Journal of Economic Integration

Vol. 39, No. 1, March 2024, 55-85
https://doi.org/10.11130/jei.2024008

pISSN: 1225-651X eISSN: 1976-5525

Monetary Integration Effects on Foreign Direct Investments in New EU Member States

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Abstract This study examines the impact of accession to the Economic and Monetary Union (EMU) on foreign direct investment (FDI) inflows in the 11 New Member States (NMS), during the period 2005-2018. Using panel regression analysis and the gravity model, the influence of macroeconomic indicators on FDI outflows from 21 industrialised countries (including EU and non-European counties, such as Japan and USA) to the NMS is assessed. The empirical results suggest that favourable macroeconomic indicators in the NMS, such as a stable exchange rate, lower inflation, long-term interest rates and EU/EMU membership, are positively correlated with FDI inflows from NMS. Conversely, rising inflation and exchange rate volatility in the NMS are negatively associated with FDI inflows, while inflation in the FDI origin countries is positively correlated with investment in the NMS. The results suggest that joining the EMU has a statistically significant and positive relationship on FDI inflows to the NMS.

Keywords: foreign direct investments - FDI, monetary integration, European economic integration (EU and EMU), gravity model, panel-regression analysis

JEL Classifications: F21, F15, E12, N31, C23

Received 21 July 2023, Revised 4 December 2023, Accepted 7 December 2023

I. Introduction

The end of the 20th century and the beginning of the 21st century have been characterized by significant capital movements and unprecedented technological progress, which have translated into remarkable economic growth. Foreign Direct Investments (FDI) have proven to be an important driver of this growth, offering significant potential for the development and modernization of host countries (Vig, 2018). In transition countries, FDI can facilitate the processes of privatization and restructuring of former state-owned enterprises through the knowledge and experience of foreign investors. This can be beneficial for the Eastern

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Acknowledgment: This research was realized as part of the scientific project "PROBLEM-2020 / PROtectionism, Between open Liberalism and Economic Meltdown in 2020-ies?" (ZIP- UNIRI-130-3-20)

enlargement countries of the European Union (EU) as they face economic challenges that require significant FDI inflows to catch up with their Western counterparts in terms of competitiveness.

Most theoretical and empirical studies on FDI emphasise the importance of stable and large markets as crucial determinants of international capital movements. To create favourable business conditions and an investment-friendly environment, it is essential to address exchange rate risks and price volatility. This is precisely one of the main objectives of monetary integration in Europe, including facilitating price comparisons within the European single market. Consequently, regional integration in Europe is proving to be a viable solution to attract foreign capital. The integration of the New Member States - NMS into the Single Market with a common currency could mitigate potential risks by significantly reducing idiosyncratic exchange rate risks and, to some extent, inflation risks, while facilitating access to the wider European market.

So, the question arises: Can EU membership, followed by membership in the EMU, attract FDI inflows to the NMS on a larger scale? Answering this question leads to further research, e.g., to identify the specific channels through which EMU membership can attract FDI and to explore the possibility of quantifying the impact of these channels.

The objective of this paper is to examine the impact of NMS monetary integration on FDI inflows and to contribute to the existing literature in this area. The focus of this study is on the relationship between NMS monetary integration and FDI inflows, taking into account the influence of macroeconomic indicators in the NMS, such as: The level of the real effective exchange rate and its volatility, inflation, long-term interest rates, central bank interest rates and the level of financial development of the country. These indicators can be considered as quantitative channels through which monetary integration attracts FDI. The empirical analysis conducted in this research also includes other important macroeconomic factors that may attract foreign investment, such as the size and openness of the economy, taxes and legal restrictions on foreign investment. Our empirical analysis also includes the assessment of the direct impact of EU and EMU integration through dichotomous variables defining EU membership and EMU. Most of the above macroeconomic indicators were empirically estimated for the origin and incoming countries of capital flows. However, all variables that did not show statistically significant relationships with the dependent variable in the stepwise regression procedure were dropped from the models used for the estimations.

To achieve our goal, we employ panel data analysis, specifically using a gravity equation framework that has been used in similar research (Wei and Choi, 2002; Schiavo, 2007; de Sousa and Lochard, 2011; Barrel et al., 2017; Sondermann and Vansteenkiste, 2019). The gravity equation framework provides a robust approach for analysing bilateral FDI flows, while the ordinary least squares (OLS) estimator is used to estimate the model parameters.

Since previous studies have mainly focused on the impact of monetary integration in the old EU Member States and few studies have been conducted in the specific context of the

NMS, this paper complements the existing literature by filling the research gap regarding the impact of monetary integration on FDI inflows in the NMS. By analysing a unique sample of 11 NMS (Bulgaria, Croatia, Czechia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia, Slovenia) and 21 industrially developed countries, i.e., Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Korea Republic, the Netherlands, Norway, Spain, Sweden, Switzerland, Turkey, United Kingdom and the United States, from which investment flows to the NMS are statistically recorded. Our aim is to fill the gap and provide insights into the relationship between NMS' monetary integration and FDI inflows. The contribution of this research lies in its examination of the impact of NMS monetary integration on FDI inflows, its consideration of additional indicators, and its focus on unique sample of NMS. The results of the research can provide information to policy makers and guide further the integration process of NMS, also to increase their attractiveness to foreign investors.

This paper consists of several separate but interrelated sections. In the next section, we begin with a review of previous research. In the third section, we define the sample and the key research variables. The fourth section defines the methodology and models, necessary diagnostics, and research results. The fifth section discusses the main findings of the research, which are compared with previous research in the field, advantages and disadvantages, and potential improvements for future research. In the sixth section, we summarize all our findings and their implications.

II. Literature Review

Most empirical studies examine the impact of monetary unions on FDI through the influence of exchange rates and other monetary indicators on FDI movements. For this reason, we first analyse papers that consider exchange rate effects on FDI movements independently of currency integration. Some previous studies point to neutral or positive relationship of exchange rate volatility on FDI inflows. Studies reporting positive relations include those by Cushman (1985 and 1988), Markusen (1995) and Goldberg and Kolstad (1995). It is worth noting that these studies in general use similar methodologies, i.e., linear regression.

The second group of studies report neutral effects of exchange rate volatility on FDI inflows. Bailey and Tavlas (1991) used linear regression methods and found no exchange rate effects on investment movements. Similarly, Görg and Wakelin (2002), Flam and Nordstrom (2007) found neutral relations of the exchange rate and FDI inflows.

The largest group of studies concludes that exchange rate volatility has a negative influence on the movement of FDI, while some of them show a positive impact of some form of a currency union. The list of studies that report negative impacts of exchange rate volatility on

FDI inflows includes: Aizenman (1992), Bénassy-Quéré at al. (2001), Wei and Choi (2002), Servén (2003), de Sousa and Lochard (2004, 2011), Aristotelous (2005), Schiavo (2007), Brouwer et al. (2008), Furceri and Borelli (2008), Schmidt and Broll (2009), Aristotelous and Fountas (2012), Kilic at al. (2014), Lily et al. (2014), Martins (2015), Cambazoğlu and Güneş (2016), Barrell et al. (2017), Pathan (2017) and Sondermann and Vansteenkiste (2019).

Since aforementioned studies deal with the impact of exchange rates and/or the integration of economies or currency blocs on FDI inflows, we focused on the few studies that are significantly similar to ours: mostly concerning similar samples and research methods. These are especially: Schiavo (2007), Brouwer et al. (2008), de Sousa and Lochard (2011), Dinga and Dingová (2011) and Barrell et al. (2017).

Schiavo's (2007) study examines the impact of EMU and exchange rate volatility on FDI flows. Schiavo (2007) uses a panel regression analysis with log-linear gravity equations and applies fixed effects, OLS estimators and a Tobit model. The dependent variable in his study, i.e., annual FDI flows, comes from the OECD International Direct Investment Database. Independent variables are host and home country GDP, dummy variables for monetary union, and short and long-term proxies for the volatility of the real effective exchange rate. The Schiavo (2007) sample included: Australia, Austria, Belgium and Luxembourg, Canada, Czechia, Denmark, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States, i.e., OECD member countries. The study suggests that the introduction of a common currency that reduces exchange rate uncertainty can stimulate investment flows. The Tobit model used in the empirical analysis supports the theoretical prediction and suggests that the removal of exchange rate volatility is not the only channel through which monetary unions operate. Even when participation in the Exchange Rate Mechanism (ERM) is controlled by introducing a dummy variable, monetary union still has a significant positive effect on FDI.

Brouwer et al. (2008) examine the investment and trade effects of a possible expansion of the Economic and Monetary Union (EMU) to ten countries that joined the EU in 2004. They analyse a dataset comprising the 25 EU Member States in 2004 and a control group consisting of Canada, Japan, USA and Switzerland. This yields 29 bilateral relationships per country from 1990 to 2004. The analysis uses panel regression, employing one-way and two-way gravity component error models to estimate unbalanced panel data and the distribution of FDI stocks across the listed countries. Explanatory variables in the models include log values of a country's GDP, changes in the trade balance, distance, volatility of the exchange rate (both appreciation and depreciation) and dummy variables representing language, EU membership and EMU membership for both old and new Member States. The results of the study show that FDI is negatively related to exchange rate depreciations and volatility and that EMU membership is positively correlated with FDI. The analysis by Brouwer et al. (2008) also shows that the potential enlargement of EMU, which includes new EU countries, can have a positive impact on FDI inflows.

De Sousa and Lochard (2011) investigated whether the introduction of the euro can explain the rapid increase in investment in Europe. Their sample included 11 members of EMU (Austria, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, and Belgium/ Luxembourg combined) and 10 non-members of EMU (Australia, Canada, Denmark, Japan, Norway, Korea Republic, Sweden, Switzerland, the UK and the US). The authors argue that currency integration can promote FDI inflows by lowering transaction costs. To assess the relationship between membership in EMU and FDI inflows, they use a simple gravity model and an OLS estimator. Explanatory variables in their model include member countries' GDP, exchange rate volatility, the attractiveness of alternative locations, unit labour costs, labour laws, statutory tax rates and macroeconomic risks of each country. The study covers 21 member countries, including eleven EMU members and ten non-member countries. Their empirical analysis shows that the introduction of the euro has significantly increased the inflow of FDI in EMU countries. However, the authors find that this effect varies by EMU member and was higher for less developed EMU member countries than for highly integrated members. This phenomenon is explained by the assumption that less developed countries might increase their investments due to lower transaction costs or greater investment opportunities as a result of cost reductions. Contrary to expectations, the empirical analysis shows that EMU members invested more in non-member countries, while EMU members did not experience a significant increase in FDI inflows from outside the euro area. It must be stressed, however, that the results of their empirical analysis showed a positive correlation between the volatility of the exchange rate, calculated by the standard deviation, and FDI inflows.

Dinga and Dingová (2011) examine the impact of the establishment of the EMU on international FDI movements. They apply a gravity model to show the relationship between the creation of the European Monetary Union and bilateral FDI flows. However, Dinga and Dingová (2011) use an OLS estimator and a Tobit model because they believe that OLS estimates may be biased. In their model, the explanatory variables for FDI include GDP, unit labour costs, short- and long-term exchange rate volatility, a common border, language, and EU membership and EMU as dummy variables. The study is conducted with data from 1997 to 2008 and covers a sample of 35 countries, including 29 OECD member countries and 6 non-OECD countries. The results of their empirical analysis (Dinga and Dingová, 2011) show that the relationship between membership in EMU and bilateral FDI flows is negligible. Conversely, their analysis shows that EU membership is significantly positively correlated with FDI flows using the Tobit model. However, the results differ when the models are estimated with OLS. They show a positive and significant correlation between EMU and FDI inflows and a negative correlation between FDI and exchange rate volatility.

Barrell et al. (2017) examine the impact of bilateral exchange rate volatility on foreign direct investment (FDI) from 14 advanced countries (Austria, Belgium, Canada, France, Germany, Italy, Japan, Korea Republic, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States) relative to other OECD member countries for the period 1995-2012. To assess the impact of crises, EU and EMU membership and exchange rate stability on bilateral FDI, the authors use a gravity model in a dynamic panel framework. Exchange rate volatility is estimated using the GARCH (1,1) method. The model incorporates several explanatory variables consistent with the theoretical determinants of FDI, including bilateral exports, the index of economic freedom for both countries, productivity measured by unit labour costs, geographical distance and dummy variables indicating common borders, membership in certain customs and currency unions, and financial and systemic banking crises. The empirical analysis shows that both exchange rate fluctuations and EU membership significantly affect FDI. The panel regression analysis shows that the share of bilateral FDI is influenced by both gravitational factors (distance and GDP) and non-gravitational factors (risk, as measured by exchange rate volatility and the economic freedom index). In particular, higher GDP and greater geographical distance between countries have a positive effect on FDI, while the results support the hypothesis that exchange rate volatility plays a role in investment decisions, confirming the commonly held view that this relationship is negative.

This paper not only adds to the existing literature on the impacts of monetary integration on FDI in the NMS but extends the analysis by considering the impact of additional indicators such as the financial development index, the legal constraints index on foreign investment, central bank and long-term interest rates, and two different measures of exchange rate volatility. By including these variables in the analysis, we aim to provide a comprehensive assessment of the factors affecting FDI inflows to the NMS. Our study also shows many similarities in terms of the positive impact of lower inflation and exchange rate risks in the NMS on FDI inflows, both qualitatively and to some extent quantitatively. The differences that exist between our study and the previous ones can be attributed to differences in variables, sample and estimators. These differences and comparisons are explained in more detail in the discussion section of the paper.

III. Sample and research variables

In the following subsections we define the sample for this research and the variables used for the empirical part of the research.

A. Sample

The sample consists of 11 new members that joined the Union in 2004, or later: Estonia, Latvia, Lithuania, Slovakia, and Slovenia - which were gradually integrated into the EMU, and the remaining six countries that had not yet joined the EMU (at the time of this research) - namely Czechia, Hungary, Poland, Romania, Bulgaria and Croatia. These countries are referred to as incoming countries (*i*) and paired with industrially developed investment origin countries (*o*) according to the panel gravity approach. The analysis covers the period 2005-2018 and includes data from 21 industrially developed countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Korea Republic, the Netherlands, Norway, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. Following this logic, we have created a panel consisting of 231 country pairs. The country pairs are set in a way that each country of origin (*o*) is associated with each incoming country (*i*) of capital flows.

B. Selection of dependent and explanatory variables

Considering that there are various indicators of FDI inflows, the dependent variables were selected based on previous empirical research. According to which, it is believed that the most appropriate and commonly used measure of FDI inflows is the total amount of FDI stocks or positions in a selected period (Barrell et al., 2017). The findings that FDI stocks are the most appropriate measure of FDI inflows can be found in the studies by Egger and Merlo (2007), Baltagi et al. (2007), Stein and Daude (2007), Cardamone and Scoppola (2015) (in Barrell et al., 2017).

FDI stocks measure the total amount of direct investment at a given point of time, with FDI stocks classified into inflows and outflows, according to the direction of investment. In this analysis, we use outward FDI stocks from industrially developed countries to the NMS obtained from the OECD database (OECD, 2020a). To analyse the data, FDI stocks are converted into unit amounts, deflated by the GDP deflator and logarithmised by the *natural logarithm (log)* and denoted as $logFDI_{iot}$.

According to the principles of the model, the gravitational variables are the size of the economy and distance. In this study, distance is approximated by variables that are negatively associated with investment inflows, such as exchange rate volatility and inflation.

Market size is approximated by the value of gross domestic product (GDP) at constant prices, with 2010 as the base year. It is a measure that includes the total value added of all producers within a country, including product taxes, while excluding subsidies not included in the product value. The conversion from national currencies to U.S. dollars is based on official 2010 exchange rates. According to theory, relevant models, and previous research, we expect a positive relation between GDP and FDI inflows in the NMS. GDP values have been *logarithmised* prior to empirical analysis and these variables are referred to as $logGDP_{it}$ and $logGDP_{ot}$.

The following variables were also used in order to form an augmented gravity equation: openness of the economy, regulatory or legal restrictions on FDI, statutory tax rates, real effective exchange rates, interest rates, inflation, financial development index, EU and EMU membership. In the following text we provide descriptions for each of these variables. Table A1 in the Appendix shows the data sources and the authors who have previously used them in empirical research.

The openness of the economy (OPN_{it} and OPN_{ot}) is approximated by the share of imports and exports in the GDP. The data for the openness indicator are expressed as a percentage (%). According to the relevant theory of economic openness and previous research, we expect a positive or neutral relation between the openness of the economy and FDI inflows to the NMS.

The index of regulatory restrictions on FDI (IRR_{it}) measures regulatory restrictions on FDI in 22 sectors of the economy. This index is scaled from zero to one, with zero representing minimum investment limits and one representing maximum investment limits. Following the economic logic, we expect a negative relation between the regulatory index and FDI inflows in the NMS. This variable was only tested for the incoming countries of capital flows.

The statutory corporate tax rates (TAX_{it}) reflect the basic statutory corporate tax rate (ceiling) of the central government. Tax rates are expressed in percentages (%). Consistent with theory and previous research, we expect a higher tax to have a negative or neutral effect on FDI inflows to the NMS. This variable was only tested for the incoming countries of capital flows.

The financial development index (F_{it}) is an indicator of the development of the financial system. It is composed of two important sub-indicators describing financial institutions and financial markets. The index is scaled in values from zero (underdeveloped financial system) to one (most developed financial system). There are only two studies that examine how financial system development affects FDI inflows (Al Nasser and Gomez, 2009; Kinda, 2010). However, it is assumed that a more developed financial system makes it easier to do business, indicating a likely positive relation with FDI inflows, which is consistent with the findings of the above studies.

Real effective exchange rates (ε_{it}) are a summary measure of changes in a country's exchange rates relative to its major trading partners. The ε_{it} value used in this paper is based on the CPI deflated value of nominal effective exchange rates for the IC37 series with the base year 2010. The values of exchange rates in the empirical analysis represent the values of effective exchange rates for the incoming countries. As the ε_{it} data was reported for each month, the annual values represent monthly averages for each year, in order to adjust them for the analysis. The values of the real effective exchange rate for the investment outflow countries are recorded on an annual basis. According to theory we expect positive relation between ε_{i} and FDI inflows in the NMS.

The first measure of exchange rate volatility ($\sigma'_{\varepsilon it}$) is calculated using the standard deviation of the available monthly data for real effective exchange rates (ε_{it}).

The values for the second measure of exchange rate volatility ($\sigma_{\varepsilon it}$) are calculated as the ratio between the standard deviation of the exchange rate and the product of the arithmetic mean of the exchange rate multiplied by the sign of the coefficient of asymmetry of exchange rate, according to the formula:

$$\sigma_{\varepsilon it} = \frac{STDEVP}{AVERAGE^{*} \dfrac{SKEW}{ABS(SKEW)}} \tag{1}$$

Exchange rate volatility is calculated only for the incoming countries, i.e., the NMS. According to theory and previous research, we expect it to be negatively related with FDI inflows in the NMS.

The central bank policy rate (CR_{ot} and CR_{it}) is an important monetary policy tool used by central banks to signal their stance and an instrument of monetary policy. The data for this variable comes from database of the Bank for International Settlements (BIS) for all NMS countries, except Bulgaria, for which no data was available from this source. For the countries that joined the exchange rate mechanism - ERM II in 2004 and 2005 (Estonia, Latvia, Lithuania, Slovakia and Slovenia), and have gradually adopted the euro (EMU), CR_{it} data was approximated using central bank interest rates for the euro area. This was necessary because data for these interest rates was not available in the BIS database, nor from other statistical sources. To fill the data gap for Bulgaria, we used the International Monetary Fund (IMF) database. This two-source approach was chosen to ensure data completeness, as the BIS database provided more comprehensive coverage for the other countries in the sample. This data was collected on a monthly basis and monthly averages were calculated for each year. In contrast, the data for Bulgaria, which comes from the IMF database, was available on an annual basis. These interest rates are expressed as percentages.

Long-term interest rates (R_{it} and R_{ot}) refer to ten-year government bonds. These rates reflect factors such as the lenders' pricings, the borrowers' risks and changes in values. They represent the prices at which government bonds trade in financial markets and are not related to lending rates. Long-term interest rates are an important determinant of business investment: Lower interest rates encourage investment in new assets, while higher rates have the opposite effect (OECD, 2020b). The data for incoming countries (R_{it}) comes from the ECB database (ECB, 2021), which contains more comprehensive data on long-term interest rates for different countries and years. The data was reported monthly and was recalculated as an average to obtain annual values. It is important to note that the data for Estonia is not available for various forms of interest rates, including long-term interest rates. Data for long-term interest rates for countries of origin of investment (R_{ot}) are from the OECD statistical database (OECD, 2020b), expressed in annual percentages. The combination of data from two sources was necessary because the ECB does not possess data for countries with investment outflows. This approach ensures comprehensive coverage in our analysis, despite the data gaps.

For both central bank policy and the long-term interest rate, we expect a positive relation with FDI inflows.

Inflation (π_{it} and π_{ot}), as measured by the consumer price index (CPI), reflects the annual change in the percentage of costs incurred by the average consumer in purchasing a basket of goods and services. Based on theory and previous empirical results, inflation in incoming countries is expected to have a negative sign, while the opposite is expected for FDI origin countries.

The last two variables are dummy variables indicating membership in the EU and EMU. They are defined with a value of 0 if the country is not a member and 1 if the country belongs to the observed form of integration. For this purpose, we use two different methods. The first approach, called "*unilateral membership*", aims to examine the impact of NMS membership in the EU_{it} and EMU_{it}. The second approach, called "*bilateral membership*", implies the mutual membership of both countries in EU integrations (EU_{iot} and EMU_{iot}), i.e., the country of investment (NMS) and the country of origin of the capital flow. For both dummy variables, we expect a strong and positive relation with FDI inflows to the NMS, according to theory and previous research.

IV. Empirical Analysis and Estimation of Foreign Direct Investment Movements Using the Gravity Model

This chapter outlines the steps of the panel regression analysis regarding FDI trends in the NMS. It covers methodology and construction of the models, pre-regression diagnosis, application of panel regression analysis to selected indicators, and interpretation of research results.

A. Pre-regression diagnostics

Country pairs for our panel are set in such a way that each outflow of FDI from origin country is connected to each incoming country of capital flows, i.e., the NMS. The analysed period ranges from 2005 to 2018 and the panel consists of 231 country pairs, resulting in a panel with 3,234 observations, sometimes reduced by missing data. The panel is considered a micro-panel due to having more observation units (N=231) than periods (T=14). Considering that micro panels (N > T) include a large number of observation units - N and a smaller number of periods - T, such panels are not subjected to the usual diagnostic procedures before regression, such as the unit root test, which is customary for macro-panels (with large N and T) and for which the lack of stationarity of the time series must be corrected (Baltagi, 2005; Barreira and Rodrigues, 2005). In addition to stationary time series, serial correlation (autocorrelation) and multi-collinearity (cross-sectional dependence) are characteristics of panels with longer time series, i.e., with a larger number of time units - T than observation units - N (Baltagi, 2005). Considering that a micro-panel was used for this analysis, the presence of the previously mentioned problems inherent to macro-panels is neither determined nor addressed. For this reason, due to the nature of the panel, the regression diagnostics are limited to determining the presence of the problem of heteroskedasticity, which is eliminated by the robust Hubert-White estimator.

For the purposes of this research, a stepwise regression was performed first. The independent variables that did not show a statistically significant impact on the dependent variable were excluded from further analysis. The variables that did not show statistically significant correlation on the dependent variable are openness of the economy (OPN_{it} and OPN_{ot}), index of regulatory or legal restrictions on FDI (IRR_{it}), statutory corporate tax rates (TAX_{it}), exchange rates calculated by the standard deviation ($\sigma'_{\varepsilon it}$) and central bank interest rates (CR_{it}), long-term interest rates of the origin country (R_{ot}).

Moreover, the empirical analysis focuses on the variables for the countries where the investments are made (i), because a country that wants to attract foreign investments has only the possibility to correct its own macroeconomic indicators through economic policy.

B. Methodology and models

The idea of applying the gravity model to international capital flows is based on the fact that bilateral investment flows can be explained by the size of the economy (GDP) and the distance between them. The equation that can be used for empirical analysis of FDI flows remains analogous to Newton's equation for gravitational force:

$$F_g = G\,\frac{M_1 * M_2}{d^2} \tag{2}$$

The gravity model principle remains the same, but the symbols in the new equation have a different meaning (Sekur, 2013). The attraction force (F_{ij}) now represents the FDI inflow and outflow, and the masses of M_i and M_j are replaced with the GDP of the countries involved. The distance is represented by transportation or transaction costs. The gravity model equation can be expressed simply as:

$$F_{ij} = Constant \ \frac{GDP_i \cdot GDP_j}{D_{ij}} \tag{3}$$

Explanation of the equation:

- F_{ij} stands for FDI (inflow and outflow) between country i and j
- GDP_i and $GDPj$ - GDP of countries i and j taken into account
- D_{ij} - distance between countries (Sekur, 2013).

Expressed in a multiplicative functional form, the gravity model can be converted from a multiplicative to a logarithmic linear equation by taking the logarithm of the variables. This allows for the linear relationship between the logarithmic values of FDI, GDP, and distance to be analysed. Therefore, the new equation can be expressed as:

$$\ln(FDI_{ij}) = b_0 + b_1\log(GDP_i) + b_2\log(GDP_j) - b_3\log D_{ij} + \epsilon_{ij} \tag{4}$$

The estimates of the model parameters are estimates of the partial elasticity coefficients. The coefficients b_1 or b_2 represent the elasticity of the dependent variable with respect to the change of the independent variable (Sekur, 2013). The popularity of the international trade model is based on its simplicity and high explanatory power, and by introducing dichotomous variables into this model, it is possible to assess the impact of a number of different factors on FDI inflows and outflows. In the specific case, these variables are membership in the EU and EMU, and the gap between the countries is approximated by the volatility of the exchange rates. The model can be extended with other economic indicators of a continuous type, creating augmented gravity models, which are utilized in this paper.

The empirical analysis is performed by estimating the several log-linear gravity equations constructed from the explanatory variables of interest, using the ordinary least squares (OLS) method. The first three models analyse the impact of the real effective exchange rate on the dependent variable (models 1-3), while in the remaining three models (models 4-6) the focus is on the impact of exchange rate volatility on FDI.

The first model consists of a pair of gravity variables, namely the logarithmic values of real GDP of the country of origin of the investment ($logGDP_{ot}$) and of the country where the investment is made ($logGDP_{it}$). The extension of the model in addition to the *gravity variable pairs* is done by adding independent variables individually or in pairs. The other variables that extend the model are π_{it}/π_{ot} - CPI-based inflation, the long-term interest rates - R_{it}, the financial development index - F_{it} and effective exchange rate index - ε_{it}.

Model 1:

$$logFDI_{iot} = \alpha_{io} + \beta_1 logGDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\varepsilon_{it} + v_{iot} \quad (5)$$

The subscript *i* and *o* represent incoming and origin countries of capital flows, respectively. Further extension of the first model is performed by adding dummy variables to assess the impact of membership in EU_{it} and EMU_{ot} unilaterally, and bilaterally (EU_{iot} / EMU_{iot}) on the inflow of FDI to the NMS, as shown in the following two equations.

Model 2:

$$logFDI_{iot} = \alpha_{io} + \beta_1 logGDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\varepsilon_{it} + \beta_8 EU_{it} + \beta_9 EMU_{it} + v_{iot} \quad (6)$$

Model 3:

$$logFDI_{iot} = \alpha_{io} + \beta_1 logGDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\varepsilon_{it} + \beta_8 EU_{iot} + \beta_9 EMU_{iot} + v_{iot} \quad (7)$$

The following three equations (Model 4-6) are focused on the impact of exchange rate volatility on FDI. Therefore, instead of the exchange rate values, its volatility of the real exchange rate - $\sigma_{\varepsilon it}$ (calculated by the standard deviation including the trend) is used as the basis of the model. The extension of the model applies the same principles as in the first three models.

Model 4:

$$logFDI_{iot} = \alpha_{io} + \beta_1 logGDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\sigma_{\varepsilon it} + v_{iot} \quad (8)$$

Model 5:

$$logFDI_{iot} = \alpha_{io} + \beta_1 logGDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\sigma_{\varepsilon it} + \beta_8 EU_{it} + \beta_9 EMU_{it} + v_{iot} \quad (9)$$

Model 6:

$$logFDI_{iot} = \alpha_{io} + \beta_1 \mathrm{log}GDP_{ot} + \beta_2 logGDP_{it} + \beta_3\pi_{ot} + \beta_4\pi_{it} + \beta_5 R_{it} + \beta_6 F_{it} + \beta_7\sigma_{\varepsilon it} + \beta_8 EU_{iot} + \beta_9 EMU_{iot} + v_{iot} \quad (10)$$

Following the setting of all equations of our models, the next section of the paper presents our results.

C. Results

We start our empirical analysis with testing fixed and random effects for all models. Results of testing are presented in Tables A2-A5 in the Appendix. These tables demonstrate that all six fixed and random effects models have explanatory power and statistically significant F-test results at the 1% significance level.

Optimal models are selected using the Hausman test (Table A6 in Appendix) based on the previous results. The test shows that fixed effects models are optimal in all six variants, rejecting the null hypothesis that random effects model is preferable with high statistical significance in all examples.

As stated before, models were tested for heteroscedasticity using the Wald test and the results are shown in Table A7 of the Appendix. The test reveals the presence of heteroskedasticity, with the null hypothesis of homoskedasticity being rejected at a high statistical significance level (P<0.0000) in all six models. Therefore, the robust Hubert-White estimator was applied to all fixed-effects models. The results using this estimator represent the final results of the analysis and can be found in Tables 1 and 2.

Table 1. *Panel Models with Fixed Effects (1-3) with the Applied Robust Hubert-White Estimator*

Estimation of models with fixed effects (fe) and robust estimator no (1-3)	M1	M2	M3
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
$logGDP_{ot}$	1.757^{**} (0.638)	1.649^{**} (0.609)	1.916^{**} (0.636)
$logGDP_{it}$	0.973^{**} (0.442)	0.870^{**} (0.423)	0.836^{*} (0.439)
π_{ot}	0.0623 (0.0421)	0.0706^{*} (0.0412)	0.0636 (0.0416)
π_{it}	-0.0340^{**} (0.0120)	-0.0241^{**} (0.0113)	-0.0276^{**} (0.0119)
R_{it}	0.0281 (0.0186)	0.0511^{**} (0.0210)	0.0387^{*} (0.0204)
F_{it}	0.0173^{*} (0.00971)	0.0111 (0.00985)	0.0140 (0.00957)
ε_{it}	0.0292^{***} (0.00590)	0.0186^{**} (0.00580)	0.0249^{***} (0.00614)
EU_{it}		0.521^{***} (0.155)	
EMU_{it}		0.398^{**} (0.156)	
EU_{iot}			0.426^{**} (0.179)
EMU_{iot}			0.311 (0.231)

Table 1. *Continued*

Estimation of models with fixed effects (fe) and robust estimator no (1-3)	M1	M2	M3
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
Constant	-56.76*** (14.53)	-50.61*** (14.03)	-57.45*** (14.33)
Number of observations	2215	2215	2215
R^2	0.151	0.173	0.162
Adjusted R^2	0.148	0.169	0.159
F	15.97	15.51	14.29
p	<0.001	<0.001	<0.001

(Source) taken from Velić (2022, p. 173)
Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

Table 2. *Panel Models with Fixed Effects (4-6) with the Applied Robust Hubert-White Estimator*

Estimation of models with fixed effects (fe) and robust estimator no (4-6)	M4	M5	M6
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
$logGDP_{ot}$	1.896** (0.655)	1.709** (0.608)	2.101** (0.638)
$logGDP_{it}$	1.751*** (0.473)	1.254** (0.417)	1.403** (0.458)
π_{ot}	0.0747* (0.0425)	0.0809** (0.0400)	0.0743* (0.0416)
π_{it}	-0.0451*** (0.0118)	-0.0285** (0.0111)	-0.0350** (0.0117)
R_{it}	0.0645*** (0.0183)	0.0775*** (0.0186)	0.0717*** (0.0189)
F_{it}	0.0172* (0.00989)	0.0105 (0.00986)	0.0137 (0.00965)
$\sigma_{\varepsilon it}$	-0.0206** (0.00946)	-0.0212** (0.00924)	-0.0221** (0.00956)
EU_{it}		0.598*** (0.150)	
EMU_{it}		0.568*** (0.151)	
EU_{iot}			0.507** (0.177)
EMU_{iot}			0.497** (0.224)
Constant	-77.62*** (15.15)	-60.41*** (13.98)	-74.68*** (14.44)
Number of observations	2215	2215	2215
R^2	0.124	0.165	0.145
Adjusted R^2	0.122	0.162	0.142
F	13.64	13.95	12.87
p	<0.001	<0.001	<0.001

(Source) taken from Velić (2022, p. 174)
Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

The results of the *F-test* of all six fixed effects models using the Hubert-White estimator show that all models are statistically significant at the one percent (1%) significance level and have explanatory power, as shown in Tables 1 and 2. After performing all necessary diagnostics we interpret our results in the next section.

D. Interpretation of results

The first model suggests that larger economies (GDP) of both home ("origin") and destination ("incoming") countries are positively correlated with FDI inflows to the NMS. Our results show that origin country inflation is significantly and negatively correlated with FDI inflows, while origin country inflation has no statistically significant correlation with FDI outflows. Long-term interest rates show no significant correlation with FDI inflows in the first model. However, the financial development index shows a statistically significant correlation with FDI inflows. The empirical analysis of the first model shows a strong and positive correlation between the real effective exchange rate index and FDI inflows in the NMS.

In the second model, the GDP of both countries is also significant and positively correlated with FDI inflows. Inflation in the NMS is statistically significant and negatively correlated with FDI inflows to the NMS, while inflation in the origin countries has a significant and positive correlation with FDI outflows. This model differs from the first model in that it shows a significant positive correlation between long-term interest rates in the NMS and FDI inflows. The real exchange rate index shows the same results as in the previous model. The inclusion of the EU membership and EMU variables shows a positive and statistically significant correlation with FDI inflows from the industrially developed countries to the NMS. However, financial system development loses significance when the dummy variables for EU and EMU membership are included in the estimates.

The estimation of the third model produced results consistent with those of the previous model in terms of the size of the economy, inflation, financial development, and the real effective exchange rate. This model aimed to examine the impact of bilateral membership on European integration. It was found that only EU membership of both countries (i and o) had a significant and positive correlation with the dependent variable. However, no statistically significant effect was found between bilateral membership in the EMU and investment flows to the NMS, suggesting that there is no increased investment between EMU member countries.

In the fourth model, the results show a statistically significant and positive correlation between origin and incoming countries' market size and FDI inflows to the NMS. Inflation in the incoming country is negatively correlated with FDI inflows, while an increase in inflation in the origin country shows a significant and positive correlation with outflows to the NMS. However, the relationship between inflation in the industrially developed countries and capital outflows to the NMS is moderately significant. Long-term interest rates in the NMS show a strong and positive correlation with foreign investment, while financial development in the NMS shows a weak but positive correlation with the dependent variable. The volatility of the real effective exchange rate, calculated using the standard deviation and asymmetry measures, shows a medium but statistically significant and negative correlation with FDI inflows to the NMS.

The fifth model includes dummy variables for a country's membership in the EU and EMU for investment inflows. In this model, the size of the economy in both countries is a significant and positive predictor of FDI inflows. Inflation in the country of origin is statistically significant and positively correlated with capital outflows, while NMS inflation is negatively correlated with FDI inflows. Long-term interest rates are strongly positively correlated with FDI inflows, while financial development shows no significant effect on FDI inflows. The volatility of the NMS' exchange rates is negatively but statistically significantly correlated with FDI inflows to the NMS. EU and EMU membership are both positively correlated with FDI inflows.

In the sixth model, there is a persistent positive correlation between FDI and GDP of both countries (*o* and *i*). Inflation in the origin country shows a positive correlation with FDI outflows to the NMS. Inflation developments in the investment country are negatively correlated with FDI inflows. Long-term interest rates are positively correlated with the dependent variable. The financial development of the NMS shows no significant correlation with FDI inflows. Exchange rate volatility is negatively correlated with FDI inflows. Bilateral membership in the EU and EMU is positively correlated with FDI inflows to the NMS.

However, at the end of this section it should be noted that in all of the above interpretations, a possible endogeneity was not taken into account. This creates space for additional research.

V. Discussion

In a comprehensive analysis of six distinct models examining FDI inflows from industrialised developed countries ("origin") into NMS ("incoming"), several key patterns emerged. Firstly, larger economies, both in the origin and investment countries, consistently predicted higher FDI performance across models. Inflation in the investment country generally had a negative relationship with FDI inflows, while the inflation rate in the country of origin showed mixed results. Long-term interest rates were found to be a significant and positive factor in attracting FDI to NMS in some models. Financial development, although not always significant, had a positive relationship in some instances. Additionally, the real effective exchange rate in NMS played a role in driving FDI inflows: Attracting FDI with its growth and repelling FDI with its volatility. Importantly, membership in the European Union (EU) appeared to have a positive relation to FDI inflows, while membership in the Eurozone (EMU) showed similar, but mixed results - particularly regarding intra-EMU investment. These results highlight the complex aspects regarding FDI flows in NMS, underscoring the importance of economic size, inflation, interest rates, and regional integration in attracting foreign investment.

Comparing our results with those of previous research is not straightforward, as most studies looking at the impact of the Eurozone focus on investment trends in the Old Member States or in somewhat larger samples (that include some of the NMS). Quantitative comparison of coefficients across studies is difficult due to differences in methods, estimators, and variable calculations. Given these challenges, we primarily aim to qualitatively compare our results with previous studies. In other words, we aim to establish the presence and sign of statistically significant relationships between FDI inflows in the NMS and the factors of interest, regardless of the sample and methodology. However, we also quantitatively compared key variables of interest such as exchange rate volatility, inflation, membership of the EU and EMU with studies using a similar methodology and sample.

Regarding the correlation of sovereign GDP with FDI inflows in the NMS, our results are consistent with previous studies, including Bailey and Tavlas (1991), Görg and Wakelin (2002), Dinga and Dingová (2011), Pantelidis et al. (2014), Aristotelous (2005), Schiavo (2007), Brouwer et al. (2008), Furceri and Borelli (2008), de Sousa and Lochard (2011), Aristotelous and Fountas (2012), Kilic et al. (2014), Martins (2015), and Barrell et al. (2017). Most previous studies emphasise that higher GDP significantly stimulates FDI flows in both origin and incoming countries, which is consistent with the modelling assumptions. However, when we examine the relation of GDP and FDI inflows in the NMS from the origin and incoming country perspectives, we find differences in the intensity of the coefficients.

The coefficients of origin country GDP on FDI inflows to the NMS range between 1.6 and 2.00 in all models, although these values are somewhat higher and most similar to the coefficients of Brouwer et al. (2008) (1.4) and de Sousa and Lochard (2011) (between 0.8 and 1.33). A more marked divergence can be seen when comparing with the results of Schiavo (2007), where the GDP coefficients range between 0.01 and 0.22. As for the incoming countries, the coefficients in the first three models range from 0.83 to 0.97, and in the other three models, which focus on assessing the role of exchange rate volatility, the coefficients remain in the range of 1.2 to 1.7. Our coefficients are similar to those of Brouwer et al. (2008) (1.2) and significantly different from those of Schiavo (2007) (around 0.9) and the results of de Sousa and Lochard (2011), which range from 0.5 to 0.9, depending on the model. The differences in coefficients between our and previous studies regarding the relation of GDP and FDI inflows to the NMS, while significant, are within a tolerable range and are most likely due to differences in methods, sample composition and control variables.

In examining the relationship between exchange rate volatility and FDI inflows in a given country, this study finds a statistically significant and negative correlation, which is consistent with previous studies such as in Aizenman (1992), Bénassy-Quéré et al. (2001), Wei and Choi (2002), Servén (2003), Aristotelous (2005), Furceri and Borelli (2008), Schmidt and Broll (2009), Aristotelous and Fountas (2012), Kilic et al. (2014), Lily et al. (2014), Martins (2015), Cambazoğlu and Güneş (2016), Barrell et al. (2017), Pathan (2017) and Sondermann and Vansteenkiste (2019). However, it is important to acknowledge that there are mixed results in previous research, as evidenced by the divergent findings in studies by Cushman (1985 and 1988), Markusen (1995), Goldberg and Kolstad (1995), Bailey and Tavlas (1991), and Görg and Wakelin (2002) and de Sousa and Lochard (2011).

Shifting the focus from a qualitative to a quantitative comparison of the research findings, our research shows a statistically significant and negative relationship between exchange rate volatility and FDI inflows in the NMS, with coefficients averaging around -0.02 across all estimated models. Although this is consistent with the general direction of previous studies, discrepancies arise due to the different methodologies and models used. For example, de Sousa and Lochard (2011) reported a positive coefficient of 0.052, which the authors attribute to the ambiguous effects of exchange rate volatility, as an increase in exchange rate volatility can reduce vertical and increase horizontal FDI. Schiavo (2007) reported a negative coefficient of -1.451, while Dinga and Dingová (2011) showed an even more pronounced negative impact with a coefficient of -1.609 using the OLS estimator. Brower et al. (2008) determined a positive coefficient of 0.106.

A direct quantitative comparison with previous studies on the impact of inflation on FDI inflows is difficult due to differences in research methods and sample characteristics. Our results show a statistically significant negative correlation between inflation and FDI inflows, which is consistent with several previous studies. In particular, Schneider and Frey (1985), Kok and Ersoy (2009), Vijayakumar et al. (2010) and Kilic et al. (2014) have also found this negative correlation. However, our results differ from those of Furceri and Borelli (2008) and Pathan (2017), who suggest a mixture of effects or insignificance of the link between inflation and FDI.

Given the relative novelty of the financial development index as an indicator in this type of analysis, it is difficult to compare the results of the relationship of this variable with FDI. However, we can distinguish a similar qualitative influence as pointed out in Servén (2003).

Our analysis suggests a significant and positive relation of EU membership and FDI flows, consistent with previous research by Aristotelous (2005), Brouwer et al. (2008), Dinga and Dingová (2011), Aristotelous and Fountas (2012) and Barrell et al. (2017). When examining models that focus on the exchange rate level, the coefficients for unilateral EU membership are 0.52 (second model) and for bilateral EU membership 0.43 (third model). When we shift the focus to the exchange rate volatility models, the impact becomes more pronounced: 0.6 for unilateral EU membership and 0.5 for bilateral EU membership (fifth and sixth models). In contrast, previous studies using similar (but not identical) models showed different coefficients.

De Sousa and Lochard, for example, found a coefficient of 0.3, indicating a comparatively smaller influence. In contrast, Schiavo's study had a significantly higher coefficient of 1.4, indicating a potentially significant effect. Dinga and Dingová (2011) reported a coefficient of 0.5, which is very close to the results of our research, as did Brouwer's et al. (2008) study with a coefficient of 0.43. These comparisons illustrate the consistency of our results with Dinga and Dingová (2011) and Brouwer's et al. (2008) studies.

The study identifies significant correlations between FDI inflows and currency integration, similar to the findings of related studies, including de Sousa and Lochard (2011), Schiavo (2007), Kilic et al. (2014), Barrell et al. (2017), Pathan (2017) and Wei and Choi (2002). However, it clearly contradicts the study by Dinga and Dingová (2011), who used a similar methodology but different estimators (fixed-effects and Tobit estimation). In the models examining the impact on the exchange rate, the study found that unilateral EMU membership has a coefficient of 0.4, while bilateral EMU membership has no statistically significant correlation in the second and third models. When looking at the models that emphasise exchange rate volatility, higher coefficients were found: 0.6 for unilateral EMU membership and 0.5 for bilateral EMU membership in the fifth and sixth models. In comparison, previous studies using similar (but not identical) models showed different coefficients. De Sousa and Lochard reported a coefficient of 0.3, suggesting a different perspective, while Schiavo's study had a significantly higher coefficient of 1.45. Dinga and Dingová (2011) reported a coefficient of 0.2 using an OLS estimate, which is somewhat consistent with the findings of the present study. In addition, Brower's coefficient was 0.73, which highlights the variability of the results.

By confirming the positive relationship between GDP and FDI inflows, our research contributes to the existing literature by improving the understanding of the impact of GDP on FDI in the NMS. Furthermore, our study contributes to the understanding of the relationship between exchange rate volatility and FDI inflows by demonstrating a statistically significant negative correlation, thereby increasing the number of recent studies that find similar effects for this particular sample. The confirmation of a statistically significant negative correlation between inflation and FDI inflows, which is consistent with previous research, adds to the literature. This study strengthens the existing literature by confirming the positive impact of EU membership on FDI inflows. The identification of significant correlations between FDI inflows and monetary integration is consistent with existing studies and supports the consensus on this relationship.

One of the fundamental limitations of this study is the lack of longer data series for the variables used in the analysis. This is mainly due to the fact that it is not possible to group countries together, which would limit the number of observations too much for a consistent empirical analysis. Moreover, due to data limitations, aggregate data on FDI inflows were used in the analysis and it was not possible to assess what type and structure of FDI may be stimulated by monetary integration. Due to the same problem, it was not possible to analyse the relationship between FDI inflows in the NMS and real interest rates.

One of the methodological "weaknesses" of the study is the use of OLS estimators. Indeed, when using the OLS estimator, all observations with a negative sign are lost (Schiavo, 2007). Moreover, the OLS estimator may be biased due to the independent selection of countries included in EMU (Dinga and Dingová, 2011). The second methodological weakness is the possible endogeneity issue between variables such as inflation and GDP.

For future research, it is essential to deepen the analysis of the selected country sample. A more refined method of country selection, possibly through clustering based on key economic indicators such as GDP and population, can improve our understanding of FDI and its relationship with various economic aspects. Future studies should aim to analyse different types of FDI (vertical, horizontal, conglomerates) and different investment methods (greenfield, mergers and acquisitions, joint ventures) as dependent variables in regression models. In addition, future research should examine FDI determinants based on investment motives, macroeconomic indicators such as real interest rates, stability of the monetary and political situation in countries and other factors. If possible, indicators such as central bank interest rates and legal restrictions on FDI should be included in future research, as the lack of significant statistical association with FDI in the NMS may be due to the lack of data for these variables.

In addition to the explained methods for calculating the volatility of the exchange rate, future research could be enriched by calculating volatility using the GARCH 1,1 and GARCH 1,2 methods. The use of other models such as Tobit can ensure that additional information is not lost when estimating the model with OLS or due to its biases (Schiavo, 2007; Dinga and Dingová, 2011).

Previous research in this area is predominantly oriented towards larger samples, which do not take into account the specificity of the subject and the problems of the broader integration process. Although the non-clustering of the sample and the smaller sample is one of the limitations of this research, on the one hand, it can be considered as an added value in the context of the application and continuation of the integration process, on the other hand. Indeed, the continuation of the integration process and monetary integration is still ahead for some NMS, although there is no time limit when they should join EMU. For this reason, this research has added value for NMS, as it shows that the continuation of the integration process could be useful to attract FDI.

The volatility of the exchange rate on FDI inflows in the NMS shows that calculating volatility using the standard deviation is not always the most reliable approach. Indeed, the positive but statistically significant impact of exchange rate volatility on FDI inflows shows a deviation from both the theoretical assumptions and the empirical results of some previous studies. In this way, one may presume ambiguous results for the overall impact of exchange rate volatility on FDI inflows. The inclusion of asymmetry measures in the calculation of volatility added another way of calculating the volatility of the exchange rate; the estimation of which gave the expected sign in the models.

Moreover, the results of the analysis show that membership in EMU stimulates FDI inflows into the NMS, and not only by reducing exchange rate volatility. Indeed, when the variables EU membership and EMU are included in the models estimating the impact of volatility on FDI inflows to the NMS, the presence of a statistically significant positive relationship between membership in EU integrations and FDI inflows to the NMS suggests the existence of other channels through which European integration stimulates FDI inflows.

The added value of this research also lies in the identification of new predictors of FDI that were not previously included in the models. While there are several studies that consider the impact of interest rates in some form of empirical analysis, they are not included in the relevant studies that assess the impact of monetary integration in the EU on FDI inflows to member countries. Considering that the results of our research show significant relationship of long-term interest rates and foreign investment inflows in five out of six models, their influence could be a subject in future assessments. In this context, the financial development index also emerges, whose statistical significance is lost when the EU and EMU variables are included in the model. This could indicate that EU and Eurozone membership might have a stronger influence on attracting FDI compared to the overall financial development of the country. As for the other variables, it is quite possible that indicators such as central bank interest rates do not have a statistically significant relationship with FDI inflows in the NMS due to lack of data, as long-term interest rates have been shown to be a significant predictor of FDI. The same applies to legal restrictions on FDI, which could be included in the analysis in future studies.

VI. Conclusion

Our analysis shows that membership in the EU and NMS accession to the EMU indirectly suggests a positive relation to FDI inflows through quantitative macroeconomic indicators (exchange rate, inflation, interest rates). On the other hand, the variables used to determine membership in the EU and EMU (our dummy variables) show a direct positive linkage of European integration and FDI inflows. Notably, the empirical analysis of all six models used in this research reveal several factors that might have a significant impact on FDI inflows in the NMS. The economy's size, inflation in the country of origin, long-term interest rates, and real exchange rate index, all play a critical role in attracting foreign investment. Moreover, membership in the EU and EMU have a positive and significant result in relation to the FDI inflows from industrially developed countries to the NMS. However, the effect of financial development on FDI inflows is inconsistent, with some models showing a significant relationship, while others don't. The volatility of the real effective exchange rate has a negative correlation on the FDI inflows, albeit with varying levels of statistical significance across different models.

These findings can be valuable to policymakers and investors in understanding the factors that might relate to FDI inflows into the NMS, as well as for developing strategies to enhance investment attractiveness. Additionally, the results obtained from this analysis highlight the importance of further integration for attracting FDI inflows to these countries.

The research limitations have prompted recommendations for future research that focus on analysing longer time series to determine the impact of monetary integration on investment inflows for future eurozone members. Improved classification of countries into groups based on macroeconomic characteristics should enhance the analysis, including the examination of FDI structures and the use of new approximations of financial development and macroeconomic stability.

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Appendix

Table A1. *List of Independent Variables Used in the Previous Research with Data Source*

Independent variable	Used in previous research	Source
$logRGDP_{it}$ $logRGDP_{ot}$	Wei and Choi (2002), de Sousa and Lochard (2011), Aristotelous (2005), Flam and Nordstrom (2007), Schiavo (2007), Brouwer et al. (2008), Dinga and Dingová (2011), Barrell et al. (2017), Sondermann and Vansteenkiste (2019)	WB, 2020a
OPNit *OPNot*	Bénassy-Quéré at al. (2001), Asiedu (2002), Servén (2003), Furceri and Borelli (2008), Vijayakumar et al. (2010), Pantelidis et al. (2014), Barrell et al. (2017), Pathan (2017), Vansteenkiste (2019)	WB, 2020b
IRR_{it}	Nicoletti et al. (2003), Koyama and Golub (2006), Fournier (2015)	OECD (2020b)
TAX_{it}	Bénassy-Quéré et al. (2003), Van Parys and James (2010), de Sousa and Lochard (2011)	OECD (2020c)
F_{it}	Al Nasser and Gomez (2009), Kinda (2010)	IMF (2020d)
CR_{it} CR_{ot}	Bailey and Tavlas (1991), Grosse and Trevino (1996), Görg and Wakelin (2002), Pantelidis et al. (2014)	BIS (2020); IMF (2020b)
R_{it} R_{ot}		ECB (2021) OECD (2020d)
ε_{it}	Cushman (1985 and 1988), Markusen (1995), Goldberg and Kolstad (1995), Bailey and Tavlas (1991), Görg and Wakelin (2002), Flam and Nordstrom (2007), Dinga and Dingová (2011), Pantelidis et al. (2014), Aizenman (1992), Bénassy-Quéré at al. (2001), Wei and Choi (2002), Servén (2003), de Sousa and Lochard (2011), Aristotelous (2005), Schiavo (2007), Brouwer et al. (2008), Furceri and Borelli (2008), Schmidt and Broll (2009), Aristotelous and Fountas (2012), Kilic at al. (2014), Lily et al. (2014), Cambazoğlu and Güneş (2016), Barrell et al. (2017), Pathan (2017) and Sondermann and Vansteenkiste (2019).	REDT_IC (BIS (2020); IMF (2020a) REDT_OC (WB (2020c)
$\sigma_{\varepsilon it}$	Aizenman (1992), Bénassy-Quéré at al. (2001), Wei and Choi (2002), Servén (2003), de Sousa and Lochard (2011), Aristotelous (2005), Schiavo (2007), Brouwer et al. (2008), Furceri and Borelli (2008), Schmidt and Broll (2009), Aristotelous and Fountas (2012), Kilic at al. (2014), Lily et al. (2014), Cambazoğlu and Güneş (2016), Barrell et al. (2017), Pathan (2017), Sondermann and Vansteenkiste (2019).	Authors' calculation based on Eurostat data (2021)
π_{it} π_{ot}	Schneider and Frey (1985), Furceri and Borelli (2008), Kok and Ersoy (2009), Vijayakumar et al. (2010); Kilic at al. (2014), Pathan (2017)	WB, 2020d
EU_{iot} EMU_{iot}	Wei and Choi (2002), Aristotelous (2005), de Sousa and Lochard (2011), Schiavo (2007), Brouwer et al. (2008), Aristotelous and Fountas (2012), Pathan (2017).	Constructed by the authors

(Source) Authors' elaboration

Table A2. *Panel Models with Fixed Effects (1-3)*

Estimation of models with fixed effects (fe) (1-3)	M1	M2	M3
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
$logGDP_{ot}$	1.757^{***} (0.277)	1.649^{***} (0.275)	1.916^{***} (0.278)
$logGDP_{it}$	0.973^{***} (0.270)	0.870^{**} (0.267)	0.836^{**} (0.270)
π_{ot}	0.0623^{***} (0.0148)	0.0706^{***} (0.0147)	0.0636^{***} (0.0147)
π_{it}	-0.0340^{***} (0.00827)	-0.0241^{**} (0.00837)	-0.0276^{***} (0.00835)
R_{it}	0.0281^{**} (0.0127)	0.0511^{***} (0.0132)	0.0387^{**} (0.0129)
F_{it}	0.0173^{***} (0.00510)	0.0111^{**} (0.00524)	0.0140^{**} (0.00520)
ε_{it}	0.0292^{***} (0.00354)	0.0186^{***} (0.00399)	0.0249^{***} (0.00368)
EU_{it}		0.521^{***} (0.0846)	
EMU_{it}		0.398^{***} (0.0829)	
EU_{iot}			0.426^{***} (0.0971)
EMU_{iot}			0.311^{**} (0.103)
Constant	-56.76^{***} (7.776)	-50.61^{***} (7.728)	-57.45^{***} (7.733)
Number of observations	2215	2215	2215
R^2	0.151	0.173	0.162
Adjusted R^2	0.068	0.090	0.079
F	51.24	46.66	43.27
p	<0.001	<0.001	<0.001

(Source) taken from Velić (2022, p. 167)

Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

Table A3. *Panel Models with Fixed Effects (4-6)*

Estimation of models with fixed effects (fe) (4-6)	M4	M5	M6
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
$logGDP_{ot}$	1.896*** (0.281)	1.709*** (0.276)	2.101*** (0.280)
$logGDP_{it}$	1.751*** (0.261)	1.254*** (0.261)	1.403*** (0.264)
π_{ot}	0.0747*** (0.0149)	0.0809*** (0.0146)	0.0743*** (0.0148)
π_{it}	-0.0451*** (0.00829)	-0.0285*** (0.00834)	-0.0350*** (0.00835)
R_{it}	0.0645*** (0.0121)	0.0775*** (0.0119)	0.0717*** (0.0120)
F_{it}	0.0172*** (0.00519)	0.0105** (0.00529)	0.0137** (0.00527)
ε_{it}	-0.0206** (0.0101)	-0.0212** (0.00993)	-0.0221** (0.0100)
EU_{it}		0.598*** (0.0844)	
EMU_{it}		0.568*** (0.0735)	
EU_{iot}			0.507*** (0.0980)
EMU_{iot}			0.497*** (0.100)
Constant	-77.62*** (7.568)	-60.41*** (7.599)	-74.68*** (7.497)
Number of observations	2215	2215	2215
R^2	0.124	0.165	0.145
Adjusted R^2	0.038	0.083	0.060
F	40.87	44.38	37.96
p	<0.001	<0.001	<0.001

(Source) taken from Velić (2022, p. 168)

Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

Table A4. *Panel Models with Random Effects (1-3)*

Estimation of random effects models (re) (1-3)	M1	M2	M3
	$logFDI_{iot}$	$logFDI_{iot}$	$logFDI_{iot}$
$logGDP_{ot}$	0.918*** (0.0965)	0.903*** (0.0965)	0.926*** (0.0938)
$logGDP_{it}$	1.253*** (0.140)	1.255*** (0.139)	1.251*** (0.136)
π_{ot}	0.0543*** (0.0144)	0.0607*** (0.0143)	0.0584*** (0.0143)
π_{it}	-0.0336*** (0.00821)	-0.0236** (0.00832)	-0.0266** (0.00824)
R_{it}	0.0231** (0.0107)	0.0492*** (0.0117)	0.0353** (0.0110)
F_{it}	0.0152** (0.00486)	0.00915* (0.00499)	0.0102** (0.00493)
ε_{it}	0.0304*** (0.00338)	0.0197*** (0.00391)	0.0258*** (0.00354)
EU_{it}		0.524*** (0.0846)	
EMU_{it}		0.356*** (0.0829)	
EU_{iot}			0.565*** (0.0930)
EMU_{iot}			0.260** (0.102)
Constant	-41.21*** (4.177)	-40.28*** (4.167)	-41.15*** (4.077)
Number of observations	2215	2215	2215
R^2	<0.001	<0.001	<0.001
Adjusted R^2	438.4	496.0	491.2

(Source) taken from Velić (2022, p. 169)
Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

Table A5. *Panel Models with Random Effects (4-6)*

Estimation of random effects models (re) (4-6)	M4	M5	M6
	$logFDI_{iot}$	*$logFDI_{iot}$*	*$logFDI_{iot}$*
$logGDP_{ot}$	0.986*** (0.0990)	0.939*** (0.0990)	0.986*** (0.0952)
$logGDP_{it}$	1.515*** (0.141)	1.400*** (0.141)	1.447*** (0.137)
π_{ot}	0.0697*** (0.0145)	0.0734*** (0.0142)	0.0728*** (0.0144)
π_{it}	-0.0451*** (0.00824)	-0.0280*** (0.00829)	-0.0347*** (0.00825)
R_{it}	0.0427*** (0.0107)	0.0700*** (0.0109)	0.0556*** (0.0107)
F_{it}	0.0177*** (0.00494)	0.00970* (0.00502)	0.0117** (0.00498)
ε_{it}	-0.0163 (0.0102)	-0.0196* (0.0100)	-0.0203** (0.0101)
EU_{it}		0.619*** (0.0840)	
EMU_{it}		0.562*** (0.0716)	
EU_{iot}			0.650*** (0.0939)
EMU_{iot}			0.479*** (0.0982)
Constant	-46.92*** (4.253)	-43.26*** (4.241)	-45.49*** (4.121)
Number of observations	2215	2215	2215
R^2	<0.001	<0.001	<0.001
Adjusted R^2	346.3	467.5	431.3

(Source) taken from Velić (2022, p. 170)
Note. *, **, *** indicate statistical significance at the 10%, 5% and 1% level; values in parentheses are corrected standard errors.

Table A6. *Results of the Husman Test Model with Fixed Effects (fe) and Random effects (re)*

Model no.	M1	M2	M3	M4	M5	M6
	$logFDI_{iot}$	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(Source) taken from Velić (2022, p. 171)

Table A7. *Wald Heteroskedasticity Test*

Fixed model no.	M1	M2	M3	M4	M5	M6
	$logFDI_{iot}$	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*	*$logFDI_{iot}$*
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(Source) taken from Velić (2022, p. 171)