competitiveness. In the long-term perspective than positive effects should appear for the labor market as production increase translates, sooner or later, into the increase in demand for labor, increased numbers of the employed and a decrease of unemployment.

Attention should be drawn to the time lags between the increase of competitiveness and the effects in the labor market that occurs in case of the long-term mechanism. The length of that lag is hard to determine, but it should be sufficient for occurrence of the supply effects of investment. It can be assumed that a period of a few years should be sufficient for appearance of the here-discussed effects.
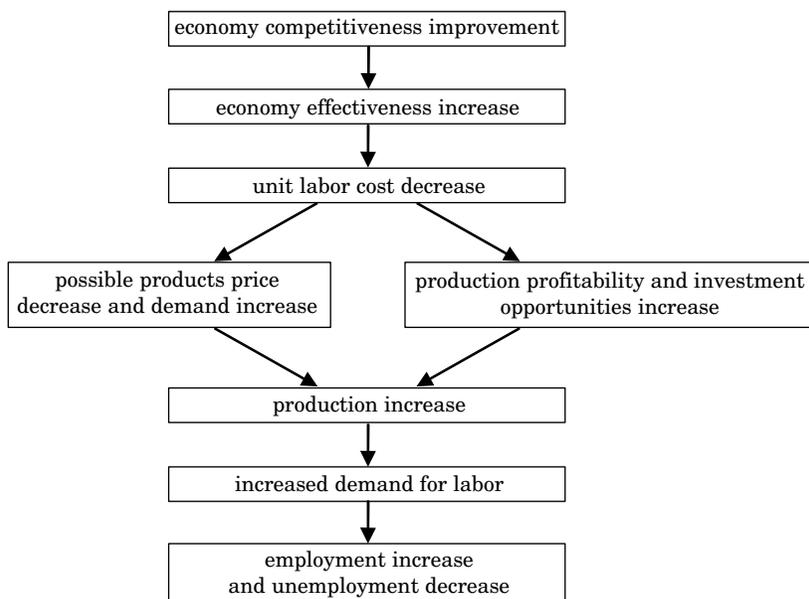
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│ decrease and demand      │  │ investment opportunities      │
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        │   and unemployment decrease        │
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Fig. 2. Competitiveness of the economy and the labor market – long-term effects
Source: own work.

Competitiveness of the economy and the situation in the regional labor markets

Indicators of competitiveness of the economy

Taxonomic competitiveness indicators are the bases for analysis of the influence of economy competitiveness on the voivodship labor markets.

A number of partial variables that in their nature are stimulants (i.e. the higher value of the variable means higher competitiveness) or destimulants (i.e. the higher value of the variable means lower competitiveness) were assumed for the design of taxonomic competitiveness indicators. The partial variables for the design of the taxonomic indicators of competitiveness were assumed on the base of the literature available (see, e.g.: *Sixth Periodic Report on the Social and Economic Situation and Development of the Regions of the European Union*, 1999).

Average values of the following partial variables for the years 2003–2008 were assumed for determination of the taxonomic competitive indicator for voivodships:

1) number of business entities in the REGON database per 1000 residents,

2) share of companies with foreign capital in the total number of entities in the REGON database,

3) investment outlays per capita in PLN '000 (at 2007 prices),

4) value of fixed assets per 1 employee in PLN '000 (at 2007 prices),

5) length of express roads and motorways in km per 1 km^2,

6) share of private sector entities in the total number of entities registered with the REGON database,

7) number of employees in the R&D facilities per 1000 employees,

8) share of people with tertiary education in the total number of the employed,

9) share of employment in market services in the total employment,

10) share of employment in agriculture in the total employment,

11) share of long-term unemployed in the total number of the unemployed.

The here assumed variables are stimulants (variables 1–9) and de-stimulants (variables 10–11). Those variables were subjected to standardization according to the formula

$$d_{ijt} \; \frac{X_{ijt}}{\max\limits_{i} x_{ijt}} \tag{1}$$

where:
x_{ijt} is the value of i characteristic in voivodship j during the year t ($t = 2003, ..., 2008$).

Standardized variables d_{ijt} are compatible and assume values within the range of (0,1). The closer to 1 is the value of the standardized stimulant the relatively better situation in respect of the given characteristic is attributable to the given voivodship.

The computed taxonomic indicator based on the distance in the Euclidean space has the form of:

$$W1_{jt} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (d_{ijt} - 1)^2} \tag{2}$$

where:
N is the number of characteristics (where: $N = 11$).

The computed indicators assume values from the range of (0.1). The higher the value of the W1 indicator, the lower the level of competitiveness characterizing the given voivodship is.

Competitiveness of the economy and the situation
in the voivodship labor markets

Let us first have a look at the unemployment rates and employment rates in two groups of voivodships: those representing the highest and the lowest competitiveness level. Both groups of voivodships were identified on the base of the average taxonomic indicator of competitiveness during the years 2003-2008. The group of voivodships with the highest competitiveness consists of voivodships in which the competitiveness index was lower than the average index for all the voivodships decreased by one standard deviation. On the other hand the voivodship with the lowest competitiveness are those for which the taxonomic competitiveness indicator (index) was higher than the average index for all the voivodships increased by one standard deviation. The specification of both groups with the corresponding values of indicators is presented in Tables 1 and 2.

As indicated by Table 1, the highest competitiveness level is encountered in Lower Silesian, Silesian and Mazowieckie voivodships. The list of those voivodships is not surprising although the third place of Mazowieckie voivodship only should be noted. In that last voivodship the labor market indicators during the covered period of the years 2003–2008 were very favorable as the average unemployment rate was 11.8% while the employment rate 64.4%. In the Silesian and Lower Silesian voivodships the labor market indicators were not so favorable. It is worth highlighting that the average unemployment rate in that group of voivodships (at 14.0%) was lower than the average unemployment rate in the voivodships with the highest competitiveness index (15.8%

Table 1

Voivodships representing the highest level of competitiveness during the years* 2003–2008 and labor market indicators

Item	Average competitiveness index during the years 2003–2008	Average unemployment rate during the years 2003–2008 [%]	Average employment index during the years 2003–2008 [%]
Lower-Silesian	0.318	17.2	48.8
Silesian	0.349	13.0	50.6
Mazowieckie	0.354	11.8	64.4
Average unemployment rate in the entire group during the years 2003–2008 [%]	14.0		
Average employment index in the entire group during the years 2003–2008 [%]	54.6		

* – In the table it was assumed that the competitiveness level is higher when the taxonomic competitiveness indicators are lower. The voivodships with the lowest level of the competitiveness index are the voivodships in which the competitiveness index is lower than the average competitiveness index in the entire group of voivodships decreased by the standard deviation.

Source: Bank of regional data, www.stat.gov.pl.

– see: Table 2). Also the employment rate was higher in the most competitive voivodships (54.6%) than in the least competitive voivodships (53.1%). Those indicators confirm the hypothesis concerning the positive influence of competitiveness of the economy on the labor market situation.

Table 2 contains the list of voivodships representing the lowest level of economic competitiveness. That group includes Podkarpackie, Świętokrzyskie and Podlaskie voivodships that is the voivodships situated in the eastern and central part of the country. It is worth drawing attention to the large distance in the competitiveness index value between the strongest and the weakest voivodships (in the strongest voivodships the index value is ca. twice lower than in the weakest voivodships). Closing that gap requires incurring numerous costs and implementation of long-term projects in infrastructure as well as human capital and entrepreneurship development. It is worth recording that the average labor market indicators in the least competitive voivodships were less unfavorable than in the group of the most competitive voivodships although that regularity is not of universal nature as, e.g. the unemployment rate in Podlaskie voivodship was much lower than in the Lower Silesian voivodship while the employment ratio in Świętokrzyskie voivodship was much higher than the corresponding indicator in Lower Silesian or Silesian voivodship. This indicates that the correlations between economy competitiveness and the labor market situation are not so simple.

Let us now have a look at the changes in competitiveness levels of voivodships during the years 2003–2008. Tables 3 and 4 present the lists of voivodships in which the largest decrease of competitiveness (Tab. 3) and the largest increase of competitiveness occurred during the covered period

Table 2

Voivodships representing the lowest level of competitiveness during the years* 2003–2008 and labor market indicators

Item	Average competitiveness index during the years 2003–2008	Average unemployment rate during the years 2003–2008 [%]	Average employment index during the years 2003–2008 [%]
Podkarpackie	0.623	16.3	50.2
Świętokrzyskie	0.608	17.8	55.4
Podlaskie	0.604	13.3	53.8
Average unemployment rate in the entire group during the years 2003–2008 [%]	15.8		
Average employment index in the entire group during the years 2003–2008 [%]	53.1		

* – The lowest level of competitiveness occurs when the taxonomic competitiveness indicators are the highest. The voivodships with the highest level of the competitiveness index are the voivodships in which the competitiveness index is higher than the average competitiveness index in the entire group of voivodships increased by the standard deviation.

Source: as in table 1, own computations.

Table 3
Voivodships with the largest decrease of competitiveness* during the years 2003–2008

Voivodship	Competitiveness index in 2008 (2003 = 100)	Unemployment rate in 2008 (2003 = 100)	Employment rate in 2008 (2003 = 100)
Świętokrzyskie	102.5	76.1	101.9
Lower Silesian	102.7	44.6	104.2
Opolskie	103.1	51.0	102.9
Average dynamics of the unemployment rate in the entire group in 2008 (2003 = 100)	57.2		
Average dynamics of the employment rate in the entire group in 2008 (2003 = 100)	103.0		

* – The competitive decrease is the highest when the dynamics of increase of the competitive index is the highest. The voivodships with the highest levels of the competitiveness indicators dynamics are the voivodships in which the dynamics of competitiveness is higher than the average level of the competitiveness index dynamics in the entire group of voivodships increased by the standard deviation.

Source: as in table 1, own computations.

Table 4
Voivodships with the largest increase of competitiveness* during the years 2003–2008

Voivodship	Competitiveness index in 2008 (2003 = 100)	Unemployment rate in 2008 (2003 = 100)	Employment rate in 2008 (2003 = 100)
Wielkopolskie	86.0	40.5	103.6
Pomeranian	89.6	39.4	102.9
Average dynamics of the unemployment rate in the entire group in 2008 (2003 = 100)	39.95		
Average dynamics of the employment rate in the entire group in 2008 (2003 = 100)	103.3		

* – The competitiveness increase is the highest when the dynamics of the competitiveness index is the lowest. The voivodships with the lowest level of competitiveness indicators dynamics are the voivodships in which the dynamics of the competitiveness index is lower than the average competitiveness index dynamics level during a given year decreased by the standard deviation.

Source: as in table 1, own computations.

(Tab. 4). The group of voivodships with the largest decrease of competitiveness consisted of Świętokrzyskie, Lower Silesian and Opolskie voivodships. It is remarkable that Świętokrzyskie voivodship is among the voivodships with the

lowest level of competitiveness while Lower Silesian voivodship is among those with the highest level of competitiveness. On the other hand, the largest competitiveness increase during the years 2003–2008 occurred in Wielkopolskie and Pomeranian voivodships that belong to the group of voivodships with the medium level of competitiveness.

The data in Tables 3 and 4 indicate occurrence of certain regularities in the influence of the change in competitiveness on the labor market indicators. In the voivodships where the level of competitiveness increased the labor market indicators changed more favorably than in the voivodships where competitiveness decreased the most. During the period covered, in the voivodship with increasing competitiveness the unemployment rate decreased by over 60% while in the voivodships with decreasing competitiveness by 42.8% only. Less evident differences were recorded as concerns the employment ratio. In the voivodships with the most pronounced decrease in competitiveness the employment ratio increased during the period covered by 3% while in the voivodships with the largest increase in competitiveness the employment ratio increased by 3.3%, that is by not much more. The differences between both groups of voivodships are small as concerns employment ratios but it is worth remembering that they do not take into account the time lag between the variables investigated.

Statistical-econometric analyses

Let us now move to the influence of competitiveness on the situation in the voivodship labor markets. Figure 3 presents the correlation between the average unemployment rate in all the voivodships during the years 2003–2008 and the average level of the competitiveness index for those voivodships during the same period. Figure 3 indicates the existence of positive correlation between those two variables, which is consistent with the theory of economy. The higher the value of the competitiveness index (i.e. the lower the level of competitiveness) the higher the unemployment rate in the voivodship labor markets was. It should be highlighted, however, that the correlation between those variables was relatively weak as the correlation coefficient was 0.23.

Figure 4 presents the correlation between the average employment ratio *s* in all voivodships during the years 2003–2008 and the average level of the competitiveness index for those voivodships during the same period. Figure 4 indicates that during the analyzed period the correlation between the analyzed variables was positive, which is inconsistent with the theory of economy. The power of the correlation between those variables was low (the correlation coefficient was only 0.0007). As a consequence of the above
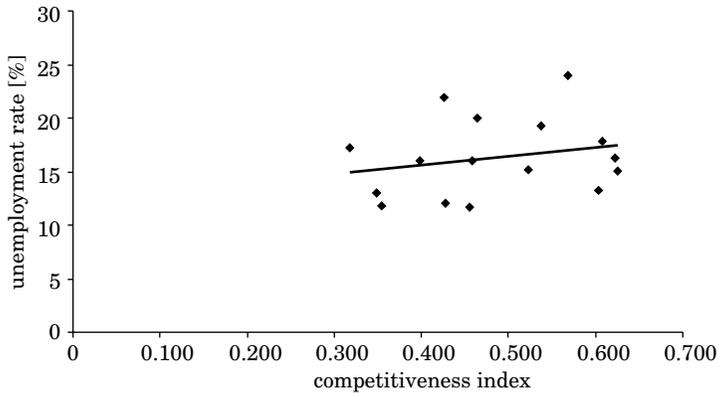
Fig. 3. Correlation between the average unemployment rate in the individual voivodships during the years 2003-2008 and the average competitiveness index in those voivodships during the years 2003–2008
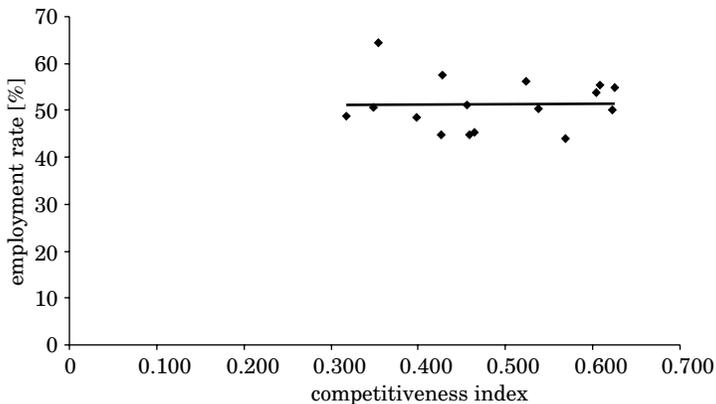
Source: as in table 1, own computations.

Fig. 4. Correlation between the average employment rate in the individual voivodships during the years 2003–2008 and the average competitiveness index in those voivodships during the years 2003–2008

Source: as in table 1, own computations.

reservation, in our analyses of the influence of the competitiveness level on the situation in the voivodship labor markets, we will use the unemployment rate (during the years 2003–2007), which we will treat as the endogenous variable.

The competitiveness index computed for all the voivodships for the years 2003–2007 and the GDP dynamics at fixed prices for the years 2002–2007 are assumed as the variables describing the development of unemployment rates at the voivodship labor markets. This can be described applying equations 3–4.

$$u_{it} = k_{it-n} + y_{it} + \zeta_{it} \tag{3}$$

$$u_{it} = k_{it-n} + y_{it-1} + \zeta_{it} \tag{4}$$

where:

u_{it} – unemployment rate in voivodship i during the period t,

y_{it} – GDP dynamics in fixed prices of 2002 in voivodship i during the period t,

y_{it-1} – GDP dynamics in fixed prices of 2002 in voivodship i during the period t-1,

k_{it-n} – taxonomic competitiveness indicator in voivodship i during the period t-n,

ζ_{it} – random component.

Equation 3 describes the correlation between the GDP dynamics during a given period and the level of the taxonomic competitiveness indicator during the period t-n and the unemployment rate levels in individual voivodships. Equation 4, on the other hand, presents the correlation between the level of the taxonomic competitiveness indicator during the period t-n and the GDP dynamics during the period t-1 and the unemployment rate levels in individual voivodships. In both equations all values except the random component are algorithmized.

Both equations were subjected to two-leveled estimation by the least squares method[1]. In both equations the delay of the taxonomic competitiveness indicator lag by the period of from 1 year up top 4 years (i.e. that $n = 1,... 4$) was considered.

In econometric analyses we use year data. Equations (3), (4) form the base for econometric analyses. The results of estimations of equations (3), (4) based on the two-leveled least squares method for voivodships are described by equations (5a)-(6e).

In all the estimated equations correct symbols of the estimated parameters standing by the endogenous variables were obtained. All the estimated parameters were statistically significant at the significance level of 0.05 in equations: (5a), (6a), (6), (6c) and (6e).

The highest level of explanation (38.19%) was obtained in the equation (6c). As indicated by that equation the increase of the competitiveness index (that is deterioration of the competitiveness level) in voivodship i during the period t-3 by, e.g. 1%, causes the unemployment rate increase in the voivodship during the current period by ca. 0.5%. As indicated by the above equation the GDP dynamics has a much stronger influence on the level of unemployment rates at the level of voivodships in a short-term perspective.

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[1] More information on two-leveled least squares method can be found in: Maddala G. S. 2008, p. 399 and p. 412.

The lowest explanation level was obtained in equations (5a). Equation (5a) indicates that the increase of the taxonomic competitiveness indicator during the period t-1 in voivodship i by, e.g. 1% (with other factors unchanged) causes the unemployment rate increase by ca. 0.35%. The low significance level, however, means that the endogenous variables in this equation contribute little (ca. 16.7%) to explaining the development of unemployment rates in the voivodship labor markets.

$$u_{it} = 22.824 + 0.347k_{it\text{-}1} - 4.248y_{it} \tag{5a}$$
$$(3.39) \quad (2.14) \quad (-2.95)$$
$$\text{Adj. } R^2 = 0.1666 \quad \text{n.o.} = 64$$

$$u_{it} = 31.031 + 0.311k_{it\text{-}2} - 6.033y_{it} \tag{5b}$$
$$(4.36) \quad (1.87) \quad (-3.95)$$
$$\text{Adj. } R^2 = 0.3068 \quad \text{n.o.} = 48$$

$$u_{it} = 21.605 + 0.398k_{it\text{-}3} - 4.006y_{it} \tag{5c}$$
$$(1.53) \quad (1.91) \quad (-1.32)$$
$$\text{Adj. } R^2 = 0.1721 \quad \text{n.o.} = 32$$

$$u_{it} = 10.285 + 0.507k_{it\text{-}4} - 1.591y_{it} \tag{5d}$$
$$(0.41) \quad (1.83) \quad (-0.30)$$
$$\text{Adj. } R^2 = 0.2101 \quad \text{n.o.} = 16$$

$$u_{it} = 27.206 + 0.448k_{it\text{-}1} - 5.197y_{it\text{-}1} \tag{6a}$$
$$(3.86) \quad (2.69) \quad (-3.43)$$
$$\text{Adj. } R^2 = 0.1893 \quad \text{n.o.} = 80$$

$$u_{it} = 24.084 + 0.51k_{it\text{-}2} - 4.529y_{it\text{-}1} \tag{6b}$$
$$(3.22) \quad (2.83) \quad (-2.83)$$
$$\text{Adj. } R^2 = 0.1937 \quad \text{n.o.} = 64$$

$$u_{it} = 32.548 + 0.498k_{it\text{-}3} - 6.372y_{it\text{-}1} \tag{6c}$$
$$(4.58) \quad (3.01) \quad (-4.17)$$
$$\text{Adj. } R^2 = 0.3819 \quad \text{n.o.} = 48$$

$$u_{it} = 16.765 + 0.611k_{it\text{-}4} - 2.981y_{it\text{-}1} \tag{6d}$$
$$(1.24) \quad (3.08) \quad (-1.03)$$
$$\text{Adj. } R^2 = 0.2822 \quad \text{n.o.} = 32$$

$$u_{it} = 2.87 + 0.634k_{it\text{-}4} \tag{6e}$$
$$(18.79) \quad (3.21)$$
$$\text{Adj. } R^2 = 0.2559 \quad \text{n.o.} = 32$$

As indicated by the estimated equations, the strongest influence of changes in the level of competitiveness on the situation in the voivodship labor markets (measured by the unemployment rate level) was obtained with the competitiveness index lag of 4 periods (years) equations 6d–6e). In equation (6e) as a consequence of the fact that the GDP dynamics lagging by one year proved statistically insignificant only the competitiveness index lagging by 4 periods was considered. Those equations indicate that with the other values unchanged the increase of the competitiveness index value (i.e. deterioration of the competitiveness level) in voivodship i during the period t-4 by, e.g. 1% causes the unemployment rate increase in that voivodship by ca. 0.6%.

Conclusions

The following conclusions come out from the presented considerations.

The change in the competitiveness level influences the situation in the labor market. Over the short-term the improvement of competitiveness leads to an increase in labor productivity and a decrease of demand for labor, that is a decrease of employment and increase of unemployment. On the other hand, over a long-term the increase of competitiveness causes improvement in the labor market.

During the analyzed period the level of competitiveness had positive influence on the situation in the voivodship labor markets. Voivodships with the highest level of competitiveness (i.e. Lower Silesian, Silesian and Mazowieckie voivodships) were characterized by the lower average unemployment rate level and higher average employment rate level than the voivodships with the lowest level of competitiveness (that group consisted of Podkarpackie, Świętokrzyskie and Podlaskie voivodships).

In the voivodships where the competitiveness level increased the most during the covered period, the situation in the labor market (measured by the level of the unemployment rate and the employment rate) improved more than in the voivodships where the level of competitiveness decreased the most.

Econometric analyses indicate that the level of competitiveness had a significant influence on the level of the unemployment rate in the labor markets of voivodships. Improvement of competitiveness during the proceeding periods leads to a decrease in the unemployment rate. The strongest influence on the unemployment rate level in voivodship labor markets was that of competitiveness improvement in a longer time perspective.

The conducted considerations indicate that the level of competitiveness influences the situation in the voivodship labor markets. Authorities of voivodships with the lowest level of competitiveness should aim at improving it through the increase of the employed with the tertiary education, decrease of

the employed in agriculture, decrease of the share of the long-term unemployed, increase of the share of people employed in market services, increase of the shares of employees in the R&D sector, improvement of road infrastructure, increase of investment outlays, increase in the number of entities registered with the REGON database and increase in the number of entities with involvement of foreign capital.

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