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RECENT IMPACTS OF SELECTED DEVELOPMENT INDICATORS ON UNEMPLOYMENT RATE: FOCUSING THE SEE COUNTRIES

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ABSTRACT

The article investigates the relationship between unemployment rate and development indicators: (1) the GDP per capita in Purchasing Power Parities (PPP in current international $); and (2) the Internet penetration rate, defined as the percentage of Internet users per 100 people. For 34 countries in 2013, only two simple linear regression models based on natural logarithms of data and the Ordinary Least Squares (OLS) estimator appeared to be useful. The simple linear regression *Model 1* shows a negative correlation between the main variable under study $\ln Y_{UemRate}$ and the regressor $\ln X_{GDPpc}$, explaining nearly half of the total variation. The simple linear regression *Model 2* shows a negative correlation between $\ln Y_{UemRate}$ and $\ln X_{IntUse}$, explaining 27 % of the total sum of squares. Regarding clustering of 34 countries based on three variables, the Ward linkage and squared Euclidean distances gave an interesting four-cluster solution. The South-East European (SEE), and especially to the Western Balkan's countries (WBC) are focused. These countries, spread in three clusters, are not homogeneous. Bosnia and Herzegovina and R. Macedonia are with Spain and Greece, all having difficult economic situation. Albania, Montenegro and Serbia are with Bulgaria, Romania and Turkey, all being the SEEC. Croatia is with more developed Italy, Cyprus and Poland, and with less developed Portugal. Central European Slovenia, joined more developed countries of that area, but the most developed European countries comprised a cluster of their own.

KEY WORDS

unemployment rate, GDP per capita in PPP, Internet penetration rate, multivariate analysis, Western Balkan countries

CLASSIFICATION

JEL: C51, O12, O57

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INTRODUCTION

In this article the impact of selected economic and Information and Communication Technology (ICT) indicators on unemployment rate in selected European countries is analysed. The aim of the research is to study the relationship of the unemployment rate (the percentage of total labour force), as the dependent variable, and two selected development indicators: the GDP per capita and the Internet penetration rate.

Regarding the geographic scope of the research, the official data availability for variables under study determined the countries for this analysis. The World Bank Data are used [1]. In the focus are the recent changes in the SEE and the WB countries. There are different trends in all three variables from 1990 to 2013 in each of 37 analysed European countries.

Based on statistical data exploration, upon recognising and deleting the outliers, the regression analysis performed for cross-sectional data for 34 countries for 2013.

The goal was to study whether and to what extent do the GDP per capita in PPP in current international \$ (X_{GDPpc}), and the Internet penetration rate, as the percentage of Internet users per 100 people (X_{IntUse}), impact the total unemployment rate $Y_{UemRate}$. For this purpose several regression models, firstly, using the original data, and secondly using the logarithms of data, are developed. The cluster analysis are conducted with the purpose of testing the research hypothesis that the similarities among the SEE (and WB) countries, and among highly developed countries exist.

LITERATURE OVERVIEW

According to European Commission [2] the Labour market conditions in Europe started to improve recently during 2013. With output growth accelerating only slowly, and given the usual lagged response of employment, small net job creation is expected in the short term. Public employment growth is set to remain Intra-euro-area rebalancing is progressing, while private employment growth is still dampened by the remaining scope for firms to adjust working hours. Employment growth in 2014 is expected to be limited, at 0,6 % in the EU and 0,4 % in the euro area. The unemployment rate is thus expected to decrease slightly in 2014 from its very well-known peak in 2013. In 2015, employment growth is set to accelerate to 0,7 % in both areas, resulting in a further slight reduction of unemployment to around 10 % in the EU and 11 % in the euro area. Such a slow decline reflects the gradual recovery but could also indicate a higher prevalence of structural unemployment than in the pre-crisis period. Large differences in labour market performance would persist although unemployment is set to decrease in a large majority of the EU Member States.

According to [3] an analysis of youth unemployment in the Euro Area was investigated. The paper starts by presenting some facts on youth unemployment over the last two decades at the euro area and at each of the European countries level. Over the last few years, youth unemployment has remained at a high level relative to other age groups in most Euro Area countries. The paper finds that there is a positive relationship between the share of young people in the total population and the youth unemployment rate. It is shown that the smaller the percentage of young people in the population, the lower the risk of them being unemployed. At the same time, economic conditions are negatively correlated with the youth unemployment rate. So, the youth unemployment rate increases when the economic situation worsens. Moreover, robust results across the regression scenarios show that higher employment protection and minimum wages imply a higher youth unemployment rate, while active labour market policies (ALMPs) tend to reduce it. The research results also indicate that the increasing share of services employment in total employment is helping to reduce unemployment among young people. The increase in the youth inactivity rate, which is mainly due to the fact that there are more young people in education, is also connected to the overall decline in youth unemployment. Regarding education, the results indicate that number of years, i.e. the length of education is associated with lower youth unemployment rates. The share of the young population not in school, however, is positively correlated with the unemployment rate. As youth unemployment is subject to certain country-specific features, each country should identify the relevant underlying sources of youth unemployment and react accordingly. European countries' governments can make a positive contribution to the smooth transition of young people from education to the labour market by supporting a well-functioning education system and labour market institutions that do not introduce distortions into the labour market.

The relationship between unemployment and economic growth in Jordan through the implementation of Okun's law is presented in [4]. Time series of annual data from the period 1970-2008 are studied. The relation between unemployment and economic growth obtaining estimates for Okun's coefficient are tested. The study used Augmented Dickey-Fuller (ADF) for unit root, co-integration test and a simple regression between unemployment rate and economic growth. The empirical results reveal that Okun's law cannot be confirmed for Jordan. Thus, it can be suggested that the lack of economic growth does not explain the unemployment problem in Jordan. The author recommended that economic policies related to demand management would not have an important effect in reducing unemployment rate. Accordingly, implementation of economic policies oriented to structural change and reform in the labour market would be more appropriate by policy makers in Jordan.

Although there is a significant literature on the relationship between economic growth and unemployment, effect of economic growth over unemployment varies among the periods and countries. The study given by [5] investigates the economic growth, productivity and unemployment data for seven industrialized countries (G7) between the years of 2000 to 2011. In addition to the mentioned period two sub-periods of 2000-2007 and 2008-2011 in which the effect of global financial crisis was felt most have been analysed. Pre and post crisis periods are compared to each other. The results of this study reveal that while the productivity and economic growth variables have significant and strong effects on the decrease of unemployment in the pre-crisis period, this effect of productivity becomes insignificant and small after the crisis whereas the effect of economic growth as a decreasing effect over unemployment continues and its impact level rises.

Accuracy, unbiasedness and efficiency of professional macroeconomic forecasts through an empirical comparison for the G7 countries is investigated in [6].

There are several recent articles developing and evaluating forecasts of unemployment in European countries. The paper [7] predicted macroeconomic indicators in the Czech Republic using econometric models and exponential smoothing techniques, while [8] evaluated the accuracy and bias of the unemployment rate forecasts suggesting methods of improving the forecasts accuracy. In [9] the forecasts for inflation and unemployment rate based on models using resampling techniques are given.

The performance of unemployment rate predictions in Romania developing strategies to improve the forecasts accuracy are presented in [10]. Voineagu, In [11] the authors forecasted monthly unemployment using econometric smoothing techniques.

According to [12] regarding male and female unemployment trends, historically, women have been more affected by unemployment than men. Recent analysis conducted by Eurostat revealed some interesting trends in unemployment rates by gender in European and non-European countries appeared.

Potential forecasting models suitable for predicting the future values of unemployment rates for male and female based on annual data from 1991 to 2013 in 12 European countries are explored in [13]. A highly developed EU country like Austria, but also others less developed countries, such as, Spain, Greece, both with the highest unemployment rates, Croatia, Portugal, Slovenia, and EU candidates, Bosnia and Herzegovina, Serbia, Turkey, Albania, R. Macedonia and Montenegro are investigated. The results of the empirical analysis showed that the optimal model for forecasting unemployment rate is different for different countries. The paper gives the insights in the most appropriate forecasting methods among regression models and smoothing methods for predicting unemployment rate by gender. Even with the best fitted models the real unemployment rates might be either under- or over-estimated.

Forecasting models for unemployment rate in selected European countries using smoothing methods are evaluated in [14].

DATA AND RESEARCH METHODOLOGY

DATA SOURCE AND DEFINITIONS

The objective of the research is to study the relationship between the unemployment rate, defined according to the International Labour Organisation as percentage of total labour force ($Y_{UemRate}$), determined in the regression analysis as the dependent variable, and two selected development indicators. The first indicator used as the regressor is GDP per capita in PPP in current international \$, X_{GDPpc}. The second regressor is the indicators called Internet penetration rate, given as the percentage of Internet users (per 100 people), X_{IntUse}.

According to [15] Eurostat defines an unemployed person as person aged 15-74 without job during the reference week who is available to start work within the next two weeks and who has actively sought employment at some time during the last four weeks. Unemployment rates represent unemployed persons as a percentage of the labour force. The labour force is the total number of people employed and unemployed. Unemployed persons are persons aged 15 to 74 who were: without work during the reference week; currently available for work (i.e. were available for paid employment or self-employment before the end of the two weeks following the reference week); and actively seeking work (i.e. had taken specific steps in the four weeks period ending with the reference week to seek paid employment or self-employment or who found a job to start later i.e. within a period of, at most, three months).

The World Bank Data time series data combined with the Eurostat data for the period from 1990 to 2013 were analysed [12, 15].

RECENT DYNAMICS OF UNEMPLOYMENT RATES

The unemployment rate showed different trends over 37 analysed European countries. Figure 1 presents the lowest and the highest unemployment rates.

After the ILO survey, the total worldwide unemployment rate in 2015 is forecasted to remain unchanged at the level of 5,9 % compared to the previous year, being the highest (12,5 %) in the North Africa, and the lowest (3,9 %) in South Asia.

UNEMPLOYMENT RATES BY GEOGRAPHY

Figure 2 shows Unemployment rate in selected world regions 2014 after worldwide surveys conducted by International Labour Organisation in 2014 and 2015.

According to the Eurostat survey data from November 2014 [12], Figure 3 resulted.

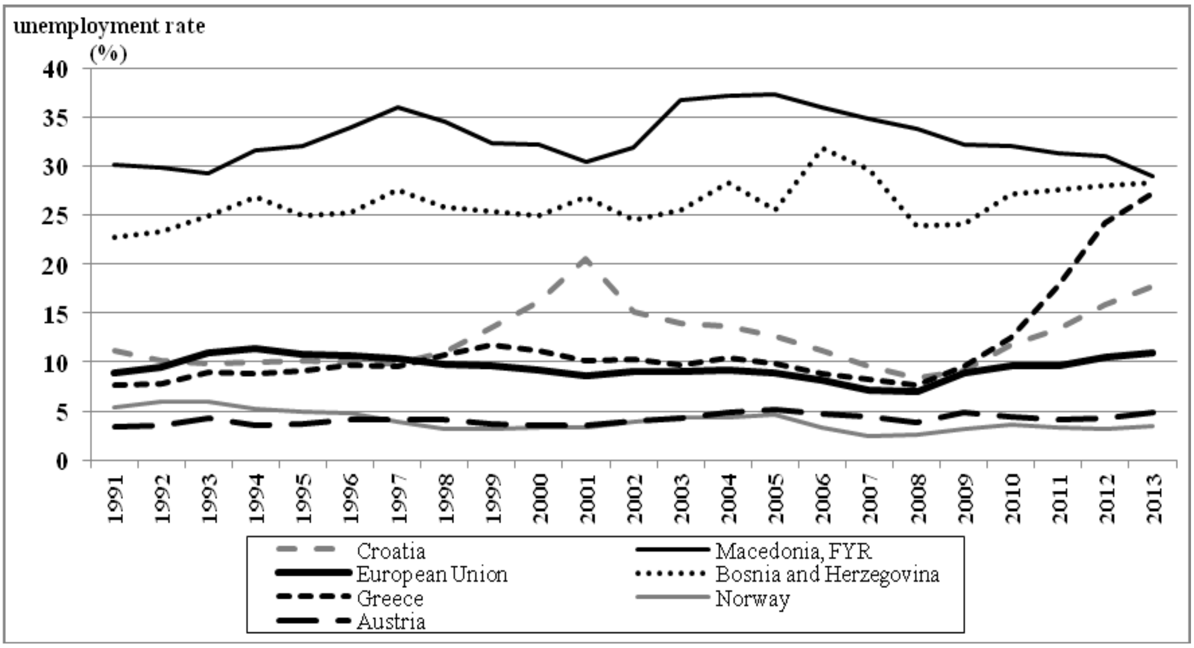

Figure 1. Unemployment rates in the period 1991 to 2013: the lowest for Norway and Austria, the highest for R. Macedonia, Bosnia and Herzegovina and Greece; and for Croatia and the EU-28 average. Source: Authors' creation and [16].

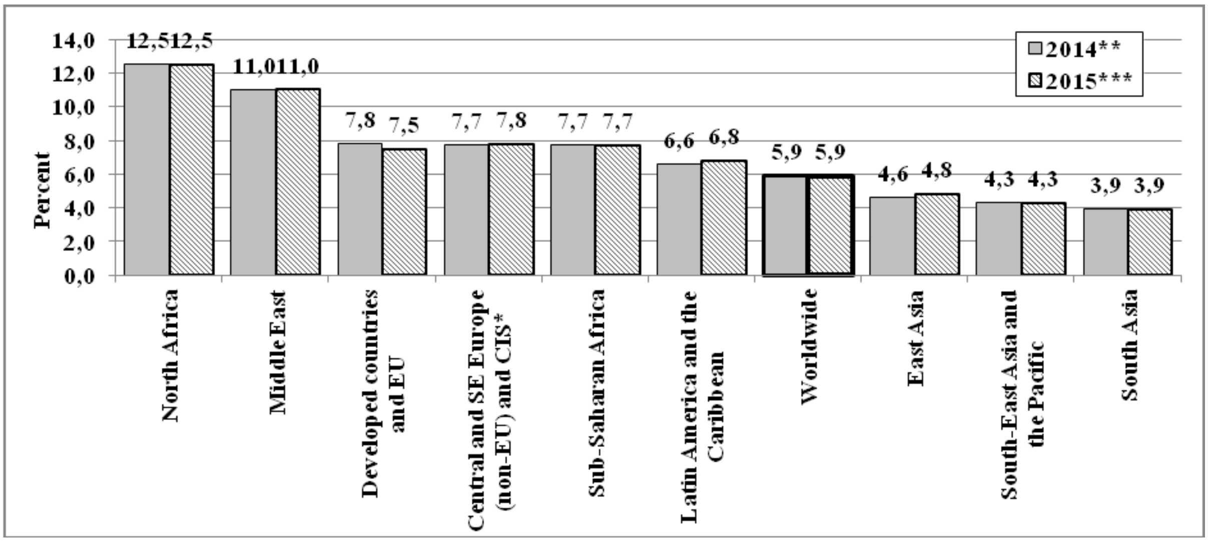

Figure 2. Unemployment rate in selected world regions in 2014 and 2015. Source: Authors' creation and [15]. Notes: * – the abbreviation CIS stands for Commonwealth of Independent States; ** – provisional estimate, *** – forecast.

DESCRIPTIVE DATA EXPLORATION

Table 1 shows the descriptive statistical analysis results. In 2013 the outlier for the Luxembourg GDP per capita is indicated with standardized value $z = 3,52$. Its standardized value for this variable was even larger in some past years.

After exploration of data variability, data for three highly developed countries Luxembourg, Iceland and Norway are excluded, being the outliers in most of the recent years regarding the GDP per capita. Figure 4 shows multiple Box Plot data for all three variables for 2013, where data for Luxembourg could be noticed as a seriously high outlier. Figure 4 indicates that the distribution of data for $Y_{UemRate}$ is positively skewed with quite high *skewness*, $\alpha_3 = 1,16$.

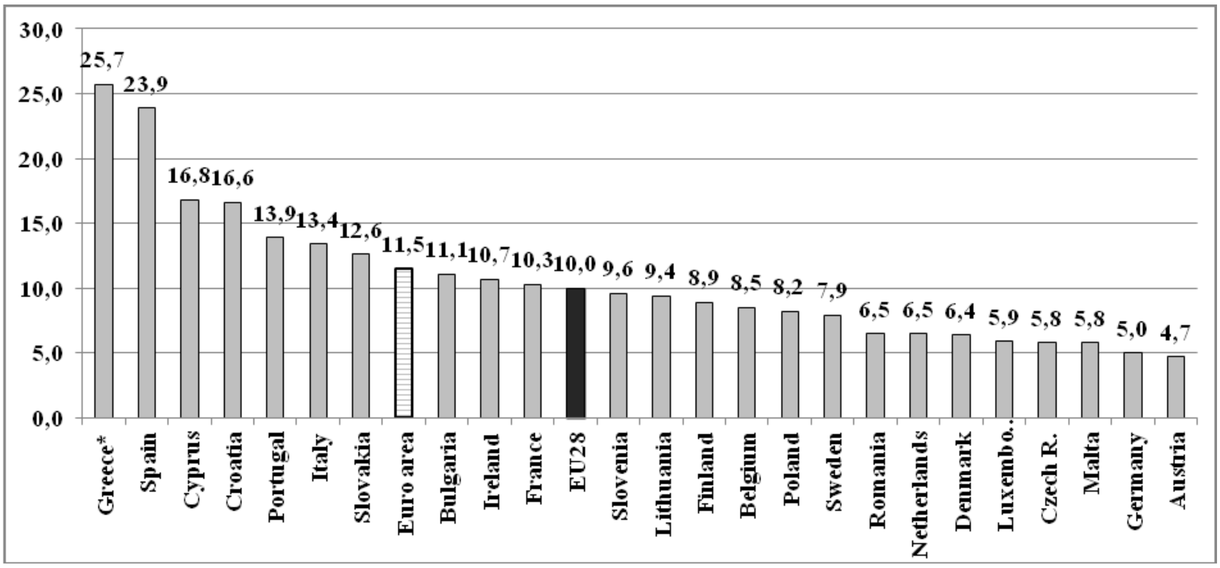

Figure 3. Unemployment rate in member states of the European Union in November 2014 (seasonally adjusted). Source: Authors' creation and [12]. Note: For Germany, the Netherlands, Austria, Finland and Iceland the trend component instead of the more volatile seasonally adjusted data is used.

Just for exploration, the scatter diagrams for $Y_{UemRate}$ and X_{GDPpc}, and $Y_{UemRate}$ and X_{IntUse}, are given in Figure 5. Only weak negative correlation might be seen for both pairs of variables.

Finally, 34 countries remained for further regression analysis: 27 from EU28 countries' data (for all countries but not for the Luxembourg data); 3 official EU candidates (R. Macedonia, Serbia and Turkey); 3 potential EU candidates (Albania, Bosnia and Herzegovina, Montenegro), plus Switzerland. From 12 South-East European (SEE) countries, 11 of them are analysed: Albania, Bulgaria, Bosnia and Herzegovina, Cyprus, Greece, Croatia, R. Macedonia, Montenegro, Romania, Serbia and Turkey. Only Kosovo could not be included because of the lack of data.

Table 1. Descriptive statistics for 2013 data.

Descriptive Measure	$Y_{UemRate}$	X_{GDPpc}	X_{IntUse}
Mean	12,18	32441,14	73,71
Standard Error	1,16	2706,07	2,38
Median	10,20	28769,86	72,68
Mode	10,40	not defined	not defined
Standard Deviation	7,04	16460,41	14,48
Kurtosis	0,52	3,06	-1,02
Skewness	1,16	1,32	-0,02
Range	25,50	80874,60	50,30
Minimum	3,50	9535,54	46,25
Maximum	29,00	90410,14	96,55
Sum	450,80	1200322,08	2727,26
Count	**37**	**37**	**37**
Coefficient of variation	0,58	0,51	0,20
Z_{min}	–1,23	–1,39	–1,90
Z_{max}	2,39	3,52*	1,58

*indicates the outlier for Luxembourg

Figure 4. Multiple Box Plot for standardised data for all three variables and 37 countries for 2013. Source: authors' creation and [16].

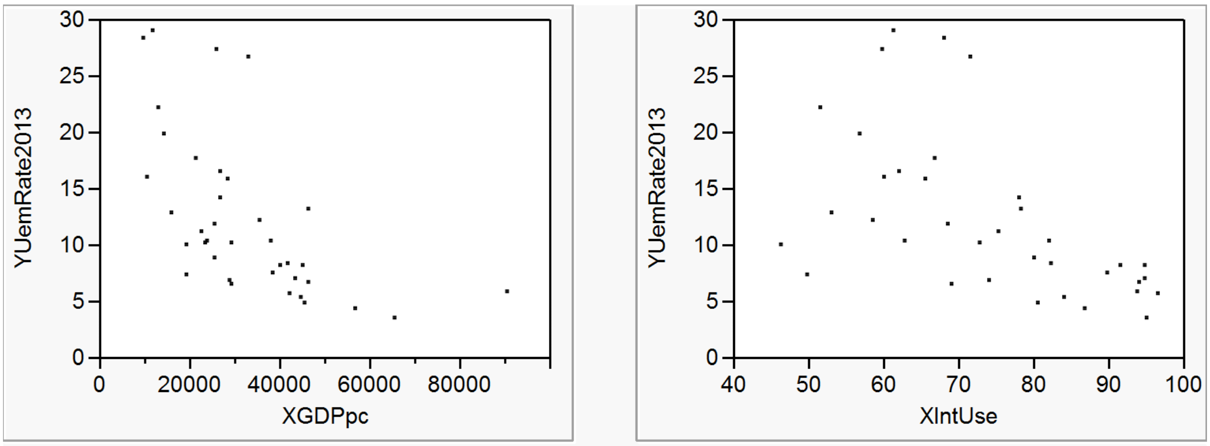

Figure 5. Scatter plots for pair of variables: $Y_{UemRate}$ and X_{GDPpc}; and $Y_{UemRate}$ and X_{IntUse}, n = 37 countries, data for 2013. Source: authors' creation and [16].

Considering the South-East European (SEE) region, from altogether 12 SEE countries, even 11 of them are included into the research. There are data for five EU member states that fall into the SEE: Bulgaria, Croatia, Cyprus, Greece and Romania, as well as data for the rest of the SEE countries: three official EU candidates (R. Macedonia, Serbia and Turkey all belonging to the Western Balkans), as well as three potential EU candidates (Albania, Bosnia and Herzegovina and Montenegro), are analysed. Slovenia, as the part of the West-Central Europe, is not included into the SEE region.

Altogether six countries, Albania, Bosnia and Herzegovina, R. Macedonia, Kosovo, Montenegro and Serbia belong to the WB region. Sometimes, according to [17], Croatia is added to the WB group of countries in the research reports. Kosovo's data are not available, so, it could not be included into the analysis shown in this article.

RESEARCH RESULTS AND FINDINGS

REGRESSION MODELLING

The aim of the research is to study the relationship of the unemployment rate (percentage of total labour force, modelled as the International Labour Organisation estimate, compare to [15]), as the dependent variable, and two selected development indicators. The regression analysis using cross-sectional data for 2013 was conducted with the purpose to investigate to what extent the GDP per capita in PPP (in current international $) and the Internet penetration rate, i.e. percentage of Internet users per 100 people, impact the total unemployment rate. The firstly developed multiple linear regression model was not statistically significant in the variable $X_{InteUse}$, so, it was not found to be appropriate for use. In addition, two simple linear regression models were evaluated, both having the heteroskedasticity problems. Therefore, the logarithmic transformation for the variables is suggested. All possible regressions with logarithms of data were investigated, but only two simple logarithmic regression models are shown to be useful, with no violation of model assumptions.

The regression models are built for 34 European countries, with the population model given as follows:

$$\ln y = \beta_0 + \beta_1 \ln x_1 + \varepsilon. \tag{1}$$

For estimating the regression parameters from the model (1) the OLS estimator was applied.

The regression model with estimated parameters is:

$$\ln \hat{y} = \hat{\beta}_0 + \hat{\beta}_1 \ln x_1. \tag{2}$$

The estimated Model 1 for regressing the $\ln Y_{UemRate}$ on $\ln X_{GDPpc}$ for 34 in 2013 is:

$$\begin{array}{llll} \ln \hat{Y}_{UemRate2013} = \underset{(1{,}4597)}{10{,}0141} \, \mathbf{-} \underset{(0{,}1430)}{\mathbf{0{,}7448}} \cdot \ln X_{GDPpc} & n = 34 & R^2 = 0{,}4587 & \overline{R}^2 = 0{,}4418 \\ & \hat{\sigma} = 0{,}3832 & \hat{V} = 15{,}83\,\% & DW = 2{,}386 \\ & & R = 0{,}6773 & F = 27{,}122 \end{array} \tag{3}$$

All the assumptions of the regression Model 1 are filled. According the Breusch-Godfrey Serial Correlation LM test (p-value equal to 0,4150), there is no autocorrelation problem on the significance level of 5 %. Moreover, the Jarque-Bera test (p-value equal to 0,2386) shows that error terms are normally distributed on significance level of 5 %. In order to check the analysed regression model for heteroskedasticity, the Breusch-Pagan-Godfrey test shows at the 5 % significance level, with p-value equal to 0,7312, the variance is stable. The individual t-test of significance shows that the independent variable (p-value < 0,0000) is statistically significant at 5 % significance level.

After the Model 1 is estimated, it might be concluded that if the *GDP per capita, X_{GDPpc}*, would increase by 1 %, the regression value of $Y_{UemRate2013}$ would decrease by 0,7448 %. The estimated model explains 45,87 % of the total sum of squares, and the regression coefficient of variation is 15,83 %, so the estimated model might be considered as a representative one.

Further, the estimated Model 2 for regressing the $\ln Y_{UemRate2013}$ on $\ln X_{IntUse}$ for 34 countries in 2013 is:

$$\begin{array}{llll} \ln \hat{Y}_{UemRate2013} = \underset{(1{,}7017)}{8{,}2864} \, \mathbf{-} \underset{(0{,}3994)}{\mathbf{1{,}3783}} \ln X_{IntUse} & n = 34 & R^2 = 0{,}2712 & \overline{R}^2 = 0{,}2484 \\ & \hat{\sigma} = 0.4447 & \hat{V} = 18{,}37\,\% & DW = 2{,}495 \\ & & R = 0{,}5208 & F = 11{,}908 \end{array} \tag{4}$$

If the Internet Penetration Rate, X_{IntUse}, would increase by 1 %, the regression value of $Y_{UemRate2013}$ would decrease by 1,3783 %. The estimated model explains 27,12 % of the total variation, and the regression coefficient of variation is 18,37 %. Therefore, the estimated model is a representative. The regression model assumptions are not violated. According the Breusch-Godfrey Serial Correlation LM test (p-value equal to 0,2062), there is no autocorrelation problem on the significance level of 5 %. The Jarque-Bera test (p-value equal to 0,9566) shows that error terms are normally distributed at 5 % significance level. In order to check the analysed regression model for heteroskedasticity, the White test was conducted (p-value equal to 0,1598) and shown that at the 5% significance level, the variance is stable. Individual t-test of significance shows that the independent variable (p-value < 0,0016) is statistically significant at 5 % significance level.

CLUSTER ANALYSIS RESULTS

Several clustering approaches were investigated. Clustering with three-cluster solution as the final partition based on standardized data for all three variables for 34 countries (data for 2013), with the squared Euclidean distance and the Ward Linkage gave the distances between the cluster centroids as it is given in Table 2. The highest is the distance (3,86102) between Cluster 2 with 11 highly developed countries: Austria, Germany, Switzerland, Belgium, France, Ireland, Denmark, Sweden, Netherlands, Finland, United Kingdom, and Cluster 3 with four countries: Spain, Greece, R. Macedonia and Bosnia and Herzegovina.

The three-cluster solution gave the dendrogram given in Figure 6, where four countries, Greece, Spain, R. Macedonia and Bosnia and Herzegovina gathered in separate Cluster 3.

Applying the same clustering method for the same variables and the same 34 countries, even more illustrative is the four-cluster, which gave the distances between cluster centroids as it is given in Table 3. Very high is the distance (3,60798) between Cluster 1 centroid with 6 countries: Albania, Bulgaria, Montenegro, Serbia, Romania, Turkey, and Cluster 2 centroid with 13 countries: Cyprus, Portugal, Croatia, Italy, Poland, Czech R., Malta, Estonia, Slovakia, Hungary, Latvia, Lithuania, Slovenia. However, the highest is the distance (3,86102) between centroids of Cluster 2 and Cluster 3, where there are Bosnia and Herzegovina, R. Macedonia, Spain, and Greece.

The corresponding dendrogram for the four-cluster solution is given in Figure 7. Cluster of 19 members form Figure 6 is split into two clusters, one with 13 and the other with 6 members.

Table 2. The three-cluster solution: Distances between Cluster Centroids.

	Cluster1	**Cluster2**	**Cluster3**
Cluster1	0,00000	2,51640	2,18576
Cluster2	2,51640	0,00000	3,86102
Cluster3	2,18576	3,86102	0,00000

Table 3. The four-cluster solution: Distances between Cluster Centroids.

	Cluster1	**Cluster2**	**Cluster3**	**Cluster4**
Cluster1	0,00000			
Cluster2	**3,60798**	0,00000		
Cluster3	2,11977	**3,86102**	0,00000	
Cluster4	1,60752	2,01563	2,39264	0,00000

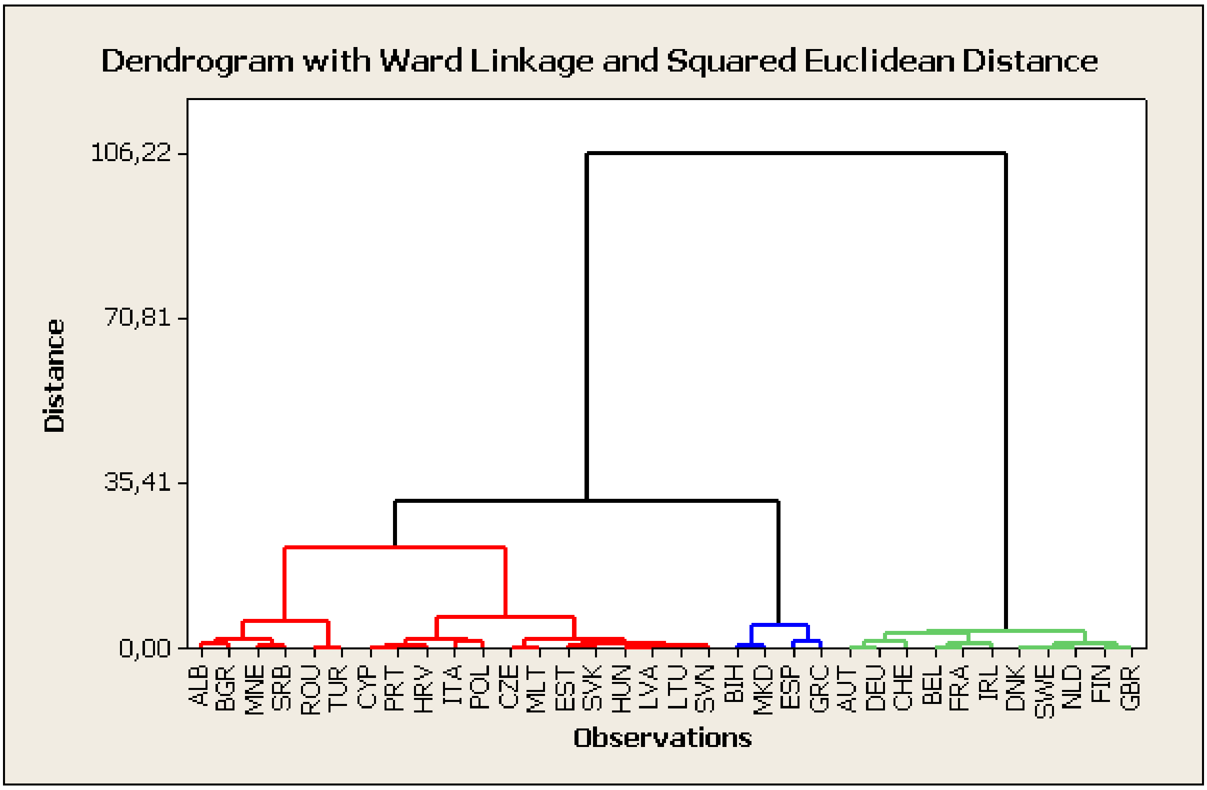

Figure 6. The three-cluster solution: The dendrogram based on three standardised variables for 34 countries for 2013. Source: authors' creation and [16].

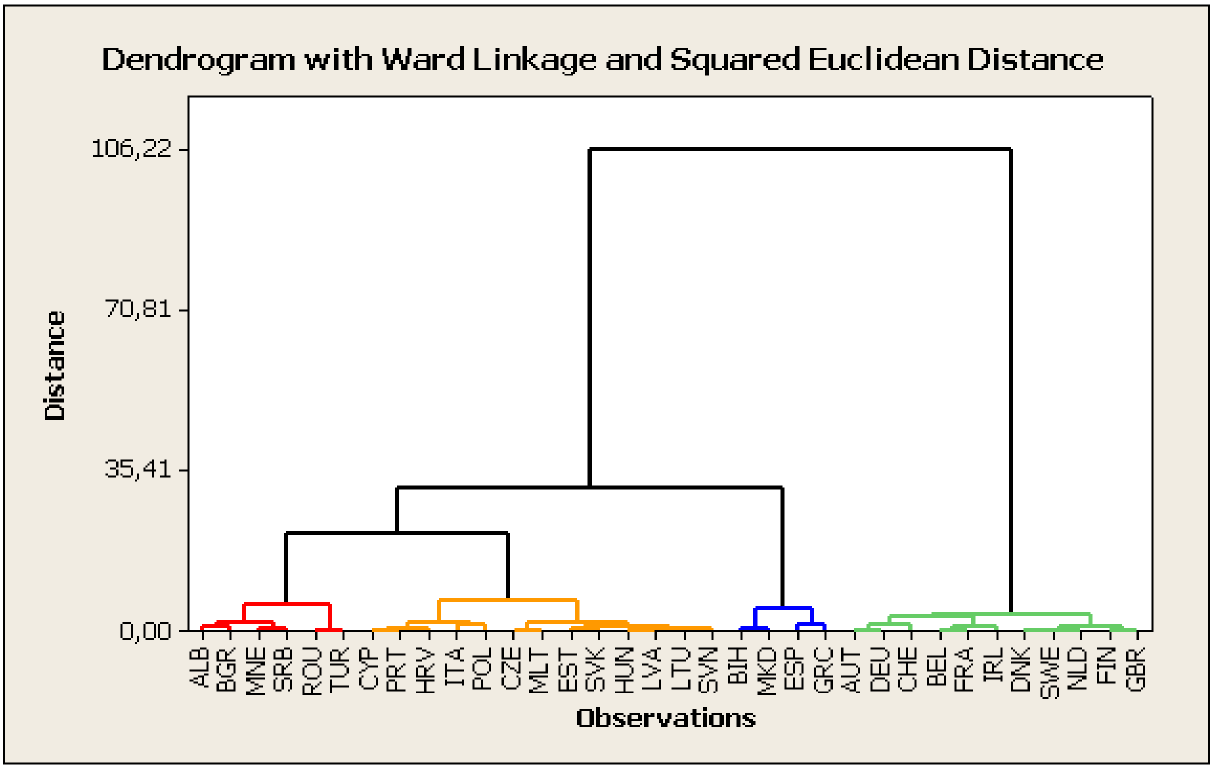

Figure 7. The four-cluster solution: Dendrogram for three standardised variables for 34 countries for 2013: four-cluster solution. Source: authors' creation and [16].

The Table 4 indicates that the SEE countries are not homogeneous while they are scattered over three clusters.

The detailed list of countries comprising each of the clusters shown in Figure 7 is given in Table 4.

Table 4. The four-cluster solution: Clusters of countries, three standardised variables for 34 countries for 2013*. The SEE countries are bolded.

Cluster	No. of countries		Countries
1st	6	**SEE and WB countries only**	**Albania*, Bulgaria, Montenegro*, Serbia*, Romania, Turkey**
2nd	13	**SEE countries** plus post-communist Central and North European plus Mediterranean countries	**Cyprus,** Portugal, **Croatia*,** Italy, Poland, Czech R., Malta, Estonia, Slovakia, Hungary, Latvia, Lithuania, Slovenia
3rd	4	**SEE and WB countries** and Spain	**Bosnia and Herzegovina*, R. Macedonia***, Spain, **Greece**
4th	11	Developed countries only	Austria, Germany, Switzerland, Belgium, France, Ireland, Denmark, Sweden, Netherlands, Finland, United Kingdom

*denotes the WB countries

PROFILES OF COUNTRIES

The profile chart is created using calculations of averages and standard deviations for standardised values of variables for 34 countries, but it is shown in Figure 8 only for selected 14 European countries: 7 the most developed and 7 the less developed regarding the considered variables. It indicates that for the variable $Y_{UemRate}$ is the highest for the countries with the lowest values of the variable X_{GDPpc}, and vice versa, the highest X_{GDPpc} values go with the lowest values of the variable $Y_{UemRate}$. Regarding X_{GDPpc} and X_{IntUse}, four countries are over-averaged and these are Denmark, Switzerland, Germany and Austria, all having very low unemployment rates. It is interesting to notice that Turkey is under-averaged for all three variables, which is good regarding the unemployment rate. At the same time, Spain is over-averaged for all three considered variables, with the variable X_{IntUse} touching the average line 0,0. Czech Republic is the closest to the average of all three variables. Seven countries, Albania, Bosnia and Herzegovina, Croatia, Greece, R. Macedonia, Montenegro and Serbia, are all with very high unemployment rates and with low GDP per capita and with low level of Internet penetration rates. These countries are all the WB countries, with the exception of Greece.

CONCLUSIONS

After exploration of 37 European countries' data, only 34 of them remain in the study, since serious outliers for GDP per capita for three countries in almost all the years from 1991 to 2013 appeared.

The World Bank data for 34 countries for 2013 were analysed using multivariate analysis, such as regression modelling and clustering. Multiple regression modelling, firstly, with the original data, and afterwards, with their logarithms is developed in discovering if the unemployment rate would be influenced by the GDP per capita in PPP in current international \$ (X_{GDPpc}) and by the Internet penetration rate, defined as the percentage of Internet users per 100 people (X_{IntUse}). Since the considered regression models had serious violations of model assumptions, they are not acceptable. Therefore, two simple linear regression models were developed using logarithmically transformed data for all variables, which appeared to give statistically significant models.

The research proves the simple linear regression Model 1 showing the negative correlation with the regressor $\ln X_{GDPpc}$ and the main variable under study $\ln Y_{UemRate}$, with the statistically

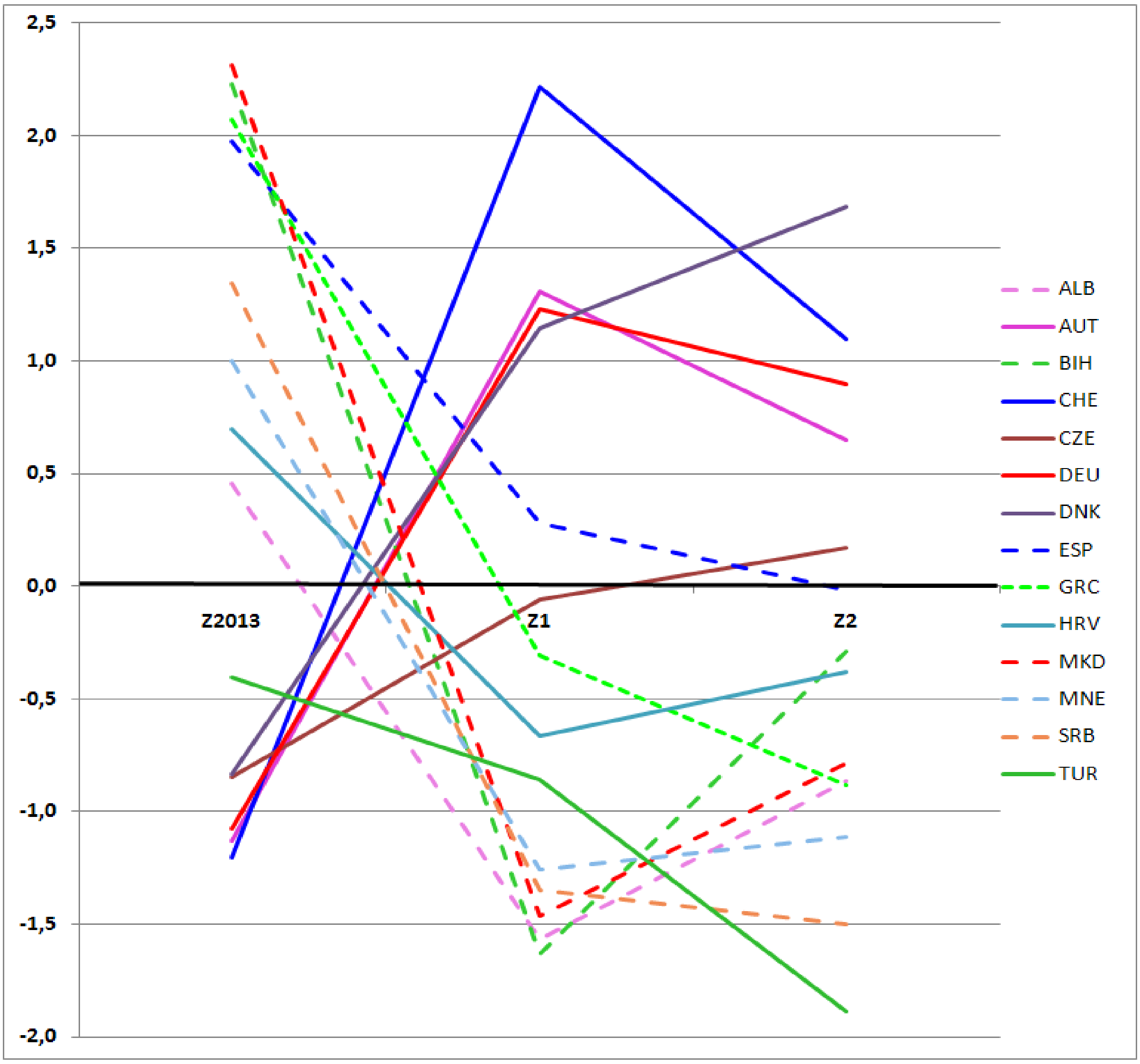

Figure 8. The profile chart for standardised values: Z2013 ($Y_{UemRate}$), Z1 (X_{GDPpc}) and Z2 (X_{IntUse}), based on 34 countries averages and standard deviations for the year 2013. Source: authors' creation and [16].

significant estimated regression coefficient of $\hat{\beta}_1 = -0{,}75$ %, explaining 46 % of the total sum of squares, and the regression coefficient of variation is 16 %. Therefore, the estimated model might be considered as moderately representative one. The second simple linear regression Model 2 shows the negative correlation of $\ln X_{IntUse}$ on $\ln Y_{UemRate}$ with the estimated regression coefficient of $\hat{\beta}_1 = -1{,}38$ %, explaining 27 % of the total sum of squares, and the regression coefficient of variation is 18 %, being less representative then the first model. All the regression models' assumptions are filled for both models.

Using the cluster analysis based on the Ward linkage and the squared Euclidean distances resulted with the four-cluster solution, showing that the SEE countries are heterogeneous being the members of three clusters. Only Bosnia and Herzegovina, R. Macedonia, Spain and Greece seem to create a very compact cluster, all with very high unemployment rates. In the same time, the most developed European countries included into this research are apart, forming a "compact" cluster of their own, too.

Profile chart for selected seven the less developed and seven the most developed European countries gave proof that European countries differ between each other a lot, but some clusters might be recognised in this graph, too. Those less developed countries have some similarities, and those the most developed are similar, too. Profile chart indicates that for the variable $Y_{UemRate}$ is the highest for the countries with the lowest values of the variable X_{GDPpc}, and the highest X_{GDPpc} values go with the lowest values of the variable $Y_{UemRate}$. Five countries are over-averaged regarding X_{GDPpc} and X_{IntUse}, and these are Denmark, Switzerland, Germany and Austria and they all have very low unemployment rates. It is interesting to notice that Turkey is under-averaged for all three variables, which is good for unemployment rate. In the same time, Spain is over-averaged for all three variables, with the variable X_{IntUse} touching the average line 0,0. Czech Republic is the closest to the average of all three variables. Seven countries: Albania, Bosnia and Herzegovina, Croatia, Greece, R. Macedonia, Montenegro and Serbia are all with very high unemployment rates and with low levels of both GDP per capita and Internet penetration rate.

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