Foreign Direct Investment and Net Wages: The Case of Western Balkan Countries

Safet Kurtovic
Faculty of Economics
Dzemal Bijedic University of Mostar
Mithada Hujdura Hujke bb, 88000, Mostar
Bosnia and Herzegovina
Tel: +38761760955
Email:safetkurtovic@yahoo.com

Sead Talovic
Ministry of Foreign Trade and Economic Relations
Musala 9, 71000, Sarajevo
Bosnia and Herzegovina
Tel: +38761386523
Email: sead.talovic@bih.net.ba

Lejla Dacic
Faculty of Management and Business Economics
University of Travnik
Aleja Konzula 5, 72270, Travnik
Bosna and Herzegovina
Tel:+38762640400
Email: lejla.dacic1987@gmail.com.

Abstract
This paper studies the relationship between foreign direct investment (FDI) and average net wages (ANW) in Bosnia and Herzegovina, Montenegro, Macedonia and Serbia. The analysis encompasses data for the time series 2007-2014. For this purpose, we have used the econometric technique called panel data analysis. Our research has shown that, in the case of Panel Unit Root Test, Panel Cointegration Test, Dynamic Ordinary Least Squares (DOLS), Fully Modified Ordinary Least Squares (FMOLS), Vector Error Correction Estimates, Impulse Response Function and Variance Decomposition Test, there is a statistical significance or long-term relationship between FDI and ANW. The results of Panel Granger Causality test demonstrate that there is only a unidirectional relationship between ANW and FDI in the case of B&H, i.e. that there is a short-term causality. In the case of Montenegro, Serbia and Macedonia, there is neither short-run nor long-run causality between the analyzed variables. However, no statistical significance has been registered in the case of Panel Granger Causality Test

Keywords: FDI, net wages, cointegration, causality, JEL Codes: F2, F23

1. Introduction
Simultaneously with the liberalization of economies in transition countries, foreign companies - via FDI - introduce new technologies, knowledge, skills and organizational business processes, increase productivity, get access to markets, increase market competitiveness of products, get cheaper access to
physical capital, possess ability to keep the best workers, reputation and political influence (Bernard & Sjöholm, 2003; Harrison & Scorse, 2005; De Creuse & Maarek, 2013).

FDI inflow is affected by the economic competitiveness factors such as workforce availability, wage levels, transferability, managerial skills and workforce skills, access to inputs, infrastructure, supplier base, technology and financial support. Among the stated factors, some of the most important factors in the process of attracting FDI are wages with the addition of compatible factors such as skills and technical efficiency. FDI and wages are two significant interconnected variables. That is best illustrated by the following two relations. First wages and then FDI, which means that wages are able to affect FDI inflow. First FDI and then wages, meaning that FDI generate change in the wage levels. Low wages affect the attraction of FDI, while high FDI inflow generates increase in wages (Mutascu & Fleischer, 2010).

By means of FDI, foreign companies ensure higher wages than the local companies and thus affect the growth of average net wages in the host country. The following are the reasons why foreign companies pay higher wages than the local companies (Heyman et al., 2007). Firstly, foreign companies pay higher wages as a result of greater variability in labor demand and more frequent failures of foreign companies (Fabbri et al., 2003; Heyman et al., 2007; Javorcik, 2014). Secondly, higher wages in foreign companies are not only determined on the basis of certain characteristics of workers such as education and certain skills, but there are other reasons that are taken into consideration. Primarily, foreign companies are forced to pay higher wages due to unfavorable legislation in the host country; in an attempt to reduce fluctuation of workforce, foreign companies invest more in training than the local companies and thus prevent the loss of their technological advantage i.e. prevent the employees from going over to the local competition: after a successful training, wages grow because employees' productivity increases i.e. an employee's wage will be equivalent to his/her marginal productivity (Almeida, 2003; Almeida & Lince de Faria, 2014). As long as productivity is significant, wages will grow in response to increase in FDI. Then, due to poor knowledge of the local labor market, foreign companies pay higher wages to attract the best workers (Lipsey & Sjoholm, 2001; Lipsey, 2002; De Velde & Morrissey, 2002; Ruane & Uğur, 2004). Apart from this, wages are higher in foreign companies because these companies, after the acquisition process, increase wages above the average wage level in the host country. They do this because, in the process of acquisition, foreign companies choose the companies that have the best educated staff and are most similar to them (Almeida, 2004).

Certain studies have shown that there is a difference between wages in underdeveloped and developed countries. Development of technological innovations and trade is named as the main cause of this (Feenestra & Hanson, 1995; Feenestra & Hanson, 2003; Figini & Görg, 2006; Driffield et al., 2010). In the South-East European countries, average net wage in foreign companies is 10% to 70% higher than in local companies (Heyman et al., 2007; Bircan, 2013; Javorcik, 2014). Principally, average net wages are almost 50% higher in foreign companies than in local companies (Arnal & Hijzen, 2008). In certain countries of Latin America, average net wages in foreign companies are 30% higher than in local companies. In addition, many companies share their gained profit with their employees. For example, the Law on Cross-Border Profit Sharing in Mexico obligates foreign companies to share with Mexican workers over 10% of the total profit gained worldwide and not only in Mexico (Budd et al., 2002).

During 1990’s, the Western Balkan countries were going through a very difficult development phase including wars and democratic and transitional reforms that had not progressed as planned or provided significant results. At this time, the presence of FDI was negligible. After 2000, significant changes take place in transitional processes and this resulted in greater FDI inflow and increase in ANW. When it comes to the total amount of worldwide investment in the period 1997-2007, 68.32% of it pertained to developed economies, 29.27% pertained to developing countries and only 2.39% to the countries of the South-East Europe (SEE) and Western Balkans (WB) (Josifidis et al., 2011). The share of SEE countries
in the total inflow of FDI to transition economies increased from 9.4% in 2000 to 14.7% in 2010. The share of WB countries in the total inflow of FDI amounted to 5.8% in 2010 (Estrin & Uvalic 2013). FDI had been significantly growing in WB countries up until 2008. Following the global economic crisis in 2008, inflow of FDI dropped significantly. FDI were reduced from 40% to 70% in most of the WB countries (Uvalic, 2013; Kurtovic et al., 2015). B&H and Macedonia saw a drastic drop in FDI inflow, while Montenegro and Serbia registered certain reduction in FDI inflow, albeit not as significant as in the first two countries. Based on the amount of FDI inflow, Serbia is considered a leader in the region and is followed by Montenegro. Total FDI for all four WB countries from 2007 to 2014 amounted to 21.804 bln euros. Considered individually, Serbia had the greatest FDI inflow amounting to 9.947 bln euros, succeeded by Montenegro with 5.893 bln euros, B&H 3.775 bln euros and Macedonia 2.209 bln euros. On the other hand, average net wages in all four WB countries increased negligibly despite numerous oscillations in FDI inflow. According to economists, if WB countries want to attract more FDI, they need to have low wages to be competitive. Of course, low wages are supposed to attract more FDI; however, increase in FDI brings about increase in wages. Accordingly, this study supports the previously carried out research showing that FDI and ANW have a long-term mutual relationship. This paper has studied cointegration relationship between FDI and ANW in the time period 2007-2014 in four WB countries. This is a very turbulent period in which the analyzed countries faced serious economic problems such as drop in GDP growth, increase in unemployment rate, drop in FDI inflow, etc. This research has shown that there is a strong integration relationship between analyzed variables in the four WB countries. In addition, we have concluded that there is a long-term cointegration between FDI and ANW, i.e. that FDI have a long-term effect on ANW, and vice-versa. We have also concluded that increase in FDI inflow brings about increase in ANW, while increase in ANW causes reduction in FDI inflow in the four WB countries. Finally, we have determined that increase in ANW will result in increased FDI inflow in the future, while increase in FDI inflow will not drastically increase ANW in Bosnia and Herzegovina, Montenegro, Macedonia and Serbia.

The main objective of this paper is to study the following: integration between FDI and ANW; existence of a long-term cointegration between FDI and ANW; whether increase in FDI inflow brings about increase in ANW, and vice-versa; whether there is a short-term or long-term relationship between FDI and ANW; to foresee whether there will be an increase in ANW in the future as a result of increase in FDI inflow, and vice-versa.

The paper consists of sections as follows. Section 2 provides an overview of literature or research closely related to this paper’s research subject; Section 3 describes econometric techniques and databases used in the research; Section 4 provides the empirical results of the research and, finally, Section 5 contains the Conclusion.

2. Literature Review

Numerous studies explored the relationship between FDI and ANW. In the case of Mexico, Feenstra & Hanson (1995) concluded that there was a strong presence of FDI in the form of outsourcing that caused an increase in demand for skilled workers, which in turn led to increase in wages. In the case of Mexico, Venezuela and USA, Aitken et al., (1995) determined that there was a strong link between FDI and high wages in foreign-owned companies. Analyzing the case of Indonesia, Lipsey & Sjoholm (2001) came to the conclusion that foreign companies pay higher wages than the local companies because foreign companies have better characteristics and establish a more significant presence in the leading industries. Using the example of the Central and Eastern European countries, Faggio (2003) concluded that in Bulgaria and Romania presence of FDI did not have a positive effect on the increase in wages, while in
Poland it did. Lipsey (2002) determined that foreign companies paid higher wages than the local companies due to several reasons. Namely, foreign companies are bigger, they have better educated and skilled workers, they have capital-intensive production and they are also more productive and more strongly involved in trade flows in comparison to local companies. Bernard & Sjöholm (2003) studied Indonesia’s manufacturing sector and found that foreign-owned companies have 20% higher probability to shut down than the local companies. Increased rate of foreign companies’ failure is linked with substantial increase in wages, which leads to decrease in companies’ profit i.e. to their shutdown or withdrawal from the market. In the case of Portugal, Almeida (2004) determined that foreign companies employed better educated workers and paid them higher wages than the local companies. Apart from this, foreign companies took over local companies similar to them; however, after the takeover, education and training of workers would remain at the same level as it was prior to takeover. Analyzing the case of Portugal, Martins (2004) found that foreign companies paid higher wage premiums than the local companies. This was caused by the lack of competition in the labor market and insufficient knowledge of employee structure.

In the case of Poland, Goh & Javorcik (2005) concluded that wages grew in the foreign companies belonging to less protected industries. This happened because, when hiring, the companies were taking into consideration workers’ characteristics, education level, sex, etc. In the case of Sweden, Heyman et al., (2007) determined that foreign companies paid higher wages than the local companies. Foreign companies paid higher wages than the local companies without branches abroad; however, they paid lower wages than the local multinational companies. When it comes to greenfield investment, foreign companies paid higher wages, while reduction in wages was registered in the case of takeovers. In the case of China, Hale & Long (2007) found that FDI had a positive effect on increase in wages of educated workers, while they negatively affected production workers. This led to rural-urban income inequality. Driffield et al., (2010) pointed out that increase in industrial concentration led to a greater wage gap, while in the case of greater market share this gap was smaller. FDI help reduce income inequality in the areas that a given country wants to develop. Du Caju et al., (2011) studied the effect of international trade on wages in small open economies. Countries with higher export rates in industrial branches saw an increase in wages as compared to the countries with higher import rates. High import rate in a low income country leads to intra-industrial wage gap Giesen & Schwarz (2011) agree that attracting FDI is affected by wages and operating costs. Presence of FDI causes increase in wages in the host country, i.e. leads to reduced production reallocation. According to this, foreign companies or exporters see benefits, while local companies are burdened with high labor costs. Bircan (2013) studied the case of Turkey and concluded that foreign companies paid higher wages than the local companies in line with the increase in ownership share in a local company. In companies where a foreign company owned up to 10% of the total assets, wages were 4% higher for unskilled workers.

3. Methodology and data

Within the panel cointegration analysis we defined average net wage as the dependent variable, while foreign direct investments represent the independent variable. We chose the aforementioned variables
based on the relevance of their mutual long-term relationship. Our empirical analysis comprises the following steps. Firstly, we introduced the regression equation. Secondly, we provided theoretical explanation for Panel Unit Root Test, Panel Cointegration Test, Dynamic Ordinary Least Squares (DOLS), Fully Modified Ordinary Least Squares (FMOLS), Vector Error Correction Estimates, Granger Causality Test, Impulse Response Function and Variance Decomposition Test. Thirdly, we presented the research results.

The starting point for our study was the following regression equation:

\[ \ln AW_{it} = \beta_0 + \beta_1 \ln FDI_{it} + \ldots + \epsilon_{it} \]  

where \( AW_{it} \) is the average net wage in country \( i \) in the time period \( t \); \( FDI_{it} \) is foreign direct investments in country \( i \) in the time period \( t \), and \( \epsilon_{it} \) is a residual.

The panel unit root tests are the Levin, Lin and Chu (LLC), Im, Pesaran and Shin (IPS), Fisher-ADF and Fisher-PP and Hadri test. LLC test (2002) 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 (Baltagi, 2005). LLC found that the panel approach substantially increases power in finite samples when compared with the single-equation ADF test. Based on the ADF specification, LLC proposed a panel-based version of equation (2) that restricts \( \beta_i \) by keeping it identical across cross-sectional regions as follows (Ho & Huang, 2009):

\[ \Delta X_{it} = \alpha_i + \beta X_{i,t-1} + \sum_{j=1}^{k_i} \theta_{ij} \Delta X_{it-j} + \epsilon_{it}. \]  

where \( \Delta \) is the first difference operator, \( X_{it} \) is the real provincial revenues and expenditures, \( \epsilon_{it} \) is a white noise disturbance with a variance of \( \sigma^2 \), \( t = 1,2,\ldots,T \) indexes time periods, and \( i = 1,2,\ldots,N \) indexes cross-sectional regions. LLC tested the null hypothesis for the existence of a unit root (i.e. the series is non stationary) with \( \beta_1 = \beta_2 = \ldots = \beta = 0 \) against the one-side alternative of having no unit root with \( \beta_1 = \beta_2 = \ldots = \beta < 0 \), based on the following test statistic

\[ t_\beta = \frac{\hat{\beta}}{se(\hat{\beta})}. \]  

where, \( \hat{\beta} \) is the OLS estimate of \( \beta \) in equation (1), and \( se(\hat{\beta}) \) is its standard error. It is worth noting that the LLC test requires a specification of the number of lags used in each cross-section ADF regression, and that one must specify the exogenous variables used in the testing equations.

Im, Pesaran and Shin (2003) test allows 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. \( u_{it} = \sum_{j=1}^{p_i} \psi_{i1} u_{it-j} + \epsilon_{it} \). Substituting this \( u_{it} \) in equation (1), we get (Chen, 2013):

\[ y_{it} = \rho y_{it-1} + \sum_{j=1}^{p_i} \psi_{i1} u_{it-j} + \sigma_{it} + \epsilon_{it}, i = 1,\ldots,N, t = 1,\ldots,T \]  

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

$$t = \frac{1}{N} \sum_{i=1}^{N} t_{\varphi i}$$

(5)

where $t_{\varphi i}$ is the individual $t - statistic$ of testing $H_0: \rho_i = 1$. It is known that for a fixed $N$,

$$t_{\varphi i} = \frac{\hat{\theta}_i \hat{\Sigma}_i \hat{\theta}_i^{-1} \hat{\varepsilon}_i}{\sqrt{\hat{\vartheta} \hat{\Sigma}_i \hat{\theta}_i^{-1}}} = t_{i\varphi}$$

(6)

as $T \to \infty$. IPS assumes that $t_{i\varphi}$ has finite means and variances. Then

$$\sqrt{N \left( \frac{\sum_{i=1}^{n} t_{i\varphi} - \varepsilon_{i\varphi}}{\hat{\vartheta} \hat{\Sigma}_i \hat{\theta}_i^{-1}} \right)} \to N(0,1)$$

(7)

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

$$t_{IPS} = \frac{\sqrt{N(t_{i\varphi} / \rho_i = 1)}}{\sqrt{\vartheta \hat{\Sigma}_i \hat{\theta}_i^{-1}}} \to N(0,1)$$

(8)

as $T \to \infty$ followed by $N \to \infty$, sequentially. The values of $E \left[ t_{i\varphi} / \rho_i = 1 \right]$ and $\sqrt{\vartheta \hat{\Sigma}_i \hat{\theta}_i^{-1}}$ have been computed by IPS via simulations for different values of $T$ and $\rho_i$’s (Baltagi, 2005).


$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_p y_{t-p+2} + \alpha_{p-1} y_{t-p+1} + \alpha_p y_{t-p} + \varepsilon_t$$

(9)

adding and subtracting $\alpha_p y_{t-p+1}$ to obtain

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \cdots + \alpha_p y_{t-p+2} + (\alpha_{p-1} + \alpha_p) y_{t-p+1} + \alpha_p \Delta y_{t-p+1} + \varepsilon_t$$

(10)

Next, adding and subtracting $(\alpha_{p-1} + \alpha_p) y_{t-p+2}$ to obtain

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \cdots + (\alpha_{p-1} + \alpha_p) \Delta y_{t-p+2} - \alpha_p \Delta y_{t-p+1} + \varepsilon_t$$

(11)

Continuing in this fashion, we obtain

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i+1} + \varepsilon_t$$

(12)

where $\gamma = -(1 - \sum_{i=1}^{p} \alpha_i)$ and $\beta_i = -\sum_{j=1}^{p} \alpha_j$ for $i = 1, 2, \ldots, p - 1$.

The null and alternative hypotheses of the Augmented Dickey-Fuller t-test are $H_0: \gamma = 0$, $H_0: \gamma < 0$. We can test for the presence of a unit root using the Dickey-Fuller t-test.
This statistic does not follow the conventional student’s t-distribution. Critical values are calculated by Dickey and Fuller and depend on whether there is an intercept, deterministic trend or intercept and deterministic trend. Hadri (2000) 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). The Hadri test is based on the residuals from the individual OLS regression on a single constant, or on a constant and a trend. Given that both constant term and trend are included, the following equation is estimated (Ho & Huang, 2009)

\[ y_{it} = \alpha_{i2} + \beta_{i1} t + \epsilon_{it} \]  

(14)

where \( \hat{\epsilon} \) is the residual from the regression, and the LM statistics is given as follows,

\[ LM_1 = \frac{1}{N} \left( \sum_{i=1}^{N} \frac{S_i(t)^2}{\tau^2} \right) f_{0} \]  

(15)

Allowing for heteroskedasticity across cross-sections, we have an alternative LM statistics,

\[ LM_2 = \frac{1}{N} \left( \sum_{i=1}^{N} \frac{S_i(t)^2}{\tau^2} \right) \hat{f}_{i0} \]  

(16)

where, \( S_i(t) = \sum_{t=1}^{t} \hat{\epsilon}_{it} \) is the cumulative sum of the regression residual and \( \hat{f}_{0} = \sum_{t=1}^{T} f_{it} / N \) is the average of the individual estimators of the residual spectrum at a frequency of zero. Hadri (2000) shows that under mild assumptions,

\[ Z = \frac{\sqrt{N} \left( LM - \psi \right)}{\xi} \rightarrow N(0,1) \]  

(17)

The Hadri panel unit root test only requires the specification of the form of the OLS regressions. The results will be two Z-statistic values, one based on \( LM_1 \), with the associated homoskedasticity assumption, and the other based on \( LM_2 \), which is heteroskedasticity consistent. Pedroni (2004) panel cointegration test is residual-based and can be regarded as panel equivalent of the Engle-Granger 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)

\[ y_{it} = \alpha_{i} + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \beta_{Ni} x_{Mi,t} + \epsilon_{i,t} \]  

(18)

\( t = 1, \ldots, T; i = 1, \ldots, N; m = 1, \ldots, M \)
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 \( \beta_{1t}, \ldots, \beta_{Mt} \) and the member specific intercept \( \alpha_i \) can vary across each cross-section

\[
\Delta y_{it} = b_{1t} \Delta x_{1it} + \beta_{2t} \Delta x_{2it} + \cdots + b_{Mt} \Delta x_{Mit} + \pi_{it}
\]  

(19)

For panel-\( \rho \) and group-\( \rho \) statistics estimate the regression \( \hat{\pi}_{it} = \gamma \hat{\pi}_{it-1} + \hat{\mu}_{it} \) using the residuals \( \hat{\pi}_{it} \) from the cointegration regression. Panel cointegration statistic includes following statistic: panel-\( \nu \) (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 (Ho & Huang, 2009)

Panel \( \nu \) statistic \( = \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1} \)

Panel \( \rho \) statistic \( = \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

Panel \( PP \) statistic \( = \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

Panel \( ADF \) statistic \( = \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

The heterogeneous group mean panel cointegration test statistics are as follows

Group \( \rho \) statistic \( = \sum_{i=1}^{N} \left( \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

Group \( PP \) statistic \( = \sum_{i=1}^{N} \left( \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

Group \( ADF \) statistic \( = \sum_{i=1}^{N} \left( \sum_{t=1}^{T} \tilde{\pi}_{it} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{\pi}_{it} \left( \hat{\pi}_{it-1} \Delta \hat{\pi}_{it} - \hat{\lambda}_i \right) \)

The null hypothesis of the between dimension statistics is given by \( H_0 : \psi_i = 1 \) for all \( i \) and the alternative is \( H_1 : \psi_i < 1 \) for all \( i \). Pedroni shows that the panel \( \nu - statistic \) 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 5%, the null hypothesis is rejected (Mucuki & Demirsel, 2013).

Kao (1999) uses both DF and ADF to test for cointegration in panel as well as this test similar to the standard approach adopted in the EG-step procedures (Chaiboonsri et al., 2010). In the bivariate case Kao consider the following model (Morshed, 2010)

\[
y_{it} = \alpha_i + \beta x_{it} + \epsilon_{it}, \quad i=1,...,N, t=1,...,T
\]  

(26)

where

\[
y_{it} = y_{it-1} + u_{it}
\]  

(27)

\[
x_{it} = x_{it-1} + \epsilon_{it}
\]  

(28)
\( \alpha_i \) are the fixed effect varying across the cross-section observations, \( \beta \) is the slope parameter, \( y_{it} \) and \( x_{it} \) are independent random walks for all \( i \). The residual series \( e_{it} \) should be I (1) series. Now Kao define a long run covariance matrix of of \( w_{it} = (u_{it}, e_{it}) \) is given by

\[
\Omega = \lim_{T \to \infty} \frac{1}{T} E(\sum_{t=1}^{T} w_{it}) (\sum_{t=1}^{T} w_{it}) = \Sigma + \Gamma + \Gamma' \equiv \begin{bmatrix} \sigma_{\alpha}^2 & \sigma_{\alpha \epsilon} \\ \sigma_{\epsilon \alpha} & \sigma_{\epsilon}^2 \end{bmatrix}
\]

(29)

where

\[
\Gamma = \lim_{T \to \infty} \frac{1}{T} \sum_{k=1}^{T-1} \sum_{t=k+1}^{T} E(w_{it} \epsilon_{j,t+1}) \equiv \begin{bmatrix} \Gamma_{\alpha} \\ \Gamma_{\epsilon \alpha} \\ \Gamma_{\epsilon} \end{bmatrix}
\]

(30)

and

\[
\Sigma = \lim_{T \to \infty} \frac{1}{T} \sum_{t=1}^{T} E(w_{it} \epsilon_{j,t+1}) \equiv \begin{bmatrix} \sigma_{\alpha}^2 & \sigma_{\alpha \epsilon} \\ \sigma_{\epsilon \alpha} & \sigma_{\epsilon}^2 \end{bmatrix}
\]

(31)

The Dickey-Fuller test can be applied to the estimated residual using

\[
\hat{\epsilon}_{it} = p \hat{\epsilon}_{it-1} + v_{it}
\]

(32)

Now the null and alternative hypothesis may be written as \( H_0: p = 1, H_1: p < 1 \). The OLS estimate of \( p \) is given by

\[
\hat{p} = \frac{\sum_{i=1}^{N} \sum_{t=2}^{T} \hat{\epsilon}_{it-1}}{\sum_{i=1}^{N} \sum_{t=1}^{T-1} \hat{\epsilon}_{it-1}^2}
\]

(33)

Further calculation for Dickey-Fuller, Kao shows the following statistics

\[
DF_p = \frac{\sqrt{NT} (\hat{p} - 1) + 3 \sqrt{N}}{\sqrt{51/5}}
\]

(34)

\[
DF_\tau = \sqrt{\frac{\hat{\epsilon}^2 + 3N}{\hat{\epsilon}^2}}
\]

(35)

\[
DF_\beta = \sqrt{\frac{N \hat{p}^2 \hat{\epsilon}^2}{3 + \hat{p}^2 \hat{\epsilon}^2}}
\]

(36)

\[
DF_\alpha = \frac{\hat{p} + \sqrt{4N \hat{p} \hat{\epsilon}^2 \hat{\epsilon}_0}}{2 \hat{\epsilon}^2}
\]

(37)

\[
ADF = \frac{\hat{ADF} \sqrt{\hat{\epsilon}^2}}{\sqrt{\hat{\epsilon}^2} - \hat{\epsilon}^2}
\]

(38)
The Johansen test of Cointegration (1988). This is a test which has all desirable statistical properties. The weakness of the test is that it relies on asymptotic properties, and is therefore sensitive to specification errors in limited samples. Start with a VAR representation of the variables, in this case what we think is the economic system we would like to investigate. We have a $p$-dimensional process, integrated of order $d$, $\{X_t\}_t \sim I(d)$, with the VAR representation (Sjo, 2008)

$$A_s(L)X_t = \mu_0 + \psi D_s + \varepsilon_t$$

(39)

The empirical VAR is formulated with lags and dummy variables so that the residuals become a white noise process. The demands for a well-specified model is higher than for an ARIMA model. Here we do test for all components in the residual process. The reason being that the critical values are determined conditionally on a normal distribution of the residual process. Typically, we will assume that the system is integrated of order one. If there are signs of I (2) variables, we will transform them to I (1) before setting up the VAR. By using the difference operator $\Delta = 1 - L$, or $\Delta = 1 - \Delta$ the VAR in levels can be transformed to a vector error correction model (VECM).

DOLS and FMOLS. Using regression Pedroni constructs his group-mean DOLS panel estimator as follows (Bispham, 2008).

$$\hat{\beta}_{GD}^* = \left[N^{-1} \sum_{i=1}^N (\Sigma_{i=1}^{T-1} z_{it}^T z_{it}^{-1})^{-1} (\Sigma_{i=1}^{T-1} z_{it}^T \hat{s}_{it})\right]$$

(40)

Where $z_{it}$ is the $(K(2p + 2) + 1)$ vector of regressors

$$z_{it} = ((x_{1it} - \hat{x}_{1i}), ..., (x_{kit} - \hat{x}_{ki}), \Delta x_{1it-p}, ..., \Delta x_{kit-p}, ..., \Delta x_{kit-p})'$$

(41)

The estimator can also be written simply as

$$\hat{\beta}_D^* = N^{-1} \sum_{i=1}^N \hat{\beta}_{Di}^*$$

(42)

Where $\hat{\beta}_{Di}^*$ is the conventional DOLS time-series estimator applied to the $i$-th member of the panel. T-statistic for the Pedroni estimator is written

$$t_{\hat{\beta}_D^*} = N^{-0.5} \sum_{i=1}^N t_{\hat{\beta}_{Di}^*}$$

(43)

The Group-Mean FMOLS estimator is given by

$$\hat{\beta}_{GFM}^* = N^{-1} \sum_{i=1}^N \hat{\beta}_{FMi}^*$$

(44)

Where $\hat{\beta}_{FMi}^*$ is the conventional FMOLS time-series estimator. The associated t-statistic is:

$$t_{\hat{\beta}_{GFM}^*} = N^{-0.5} \sum_{i=1}^N t_{\hat{\beta}_{FMi}^*}$$

(45)

Vector Error Correction Model (VECM). If cointegration has been detected between series we know that there exists a long-term equilibrium relationship between them so we apply VECM in order to evaluate the short run properties of the cointegrated series. In case of no cointegration VECM is no longer
required, we directly proceed to Granger causality tests to establish causal links between variables. The regression equation form for VECM is as follows (Asari et al., 2011).

\[
\Delta Y_t = \alpha_1 + p_1 \epsilon_{t-1} + \sum_{i=0}^{n} \delta_i \Delta X_{t-i-1} + \sum_{i=0}^{n} \gamma_i Z_{t-i-1} \tag{46}
\]

\[
\Delta X_t = \alpha_2 + p_2 \epsilon_{t-1} + \sum_{i=0}^{n} \beta_i \gamma_{t-i-1} + \sum_{i=0}^{n} \delta_i \Delta Y_{t-i-1} + \sum_{i=0}^{n} \gamma_i Z_{t-i-1} \tag{47}
\]

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 dependent variable will give rise to a stable long run relationship between the variables. We start from the null hypothesis 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 test takes the following form (Rajasekar et al., 2014)

\[
Z_{it} = \sum_{j=1}^{K} \Gamma_{ij} Z_{i,t-j} + \mu_{it} + \varepsilon_{it}, i = N & t = 1, ... T \tag{48}
\]

Where \( Z_{it} \) denote \( K \)-dimensional; \( \Gamma_{ij} \) – the parameter matrices, \( \mu_{it} \) – vector containing individual specific; \( \varepsilon_{it} \) – disturbances.

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

**Impulse response function.** Impulse response function (IRF) of a dynamic system is its output when presented with a brief input signal, called an impulse. More generally, an impulse response refers to the reaction of any dynamic system in response to some external change (Lu and Xin, 2010). An impulse response function measures the time profile of the effect of shocks at a given point in time on the future values of variables in a dynamic system. The impulse response function is defined as (Nguyen, 2011)

\[
IR(m, h, Z_{t-1}) = E \left( y_{t+m} | \varepsilon_t = h, Z_{t-1} \right) - E \left( y_{t+m} | Z_{t-1} \right) \tag{49}
\]

Where \( m \) denotes the time, \( h = (h_1, ..., h_m) \) is \( n \times 1 \) vector denotes the size of shock, \( Z_{t-1} \) denotes accumulative information about the economy from the past up to time \( t - 1 \).

**Variance decomposition** tells how much a given variable changes under the impact of its own shock and the shock of other variables. Therefore, the variance decomposition defines the relative importance of each random innovation in affecting the variables in the VAR (Nguyen, 2011).

According to the representation of \( VMA(\infty) \), Sims (1980) puts forward the variance decomposition theory (Sims, 1980; Peng et al., 2011)

\[
y_{it} = \sum_{j=1}^{k} (c_{ij}^{0} \varepsilon_{ij-1} + c_{ij}^{1} \varepsilon_{jr-1} + c_{ij}^{2} \varepsilon_{jt-2} + \cdots) \tag{50}
\]
The content in each bracket represents sum effect of the $j$-th disturbance $\varepsilon_j$ on $y_t$ from the infinite past to now. Supposing $\varepsilon_t$ sequences are independent, we can solve out its variance and get the following equation

$$
E\left[\left(\varepsilon_{ij}^{(0)} + \varepsilon_{ij}^{(1)} + \varepsilon_{ij}^{(2)} + \cdots\right)^2\right] = \sum_{q=0}^{\infty} (\varepsilon_{ij}^{(q)})^2 \delta_{ij}
$$

(51)

The result, represented by variance, shows the total effect of the $j - th$ disturbance on the $i - th$ variable from the infinite past to now. Besides, assuming covariance matrix of disturbance term vectors is diagonal matrix, we can get $y_i$'s variance by simply summing the $k$ terms of the above covariances

$$
\text{var}(y_{it}) = \sum_{j=1}^{k} \left(\sum_{q=0}^{\infty} (\varepsilon_{ij}^{(q)})^2 \delta_{jj}\right)
$$

(52)

$y_i$'s variance can be decomposed to $k$ kinds of different effects. Hence, to determine how much each disturbance affect the variance of $y_i$, we define the following measure (Peng et al., 2011)

$$
\text{RVC}_{j-i}(\infty) = \frac{\sum_{q=0}^{\infty} (\varepsilon_{ij}^{(q)})^2 \delta_{jj} \text{VAR}(y_{it})}{\sum_{q=0}^{\infty} (\varepsilon_{ij}^{(q)})^2 \delta_{jj}}
$$

(53)

RVC is the contribution of relative variance, in another words, we investigate how the $j - th$ variable affect the $i - th$ variable through $\text{RVC}_{j-i}(\infty)$. In fact, we cannot calculate $\varepsilon_{ij}^{(q)}$, $s = \infty$, but if the model fits stationary condition, $\varepsilon_{ij}^{(q)}$ would present geometric decrease as variable $q$ increases. Therefore, we only need to adopt finite $s$ terms.

4. Estimation results

To test the existence of panel unit root variables we used tests such as LLL (2002), IPS (2003), ADF-Fisher (2001), PP-Fisher (2001) and Hadri (1999). The results of panel unit root tests are presented in Table 1. LLC (2002) test demonstrated that variables ANW and FDI are statistically significant at the 1% level; therefore, we reject the unit root null hypothesis. In the case of IPS test (2003) we have concluded that variables ANW and FDI are statistically significant at the 5% level and, accordingly, we reject the unit root null hypothesis. ADF Fisher Chi-square (2001) test has pointed out that variables ANW and FDI are statistically significant at the 5% level; therefore, we reject the unit root null hypothesis. PP Fisher Chi-square (2001) test has also shown that variables ANW and FDI are statistically significant at the 5% level and, accordingly, we reject the unit root null hypothesis. Finally, the results of Hadri test (1999) demonstrate that variables ANW and FDI are statistically significant at the 5% level and therefore we reject the unit root null hypothesis.
Table 1: Results of Panel Unit Root Tests

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>lnANW</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0016</td>
<td>0.0000</td>
<td>0.0014</td>
</tr>
<tr>
<td>lnFDI</td>
<td>0.0000</td>
<td>0.0102</td>
<td>0.0053</td>
<td>0.0010</td>
<td>0.0165</td>
</tr>
<tr>
<td>lnANW</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>lnFDI</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's

Based on the results of panel unit root tests, we can conclude that variables ANW and FDI do not have a unit root. Despite this fact, we introduced first differences and came up with the results showing that for all tested models i.e. for both ANW and FDI variable there is statistical significance at the 1% level. Accordingly, we reject the unit root null hypothesis, which means that we have stationary data and that there is a long-term integration relationship between tested variables in the case of B&H, Montenegro, Macedonia and Serbia.

The results of Pedroni (1999) Panel Cointegration Test are presented in Table 3. They show us that we can reject the null hypothesis of no cointegration in the case of Panel ADF Statistic, Panel PP-Statistic and Group PP-Statistic and Group ADF-Statistic, while in the case of Panel v-Statistic, Panel rho-Statistic, Group rho-Statistic and Group ADF-Statistic we cannot reject the null hypothesis of no cointegration. Based on the significance of two panel statistics and two group statistics at the level of 5%, we reject the null hypothesis of no cointegration. The results of Kao (1998) Residual Cointegration Test are also given in Table 3. Based on these results, we observed the statistical significance at the level of 1%; hence, we reject the null hypothesis of no cointegration. This means that there is a long-term relationship or cointegration between the analyzed variables. Finally, we used the results of Johansen Panel Cointegration Test to determine the statistical significance at the level of 1% and therefore reject the null hypothesis of no cointegration. Based on all three panel cointegration tests, we conclude that there is a long-term cointegration between ANW and FDI in the countries under analysis.
Table 2: Panel Cointegration Test

<table>
<thead>
<tr>
<th>Test Name</th>
<th>T - statistic</th>
<th>Prob.%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Pedroni Residual Cointegration Tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panel v-Statistic</td>
<td>-1.460938</td>
<td>0.9280</td>
</tr>
<tr>
<td>Panel rho-Statistic</td>
<td>-1.384271</td>
<td>0.0831</td>
</tr>
<tr>
<td>Panel PP-Statistic</td>
<td>-2.775733</td>
<td>0.0028</td>
</tr>
<tr>
<td>Panel ADF-Statistic</td>
<td>-2.220206</td>
<td>0.0132</td>
</tr>
<tr>
<td>Group rho-Statistic</td>
<td>0.344832</td>
<td>0.6349</td>
</tr>
<tr>
<td>Group PP-Statistic</td>
<td>-2.711933</td>
<td>0.0039</td>
</tr>
<tr>
<td>Group ADF-Statistic</td>
<td>-1.830446</td>
<td>0.0336</td>
</tr>
<tr>
<td>(2) Kao Residual Cointegration Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADF-Statistic</td>
<td>-3.994308</td>
<td>0.0000</td>
</tr>
<tr>
<td>(3) Johansen Panel Cointegration Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trace Statistic</td>
<td>48.21427</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's

The results for DOLS and FMOLS estimators are provided in Table 3. The results of DOLS cointegration analysis show that statistical value of FDI and ANW for B&H, Montenegro, Macedonia and Serbia has significance level of 5% and, therefore, we reject the null hypothesis of no cointegration. This indicates that there is a long-term relationship or cointegration between FDI and ANW. However, in the case of FMOLS cointegration analysis, statistical value of the analyzed variables has significance level of 1%; hence, we reject the null hypothesis of no cointegration between FDI and ANW for the four countries that are the subject of our analysis. The analysis of FMOLS indicates that there is a long-term relationship between FDI and ANW in B&H, Montenegro, Macedonia and Serbia. The existence of a positive long-term relationship between FDI and ANW in analyzed countries is explained by the fact that all the countries in question had a strong FDI inflow during 2007 and 2008, which affected the growth in average net wages in these countries. This period was followed by the global economic crisis, which resulted in reduced FDI inflow and thus in lower growth in average net wages in the given countries.

Table 3: DOLS and FMOLS estimators

<table>
<thead>
<tr>
<th>Country</th>
<th>DOLS</th>
<th></th>
<th>FMOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t-stat.</td>
<td>prob.%</td>
<td>t-stat.</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>93.21181</td>
<td>0.0068</td>
<td>84.03198</td>
</tr>
<tr>
<td>Montenegro</td>
<td>37.76484</td>
<td>0.0169</td>
<td>-11.29700</td>
</tr>
<tr>
<td>FYR Macedonia</td>
<td>162.5981</td>
<td>0.0039</td>
<td>44.41188</td>
</tr>
<tr>
<td>Serbia</td>
<td>32.52383</td>
<td>0.0196</td>
<td>32.19900</td>
</tr>
<tr>
<td>Panel group</td>
<td>106.6068</td>
<td>0.0000</td>
<td>104.3863</td>
</tr>
</tbody>
</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's
Empirical results of the panel error correction model are presented in Table 4. Based on these results, we can conclude that the statistical value of ANW is insignificant as compared to FDI. This means that increase in ANW leads to reduction in FDI inflow in the countries that are the subject of analysis. On the other hand, FDI have a positive impact on ANW, i.e. they have significance level of 5%. Therefore, with an increase in FDI there comes along an increase in average net wages in the given countries. Eventually, it is important to note that in the case of ANW and FDI there is a short-term causality and cointegration, while in the case of FDI and ANW there is a long-term causality and cointegration. In order to determine whether there is a short-term causality between ANW and FDI, we need to apply a Wald Test. The results of the Wald Test are presented in Table 4 below. Based on the results, we conclude that we have an insignificant value, which means that there is no short-term relationship between analyzed variables.

Table 4: Vector Error Correction Estimates

<table>
<thead>
<tr>
<th>Cointegrating Eq:</th>
<th>CointEq1</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnANW (-1)</td>
<td>1.000000</td>
</tr>
<tr>
<td>FDI(-1)</td>
<td>-0.689684 (0.11617)</td>
</tr>
<tr>
<td></td>
<td>[-5.93696]</td>
</tr>
<tr>
<td>C</td>
<td>-21.17579</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Error Correction:</th>
<th>D(AWAGE)</th>
<th>D(FDI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CointEq1</td>
<td>-0.008276 (0.00798)</td>
<td>0.747336 (0.18766)</td>
</tr>
<tr>
<td></td>
<td>[-1.03679]</td>
<td>[3.98242]</td>
</tr>
<tr>
<td>D(lnANW (-1))</td>
<td>0.186520 (0.10372)</td>
<td>-5.072204 (2.43836)</td>
</tr>
<tr>
<td></td>
<td>[1.79831]</td>
<td>[-0.47402]</td>
</tr>
<tr>
<td>D(lnANW (-2))</td>
<td>-0.127348 (0.07576)</td>
<td>5.072204 (1.78098)</td>
</tr>
<tr>
<td></td>
<td>[-1.68100]</td>
<td>[-2.84799]</td>
</tr>
<tr>
<td>D(FDI(-1))</td>
<td>-0.019675 (0.00653)</td>
<td>-0.745056 (0.15344)</td>
</tr>
<tr>
<td></td>
<td>[-3.01447]</td>
<td>[-4.85561]</td>
</tr>
<tr>
<td>D(FDI(-2))</td>
<td>-0.000958 (0.00594)</td>
<td>-0.550484 (0.13970)</td>
</tr>
<tr>
<td></td>
<td>[-0.16119]</td>
<td>[-3.94041]</td>
</tr>
</tbody>
</table>

Wald Test  
F-statistic | Prob.  
--- | ---  
7081 | **0.01**

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author’s

Granger (1969) Causality tests results are provided in Table 5. Granger Causality tests measure causality between variables in one direction (unidirectional) and two directions (bidirectional). They show that in the case of lags 1 and lags 2, upon testing causality between ANW and FDI, we observed statistical significance level of 5% in the case of B&H that is unidirectional, which tells us that there is a short-term causality between FDI and ANW. This indicates that FDI positively affect the growth in average net wages.
wages in the short run, but that there is no positive or long-term effect of ANW on attracting FDI in B&H. In the case of Montenegro, Serbia and Macedonia, we detected statistical significance level of 10%. Therefore, we concluded that there was no long-term causality between analyzed variables in these countries. The lack of long-term relationship between FDI and ANW in the long run leads to reduction in FDI inflow in countries under analysis, which in turn reduces the level of economic development.

Table 5: Pairwise Granger Causality Tests

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bosnia and Herzegovina</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnFDI does not Granger Cause lnANW</td>
<td>1</td>
<td>0.7290</td>
<td>0.441</td>
<td>2</td>
<td>340.77</td>
<td>0.038</td>
</tr>
<tr>
<td>lnANW does not Granger Cause lnFDI</td>
<td>9</td>
<td>4.0357</td>
<td>0.114</td>
<td>3</td>
<td>0.9774</td>
<td>0.581</td>
</tr>
<tr>
<td><strong>Montenegro</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnFDI does not Granger Cause lnANW</td>
<td>1</td>
<td>0.6558</td>
<td>0.463</td>
<td>2</td>
<td>0.7681</td>
<td>0.627</td>
</tr>
<tr>
<td>lnANW</td>
<td>6</td>
<td>1.4763</td>
<td>0.291</td>
<td>5</td>
<td>10.769</td>
<td>0.210</td>
</tr>
<tr>
<td>lnANW does not Granger Cause lnFDI</td>
<td>4</td>
<td>0.0498</td>
<td>0.834</td>
<td>2</td>
<td>2.7953</td>
<td>0.389</td>
</tr>
<tr>
<td><strong>FYR Macedonia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnFDI does not Granger Cause lnANW</td>
<td>1</td>
<td>0.5548</td>
<td>0.497</td>
<td>3</td>
<td>1.8431</td>
<td>0.461</td>
</tr>
<tr>
<td>lnANW</td>
<td>4</td>
<td>0.0498</td>
<td>0.834</td>
<td>1</td>
<td>2.7953</td>
<td>0.389</td>
</tr>
<tr>
<td>lnANW does not Granger Cause lnFDI</td>
<td>7</td>
<td>0.5548</td>
<td>0.497</td>
<td>5</td>
<td>1.8431</td>
<td>0.461</td>
</tr>
<tr>
<td><strong>Serbia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lnFDI does not Granger Cause lnANW</td>
<td>1</td>
<td>0.7656</td>
<td>0.431</td>
<td>2</td>
<td>29.145</td>
<td>0.129</td>
</tr>
<tr>
<td>lnANW</td>
<td>5</td>
<td>0.1847</td>
<td>0.689</td>
<td>6</td>
<td>0.0109</td>
<td>0.989</td>
</tr>
<tr>
<td>lnANW does not Granger Cause lnFDI</td>
<td>2</td>
<td>0.7656</td>
<td>0.431</td>
<td>9</td>
<td>2.9145</td>
<td>0.129</td>
</tr>
</tbody>
</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's

Nevertheless, Granger Causality tests often turn out to be unreliable when measuring long-term causality between analyzed variables. Therefore, we applied the Impulse Response Function Test and Variance Decomposition Test. The results of the Impulse Response Function Test are shown in Table 6. They indicate that the reaction of ANW to FDI impulse will be mostly positive in the next ten years. On the other hand, reaction of FDI to ANW impulse encompasses both positive and negative values in the next ten years, i.e. there will be a positive response of FDI to ANW impulse or action in the aforementioned future period. This bring us to the conclusion that there will be a long-term relationship between analyzed variables in the given four Western Balkan countries, i.e. that ANW will grow as a result of the increase in FDI, and vice-versa.
Table 6: Impulse Response Function Test

<table>
<thead>
<tr>
<th>Period</th>
<th>lnANW</th>
<th>lnFDI</th>
<th>Period</th>
<th>lnANW</th>
<th>lnFDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.031865</td>
<td>0.000000</td>
<td>1</td>
<td>0.207564</td>
<td>0.381353</td>
</tr>
<tr>
<td>2</td>
<td>0.029208</td>
<td></td>
<td>2</td>
<td>0.099140</td>
<td>0.041627</td>
</tr>
<tr>
<td>3</td>
<td>0.030603</td>
<td>0.001770</td>
<td>3</td>
<td>5.09E-05</td>
<td>0.037424</td>
</tr>
<tr>
<td>4</td>
<td>0.029733</td>
<td>0.003794</td>
<td>4</td>
<td>0.152788</td>
<td>0.220023</td>
</tr>
<tr>
<td>5</td>
<td>0.025801</td>
<td>0.000291</td>
<td>5</td>
<td></td>
<td></td>
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</tbody>
</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's

Variance Decomposition Test results are given in Table 7 above. They demonstrate that the reaction of FDI to ANW signal is positive with a high percentage change over the next ten years. This means that an increase in ANW over the next ten years will lead to an increase in FDI in the given four WB countries. Reaction of ANW to FDI impulse is positive, albeit with a lower percentage change over the next ten years. Hence, increase in FDI inflow will not significantly affect the growth in ANW in B&H, Montenegro, Macedonia and Serbia.

Table 7: Variance Decomposition Test

<table>
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<th>Variance Decomposition of lnANW</th>
<th>Variance Decomposition of lnFDI</th>
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</table>

Note: *** 0.01, ** 0.05 and * 0.10 represent statistical significance at the 1%, 5%, and 10% level, respectively.

Source: Author's
5. Conclusion

This paper investigated whether there is cointegration or causality between ANW and FDI in B&H, Montenegro, Macedonia and Serbia. For the aforementioned countries we used the time series 2007 - 2014. The research applied the econometric techniques such as LLC (2002), IPS (2003), ADF-Fisher (2001), PP-Fisher (2001) and Hadri Test (1999), Kao Cointegration Test (1998), Pedroni Cointegration Test (2004), Johanson Cointegration Test (1998), DOLS and FMOLS estimators, Vector Error Correction Estimates, Panel Granger Causality, Impulse Response Function and Variance Decomposition Test.

Having applied panel unit root tests, we concluded that there is a long-term integration between ANW and FDI. This indicates that there is a strong link between the increase in ANW and FDI inflow in B&H, Montenegro, Macedonia and Serbia, and vice-versa. In the case of Kao Cointegration Test, Pedroni Cointegration Test and Johansen Cointegration Test, we determined that there is a long-term relationship or cointegration between ANW and FDI for all four WB countries under analysis. Increase or reduction in FDI in these countries is in a long-term relationship with the increase or reduction in ANW, and vice-versa. The analysis of DOLS and FMOLS has shown that there is a long-term relationship between FDI and ANW for all four WB countries under analysis. This positive long-term relationship between FDI and ANW in the countries under analysis is explained by the fact that all analyzed countries saw record FDI inflows during 2007 and 2008, which affected the growth in ANW. This period was followed by the global economic crisis, which resulted in reduced FDI inflows and, consequently, in low growth in average net wages in the given countries.

Additionally, Vector Error Correction Estimates have shown that there is a long-term relationship between ANW and FDI in the four given WB countries. This means that increase in FDI inflow leads to growth in ANW, while the growth in ANW results in reduced FDI inflow. The results of Panel Granger Causality test demonstrate that there is only a unidirectional relationship between ANW and FDI in the case of B&H, i.e. that there is a short-term causality. Short-term causality means that FDI affect the growth of ANW, while ANW do not have a positive effect on attracting FDI. In the case of Montenegro, Serbia and Macedonia, there is neither short-run nor long-run causality between the analyzed variables. It can be stated for all the countries that there is no long-term relationship between FDI and ANW. On the other hand, the results of Impulse Response Function Test have shown that there will be a mutual positive reaction between ANW and FDI over the next ten years, i.e. ANW will grow as a result of increased FDI inflow, and vice-versa. Finally, having applied the Variance Decomposition Test, we determined that over the next ten years the growth in ANW will lead to increase in FDI inflow, but that the increase in FDI inflow will not have a significant impact on the growth in ANW in the four WB countries under analysis.
Literature


Appendix

Figure A1
Amount of FDI in B&H in the period 2007 - 2014

![Figure A1](image1)

Source: Author's

Figure A2
Average net wage in B&H in the period 2007 - 2014

![Figure A2](image2)

Source: Author's
Figure A3
*Amount of FDI in Montenegro in the period 2007 - 2014*

![FDI in Montenegro](chart1)

Source: Author's

Figure A4
*Average net wage in Montenegro in the period 2007 - 2014*

![Average net wage in Montenegro](chart2)

Source: Author's

Figure A5
*Amount of FDI in Macedonia in the period 2007 - 2014*
Source: Author's

**Figure A6**
*Average net wage in Macedonia in the period 2007 - 2014*
Figure A7
Amount of FDI in Serbia in the period 2007 - 2014

[Graph showing FDI in Serbia from 2007 to 2014]

Source: Author's

Figure A6
Average net wage in Serbia in the period 2007 - 2014

[Graph showing average net wage in Serbia from 2007 to 2014]

Source: Author's
Safet Kurtovic, PhD. Full professor
Faculty of Economics
Dzemal Bijedic University of Mostar
Mithada Hujdura Hujke bb, 88000, Mostar
Bosnia and Herzegovina
Tel: +38761760955
Email: safetkurtovic@yahoo.com

Sead Talovic, PhD.
Ministry of Foreign Trade and Economic Relations
Musala 9, 71000, Sarajevo, Bosnia and Herzegovina
Tel: +38761386523
Email: sead.talovic@bih.net.ba

Lejla Dacic, MA. Senior assistant
Faculty of Management and Business Economics,
University of Travnik
Aleja Konzula 5, 72270, Travnik
Bosna and Herzegovina.
Tel:+38762640400
Email: lejla.dacic1987@gmail.com.