THE ANALYSIS OF THE UNEMPLOYMENT, POVERTY AND INTERNATIONAL MIGRATION WITHIN THE EUROPEAN UNION AT NUTS 2 LEVEL

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Abstract

People tend to migrate for several reasons. These reasons can be their own economic situation and economic situation in their country of origin. The long-term unemployment rate (LTU), at risk of poverty rate (PR) and crude rate of net migration statistically adjusted (CRN); these are three very considerable indicators which influence not just the economic strength of the particular state, but also the living standard and competitiveness of each region within the state. We can hypothesis that high and especially long-term unemployment in the state or in the particular region can give a rise to the poverty, to the decrease of the living standard and ultimately it can be the cause of the emigration from the country or of the emigration from one region into another. Our main aim is therefore to analyse if there is a correlation among these indicators and how strong it is. We focus on the NUTS 2 level within the European Union. The analysed period consists of 4 years – 2005, 2008, 2010 and 2011.

Key words: unemployment, poverty, migration, NUTS 2

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Introduction

People tend to migrate for several reasons. These reasons can be their own economic situation and economic situation in their country of origin. The economic situation within the country is affected, inter alia, by such macroeconomic factor as unemployment and by socioeconomic factor as poverty. Therefore, the main aim of this paper is to analyse the correlation between long-term unemployment and at risk of poverty rate and long-term unemployment and crude rate of net migration statistically adjusted. The correlation between PR and CRN was proved in our previous research.

Researchers from different institutions and countries wrote papers in which they introduced some important findings. For example, Foulkes and Schafft (2010) analysed redistribution of the poverty across the United States, especially how migration can

reconfigures poverty rates across metropolitan, micropolitan, and noncore counties. They stated that share of the African; American and Latino American migrants on the migration rates within the USA reinforce existing poverty concentrations. Gaston and Nelsen (2011) examined links between the international migration, trade theory and labour empirics. Pekkala and Tervo (2002) analyse, on the example of Finland, the behaviour of the migration of the unemployed persons in terms of the causal effect of moving on individual employment status. From their findings is obvious that better "quality" of the migrants, e.g. age, education, human capital, etc. causes an improvement in re–employability and migration as such may not be a very effective mechanism for alleviating individual unemployment.

Unemployed individuals respond to regional differences in expected individual wages, whereas the employed are more sensitive to employment opportunities and heads of households are tied migrants, these are the main findings from Rabe's and Taylor's research (2011). A cross-country analysis from the point of view of the international migration, the brain drain and poverty has been presented by Cattaneo's paper (2009). Her work identified the positive effect of the number of international migrants on the income of the poor. On the other hand the stock of international migrants does not have a significant impact on the income of the middle and top quintiles of the population. The main finding is that migration has the poverty-reducing effect.

1 Materials and methods

The theoretical background for this paper came from online scientific journals and other expert research and publications. The statistical data are from Eurostat. The most important terms with which we work are: the long-term unemployment rate (LTU), at risk of poverty rate (PR) and crude rate of net migration statistically adjusted (CRN). These are three indicators which influence not just the economic strength of the particular state, but also the living standard and competitiveness of each region within the particular state. Under LTU we understand unemployed persons as a percentage of the economically active population whose are seeking a job for longer than one year. (Eurostat, 2012) PR represents proportion of people whose net income is below 60% of median disposable income in the country. (Eurostat, 2013a)

CRN represents ratio of net migration plus statistical adjustment during the year to the average population in the same year, expressed per 1 000 inhabitants. The net migration is the difference between the total gross rate of total change and the gross rate of natural change of

the population. Net migration is therefore a part of the movement of the population which was not caused by death or birth. (Eurostat, 2013b)

Our analysis is based on the both parametric and non-parametric measure of statistic dependence, respectively independence between selected variables as we test the correlation between LTU and CRN and LTU and PR by using Pearson product-moment correlation, Spearman rank-order correlation, Kendall's tau-b correlation coefficient and Hoeffding measure of independence. The calculations were made in SAS 9.3. The analysed years are 2005, 2008, 2010 and 2011. The regional level of our examination is NUTS 2 level within the European Union.

Pearson product-moment correlation is a parametric measure of association for two variables which measures as the strength so the direction of a linear relation between these two variables. The statistic values come from interval <-1, 1> and negative values indicate indirect correlation and positive values indicate direct correlation between variables. There is no linear correlation between variables if $\rho_{xy} = 0$. The formula for the population Pearson product-moment correlation is:

$$\rho_{xy} = \frac{\mathrm{Cov}(x,y)}{\sqrt{\mathrm{V}(x)\mathrm{V}(y)}} = \frac{\mathrm{E}(\,(x-\mathrm{E}(x))(y-\mathrm{E}(y))\,)}{\sqrt{\mathrm{E}(x-\mathrm{E}(x))^2\,\mathrm{E}(y-\mathrm{E}(y))^2}} \tag{1}$$

Spearman rank-order correlation is a non-parametric measure of statistical dependence based on the ranks of the data values. The interval for statistic values and its interpretation is the same as in the cause of Pearson product-moment correlation. The formula is:

$$\theta = \frac{\sum_i (\,(R_i-\bar{R})(S_i-\bar{S})\,)}{\sqrt{\sum_i (R_i-\bar{R})^2 \sum (S_i-\bar{S})^2}} \tag{2}$$

where R_i is the rank of x_i, S_i is the rank of y_i, $\overline{R}$ is the mean of the R_i values, and $\overline{S}$ is the mean of the S_i values.

Kendall's tau-b correlation coefficient is also a non-parametric measure of statistical dependence, but based on the number of concordances and discordances in paired observations. The formula is:

$$\tau = \frac{\sum_{i<j} (\mathrm{sgn}(x_i-x_j)\mathrm{sgn}(y_i-y_j))}{\sqrt{(T_0-T_1)(T_0-T_2)}} \tag{3}$$

where $T_0 = n(n-1)/2, T_1 = \sum_k t_k(t_k-1)/2$ and $T_2 = \sum_l u_l(u_l-1)/2$. The t_k is the number of tied x values in the *k*th group of tied x values, u_l is the number of tied y values in the *l*th group of tied y values, n is the number of observations, and *s*gn(z) is defined as:

$$\operatorname{sgn}(z) = \begin{cases} 1 & \text{if } z > 0 \\ 0 & \text{if } z = 0 \\ -1 & \text{if } z < 0 \end{cases}$$

Hoeffding measure of independence is our last non-parametric test which measures the relation that detects more general departures from independence. The statistic values are from interval <-0.5, 1>. Value 1 indicates the perfect dependence. The formula for Hoeffding dependence test is:

$$D = 30\,\frac{(n-2)(n-3)D_1 + D_2 - 2(n-2)D_3}{n(n-1)(n-2)(n-3)(n-4)} \qquad (4)$$

Where, $D_1 = \sum_i (Q_i - 1)(Q_i - 2)$, $D_2 = \sum_i (R_i - 1)(R_i - 2)(S_i - 1)(S_i - 2)$ and $D3 = \sum_i (R_i - 2)(S_i - 2)(Q_i - 2)$. R_i is the rank of x_i, S_i is the rank of y_i, and Q_i is 1 plus the number of points with both x and y values less than the *i*th point. (SAS, 2013).

2. Results and discussion

With the use of formulas (1) – (4) we obtained results, which are presented in the table 1 and table 2 and are illustrated in figure 1 and figure 2 below.

Results in table 1 represent calculated values for selected statistical correlation tests and for particular years. In each case, we can prove the hypothesis H_0 that analysed variables are independent if the p-value is greater than selected significance level $\alpha = 0.05$. As the p-value for each test is $0.0001 < 0.05$ in each examined year, we can state that there is statistically significant linear and also non-linear correlation between CRN and LTU in selected years. Pearson and Spearman correlation coefficients get negative values; therefore there is indirect correlation between CRN and LTU. As Kedndall Tau b correlation coefficient is also negative the association between these variables is negative. Positive Hoeffding coefficient indicates that there is dependence between variables.

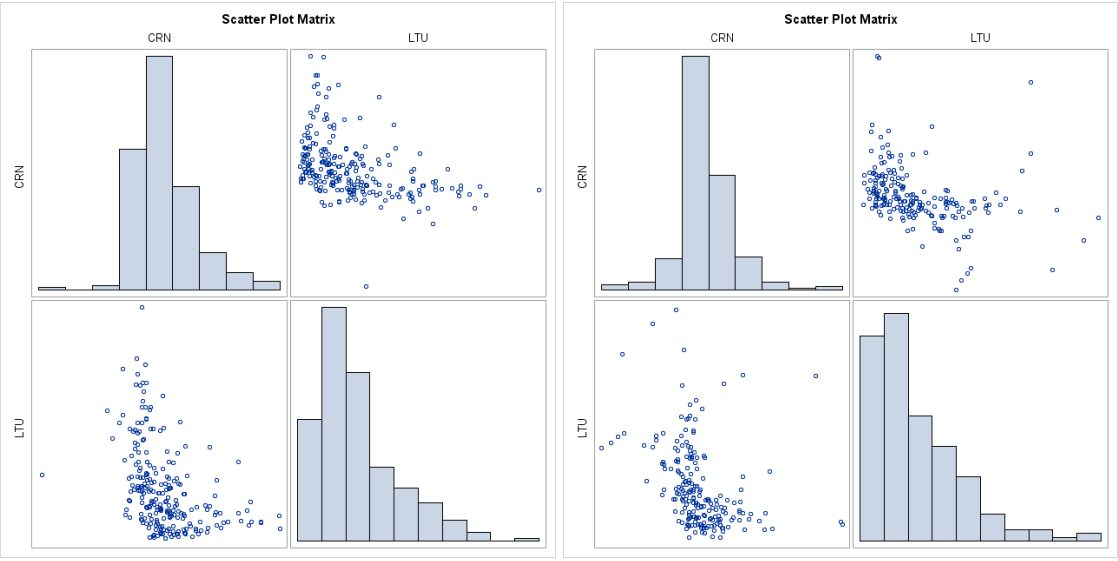
Tab. 1: Correlation between CRN and LTU

Test/ Value	Year				p-value for particular test in each year
	2005	2008	2010	2011	
Pearson Correlation coefficient	-0.41499	-0.37528	-0.29067	-0.36018	<0.0001
Spearman Correlation Coefficient	-0.52365	-0.44567	-0.38598	-0.53388	<0.0001
Kendall Tau b Correlation Coefficient	-0.35393	-0.30311	-0.26587	-0.37364	<0.0001
Hoeffding Dependence Coefficient	0.09386	0.06595	0.051	0.10478	<0.0001

Source: own processing of Eurostat data, 2013c.
*The resulting p-value < 0.0001 for particular test is the same in each of the examined year.

Scatter plot matrix of correlation between CRN and LTU presents figure 1. It is two years comparison. Year 2005 is on the left side of the figure and year 2011 is on the right side. From both situations is obvious that there is negative correlation between CRN and LTU which means that when the LTU in the country increase, the CRN decrease. Decreasing of CRN means that the emigration is greater than immigration in the particular region and hence we can state that with the increase of LTU, emigration from this country increase too.

Fig. 1: Scatter Plot Matrix of correlation between CRN and LTU in years 2005 and 2011



Source: own processing.

Correlation coefficients in table 2 help us understand the correlation between PR and LTU. We know from the previous results that there is statistically significant negative parametric and also non-parametric correlation between CRN and LTU which is supported also by the Kendall Tau b correlation and Hoeffding dependence coefficient. Now we are interested besides in correlation between PR and LTU.

Tab. 2: Correlation between PR and LTU

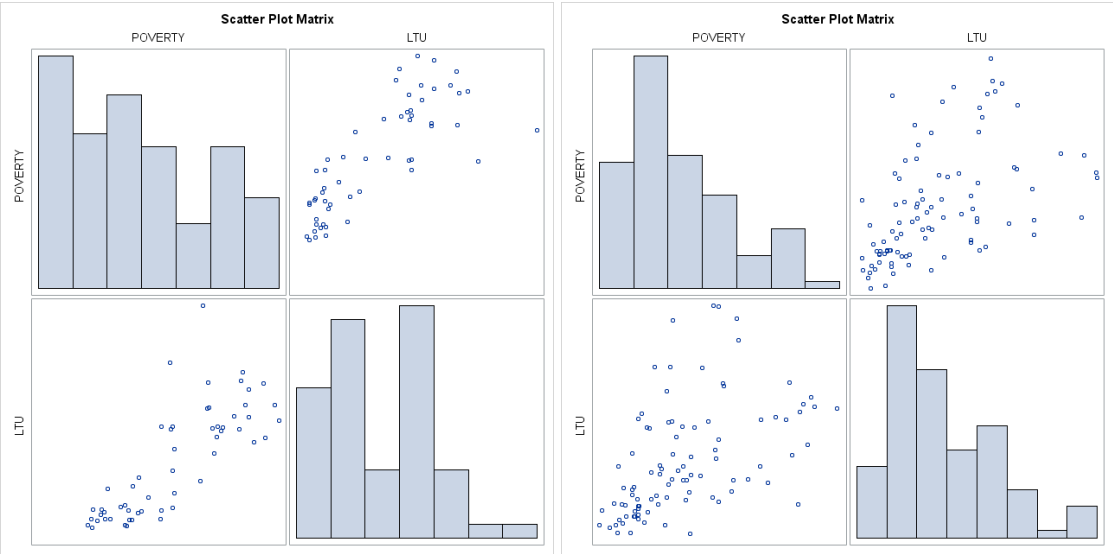
Test/ Statistic value	Year				p-value for particular test in each year
	2005	2008	2010	2011	
Pearson Correlation Coefficient	0.7936	0.53673	0.43742	0.49983	<0.0001
Spearman Correlation Coefficient	0.80556	0.70832	0.56273	0.63059	<0.0001
Kendall Tau b Correlation Coefficient	0.59214	0.49715	0.38951	0.44115	<0.0001
Hoeffding Dependence Coefficient	0.29391	0.19538	0.10495	0.13324	<0.0001

Source: own processing of Eurostat data, 2013c.
*The resulting p-value < 0.0001for particular test is the same in each of the examined year.

In the case of these two variables, there is positive statistically significant linear and non-linear correlation as the p-value 0.0001 < 0.05 in each examined year and hence we can reject the hypothesis H_0 that these variables are independent. There was very strong positive correlation between PR and LTU in year 2005 as the Pearson correlation coefficient was 0.7936 and Spearman Correlation coefficient was 0.80556. Relatively high positive Kendall Tau b correlation coefficient, and Hoeffding dependence coefficient, mainly in year 2005, prove that there is positive association between our variables and that they are dependent. Positive correlation between these two variables was proved also in other examined years.

From the scatter plot matrix for variables: PR and LTU (figure 2) for years 2005 (on the left side) and 2011 (on the right side) is, unlike the previous results, visible the difference between years 2005 and 2011.

Fig. 2: Scatter Plot Matrix of correlation between PR and LTU in years 2005 and 2011



Source: own processing.

We can sight relatively perfect positive linear correlation between PR and LTU, however there are some extreme regions which reduce the strength and a linear shape of the correlation in year 2005. These regions represent mainly two Slovakian regions "Východné Slovensko" with PR 37.9 % and LTU 18.11 % and the second is "Stredné Slovensko" with PR 30.4 % and LTU 13.68 %. There are of course other extreme regions as regions in Poland (Podkarpackie, Lubelskie, Lubuskie, Zachodniopomorskie, …) and Italy (Sicilia, Calabria, Campania, …).

On the other hand, we can sight the uprise of two main branches, respectively groups of regions in year 2011. To the first group belong regions with high PR and medium LTU and regions with medium PR and high LTU belong to the second group. The closer analysis of these two main groups of regions will be discussed in the next published paper.

Conclusion

We have hypothesis that high and especially long-term unemployment in the state or in the particular region can give a rise to the poverty, to the decrease of the living standard and ultimately it can be the cause of the emigration from the country or of the emigration from one region into another.

From our results is obvious that there is statistically significant negative linear and also non-linear correlation between CRN and LTU in selected years, therefore we can state that with the increase of LTU, emigration from this country increase too. Negative association between these two variables was proved also by Kendal Tau b correlation coefficient and positive Hoeffding coefficient indicates that there is dependence between them. On the base of these results we can stat that long-term unemployment can affect emigration from the particular region.

The second part of our results indicates that there is strong positive correlation between PR and LTU especially in year 2005. On the other hand, we can sight that development among NUTS 2 regions between years 2005 and 2011 was not similar and there uprise two main groups of regions, the first with high PR and medium LTU and second with medium PR and high LTU. The closer analysis of these two main groups of regions will be discussed in our next published paper.

When we take in consideration that there is correlation between CRN and PR, which have been proved in our previous paper (Bednáriková & Stehlíková, 2012), then we can sustain that LTU, CRN and PR are three very important factors which are interrelated and

influence also the socio-economic development within the particular region as within the selected country.

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