Journal of Applied Economics and Business Research
JAEBR, 5 (2): 112-129 (2015)

Long-term impact of foreign direct investment on reduction of unemployment: panel data analysis of the Western Balkans countries

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Abstract
The main objective of this paper is to investigate the long-term relationship between foreign direct investment (FDI) and unemployment in the countries of the Western Balkans (WB). The study used panel data time series at the intervals from 1998 to 2012. In addition, sophisticated panel data models, such as panel unit root, cointegration, vector error correction model (VECM) and Granger causality test have been used. Results showed that there is a long-term relationship and cointegration between FDI and unemployment, and that FDI positively influence the reduction of unemployment in most countries of the WB. In the case of Granger causality test, there is causality between the observed variables in the long run.

Jel code: F, F21

Keywords: *Foreign Direct Investment, Unemployment, Causality, Panel, Cointegration*

1. Introduction

Foreign direct investment (FDI) is an important driver of economic development in the Western Balkans (WB). Among the countries of the WB, we will analyze Albania, Bosnia and Herzegovina (B&H), Croatia, Macedonia, Montenegro, Serbia and Croatia. The WB countries, in comparison with the countries of Central and Eastern Europe, have received less FDI during the 1990s. The key reason is because the mentioned countries were mainly in transition or in conflict. Observed from 1989 to 2000, FDI in WB countries amounted to 15.3 billion dollars or 9.4% of total FDI in 27 transition countries (Estrin and Uvalic, 2013). In the period from 1997 to 2007, 68.32% of total FDI was directed towards developed economies, 29.27% to developing countries, and only 2.39% to the countries of Eastern Europe and the WB (Josifidis et al. 2011). Share of South East Europe countries in total FDI inflows into transition economies increased from 9.4% in 2000 to 14.7% in 2010. Amount of 5.8% refers to the WB countries (Estrin and Uvalic, 2013). In the period from 1989 to 2006, foreign investors have invested about 31.2 billion dollars in the entire region of the WB, which was about 1.450 per capita, while for ten new EU member states it was about 4.700 dollars per capita. The largest percentage of investment or 44% is invested in Croatia, 32% in Serbia, and 26% in the remaining four countries. During the period, from 1989 to 2006, the total cumulative investments amounted to 5.2% in Macedonia, 6.7% in Albania and 8.6% in BiH. Condition of FDI per capita for the observed period is little bit different. Croatia has made 3.067 dollars, Montenegro 2.009 dollars,

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 ISSN 1927-033X

Serbia 1.312 dollars, while other countries in the region had inflows of FDI per capita less than $ 1,000 (Skuflic, 2010).

After the economic crisis hit the United States and most European countries, unemployment was growing so strongly that in 2013 worldwide was 202 millions of unemployed, which is an increase of nearly five million, compared with 2012. If current trends continue global unemployment could worsen, though gradually, reaching more than 215 million of unemployed by the end of 2018 (Global Employment Trends, 2014). The labour market in the countries of the WB is characterized by stagnant and high long-term unemployment. The transition has left strong structural problems that have caused a high rate of unemployment, i.e. non-existence of adequate skills needed for the labour market. All WB countries are faced with a high rate of long-term unemployment, which ranges over 80%, in particular, Albania, Macedonia, Bosnia, Montenegro, while Croatia has the lowest long-term unemployment rate of less than 60% (Nero, 2010). According to data from the Labour Force Surveys (LFS), the WB countries had growing unemployment rates. In these countries, there was in total 2.433.706 unemployed. The average unemployment rate in the region is 26.8%. Youth unemployment rate in 2012 for the age group 15-25 amounted to 63.1% in B&H, 41% in Montenegro, 45.2% and 48.4% in Croatia and Serbia (Bartlett and Prica, 2013). The unemployment rate in B&H was one of the highest rates in the region in 2012 and amounted to over 28%. LFS unemployment rate was 27.5% in 2013 (Oslobođenje, 2014). The registered unemployment rate for April 2013 was 44.5%, while for March 2014 was 44.1%, which represents a decrease of 0.4% (Agencija za statistiku BiH, 2013). In 2006 Serbia had unemployment rate of 20.8%, and in 2008 had the lowest unemployment rate of 13.8%. Unemployment has increased dramatically in Serbia from 19.2% in 2010 to 25.5% in 2012 (Euroaktiv, 2013). Unemployment rate in Serbia in 2013 was 28.9%. According to the April labor force survey from 2014, unemployment rate in Serbia was 24.1%, which was 1.7% more than in October 2013. The unemployment rate of young people under the age of 25 in Serbia amounted to 49.7% in 2013 (Makroekonomija, 2013). Montenegro must also deal with the low employment rate of the active population and high unemployment. During 2005, unemployment rate in Montenegro reached a record high of 30.3%. After this period, a significant decrease in the unemployment rate occurred. In 2010 and 2011 the unemployment rate was 19.7%. Montenegro in 2013 had the lowest unemployment rate of 15% (SEE biz net, 2014). In 2001 the unemployment rate in Albania reached a record of 22.8%. In 2011 and 2012, the unemployment rate was 13.3% and 13.2%. However, the unemployment rate of active working age population (15 - 64 years) in Albania amounted to 13.9% in 2012. The unemployment rate in 2013 was 13%, which represents a decrease of 0.9% compared to 2012 (Sejdini, 2014). In the case of the population between the ages 15 to 24, the unemployment rate amounted at 27.4% in 2012 (Republic of Albania Ministry of Social Welfare and Youth, 2014). During the last decade and more, Macedonia had the highest unemployment rate among the countries of the WB. In 1997 the unemployment rate was 37%, and in 2005 Macedonia achieved the highest unemployment rate of 37.4%. In 2010 and 2011 the unemployment rate was 32% and 31.4%. In Macedonia, the average unemployment rate decreased from 31.4% to 31% in 2012 (Analitika, 2013). The unemployment rate in Macedonia reduced to 28.39% in the first quarter of 2014 and 28.65% in the fourth quarter of 2014. Unemployment rate in Macedonia averaged 32% in the period from 1993 to 2014, achieving the highest rate of 37.3% in 2005 and a relatively low rate of 27.7% in the fourth quarter of 1993 (Republic of Macedonia State Statistical Office, 2014). The unemployment rate for young people aged 15 - 25 in Macedonia amounted to 50.3% in 2013 (Trading economic, 2014). In 1991 Croatia had a low unemployment rate of 11.1%, and in 2001 reached the highest unemployment rate of 20.5% (Trading economic, 2014). After this period there was a considerable drop in the unemployment rate. The unemployment rate in Croatia amounted to an average of 18.26% in the period from 1996 to 2014. During the last three years, the unemployment rate in Croatia increased significantly. Thus, in 2011, 2012 and 2013 the unemployment rate was respectively 17.8%,

 ISSN 1927-033X

18.9% and 20.2%. Croatia also had a high unemployment rate for population aged 15 to 64, which was 50.1% in 2013 (Narodna banka Hravtske, 2014).

In line with the defined problem, the main objective of this study is to determine whether there is a long-term relationship between foreign direct investment and unemployment in the countries of the WB. In the research we came up with the results which suggest that there is long-term and positive impact of FDI on employment. Accordingly, the governments of the WB countries should undertake certain reforms of eliminating administrative barriers in order to enable inflow of FDI which will stimulate export trade, encourage domestic consumption through the implementation of appropriate macroeconomic policies, as well as increase capital investment in infrastructure and reduce the unemployment.

In our research we start with H_0 hypothesis that there is no long-term relationship between FDI and unemployment in the WB countries, i.e. H_0:α_1=1. In addition, we set up an alternative hypothesis that there is a long-term relationship between FDI and unemployment in the WB countries H_1:α_1<1.

The paper is structured as follows. The introduction section presents the subject and objectives of the research as well as hypotheses. The second section provides an overview of literature or studies that are closely related to the topic. The third section describes the research methodology and the database from which the figures were used. The fourth section presents the empirical results of the paper. At last, the fifth section concludes the paper.

2. Literature Review

Over the last decade a few studies pertaining to the impact of FDI on the rate of unemployment in transition and developed countries were conducted. Ciftcioglu et al. (2007) examined the impact of net FDI on the growth rate of gross domestic product, or GDP, unemployment rate, openness, sectorial composition of GDP and employment in nine countries of Central and Eastern Europe. In their study, they applied a panel data analysis to determine the effect of net FDI on GDP in nine countries in the period from 1995 to 2003. Within the panel data analysis, they applied the fixed effects model and pooled classical regression and found that economic growth and the unemployment rate negatively affects the growth of net FDI inflows and GDP, while the openness of the economy shows positive correlation. Jurajda and Terrell (2007) explored unemployment in the transition countries of Central Europe. In the study they applied a multiple regression model and came up with some results that suggest that those countries that have had a better education and a younger population received more FDI, which resulted in the growth of employment rate. Aktar et al. (2008) scrutinized the impact of FDI, economic growth, and total fixed investment on unemployment in Turkey in the period from 1987 to 2007. In the exploration they applied Johansen cointegration technique to calculate long-term relationship between the observed variables. Results showed that there are two cointegration vectors during the period in Turkey. Apergis and Theodosiou (2008) investigated the relationship between real wages and employment on the sample of ten OECD countries in the period from 1950 to 2005. The study applied the panel cointegration analysis and causality methodology. They found that there is no long-run relationship between the observed phenomena, but also that the wages do not have impact on the employment rate in the short term. Ajaga and Nunnenkamp (2008) examined the long-term relationship between FDI and economic outcomes in terms of value added and employment at the level of the United States. They applied the Johansen cointegration test and Toda and Yamamoto Granger causality tests on the data in the period from 1977 to 2001. They found that there is bidirectional causality or causality between FDI and the variables. Subramaniam (2008) investigated the dynamic relationship between FDI, unemployment, economic growth and exports using the vector autoregression. Research has shown that there is a complete cointegration in the case of Malaysia, then that there is long-run causality between unemployment rate and economic growth and that economic growth and exports are the main determinants of unemployment in Malaysia. Aktar and Ozturk (2009) in their study applied the VAR variance techniques to determine different internal relationships between FDI, exports, unemployment and GDP in Turkey for the period from 2000 to 2007. The results showed that FDI did not contribute to the reduction of unemployment in Turkey. In addition, changes in GDP did not reduce the unemployment rate.

Jude and Silaghi Pop (2010) examined the impact of FDI on reducing unemployment rate and growth boost in Central and Eastern Europe. In particular, they probed the effects of FDI on employment growth in host countries, i.e. determining the positive and negative effects. In addition, they investigated the factors that determine the relation between the employment and FDI. Lund (2010) has explored in his doctoral dissertation causality between FDI and GDP in the countries of Latin America and East Asia, with special emphasis on Mexico. In his study, he applied a panel cointegration and Granger causality test. The study came to the following conclusions: that there is causality between GDP and FDI among countries that have higher incomes and a higher level of development. Rizvi and Nishat (2010) examined the impact of FDI on growth of the unemployment rate in Pakistan, India and China in the period from 1985 to 2008. In the study, they used the Im-Pesaran-Shin (IPS) and Pedroni tests. Applying the above tests, they have revealed that there is a long-term relationship between the variables, i.e. the strong impact of FDI on unemployment in these countries. Balcerzak and Zurek (2011) examined the impact of FDI on the unemployment rate in Poland. In the research, they applied the VAR techniques and analyzed the period from 1995 to 2009. Results showed that FDI leads to a decrease in the unemployment rate in Poland, although it's a short-term effect. Mucuk and Demirsel (2013) investigated the relationship between FDI and unemployment rates in seven developing countries. They applied panel unit root, panel cointegration and panel causality tests. Research has shown that FDI leads to an increase in employment rates in Turkey and Argentina, while in Thailand, leading to decrease. In fact, they found that there is a long-term causality or causality between the observed variables. Hisarciklilar et al. (2013) explored the impact of FDI on reduction of the unemployment rate in Turkey in the period from 2000 to 2007. They applied a panel data analysis and came to a result that indicates that there is a negative relationship between FDI inflows and reducing unemployment rate. Jaouad (2014) scrutinized the impact of FDI on unemployment in host countries. The research applied a panel cointegration test and came to certain results which show that FDI has a negative effect on unemployment in KSA both in the short as well as long term.

3. Data and Method

This research refers to the empirical analysis of the measurement of long-term impact of FDI on reduction of unemployment in six countries of the WB. In the panel data analysis, we used the data within the time intervals from 1998 to 2012. Data were taken from the database of World Bank. Moreover, in our empirical analysis, we started from a simple regression model in which we have only two variables, i.e. we determined that the dependent variable is the unemployment rate (%UNPL) and the independent variable is FDI.

$$\%UNPL_{it} = \beta_0 + \beta_1 FDI_{it} +, \dots, +\varepsilon_{it}. \tag{1}$$

Our empirical analysis consists of the following stages: a panel unit root, panel cointegration (Fisher Johansson combined test and Pedroni test) and Granger causality test. Panel unit root testing emerged from time series unit root testing. The main difference with respect to the testing time series unit root testing is that we have to consider asymptotic behaviour of time-series dimension T and the cross-sectional dimension N (Nell and Zimmermann, 2011).

 ISSN 1927-033X

As the panel unit root tests will use the Levin, Lin and Chu (LLC), Im, Peseran and Shin (IPS), Hadri test and combining p-values tests. LLC test (2002) LLC argued that individual unit root tests have limited power against alternative hypotheses with highly persistent deviations from equilibrium. This is particularly severe in small samples. LLC suggest a more powerful panel unit root test than performing individual unit root tests for each cross-section. The null hypothesis is that each individual time series contains a unit root against the alternative that each time series is stationary. We will introduce the LLC test with the following model (Baltagi, 2005)

$$\Delta y_{it} = p y_{i,t-1} + \sum_{L=1}^{\rho_i} \theta_{i\,L}\, \Delta y_{it-L} + \alpha_{mi} d_{mt} + e_{it}\ m = 1,2,3 \tag{2}$$

with d_{mt} indicating the vector of deterministic variables and d_{mi} the corresponding vector of coefficients for model $m = 1,2,3$. In particular, $d_{1t} = \{empty\ set\}, d_{2t} = \{1\}$ i $d_{3t} = \{1, t\}$.

Since the lag order p_i is unknown, LLC suggest a three-step procedure to implement the test. The approach is mostly described as a three-step procedure with preliminary regressions and normalizations necessitated by cross-sectional heterogeneity. The first step is to perform a special augmented Dickey-Fuller (ADF) regression for each cross-section. The second step is to obtain an estimate of the ratio of the long-run variance to the short-run variance of Δy_{it}, or equivalently of u_{it}. The third step is to compute $t - statistic$ (Hlouskova and Wagner, 2005). LLC test is restrictive in a sense that it requires ρ to be homogenous across i (Baltagi, 2005). Im, Pesaran and Shin test allow for heterogeneous coefficient of $y_{it-1}$and proposes an alternative testing procedure based on the augmented DF tests when $u_{it}$is serially correlated with different serial correlation properties across cross-sectional units, i.e.,$u_{it} = \sum_{j}^{pi} = 1\psi_{it} u_{it-j} + \varepsilon_{it}$. Substituting this u_{it} in equation (1), we get (Chen, 2013)

$$y_{it} = \rho_i y_{it-1} + \sum_{j=1}^{\rho i} \psi_{it}\, u_{it-j} + \alpha_{mi} + \varepsilon_{it}, i = 1, \dots, N, t = 1, \dots, T. \tag{3}$$

The null hypothesis is $H_0\colon \rho_i = 1$for all i against the alternative hypothesis $H_1\colon \rho_i < 1$ for at least i. The $T - statistic$ suggested by IPS is defined as

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t_{pi} \tag{4}$$

Where $t_{\hat{\rho} i}$ is the individual $t - statistic$ of testing $H_0\colon \rho_i = 1$. It is known that for a fixed N,

$$t_{pi} \Rightarrow \frac{\varepsilon_0^1 W_{iZ} dW_{iZ}}{\left[\varepsilon_0^1 W_{iZ}^2\right]^{1/2}} = t_{iT} \tag{5}$$

as $T \to \infty$. IPS assume that t_{iT} has finite means and variances. Then

$$\frac{\sqrt{N\left(\frac{1}{N}\sum_{i=1}^{N} t_{iT} - E\left[\frac{t_{iT}}{\rho_i} = 1\right]\right)}}{\sqrt{var}\left[\frac{t_{iT}}{p_i} = 1\right]} \Rightarrow N(0,1) \tag{6}$$

as $N \to \infty$ by the Lindeber-Levy central limit theorem or limitations. Hence, the$t - statistic$ of IPS has the limiting distribution as

$$t_{IPS} = \frac{\sqrt{N(\hat{t} - E[t_{iT}/\rho_i = 1])}}{\sqrt{var}[t_{iT}/\rho_i = 1]} \Rightarrow N(0,1) \tag{7}$$

as $T \to \infty$ followed by $N \to \infty$, sequentially. The values of $E\ [t_{iT}/\rho_i = 1]$ and $\sqrt{var}[t_{iT}/\rho_i = 1]$ have been computed by IPS via simulations for different values of T and p_i's (Baltagi, 2005).

Hadri test is based on the null hypothesis of stationarity. This is an extension test of the stationarity test developed in the time series context (Kwiatkowski et al. 1992). Hadri proposes a residual-based Lagrange multiplier test for the null hypothesis that the individual series y_{it} $(za\ i = 1, \ldots, N)$ are stationary around a deterministic level or trend, against the alternative of a unit root in panel data. In addition, he considers the two following models: $y_{i,t=r_{i,t}} + \varepsilon_{i,t}$(6) and $y_{i,t=r_{i,t}} + \beta_i t + \varepsilon_{i,t}$ (8) where $r_{i,t}$ is a random walk $y_{i,t} = r_{it-1} + u_{i,t,} u_{i,t}$ is independent and identically distributed i.i.d.$(0, \sigma_u^2)$, $u_{i,t}$ and $\varepsilon_{i,t}$are being independent. The null hypothesis can thus be stated as $\sigma_u^2 = 0$. Moreover, since $\varepsilon_{i,t}$ are assumed i. i. d., then under the null hypothesis, $y_{i,t}$ is stationary around a deterministic level in model (6) and around deterministic trend in model (7) (Hurlinand and Mignon, 2007). Also, ε_{it} and $u_{it}$are i. i. d., independently and identically distributed across i and over t, with $E[e_{it}] = 0, E[\varepsilon_{it}^2] = \sigma_\varepsilon^2 > 0, E[u_{it}] = 0, E[u_{it}^2] = \sigma_u^2 \geq 0, t = 1, \ldots, T\ and\ i = 1, \ldots, N.$ Let $\hat{\varepsilon}_{it}^u(\hat{\varepsilon}_{it}^T)$ be the residuals from the regression y_i on an intercept, for model 1, an intercept and a linear trend term for model 2. Let $\hat{\sigma}_\varepsilon^2 \mu$ $(\hat{\sigma}_\varepsilon^2 t$)be a consistent estimator of the error variance (corrected for degrees of freedom) from the appropriate regression, which are given by (Giulietti et al. 2007)

$$\hat{\sigma}_\varepsilon^2 u = \frac{1}{N(T-1)} \sum_{i=1}^N \sum_{t=1}^T \hat{\varepsilon}_{it}^{u2}. \tag{9}$$

and

$$\hat{\sigma}_\varepsilon^2 t = \frac{1}{N(T-2)} \sum_{i=1}^N \sum_{t=1}^T \hat{\varepsilon}_{it}^{T2}. \tag{10}$$

Also, let S_{it}^l be the partial sum process of the residuals. Then the LM statistic is

$$LM_l = \frac{\frac{1}{N}\sum_{i=1}^N \frac{1}{T^2}\sum_{t=1}^T s_{it}^{l}2}{\hat{\sigma}_\varepsilon^2 l}, u, \tau. \tag{11}$$

Hadri test considers the standardised statistic

$$Z_\mu = \frac{\sqrt{N}(LM_u - \varepsilon_u)}{\varsigma_u} \Rightarrow N(0,1) \tag{12}$$

And

$$Z_\tau = \frac{\sqrt{N}(LM_\tau - \varepsilon_\tau)}{\varsigma_\tau} \Rightarrow N(0,1) \tag{13}$$

Combining p-value tests - Let $G_{i,Ti}$ be a unit root test for i-th group in equation (1) and $T_i \to \infty$, $G_{i,Ti} \Rightarrow G_i$. Besides, let p_i be $p - value$ of a unit root testa for cross-section i, i.e., $p_i = 1 - F(G_{i,Ti})$, where$F(\cdot)$ is the distribution function of the random variable G_i.We highlight that the null hypothesis of the unit root test is not rejected when the p-value is larger than 0.05%, if the significance level is set at 95%. In contrast, the null hypothesis is rejected when p-value is smaller than 0.05%. Fisher type test is (Baltagi, 2005)

$$P = -2 \sum_{i=1}^N lnp_i \tag{14}$$

which combines the $p - values$ from unit root tests for each cross-section i to test for unit root in panel data. This means that P is distributed as χ^2 with$2N$degrees of freedom as$T_i \to \infty$for finite$N$. When $p_i$closes to 0 (null hypothesis is rejected), $\ln p_i$ closes to$-\infty$ so that large value P will be found and then the null hypothesis of existing panel unit root will be rejected. In contrast, when p_i closes to 1 (null hypothesis is not rejected), $\ln p_i$closes to 0 so that small value P will be found and then the null hypothesis of existing panel unit root will not be rejected.
When N is large, Choi (1999) proposed a Z test

$$Z = \frac{\sqrt[1]{N}}{2}\sum_{i=1}^{N}(-2\ln p_i - 2) \quad (15)$$

since $E[-2lnp_i] = 2$ and $var[-2lnp_i] = 4$. Assume p_i's are i.i.d. (independent and identically distributed) and use Lindeberg-Levy central limit theorem to get $Z \Rightarrow N(0,1)$, as $T \to \infty$, followed by $N \to \infty$ (Chen, 2013).

There is a close connection between the panel cointegration and panel unit root tests. Some of these tests are based on group-mean estimates, while others are based on pooled estimates. Some take into account the cross-section dependence, while others disregard it. In our analysis of the impact of FDI on unemployment, we will apply Pedroni test and Fisher Combined Johansson test. Pedroni panel cointegration technique is used for the assessment of long-term relationship between the independent and dependent variable. Pedroni (2004) panel cointegration test is residual-based and can be regarded as panel equivalent of the Engle-Grenger test for cointegration commonly applied in time series analysis. Pedroni proposes seven tests, of which three are group-mean tests and the remaining four are pooled tests (with different alternative hypotheses) (Hossfeld, 2010).

The starting point of residual-based panel cointegration test statistics is the computation of the residuals of the hypothesized cointegrating regression (Karaman, 2004)

$$y_{i,t} = \alpha_i + \beta_{1,i}x_{1i,t} + \beta_{2,i}x_{2i,t} + \beta_{M,i}x_{Mi,t} + e_{i,t} \quad (16)$$
$$t = 1, \dots, T; i = 1, \dots, N; m = 1, \dots, M$$

where T is the number of observations over time, N denotes the number of individual members in the panel, and M is the number of independent variables. It is assumed here that the slope coefficients $\beta_{1i}, \dots, \beta_{Mi}$, and the member specific intercept α_i can vary across each cross-section

$$\Delta y_{i,t} = b_{1,i}\Delta x_{1,i,t} + \beta_{2,i}\Delta x_{2i,t} + \dots + b_{Mi}\Delta x_{Mi,t} + \pi_{i,t} \quad (17)$$

For panel-$p$and group-ρstatistics estimate the regression$\hat{e}_{i,t} = \hat{\gamma}_i\hat{e}_{i,t-1} + \hat{u}_{i,t}$using the residuals$\hat{e}_{i,t}$from the cointegration regression (equation 15). Panel cointegration statistic includes following statistic: panel-v (variance ratio statistic), panel-$rho\ statistic$ (non-parametric Phillips and Perron $rho\ statistic$), panel $-PP$ statistic (non-parametric Phillips and Perron type $t - statistic$), panel $-ADF$ statistic (augmented Dickey-Fuller type $t - statistic$), group $-rho$ statistic (group $p - statistic$) and group $-PP$statistic (Phillips and Perron type $p - statistic$). Following Pedroni, the heterogeneous pooled panel cointegration test statistics are calculated as follows (Yuang-Hong and Ching-Ju, 2009)

$$Panel\ v\ statistic = \left(\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\,\hat{e}_{i,t-1}^{2}\right)^{-1} \quad (18)$$

$$Panel\ rho\ statistic = \left(\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\,\hat{e}_{i,t-1}^{2}\right)^{-1}\sum_{i=1}^{N}\sum_{r=1}^{T}\hat{L}_{11i}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{it} - \hat{\lambda}_i\right) \quad (19)$$

$$Panel\ PP\ statistic = \left(\sigma^2\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\,\hat{e}_{i,t-1}^{2}\right)^{-1/2}\sum_{i=1}^{N}\sum_{r=1}^{T}\hat{L}_{11,i}^{-2}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{it} - \hat{\lambda}_i\right) \quad (20)$$

$$Panel\ ADF\ statistics = \left(\hat{s}^{*2}\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{L}_{11i}^{-2}\,\hat{e}_{i,t-1}^{2}\right)^{-1/2}\left(\sum_{i=1}^{N}\sum_{r=1}^{T}\hat{L}_{11,i}^{-2}\,\hat{e}_{1,t-1}^{*}\Delta\hat{e}_{i,t}^{*}\right) \quad (21)$$

The heterogeneous group mean panel cointegration test statistics are as follows

$$Group\ rho\ statistic = \sum_{i=1}^{N}\left(\sum_{i=1}^{T}\hat{e}_{i,t-1}^{2}\right)^{-1}\sum_{t=1}^{T}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_{i}\right) \quad (22)$$

$$Group\ PP\ statistic = \sum_{i=1}^{N}\left(\hat{\sigma}_{i}^{2}\sum_{i=1}^{T}\hat{e}_{i,t-1}^{2}\right)^{-1/2}\sum_{t=1}^{T}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_{i}\right) \quad (23)$$

$$Group\ ADF\ statistic = \sum_{i=1}^{N}\left(\sum_{i=1}^{T}\hat{s}_{i}^{-2}\,\hat{e}_{i,t-1}^{*2}\right)^{-1/2}\sum_{t=1}^{T}\hat{e}_{i,t-1}^{*}\,\Delta\hat{e}_{i,t}^{*} \quad (24)$$

The null hypothesis of the between dimension statistics is given by $H_O: \psi_i = 1$ for all i and the alternative is $H_A: \psi_i < 1$ for all i. Pedroni shows that the panel $v - statistic$ is a one-sided test where large positive values reject the null hypothesis that means there is no cointegration. In case of other statistics when $p - value$ is smaller than 0.05%, the null hypothesis is rejected (Mucuki and Demirsel, 2013).

Fisher Combined Johansen Test - Johansen proposed two different approaches, one of them is likelihood ratio trace statistics) and the other one is maximum eigen value statistics, to determine the presence of cointegration vectors in non stationary time series. The mentioned statistics are derived by fitting the equation (Rajasekar et al. 2014)

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n}\ln(1-\hat{\lambda}_i) \quad (25)$$

$$\lambda_{max}(r, r+1) = -Tln(1-\hat{\lambda}_{i+1}) \quad (26)$$

Here T is the sample size, n is total number of variables and $\hat{\lambda}_i$ is the largest canonical correlation between residuals from three dimensional processes. We start with the hypotheis $H_0: \lambda = 1$ against the alternative hypothesis $H_1: \lambda < 1$.

Vector Error Correction Model (VECM) - Time series stationarity is the statistical exists a long-term equilibrium relationship between them characteristics of a series such as its mean and variance so we apply VECM in order to evaluate the short run over time. If both are constant over time, then the series properties of the cointegrated series. In case of no is said to be a stationary process (i.e. is not a random cointegration VECM is no longer required and we directly walk/has no unit root), otherwise, the series is described precede to Granger causality tests to establish causal as being a non-stationary process (i.e. a random walk/has links between variables. The regression equation form for unit root). Differencing a series using differencing VECM is as follows (Asari et al. 2011)

$$\Delta Y_t = \alpha_1 + p_1 e_1 + \sum_{i=0}^{n}\delta_i\,\Delta X_{t-1} + \sum_{i=o}^{n}\gamma_i\,Z_{t-1}$$

$$\Delta X_t = \alpha_2 + p_2 e_{i-1} + \sum_{i=0}^{n}\beta_i\,Y_{t-1} + \sum_{i=0}^{n}\delta_i\,\Delta X_{t-1} + \sum_{i=o}^{n}\gamma_i\,Z_{t-1} \quad (27)$$

In VECM the cointegration rank shows the number of cointegrating vectors. A negative and significant coefficient of the ECM indicates that any short-term fluctuations between the independent variables and the dependant variable will give rise to a stable long run relationship between the variables. We start from the null pypothesis that $H_0: p_1 = 1$ against the alternative hypothesis $H_1: p_1 < 1$.

Panel Granger Causality Test - It is the test whose aim is to find out the causality between the variables test to identify the cause and effect. Granger causality tests measures the causal relationship with bivariate data sets and these relationships can be expressed as unidirectional and bidirectional. The Granger causality tests takes the following form (Rajasekar et al. 2014)

 ISSN 1927-033X

$$Z_{it} = \sum_{j=i}^{p} \Gamma_{ijt} Z_{i,t-j} + \mu_{it} + \varepsilon_{it}, i = N \,\&\, t = 1, \dots T \tag{28}$$

Where Z_{it} denote $K - dimensional$; $\Gamma_{ijt}\mu_{it}$ – the parameter matrices, μ_{it}– vector containing idividual specific;ε_{it} – disturbances.

Unidirectional causality between two variables occurs if a null hypothesis is rejected. Bidirectional causality exists if both null hypotheses are rejected.

4. Empirical Results

In ours study, we performed testing such as LLC, IPS, FisherChi-square and Hadri tests using panel unit root test. In the context of time series, it is necessary to determine the presence of data stationarity in order to thereby eliminate potential false regression between the variables within the time and cross-section analysis. In Table 1, we can see the results of panel unit root test.

Table 1: Cumulative results of panel unit root test
Series: D(_UNPL)
Date: 09/06/14 Time: 20:48
Sample: 1998 2012
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.47818	0.0000	6	75
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.27831	0.0000	6	75
ADF - Fisher Chi-square	55.1244	0.0000	6	75
PP - Fisher Chi-square	68.3886	0.0000	6	78

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.
Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Based on the calculated $p - value$, which is 0.0000% for LLC and IPS, we can conclude that it is a value that is far less than the accepted critical $p - value$ of 0.05%. This means that in the case of LLC and IPS test we can reject the null hypothesis and conclude that the given tests do not have a unit root. Also in the case of ADF, Fisher Chi-square and PP Fisher Chi square $p - value$ is very low and amounts 0.0000%, which is lower than the set critical value of 0.05%, and therefore we conclude that we can reject the null hypothesis. In the panel unit root test, we introduced the first difference which caused the time series data to be stationary. In addition, within the panel unit root we tested only Hadri test and come up with some results. A low $p - value$ of 0.0000% was obtained in Hadri Z-stat. and Heteroscedastic Consistent Z-stat, which entitles us to reject the null hypothesis and conclude that the time-series and cross-sectional data are stationary. Based on this, it follows that there is a long-term relationship between FDI and unemployment.

Table 2: Results of Hadri test
Null Hypothesis: Stationarity
Series: D(_UNPL)
Date: 09/06/14 Time: 21:21
Sample: 1998 2012

Exogenous variables: Individual effects, individual linear trends
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 84
Cross-sections included: 6

Method	Statistic	Prob.**
Hadri Z-stat	5.20874	0.0000
Heteroscedastic Consistent Z-stat	7.68388	0.0000

* Note: High autocorrelation leads to severe size distortion in Hadri test, leading to over-rejection of the null
** Probabilities are computed assuming asymptotic normality
Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Pedroni panel cointegration test is used to examine the long-term relationship between time series variables. Pedroni (2004) panel cointegration test is residual-based and can be regarded as a panel equivalent of the Engle-Granger test for integration commonly applied in time series analysis. Pedroni proposes seven tests. Of which three are group-mean tests and the remaining four are pooled tests (with the respective differing alternative hypothesis) (Hossfeld, 2010**)**.The following Table 3 shows the results of:

Table 3: Panel Cointegration Tests: Pedroni test
Series: _UNPL FDI
Date: 09/06/14 Time: 22:22
Sample: 1998 2012
Included observations: 90
Cross-sections included: 6
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on SIC with a max lag of 2
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.539605	0.9382	-2.232267	0.9872
Panel rho-Statistic	-0.109648	0.4563	0.186531	0.5740
Panel PP-Statistic	-3.071452	0.0011	-3.577332	0.0002
Panel ADF-Statistic	-3.891000	0.0000	-4.048554	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.086702	0.8614
Group PP-Statistic	-2.618590	0.0044
Group ADF-Statistic	-2.918613	0.0018

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

We can see in Table 3 that the panel $v-statistic$ is 0.9382%, and this tells us that it is a value that is higher than the critical value of 0.05%, which means that we can not reject the null hypothesis. Panel $rho-statistic$ amounts to 0.4563% and this is a larger value than 0.05%, which means that we can not reject the null hypothesis. However, in terms of other variables, the $p-value$ is smaller than the critical value of 0.05%, which means that we can reject the null hypothesis and conclude that there is no cointegration among the observed variables. Thus, we conclude that nine out of 11 observed variables have the $p-value$ smaller than the critical value of 0.05%, which entitles us to reject the null hypothesis and conclude that there is cointegration, i.e. there is a long-term relationship between FDI and unemployment.

Table 4: Johansen Fisher panel Cointegration Test
Series: _UNPL FDI

Date: 09/21/14 Time: 14:18
Sample: 1998 2012
Included observations: 90
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 2
Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	59.07	0.0000	52.12	0.0000
At most 1	31.58	0.0016	31.58	0.0016

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

Cross Section	Statistics	Prob.**	Statistics	Prob.**
Hypothesis of no cointegration				
_ALB	6.5296	0.6329	3.4401	0.9132
_B&H	17.5020	0.0246	14.0120	0.0548
_CRO	23.8567	0.0022	20.7653	0.0041
_MAC	44.7616	0.0000	39.6684	0.0000
_MONT	20.2577	0.0089	16.8410	0.0191
_SRB	5.9859	0.6972	4.5692	0.7949
Hypothesis of at most 1 cointegration relationship				
_ALB	3.0895	0.0788	3.0895	0.0788
_B&H	3.4900	0.0617	3.4900	0.0617
_CRO	3.0914	0.0787	3.0914	0.0787
_MAC	5.0932	0.0240	5.0932	0.0240
_MONT	3.4167	0.0645	3.4167	0.0645
_SRB	1.4167	0.2339	1.4167	0.2339

**MacKinnon-Haug-Michelis (1999) p-values

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

We can see in Table 4 the results of the trace test and the max eight value, which suggest that there is a long-term relationship between FDI and unemployment. The result within none statistic, whose p-value is 0.0000% in relation to the trace test and the maximum eight value, tells us that there is cointegrating relationship between the observed variables, or we can reject the null hypothesis. Also in case of testing the same variables under the hypothesis of at most 1 cointegrating relationship, most of the variables had a cointegrating relationship. In the end, the result of Fihser Johansen Cointegration test confirms the existence of a long-term relationship between FDI and unemployment in the WB countries.

When countries are observed respectively within the trace test and max eight test, B&H, Croatia, Macedonia and Montenegro have $p - value$ smaller than the critical value of 0.05%, and we can reject the null hypothesis, or say that there is cointegration between the observed variables, while Serbia and Albania have a higher value than the critical value of 0.05%, and we can not reject the null hypothesis, i.e. there is no cointegration among the observed variables. This means that FDI had a positive impact on reduction of unemployment in B&H, Croatia, Macedonia, Montenegro, and while in Serbia and Albania didn't have. Also in case of testing countries under the hypothesis of at most 1 cointegrating relationship only Macedonia had $p -$

$value$ smaller than the critical value of 0.05%, which means that there is a cointegrating relationship between the observed variables.

Based on Table 5, in which is presented the vector error correction model (VECM), we can identify short-term and long-term dynamic relationship between the observed variables. Those variables which have a negative sign and significant coefficient are considered to have a long term relationship, while those which have a negative sign but are not significant are considered to have a short-term dynamic relationship. Based on the $p - value$, we can conclude that there is a long-term relationship between the observed variables, i.e. value-based Wald test shows that the $p - value$ is insignificant and amounts to 0.3248% (see Table 6).

Table 5: Panel Vector Error Correction Estimates
Date: 09/24/14 Time: 14:07
Sample (adjusted): 2001- 2012
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
_UNPL(-1)	1.000000	
FDI(-1)	12.87883	
	(3.13894)	
	[4.10293]	
C	-34.32569	
Error Correction:	**D(_UNPL)**	**D(FDI)**
CointEq1	-0.018329	-0.026098
	(0.02940)	(0.00748)
	[-0.62352]	[-3.49096]
D(_UNPL(-1))	-0.263738	0.026043
	(0.11021)	(0.02803)
	[-2.39296]	[0.92913]
D(_UNPL(-2))	-0.107251	0.020738
	(0.10767)	(0.02738)
	[-0.99610]	[0.75735]
D(FDI(-1))	-0.556964	0.199301
	(0.50051)	(0.12729)
	[-1.11279]	[1.56576]
D(FDI(-2))	-0.584191	0.003191
	(0.52174)	(0.13269)
	[-1.11969]	[0.02405]
C	0.049123	0.017895
	(0.36184)	(0.09202)
	[0.13576]	[0.19446]

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: Wald Test
System: SYS01

Test Statistic	Value	df	Probability
Chi-square	0.969365	1	0.3248

Source: Author's

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7 shows the result of Granger Causality test between FDI and unemployment in the countries of the WB. Based on the $p - value$, which amounts to 0.2242% and 0.3325%, we conclude that there is statistical significance at the level of critical value of 10%, which means

 ISSN 1927-033X

that there is a bidirectional relationship or causality between the observed variables in the long run. This information is important because it tells us that the FDI affects the reduction of unemployment in the WB countries.

Table 7: Pairwise Granger Causality Tests
Date: 09/07/14 Time: 22:48
Sample: 1998 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
FDI does not Granger Cause _UNPL	78	1.52607	0.2242
_UNPL does not Granger Cause FDI		1.11782	0.3325

Note: ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

5. Conclusion

In this study we investigated the long-term relationship or impact of FDI on reducing unemployment in the countries of the WB. In the study we used panel data model such as panel unit root, cointegration, vector error correction model (VECM) and Granger causality test. Within the panel root, we tested Levin, Lin and Chu (LLC), Im, Peseran and Shin (IPS), Hadri test and combining p-value tests in order to determine whether there is a long-term impact of FDI on reducing unemployment in the WB. Results showed that the data is stationary and there is no unit root, and that there is a long term relationship, or the impact of FDI on reducing unemployment. In the case of panel cointegration, we examined only Fisher Combined Johansson test and Pedroni test. The results showed that in the case of Pedroni test there is cointegration between FDI and unemployment, and that in the case of Fisher Combined Johansson test there is cointegration between the observed variables at the group level, but viewed individually all countries had a long-term cointegration between the observed variables except Serbia and Albania. This means that all countries except Serbia and Albania had a decrease in the unemployment rate as a result of FDI impact. Serbia and Albania have not achieved a reduction in the unemployment rate since FDI was mainly in the form of joint ventures, mergers and acquisitions. In addition, the results of the vector error correction model (VECM) show that there is a long-term relationship between the observed variables. Finally, we applied the Granger causality test and found that there is bidirectional causality between the observed variables in the long run. Based on this, we can conclude that there is long-run causality between the observed variables, i.e. that FDI has impact on reducing unemployment in the countries of the WB.

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Appendix

Table 8: Variable definitions

Variable	Data sources
Unemployment - %UNPL	The World Bank
FDI - Foreign direct investment, net inflows in millions dolars	The World Bank

Table 9: Data for WB from 1998 to 2012

Country	Years	FDI	%UNPL	Country	Years	FDI	%UNPL	Country	Years	FDI	%UNPL
_ALB	1998	0,04501	19,3	_CRO	1998	0,940831	11	_MONT	1998	0	20,6
_ALB	1999	0,0412	19,7	_CRO	1999	1,452386	13,5	_MONT	1999	0	20,8
_ALB	2000	0,143	13,5	_CRO	2000	1,109936	16,1	_MONT	2000	0	30,4
_ALB	2001	0,2073	22,7	_CRO	2001	1,582412	20,5	_MONT	2001	0	20,4
_ALB	2002	0,135	13,2	_CRO	2002	1,099965	15,1	_MONT	2002	0	20,5
_ALB	2003	0,178036	12,7	_CRO	2003	2,048806	13,9	_MONT	2003	0	20,6
_ALB	2004	0,341285	12,6	_CRO	2004	1,078565	13,7	_MONT	2004	0	29,3
_ALB	2005	0,262479	12,5	_CRO	2005	1,777125	12,6	_MONT	2005	0	30,3
_ALB	2006	0,325138	12,4	_CRO	2006	3,219596	11,1	_MONT	2006	0	24,7
_ALB	2007	0,652276	13,5	_CRO	2007	4,947149	9,6	_MONT	2007	0,937515	19,4
_ALB	2008	1,240973	13	_CRO	2008	5,81257	8,4	_MONT	2008	0,975106	16,8
_ALB	2009	1,343091	13,8	_CRO	2009	3,400982	9,1	_MONT	2009	1,549313	19,1
_ALB	2010	1,089416	14,2	_CRO	2010	0,845077	11,8	_MONT	2010	0,758407	19,7
_ALB	2011	1,049425	14,3	_CRO	2011	1,242602	13,4	_MONT	2011	0,556258	19,7
_ALB	2012	0,920081	14,7	_CRO	2012	1,336488	15,8	_MONT	2012	0,618367	19,6
_B&H	1998	0,066736	26,1	_MAC	1998	0,150482	34,5	_SRB	1998	0,113	13,7
_B&H	1999	0,176781	25,6	_MAC	1999	0,088406	32,4	_SRB	1999	0,112	13,7
_B&H	2000	0,146076	25	_MAC	2000	0,215057	32,2	_SRB	2000	0,051887	12,6
_B&H	2001	0,118495	27	_MAC	2001	0,447132	30,5	_SRB	2001	0,177484	12,8
_B&H	2002	0,26777	24,5	_MAC	2002	0,105575	31,9	_SRB	2002	0,567326	13,8
_B&H	2003	0,381785	25,6	_MAC	2003	0,11776	36,7	_SRB	2003	1,405952	15,2
_B&H	2004	0,70985	28,4	_MAC	2004	0,323027	37,2	_SRB	2004	1,02806	18,5
_B&H	2005	0,623813	25,7	_MAC	2005	0,14533	37,3	_SRB	2005	2,050767	20,8
_B&H	2006	0,845963	31,8	_MAC	2006	0,427445	36	_SRB	2006	4,968045	20,8
_B&H	2007	1,804047	29,7	_MAC	2007	0,733467	34,9	_SRB	2007	3,43192	18,1
_B&H	2008	1,004853	23,9	_MAC	2008	0,611688	33,8	_SRB	2008	2,996385	13,6
_B&H	2009	0,138511	24,1	_MAC	2009	0,25953	32,2	_SRB	2009	1,935602	16,6
_B&H	2010	0,44384	27,2	_MAC	2010	0,300735	32	_SRB	2010	1,340195	19,2
_B&H	2011	0,468734	27,6	_MAC	2011	0,495097	31,4	_SRB	2011	2,700435	19,1
_B&H	2012	0,349608	28,2	_MAC	2012	0,282677	31	_SRB	2012	0,355287	19,6

 ISSN 1927-033X