The Asymmetric Effect of Foreign Direct Investment on the Net Average Wages of Southeastern European Countries

Kurtović, Safet and Maxhuni, Nehat and Halili, Blerim and Krasniqi, Bujar

University of Travnik, University Union Nikola Tesla

12 March 2021

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Abstract: There is a widespread belief in transition and growing economies that the relationship between FDI and wages is symmetrical. On the other hand, the problem of the nonlinear impact of FDI on wages has remained insufficiently explored. Therefore, this paper aims to determine whether there is an asymmetric effect of FDI stock on the net average wages within the eight SEE (Southeastern European countries) economies. We used the nonlinear autoregressive distributed lag (NARDL) and as well on the annual data for the period from 2000 to 2018. We found that there is an asymmetric impact of FDI stock on the net average wages of Bulgaria and Slovenia. In addition, we found that the symmetric effect is stronger compared to the asymmetric effect that the FDI stock has on the net average wages of Bulgaria, N. Macedonia, Montenegro, Serbia and Slovenia. Finally, we found that productivity, employment and education significantly affect solely Slovenia's net average wages.

Keywords: symmetry, asymmetry, wages, productivity, employment.
JEL Classification: F21, F23, J31

1 Introduction

In the late 1980s, the socialist regimes of the countries of Southeast Europe experienced a complete collapse. This was followed by a transition process from a centrally planned economic system to a market-oriented economic system (Kurtović et al. 2020a; Goh & Wong, 2014). Transition reforms have included economic reforms rule of law and social democratization. Economic reforms envisaged the privatization of state property, restructuring of economy, trade liberalization and integrative processes. Trade liberalisation led to the strengthening of international trade and FDI flows. At the end of the 1980s and the beginning of the 1990s, the first FDI inflows into transitional SEE economies were recorded. In the past three decades, FDI has been the main source of financial inflow into the SEE economies (De Mello, 1999).

Simultaneously with the liberalization of economies in transition countries, multinational companies introduce new technologies, knowledge, skills, increase productivity, increase market competitiveness of products, possess ability to keep the best workers, etc., (Bernard and Sjöholm, 2003; Harrison and Scorse, 2005; Decreuse and Maarek, 2015; Kurtovic, Talović and Dacić, 2015).

FDI inflow is affected by the economic competitiveness factors such as workforce availability, wage levels, managerial skills and workforce skills, access to inputs, infrastructure, ect. Among the stated factors, some of the most important factors in the process of attracting FDI are wages (Kurtovic, Talović and Dacić, 2015). There is a reciprocal relationship between FDI and wages. Low wages have a positive effect on FDI inflows, while an increase in FDI inflows has a positive effect on wage growth (Mutascu and Fleischer, 2010).

Multinational companies ensure higher wages than the local companies and thus affect the growth of average net wages in the host country. They pay higher wages as a result of greater variability in labor demand, poor knowledge of the local labor market, unfavorable legislation in the host country, productivity growth, etc., (Lipsey and Sjoholm, 2004; Lipsey, 2002; Almeida, 2007; Fabbri, Haskel and Slaughter, 2003; Ruane and Uğur, 2004; Heyman, Sjöholm and Tingvall, 2007; Almeida and Lince de Faria, 2014; Javorcik, 2015; Kurtovic, Talović and Dacić, 2015).

In this context, in 2000, the net average wage for SEE economies was 182 US dollars, while the volume of FDI inflows was only 669 million US dollars. This was followed by a significant increase in FDI inflows and wages. The year 2008 is considered to be a record year with average net wages for SEE economies at 653 US dollars and total FDI inflows of 4.166 billion US dollars. In the period from 2000 to 2018, the SEE countries achieved a total FDI inflow of 507 billion US dollars. The global financial crisis of 2007 and the post-crisis period had a negative impact on the reduction of FDI inflows and net average wages. Namely, after coming out of the recession in 2015, almost all SEE countries recorded a growth trend in FDI inflows and net average wages.[1]

Despite the prominent trends, there is still no consensus among economists and decision makers in SEE economies on the extent to which FDI affects wage growth. Nevertheless, the majority belief prevails that the growth of FDI inflows leads to wage growth, and vice versa. In addition, previous research has started from the assumption that the relationship between FDI and wages is symmetrical. As FDI inflows increase, so does wage growth, and vice versa. On the other hand, the problem of the asymmetric effect of FDI on wages has remained insufficiently explored.

Accordingly, it is necessary to evaluate the effect of the positive and negative changes in the decomposition of the partial sum of FDI on wages.
This paper will be among the first studies to evaluate the asymmetric effect of FDI stock on net average wages of SEE economies. This research has three objectives: a) to examine whether there is an asymmetric impact of FDI stock on net average earnings; b) to examine whether productivity, employment, education and trade openness affect net average wages; c) to examine whether the asymmetric effect is more dominant than the symmetric effect of FDI stock on net averages wages.
This study includes a sample of eight SEE countries (Albania, Bulgaria, Croatia, Montenegro, N. Macedonia, Romania, Serbia and Slovenia). We used the nonlinear autoregressive distributed lag (NARDL) and as well on the annual data for the period 2000 to 2018.
This study is structured as follows. Section 2 presents an overview of the literature and hypotheses. Section 3 presents the methodology and the description of the data source. Section 4 presents the research results and discussion and Section 5 conclusions.

2 Literature Review

In the literature, the relationship between FDI and wages is analyzed using three approaches - the neoclassical approach, the political economy approach and the sociological approach. The neoclassical approach holds that FDIs may have technological spillovers on wages. Foreign companies bring with them capital, knowledge and organizational skills and they influence the growth of local workers' productivity and earnings (Aitken, Harrison and Lipsey, 1996; Lipsey and Sjoholm, 2004; Decreuse and Maarek, 2015). The political economy approach points out that there is an imbalance between capital mobility and labor mobility due to deregulation, cultural and institutional factors. Foreign capital puts lower wages in the foreground as a motive for investing in the international market. Wages are no longer seen as a source of demand but as a cost (Bowles and Gintis, 1993; Blecker, 1996; Vijaya and Kaltani, 2007; Mehmet and Tavakoli, 2003). The social approach views FDI in the context of neo-colonialism in which capital from developed countries is used to strengthen control over developing countries (Bornschiera and Chase-Dunna, 1985). Moreover, foreign capital prevents the host country from developing a coherent internal economic structure and production process (Dixon and Boswell, 1996).
Further analysis will refer to the literature on which our research is based. Based on the results of research from previous studies, we point out that the impact of FDI on wages can be positive, negative and neutral. Feenstra and Hanson's (1997) work is included in the group of papers that determined the positive effect of FDI on wages. They used panel analysis for the period from 1975 to 1988. They found that FDI has a positive effect on wage growth in Mexico. Baldwin (1995) examined the effect of FDI on relative earnings for the OECD countries. He found that FDI has a positive effect on relative wages. Aitken, Harrison and Lipsey (1996) examined the effect of FDI on wages in Venezuela, Mexico, and the United States. They used OLS and two-stage least squares (2SLS) for the period 1987-1990. They found that FDI has a positive effect on wage growth in all three countries, while for the US alone there are wage spillovers. Faggio (2003) examined the effect of FDI on wage growth for Bulgaria, Poland, and Romania. She used panel analysis for the period from 1994 to 1997. She found that FDI has a positive effect on wage growth in all three countries. Lipsey and Sjöholm (2004), Ramasamy and Yeung (2005) and Ge (2006) investigated the effect of FDI on wages for Indonesian and Chinese provinces and large cities. They used dynamic panel analysis and found a positive effect of FDI on wages. Onaran and Stockhammer (2008) examined the effect of FDI and trade openness on wages for five CEES economies. They used panel analysis for the period 2000-2004. They found that FDI had a positive effect on wage growth, but not trade openness. Tintin (2012) examined the effect of FDI on average annual wages, minimum wages and labor income share for 40 OECD countries. He used panel analysis for the period 1990-2010. He found that FDI, trade openness, productivity and employment have a positive effect on wages.
In the group of papers that found a negative effect of FDI on earnings and productivity, we classify the research of Girma, Greenaway and Wakelin (1999) who examined FDI spillovers on wages in the UK. They used panel analysis for the period from 1991 to 1996. They found negative FDI spillovers on wages and productivity. Majid (2004), Vijaya and Kaltani (2007) found a negative effect of FDI, trade openness and employment on wages for developed and developing countries. For Mexico, Kato-Vidal (2013) examined the effect of FDI on wages. He used dynamic panel analysis for the period 1993-2010. He found that FDI negatively affects wages. Diaconu and Sterbuleac (2017) examined the effect of FDI, productivity and employment on wages for newly acceded EU members in 2004. They used OLS regression for the period 1993-2014 and they found a positive effect of productivity and employment on wages, but not a positive effect of FDI. Nguyena, Suna and Rabiul Alam Beg (2019) examined the effect of FDI on

domestic wages for Vietnam. They used panel analysis for the period 2009-2013. They found that FDI had a negative effect on wage cuts.
Finally, the group of papers that found a neutral effect of FDI on wages includes studies of Axarloglou and Pournarakis (2007), as well as the research of Waldkirch (2010), who found a neutral effect of FDI on wages for the United States and Mexico.
Finally, based on the arguments made in the literature review, the FDI stock hypothesis can be represented as it follows:
Hypothesis 1: We expect that those SEE economies with higher FDI stock will achieve stronger net average wages.
Hypothesis 2: We expect that those SEE economies with higher labor productivity, trade openness, education and employment will achieve stronger net average wages.

3 Empirical Methodology and Data Source

3.1 Theoretical framework

Shin, Yu and Greenwood-Nimmo (2014) developed a NARDL model that enables the simultaneous modelling of asymmetric linearity and cointegration between the basic variables within a single equation. With a view to enable a better understanding of the NARDL model, it is necessary to present the linear ARDL model requires the following two steps (Pesaran, Shin and Smith, 2001): the first step relates to the process of determining any significant long-run relationship between the variables using the Fisher statistics; the second step relates to the long-run relationship variables and determining their value and assessment of the short-run elasticity of variables showing the error correction representation of the ARDL model (Kurtović, Halili and Maxhuni, 2017). The ARDL model will be presented as follows:

$$\Delta \text{lwage}_{\text{it-1}} = \mu + \sum_{i=1}^{l} \tau_1 \, \Delta \text{lwage}_{\text{it-1}} + \sum_{i=1}^{l} \tau_2 \Delta \text{lfdi}_{\text{it-1}} + \sum_{i=0}^{l} \tau_{3,i} \, \Delta \text{lprod}_{\text{it-1}} + \sum_{i=0}^{l} \tau_{4,i} \, \Delta \text{lopen}_{\text{it-1}} + \sum_{i=0}^{l} \tau_{5,i} \, \Delta \text{ledu}_{\text{it-1}} + \sum_{i=0}^{l} \tau_{6,i} \, \Delta \text{lempl}_{\text{it-1}} + \beta_{1,i} \text{lwage}_{\text{it-1}} + \beta_{2,i} \text{lfdi}_{\text{it-1}} + \beta_{3,i} \text{lprod}_{\text{it-1}} + \beta_{4,i} \text{lopen}_{\text{it-1}} + \beta_{5,i} \text{ledu}_{\text{it-1}} + \beta_{6,i} \text{lempl}_{\text{it-1}} + \varepsilon_t. \quad \text{(A.1)}$$

where τ_1 and β_1 are short-run and long-run net average wages, τ_2 and β_2 are short-run and long-run of FDI stock, τ_3 and β_3 are short-run and long-run of productivity, τ_4 and β_4 are short-run and long-run of trade openness, τ_5 and β_5 are short-run and long-run of education (school enrollment, secondary - % gross), τ_6 and β_6 are short-run and long-run of employment, l is the number of lags and ε_t the error terms.
Testing of a long term relationship between the variables is done by means of bounds testing. The steps in the bounds process are based on the F or Wald statistics and represent the first phase of the ARDL method. The second phase relates to the F test of the null hypothesis of long-term variables with a time lag whose aggregate value equals zero, while in the case of the alternative hypothesis at least one long-term variable does not equal zero (Kurtović, Halili and Maxhuni, 2017).
The ARDL model disregards the asymmetric relationship between the variables. It starts from the assumption that the positive and negative changes of the explanatory variables have the same effect on the dependent variable. The application of the NARDL model measures the asymmetric long-term relationship between the variables (Kurtović et al. 2020b):

$$x_t = \lambda^+ y_t^+ + \lambda^- y_t^- + e_t. \quad \text{(A.2)}$$

Equation (2) represents an equilibrium between the dependent variable x and the y independent variable, divided into a positive ($\lambda^+ y_t^+$) and ($\lambda^- y_t^-$) negative effect (Kurtović et al. 2020b).
The NARDL model requires a decomposition of the FDI logarithm (Kurtović et al. 2020b):

$$y_t^+ = \sum_{i=1}^{t} y_i^+ = \sum_{i=1}^{t} \max(\Delta y_i, 0), \quad \text{(A.3)}$$

$$y_t^- = \sum_{i=1}^{t} y_i^- = \sum_{i=1}^{t} \min(\Delta y_i, 0). \quad \text{(A.4)}$$

where $\Delta y_t \equiv \Delta y_t + y_t^+ + y_t^-$. The partial decomposition process efficiently divides the FDI stock into positive (y_t^+) and negative (y_t^-). The initial value Δy_0 can be zero without losing significance (Kurtović et al. 2020b).
By incorporating equations (A.3 and A.4) into equation (A. 2), we obtain an asymmetric ECT (Error Correction Term) (Kurtović et al. 2020b):

$$\Delta x_t = \mu + \tau x_{t-1} + \vartheta^+ y_{t-1}^+ + \vartheta^- y_{t-1}^- + \sum_{i=i}^{v} \beta_i \Delta x_{t-i} + \sum_{i=i}^{v} (\alpha_i^+ \Delta y_{t-i}^+ + \alpha_i^- \Delta y_{t-i}^-) + e_t. \quad \text{(A.5)}$$

The ECT ensures an assessment of the relationship between FDI stock and net average wages in a dynamic and unique framework (Kurtović et al. 2020b).
Based on equation (5), the NARDL model will be presented as follows (Kurtović et al. 2020b):

$$\begin{aligned}\Delta \text{lwage}_{it} = {} & \mu + \tau_1 \text{fdi}_{it-1} + \tau_2 \text{prod}_{it-1} + \tau_3 \text{open}_{it-1} + \tau_4 \text{edu}_{it-1} + \tau_5 \text{emp}_{it-1} + (\vartheta_6 \text{fdi}_{t-1}^+ + \vartheta_7 \text{fdi}_{t-1}^-) + \\ & \sum_{i=1}^{v} \beta_8 \Delta \text{lfdi}_{it-1} + \sum_{i=1}^{v} \beta_9 \Delta \text{lprod}_{it-1} + \sum_{i=1}^{v} \beta_{10} \Delta \text{open}_{it-1} + \sum_{i=1}^{v} \beta_{11} \Delta \text{edu}_{it-1} + \sum_{i=1}^{v} \beta_{12} \Delta \text{emp}_{it-1} + \\ & + \sum_{i=1}^{v} \alpha_{13} \Delta \text{lfdi}_{it-1}^+ + \sum_{i=1}^{v} \alpha_{14} \Delta \text{lfdi}_{it-1}^- + e_t. \end{aligned} \quad \text{(A.6)}$$

where $\Delta lwage_{it}$ is the natural logarithm of net average wages, i.e. a dependent variable, $\Delta lfdi_{it-1}^+$ and $\Delta lfdi_{it-1}^-$ are the logarithmed partial values of the positive and negative changes of the FDI stock in the long run, $\Delta lprod_{it-1}$ is the logarithm of productivity, Δedu_{it-1} is education (school enrollment, secondary - % gross), $\Delta open_{it-1}$ is trade openness, Δemp_{it-1} is employment (total %), v is the lag order of the dependent variables and the lag order of the independent variables, while e_t is the error term in period t. The first part of equation (5) represents the long-run relationship and the second part is the associated short-run of the relationship.
The assessment of the NARDL model is a three-stage process. The first stage implies the testing of the long-term cointegration. The F-test or PPS tests the null hypothesis of no cointegration ($\tau = \vartheta^+ = \vartheta^- = 0$) against the alternative cointegration hypothesis ($\tau \neq \vartheta^+ \neq \vartheta^- \neq 0$), while the t-test tests the null hypothesis of $\vartheta = 0$ against the alternative hypothesis $\vartheta < 0$. The second stage implies testing the short and long run asymmetry ($\vartheta^+ = \vartheta^-$) using the Wald test. The Wald test confirmed the validity of our results as well as the fact that different models generate similar results. The third stage implies the application of dynamic multipliers (Kurtović et al. 2020b).

3.2 Data

In this section, we are going to present the variables from regression equation (6). Net averages wages represents a dependent variable and gross salaries from which social benefits and employee income taxes are deducted. Data for net average wages were obtained from the national statistics agencies of SEE countries. The inward FDI stock measures the cumulative value of the equity invested and the parent company's net loans (parent loans) provided to its subsidiaries or the subsidiaries resident in the host country. The inward FDI stock information was obtained from Unctad. Trade openness (% of GDP) represents the share of exports and imports in GDP. Trade openness includes freight, merchandise, transportation, insurance, license fees, royalties and other services. It excludes property income and excludes labour and transfer payments. The trade openness data (% of GDP) was obtained from the World Development Indicators. School enrollment, secondary (% gross) represents the coefficient of gross enrollment, regardless of age, of the population in the age group that corresponds to the official level of education. Data on school enrollment, secondary (% gross) was obtained from the World Development Indicators. Labour productivity or output per worker represents the total volume of output (GDP constant 2011 international US dollars in PPP) produced per unit of labour (measured in terms of the number of employed persons) during a given time reference period. Data on labor productivity were obtained from the ILO modelled estimates. Employment to population ratio represents the share of the population of a particular country that works. Persons aged 15+, (total%) and over are considered to be able-bodied. Data on the employment rate were obtained from the World Development Indicators.

4 Empirical Results and Discussion

The results of the F-test and t-test are given in Table 1. In one or both tests, the F-statistics (PSS) and the t-test (t_{BDM}) are above the upper critical value. Therefore, we can reject the null-hypothesis that there is no cointegration for the majority of variables. Tables A.1 and A. 2 (see Appendix) contains descriptive statistics and unit root.

Table 1. Bounds statistics

	Asymmetry		Symmetry	
Variable	F-test or PSS	t-test or t_{BDM}	F-test or PSS	t-test or t_{BDM}
ALB	6.28***	-4.31***	7.80***	-5.46***
BUL	23.52***	-6.99***	8.58***	-5.84***

CRO	22.20***	2.25	17.30***	-2.29
N. MAC	4.83***	-4.30***	6.08***	-4.86***
MNE	8.92***	-1.87	7.02***	-3.26***
ROM	3.07***	-0.82	5.96***	-1.98
SRB	5.37***	-3.47***	23.45***	-4.37***
SLV	4.08***	2.72***	4.98***	-4.49***

Note: Unrestricted constant and no trend.
*, **, and *** show significance levels at 10%, 5% and 1% respectively.
Source: Author's compilation

The results of the long-term and short-term asymmetry of the NARDL model are presented in Table 2. The lag length was obtained on the basis of the Akaike Information Criterion (AIC). In the long run, the change in the positive fdi^+ stock and change in the negative fdi^- stock have significant impact on net average wages of Bulgaria and Slovenia. Asymmetry impact of FDI stock on net average wage of Bulgaria ranges from 0.25% to -0.91% and Slovenia from 1.16% to -6.45%. Therefore, we cannot reject Hypothesis 1. An increase of 1% in the positive change in fdi^+ stock leads to increase of net average wages of Bulgaria for 0.25% and 1.16% for Slovenia. On the other hand, the negative change of fdi^- stock are negatively significant, meaning that there is a 1% decrease in the negative change in fdi^- stock leads to increase of net average wages for 0.91% in Bulgaria and 0.89% for Slovenia. The impact of the negative change of fdi^- stock is greater than the positive change of fdi^+ stock, thus confirming the asymmetric impact of the FDI stock on the net average wages of Bulgaria and Slovenia. On the other hand, in the short term, the coefficients of positive change in fdi^+ stock and a negative change in fdi^- stock are statistically significant only for Slovenia.

Table 2. Estimation results of asymmetric NARDL model

Variable	Long run of asymmetric							
Country	ALB	BUL	CRO	N. MAC	MNE	ROM	SRB	SLV
fdi^+	-0.094 [-0.624] (0.549)	0.254 [4.660] (0.009) ***	-0.530 [-0.919] (0.400)	-0.189 [-0.381] (0.718)	0.704 [4.871] (0.004) ***	1.061 [0.896] (0.411)	0.341 [2.033] (0.134)	1.161 [6.152] (0.008) ***
fdi^-	2.557 [1.554] (0.158)	-0.914 [-2.659] (0.055)**	0.783 [1.529] (0.186)	3.163 [1.959] (0.107)	-0.193 [-0.895] (0.411)	1.756 [0.161] (0.877)	3.281 [0.784] (0.489)	-6.459 [-7.498] (0.004) ***
$lprod$	3.243 [1.790] (0.037)	0.701 [2.415] (0.07)*	9.226 [1.774] (0.136)	7.533 [2.298] (0.069)	-2.022 [-1.734] (0.143)	-4.635 [-0.604] (0.572)	6.220 [1.212] (0.312)	4.014 [4.456] (0.021) **
edu	-1.133 [-0.632] (0.544)	-0.677 [-1.489] (0.210)	1.152 [0.228] (0.828)	-7.436 [-0.432] (0.683)	3.190 [3.240] (0.282)	-16.695 [-0.455] (0.668)	-0.356 [-0.095] (0.930)	-1.746 [-7.143] (0.005) ***
emp	-0.136 [-0.262] (0.799)	0.656 [1.347] (0.249)	3.156 [1.794] (0.132)	2.827 [1.100] (0.321)	-1.997 [-1.799] (0.131)	-8.168 [-0.455] (0.674)	1.836 [1.402] (0.255)	5.072 [4.653] (0.018) **
$open$	0.501 [0.461] (0.656)	-0.062 [-0.604] (0.578)	-2.515 [1.774] (0.163)	0.463 [0.764] (0.479)	0.039 [0.106] (0.919)	7.371 [0.548] (0.606)	-1.03 [-0.848] (0.458)	-1.871 [-2.631] (0.078)*
	Short run of asymmetric							
Country	ALB	BUL	CRO	N. MAC	MNE	ROM	SRB	SLV
$\Delta(fdi^+)$	-0.111 [-0.631] (0.545)	-0.818 [-6.214] (0.003)***	-0.417 [-3.747] (0.013) **	-0.157 [-0.387] (0.714)	0.784 [1.733] (0.143)	-1.380 [-0.810] (0.454)	0.047 [0.174] (0.872)	-0.249 [-0.814] (0.474)
$\Delta(fdi^+ - 1)$		0.489 [2.995] (0.040) **						2.339 [3.199] (0.049) **
$\Delta(fdi^-)$	2.557 [1.242] (0.249)	-1.755 [-2.061] (0.108)	0.252 [1.791] (0.133)	-0.110 [-0.066] (0.949)	-0.384 [-1.328] (0.241)	1.061 [0.190] (0.856)	-1.123 [-0.356] (0.744)	2.896 [1.050] (0.370)
$\Delta(fdi^- - 1)$								-13.009 [-2.511] (0.086) *
$\Delta(prod)$	0.501 [0.461] (0.111)	-5.061 [-4.747] (0.009)***	2.092 [3.278] (0.022) **	0.456 [0.154] (0.883)	-2.250 [-1.542] (0.183)	-7.816 [-1.541] (0.183)	3.669 [1.507] (0.228)	8.677 [2.226] (0.112)

$\Delta(prod-1)$		1.346 [2.873] (0.045)**	2.971 [4.385] (0.007) ***	6.290 [2.110] (0.088)*				-8.085 [-2.496] (0.087) *
$\Delta(edu)$	-1.333 [-0.659] (0.527)	0.983 [2.025] (0.112)	-3.253 [-3.298] (0.021) **	0.530 [0.068] (0.948)	-0.118 [-0.064] (0.950)	5.929 [0.440] (0.678)	2.699 [0.863] (0.451)	-2.001 [-1.451] (0.242)
$\Delta(edu-1)$								
$\Delta(emp)$	-0.160 [-0.259] (0.801)	-1.000 [-1.409] (0.231)	2.174 [3.845] (0.012) **	-1.323 [-0.551] (0.605)	-3.842 [-1.291] (0.252)	-4.936 [-0.654] (0.541)	4.134 [2.747] (0.070)*	18.656 [2.860] (0.064) *
$\Delta(emp-1)$			1.016 [5.020] (0.004) ***					10.217 [3.307] (0.045) **
$\Delta(open)$	-1.470 [-1.789] (0.111)	0.204 [0.915] (0.411)	-0.810 [-2.354] (0.065)*	0.386 [0.770] (0.475)	-0.182 [-0.418] (0.693)	1.565 [0.579] (0.587)	-0.193 [-0.332] (0.761)	-9.345 [-2.727] (0.072) *
$\Delta(open-1)$								-3.768 [-3.098] (0.045)**
ECT(-1)	-1.17***	-1.91***	-0.32***	-0.83***	-1.11***	-0.60***	-0.87***	0.95***
Adjusted R2	0.84	0.76	0.64	0.73	0.76	0.74	0.64	0.57
Wald Test	0.000	0.000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Unstable	Stable	Stable	Unstable	Stable	Stable
LM x^2_{SC}	0.0621	0.2848	0.1743	0.0696	0.3204	0.4539	0.1364	0.6549
Norm. x^2_{FC}	0.5786	0.8120	0.6582	0.7689	0.8762	0.8111	0.8341	0.8892
Heter. x^2_N	0.6345	0.2456	0.3184	0.8566	0.8974	0.4926	0.1538	0.2018
RESET	0.6298	0.3651	0.7662	0.5161	0.3342	0.0476	0.9714	0.5213

Note: *, ** and *** indicate "statistical significance" at 10%, 5% and 1% levels, respectively.
Source: Author's compilation

In the analyzed period, Bulgaria and Slovenia achieved growth of FDI stock except during 2010 when FDI stock decreased by 8% for Bulgaria and 6% for Slovenia. The decline in the FDI stock is a consequence of the 2007 global financial crisis. This was followed by a significant increase in FDI stock, which had a positive effect on the growth of net average wages. In the post-crisis period, Bulgaria and Slovenia took measures that facilitated the business of foreign investors, which led to the growth of FDI stock. On the other hand, in the long and short run, no asymmetrically significant effect of FDI stock on net average wages was found for the other countries in the sample. These countries had a significant decrease in FDI stock during the 2007 financial crisis and the post-crisis period. The process of recovering their economies and coming out of the recession lasted quite a long time (until 2015) and was followed by the growth of FDI stock and net average wages.

The results of the assessment, in the long run, showed that productivity is statistically significant at the level of 5% and that it has a positive effect only on the net average wages of Slovenia. An increase in productivity or output per capita by 1% leads to an increase in net average wages by 4%. Therefore, we cannot reject Hypothesis 2. Slovenia traditionally has the highest rate of productivity or output per capita compared to all other SEE economies, which implicitly means that it also has the highest net average wages. In the analyzed period, the average productivity for Slovenia was US dollars 60,000 per unit of labor, while for other SEE economies it averaged US dollars 41,288 per unit of labor. On the other hand, in the short run, productivity had a positive effect only on the growth of net average wages in Bulgaria and Croatia.

In the long and short term, employment is statistically significant at the level of 5% and has a positive effect only on Slovenia's net average wages. An increase in employment by 1% leads to an increase in net average wages by 4%. Therefore, we cannot reject Hypothesis 2. Slovenia also has the highest employment rate compared to other SEE economies. In the analyzed period, the employment rate averaged 54% for Slovenia, while for other SEE economies it averaged 47%. However, in Slovenia, in the post-crisis period or the period of depression from 2009 to 2016, there was a significant reduction in employment. In the long run, the decline in employment did not have a negative impact on the decline in net average wages. For other SEE economies, no significant effect of employment on net average wages was found. During the financial crisis of 2007 and the post-crisis period, these countries recorded a decline in economic activity and a decline in employment.

In the long run, education (school enrollment, secondary -% grosse) is negatively significant at the level of 1% and it has a positive effect only on the net average wages of Slovenia. A 1% reduction in the number of high school enrollments leads to a 5% increase in net average earnings. Therefore, we cannot reject Hypothesis 2. Slovenia in the case of education (school enrollment, secondary -% gross) has the highest average rate of 105% compared to other SEE economies whose average rate is 95%. In the period from 2004 to 2012, Slovenia recorded a significant decrease in secondary school enrollment. The decrease in the number of high school enrollments has led to a decrease in the number of high school graduates, which has led to an increase in labor demand and an increase in net average wages. It is common knowledge that FDIs are dominant in the industrial and service sectors of SEE countries and that mostly these sectors employ skilled labor. On the other hand, in the short run, education is significant only on Croatia's net average wages.

Finally, in the long run and short run, trade openness is not statistically significant on the net average wages of SEE economies. Therefore, we can reject Hypothesis 2. The results of our research are in line with theoretical assumptions and empirical results that point out that trade openness has a positive effect on net wages of developed economies and negatively on net wages of growing and transition economies. The insignificant effect of trade openness on net average wages of SEE economies shows that these countries have failed to sufficiently develop market structures and market competitiveness which would lead towards a positive effect on net average wages. These are economies, besides Slovenia, which are highly imported and in which the presence of foreign competition is not so strongly expressed.

Table 2 presents control statistics, such as the Wald test which shows that there is a long-term effect of FDI stock on net average wages. ECT (-1) (Error-Correction Term) indicates whether there is a long-term relationship between the variables. We found that ECT (-1) was significant and had a negative sign for all SEE countries. Finally, the results of diagnostic statistics and stability tests show that (Lagrange Multiplier, RESET test, Normality test, CUSUM and CUSUMSQ tests) there is no autocorrelation and ARCH effects, that there is optimal data distribution and stability of the residual of the model.

In Table 3, the results, in the long and short term, estimation of a symmetric ARDL model are presented. We found that there is a stronger symmetry effect relative to the FDI stock asymmetry on net average wages. In the long run, we found that there is a positively significant symmetry of FDI stock to net average wages of Bulgaria, N. Macedonia, Montenegro, Serbia and Slovenia. An increase of 1% in FDI stock leads to an increase in Bulgaria's net average wages of 0.16%, 0.69% in N. Macedonia, 0.92% in Montenegro, in Serbia 0.37% and 0.63% in Slovenia.

On the other hand, in the short run, we found for Bulgaria a negatively significant symmetry of FDI stock in the amount of -0.65% on net average wages. For other independent variables, we found that in the long run there was a significant effect of productivity and employment on Bulgaria's net average wages. In the long and short run, we did not find a linear effect on net average wages for other SEE countries. On the other hand, in the short term, we found only a positive symmetrical effect of FDI stock on the net average wages of Bulgaria.

Table 3. Estimation results of symmetric ARDL model

Variable	Long run of Symmetric							
Country	ALB	BUL	CRO	N. MAC	MNE	ROM	SRB	SLV
$lfdi$	0.106 [0.425] (0.680)	0.168 [2.975] (0.020) **	0.200 [0.846] (0.421)	0.693 [2.902] (0.017) **	0.920 [2.266] (0.053) ***	0.807 [1.474] (0.184)	0.378 [2.388] (0.038) **	0.627 [3.114] (0.012) **
$lprod$	1.304 [0.705] (0.498)	2.254 [8.138] (0.000***)	5.793 [1.555] (0.158)	0.744 [0.400] (0.698)	-1.111 [-0.280] (0.786)	-3.547 [-0.852] (0.422)	3.889 [1.507] (0.162)	-1.419 [-0.732] (0.482)
edu	-2.074 [-1.161] (0.275)	-0.679 [-1.299] (0.234)	-6.568 [-1.516] (0.167)	5.058 [0.982] (0.351)	1.778 [0.476] (0.646)	-10.748 [-0.981] (0.359)	-3.805 [-1.641] (0.131)	-0.813 [-1.332] (0.215)
emp	-0.575 [-0.665] (0.522)	1.021 [3.588] (0.008)***	1.259 [1.205] (0.262)	-2.053 [-2.121] (0.062)*	-0.695 [-0.286] (0.781)	-6.258 [-0.844] (0.426)	-3.805 [-0.172] (0.804)	1.045 [0.901] (0.391)
$open$	1.841 [1.930] (0.085)*	-0.324 [-1.899] (0.099) *	-2.633 [-1.649] (0.137)	0.373 [0.782] (0.454)	-1.111 [-0.706] (0.500)	5.883 [1.062] (0.323)	-0.786 [-1.567] (0.148)	0.801 [1.150] (0.279)
Variable	Short run of symmetric							
Country	ALB	BUL	CRO	N. MAC	MNE	ROM	SRB	SLV
$\Delta(fdi)$	-0.248 [-1.238] (0.246)	-0.656 [-3.490] (0.01) **	-0.084 [-1.104] (0.301)	-0.182 [-0.691] (0.506)	0.067 [0.802] (0.445)	-1.027 [-1.581] (0.157)	0.239 [1.630] (0.134)	0.140 [0.749] (0.472)
$\Delta(fdi-1)$		0.255		0.531	0.306			0.431

		[2.405] (0.047) **		[2.408] (0.039) **	[2.821] (0.022) **			[3.031] (0.014) **
$\Delta(prod)$	1.207 [0.693] (0.505)	-0.812 [-1.177] (0.277)	2.069 [2.396] (0.043)**	-2.245 [-1.351] (0.209)	-0.369 [-0.294] (0.775)	-7.609 [-1.861] (0.105)	2.458 [1.844] (0.095)*	-0.975 [-0.752] (0.470)
$\Delta(prod-1)$		3.416 [4.843] (0.001) ***	2.452 [2.853] (0.021)**					
$\Delta(edu)$	-1.920 [-1.142] (0.282)	-0.005 [-0.008] (0.993)	-2.779 [-3.117] (0.014)**	3.875 [0.976] (0.354)	-2.375 [-1.636] (0.140)	9.554 [1.689] (0.134)	-2.405 [-1.369] (0.200)	-0.559 [-1.259] (0.239)
$\Delta(edu-1)$								
$\Delta(emp)$	-0.532 [-0.657] (0.527)	1.548 [3.946] (0.005***)	1.753 [2.464] (0.039) **	-1.573 [-2.279] (0.048) **	-0.231 [-0.306] (0.767)	-4.762 [-1.295] (0.236)	1.979 [2.234] (0.049) **	-0.374 [-0.431] (0.676)
$\Delta(emp-1)$			0.532 [1.920] (0.091)*					
$\Delta(open)$	-0.436 [-0.514] (0.619)	-0.232 [-1.135] (0.293)	-1.114 [-[3.008] (0.016)**	0.285 [0.786] (0.451)	-0.878 [-2.152] (0.063) *	-4.762 [-1.236] (0.374)	-0.497 [-1.660] (0.127)	0.550 [1.138] (0.284)
$\Delta(open-1)$	1.704 [2.016] (0.074)*							
ECT(-1)	-0.92***	-1.51***	-0.42***	-0.76***	-0.33***	-0.76***	-0.63***	-0.68***
Adjusted R2	0.82	0.79	0.67	0.74	0.79	0.68	0.57	0.74
Wald Test	0.0000	0.0000	0.0000	0.0000	0.0000	0.0976	0.0000	0.0000
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Unstable	Stable	Stable	Stable	Stable	Stable
LM x^2_{SC}	0.0646	0.3239	0.3295	0.2055	0.1276	0.2372	0.3220	0.4765
Norm. x^2_{FC}	0.7375	0.6231	0.4383	0.0657	0.6516	0.8537	0.5714	0.7027
Heter. x^2_N	0.2253	0.6269	0.8717	0.9984	0.9173	0.4198	0.5941	0.5484
RESET	0.9902	0.4712	0.5254	0.2845	0.4545	0.0192	0.7456	0.9202

Note: *, ** and *** indicate "statistical significance" at 10%, 5% and 1% levels, respectively.
Source: Author's compilation

The cumulative dynamic multipliers showed the adjustment in net average wages to a new equilibrium level based on the positive change in fdi^+ stock and the negative change in fdi^- stock (Figure 1).[2] There is an asymmetry in the positive fdi^+ stock for Bulgaria and Montenegro. The asymmetry of the positive change of fdi^+ stock is more powerful than the symmetric of the negative change in fdi^- stock in the short and long run - the positive change in fdi^+ stock has a greater impact on net average wages on a new equilibrium level. In the short run, equilibrium for most countries is achieved in the second year. We found unstable behaviour for Bulgaria, while for most of the other countries we found stable behavior. The growth of FDI stock had a positive effect on establishing a new equilibrium level of net average wages in Bulgaria.

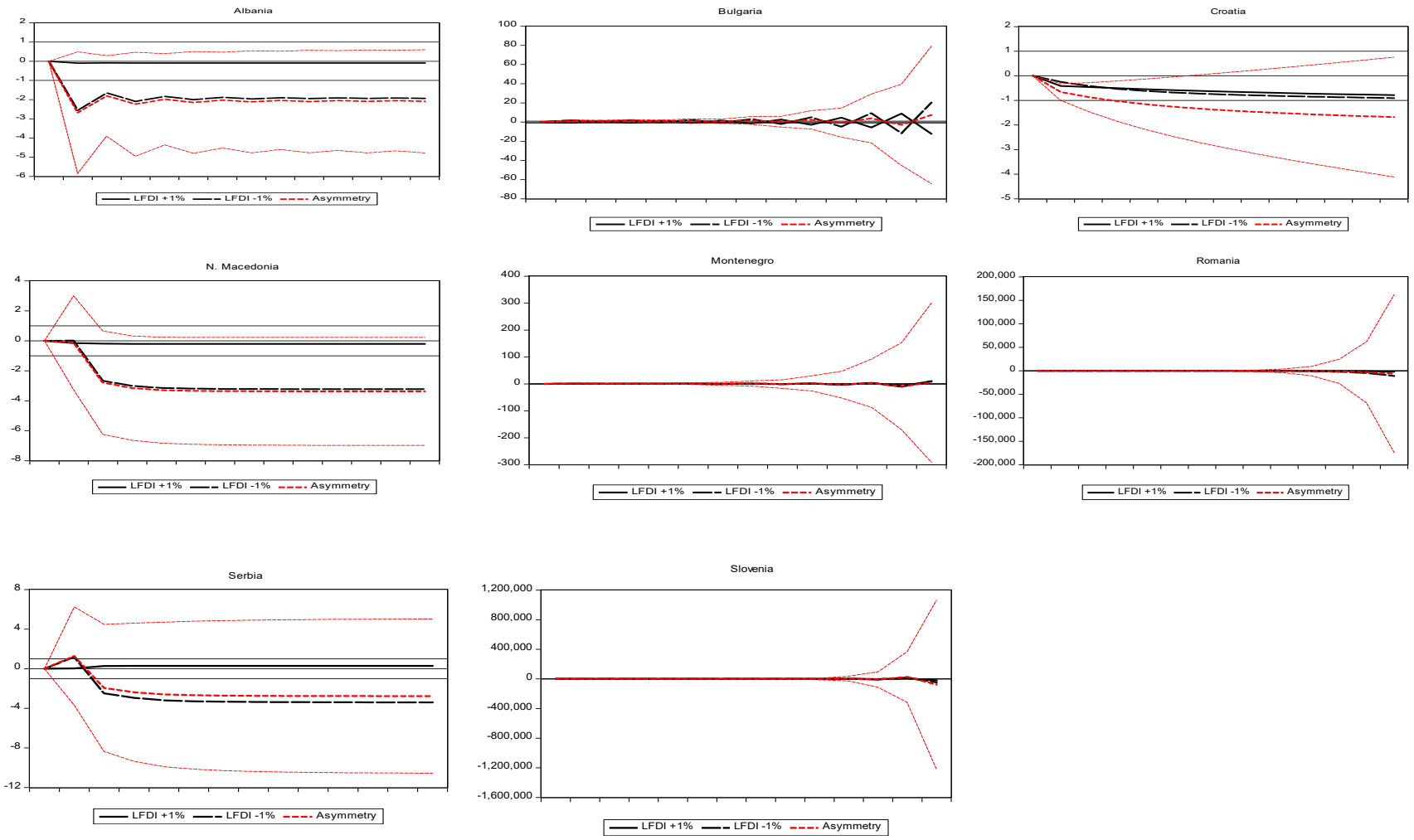

Figure 1. Dynamic multipliers for the NARDL model
Source: Authors

The next step in our work was to test the robustness of the results. We tested the research results using cross sectional dependence tests and a dynamic panel model pooled mean group estimator. We used cross sectional dependence tests to test whether there is an autocorrelation caused by external economic shocks and unobserved components. In Table 4 we can see that the estimated fixed and random effect coefficients are statistically significant at the level of 1%, thus confirming that there is a cross-sectional dependence between countries.

Table 4. Cross-section dependence tests

Test	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
Fixed effect (all countries)	81.286 0.0000***	7.120 0.0000***	6.898 0.0000***	5.141 0.0000***
Random effect (all countries)	93.677 0.0000***	8.776 0.0000***	7.279 0.0000***	6.416 0.0000***

Source: Authors' calculations

Table 5 shows the results of the coefficient estimation and the dynamic panel model pooled mean group estimator. In the long run, we found an asymmetric effect of a positive change fdi^+ stock and negative fdi^- stock on net average wages of eight SEE countries, while in the short term this impact was not found. The effect of negative fdi^- stock is greater than the positive change fdi^+ stock on net average wages. The results of the robust assessment in Table 5 differ from the results of the assessment in Table 2. The aggregate assessment provides a less objective and accurate assessment compared to the disaggregated assessment. Therefore, we cannot reject Hypothesis H1. The estimated coefficients show that there is a significant and a positive symmetrical effect of FDI stock on net average wages of eight SEE countries. Therefore, we cannot reject Hypothesis H1.

Table 5. Pooled Mean Group estimator

Variable	Asymmetry	Symmetry
	Long run	Long run
$lfdi$		0.447 [14.051] (0.000) ***
fdi^+	0.425 [13.188] (0.000)***	
fdi^-	0.758 [6.139] (0.000)***	
$lprod$	1.457 [5.443] (0.000)***	1.572 [5.290] (0.000) ***
edu	-3.299 [-6.676] (0.000)***	-4.154 [-8.233] (0.000)***
emp	-0.219 [-0.899] (0.370)	-0.337 [-1.462] (0.147)
$open$	-0.371 [-2.207] (0.000)***	-0.591 [-3.670] (0.000)***
	Short run	Short run
$lfdi$		-0.403 [-3.071] (0.002) ***
$\Delta(fdi^+)$	-0.401 [-2.123] (0.036)**	
$\Delta(fdi^-)$	0.190 [0.592] (0.555)	
$\Delta prod$	-0.564 [-1.825] (0.071)*	-0.682 [-1.341] (0.183)

	0.996	1.412
	[1.088]	[1.622]
Δedu	(0.279)	(0.108)
	0.857	1.086
	[1.933]	[2.692]
Δemp	(0.056) *	(0.008) ***
	-0.157	-0.182
	[-1.252]	[-1.466]
$\Delta open$	(0.214)	(0.146)
Wald test	0.0000***	0.0000***
ECT(-1)	-0.58	-0.57

*, ** and *** indicate "statistical significance" at 10%, 5% and 1% levels, respectively.
Source: Authors' calculations

In the long and short term, there is a significant asymmetric and symmetric effect of productivity on net average wages. Our results are robust and are in line with our results in Table 2. Therefore, we cannot reject Hypothesis H2. Likewise, in the long and short run, the assessment of education (school enrollment, secondary -% grosse) showed that there is a negatively significant asymmetric and symmetric effect on net average wages. Our results are robust and are in line with our results in Table 2. Therefore, we cannot reject Hypothesis H2. Finally, in the long run, trade openness and employment are asymmetrically and symmetrically insignificant on net average wages. Therefore, we cannot reject Hypothesis H2. On the other hand, in the short run, we found that employment was statistically significant asymmetrically and symmetrically to net average wages. Therefore, we can reject Hypothesis H2. Our results are robust and are in line with our results in Table 2.

5 Conclusion

This paper measures the asymmetric effect of inward FDI stock on the net average earnings of SEE countries. We used the nonlinear NARDL model and a sample of eight SEE countries (Albania, Bulgaria, Croatia, Montenegro, N. Macedonia, Romania, Serbia and Slovenia) and the annual data for the period from 2000 to 2018.
Based on the results of the research, we can conclude the following: 1) in the long run, we found that there is an asymmetric impact of FDI stock on the net average wages of Bulgaria and Slovenia. In the short term, there is an asymmetric impact of FDI stock on the net average wages of Slovenia; 2) in the long run, we found that productivity has a significant impact on the net average wages of Slovenia, while in the short-term it has a significant impact on the net average wages of Croatia and Bulgaria; 3) in the long and short term, we found that employment has a significant impact only on the net average wages of Slovenia; 4) in the long run, we found that education has a significant impact on the net average wages of Slovenia, while in the short run has a significant impact on the net average wages of Croatia; 5) in the long run and short run, we found that trade openness is not significant on net average wages; 6) we found that the symmetric effect is stronger compared to the asymmetric effect of FDI stock on the net average wages of Bulgaria, N. Macedonia, Montenegro, Serbia and Slovenia.
The main implication of our study is that the symmetric approach is more dominant than the asymmetric approach in estimating the effect of FDI stock on the net average wages of SEE economies. The results of the research may suggest to policy makers that the growth of net average wages of SEE countries depends on policies and measures to attract FDI. It is necessary to use measures that will increase the inward FDI stock (to take measures to attract and encourage FDI, the creation of free trade zones, the improvement of the quality of infrastructure and institutions, etc.), develop market structures and improve the competitiveness of the economy, increase productivity, increase employment, improve education and trade openness, etc.
Finally, due to lack of data, we were unable to examine the asymmetric effect of inward FDI stock on the net average wages of industrial sectors of the SEE economies.

Note:

1. The figures are based on data from the national statistics agencies of SEE countries
2. The positive change in fdi^+ stock is represented with a bold black line while the negative change in fdi^- stock is presented with a dotted black line. These are the curves representing the adjustment of net average wages based on the positive change in fdi^+ stock and the negative change in fdi^- stock. The central red dotted line denotes the asymmetry and represents a difference between the positive change in fdi^+ stock and the negative change of fdi^- stock. The two red dotted lines indicate the upper and lower boundaries of statistical significance at the 5% level.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Appendix

Table A.1: Descriptive statistics

Variable	fdi_t		$prod_t$		$wage_t$	
Country	Mean	Stan. Dev	Mean	Stan. Dev	Mean	Stan. Dev
ALB	7.598	1.097	10.088	0.226	5.449	0.471
BUL	10.032	1.058	10.452	0.165	5.762	0.620
CRO	9.809	0.839	10.872	0.089	6.672	0.306
N. MAC	8.030	0.690	10.462	0.082	5.656	0.602
MNE	8.329	0.628	10.672	0.048	5.925	0.679
ROM	10.609	0.912	10.557	0.270	5.737	0.688
SRB	9.353	1.224	10.672	0.048	5.926	0.719
SLV	9.092	0.571	11.001	0.094	6.895	0.371
Country	edu_t		emp_t		$open_t$	
	Mean	Stan. Dev	Mean	Stan. Dev	Mean	Stan. Dev
ALB	4.441	0.112	3.865	3.713	4.274	0.108
BUL	4.545	0.056	3.851	0.075	4.677	0.199
CRO	4.556	0.057	3.817	0.042	4.446	0.086
N. MAC	4.401	0.026	3.624	0.079	4.579	0.197
MNE	4.535	0.029	3.659	0.073	4.643	0.120
ROM	4.491	0.074	3.946	0.051	4.215	0.191
SRB	4.518	0.032	3.791	0.070	4.353	0.347
SLV	4.648	0.571	3.992	0.031	4.852	0.147

Source: Authors' calculations

Table A. 2: Unit root tests

Variable	Δfdi_t			$\Delta prod_t$			$\Delta wage_t$		
Country	ADF Ho: I(1) c,t	PP Ho: I(1) c,t	KPSS Ho: I(0) c,t	ADF Ho: I(1) c,t	PP Ho: I(1) c,t	KPSS Ho: I(0) c,t	ADF Ho: I(1) c,t	PP Ho: I(1) c,t	KPSS Ho: I(0) c,t
ALB	-5.877***	-8.753***	0.484***	-4.822***	-6.244***	0.183**	-4.974***	-8.466***	0.166**
BUL	-4.272**	-4.406**	0.135	-4.016***	-7.232***	0.160**	-4.246***	-8.921***	0.402***
CRO	-4.766***	-4.909***	0.157***	-5.350***	-4.667***	0.160**	-3.866**	-3.894**	0.155**
N. MAC	-3.827**	-3.855**	0.164**	-5.048**	-5.357***	0.165**	-3.640**	-8.395***	0.213***
MNE	-4.328**	-4.583**	0.172**	-5.405***	-5.495***	0.151**	-4.671**	-8.298***	0.148**
ROM	-4.179***	-4.892***	0.246***	-4.043**	-14.395***	0.224***	-3.854**	-3.853**	0.113
SRB	-3.542*	-7.484***	0.171**	-5.405***	-5.427***	0.151**	-3.943***	-4.826***	0.177**
SLV	-4.431**	-5.122***	0.227***	-4.580***	-6.292***	0.345***	-5.021***	-3.698**	150**
Variable	Δedu_t			Δemp_t			$\Delta open_t$		
Country	ADF Ho: I(1) c,t	PP Ho: I(1) c,t	KPSS Ho: I(0) c,t	ADF Ho: I(1) c,t	PP Ho: I(1)	KPSS Ho: I(0) c,t	ADF Ho: I(1) c,t	PP Ho: I(1) c,t	KPSS Ho: I(0) c,t
ALB	-7.014***	-11.741***	0.134	-6.036***	-3.724**	0.362***	-4.820***	-5.895***	0.175**
BUL	-3.859**	-3.678**	0.224***	-5.281***	-5.297***	0.135	-4.833***	-4.630***	0.253***
CRO	-5.231***	-5.353***	0.147**	-4.090***	-4.105***	0.233***	-3.836**	-3.840**	0.345***
N. MAC	-4.143***	-6.136***	0.153**	-3.207	-9.333***	0.160***	-4.681***	-7.565***	0.358***
MNE	-5.168***	-10.552***	0.177***	-4.791***	-4.783***	0.113	-3.931**	-3.987**	0.178**
ROM	-5.478***	-5.268***	0.123	-5.009***	-6.283***	0.163**	-4.451***	-6.331***	0.472***
SRB	-4.418**	-3.927**	0.153**	-3.853**	-0.608	0.151**	-5.806***	-5.364***	0.156**
SLV	-4.691***	-9.462***	0.170**	-4.141**	-3.967**	0.139	-3.817**	-4.329**	0.199**

Note: c, t indicate that the tests include a constant and time trend. *, ** and *** indicate "statistical significance" at 10%, 5% and 1% levels, respectively.
Source: Authors' calculations