JUDIT BURUCS – FANNI DUDÁS

# DID THE VIRTUAL INTEGRATION OF STOCK MARKETS IMPACT THE STOCK EXCHANGES IN SOUTHEASTERN EUROPE

# A RÉSZVÉNYPIACOK VIRTUÁLIS INTEGRÁCIÓJA HATÁSSAL VOLT-E A DÉLKELET-EURÓPAI TŐZSDÉKRE?

This study investigates the impact of the SEE Link trading platform on capital market development and financial integration in Southeastern Europe (SEE). Established in 2016 with support from the European Bank for Reconstruction and Development, SEE Link sought to enhance market depth, liquidity, and cross-border connectivity among relatively small regional stock exchanges. Using a difference-in-differences framework complemented by correlation and cointegration analysis over a ten-year horizon, the paper evaluates the platform's effects on market performance and integration. The findings reveal only modest outcomes: turnover ratios increased marginally, while market capitalization to GDP, traded value to GDP, and portfolio equity net inflows showed no significant changes. Short-term return correlations among member exchanges remain weak, and long-run cointegration was absent both before and after the platform's introduction. Persistent structural, regulatory, and technical barriers–including market fragmentation, heterogeneous legal frameworks, high transaction costs, unlinked central securities depositories, and limited visibility–continue to hinder meaningful integration.

Keywords: **stock market co-movements, Southeast Europe, difference-in-differences model, co-integration model**

A 2016-tól működő SEE Link egy regionális kereskedési platform, amely hat kis ország – Bulgária, Bosznia-Hercegovina, Horvátország, Észak-Macedónia, Szlovénia és Szerbia – tőzsdéit köti össze vállalati egyesülés nélkül. Ennek a cikknek az a célja, hogy feltárja a SEE Link hatását a részt vevő tőzsdékre, különös tekintettel a kereskedési volumenre és a hozamok kointegrációjának szintjére 2012 és 2022 között. A kointegráció tesztelésére a DCC-modellt és a Johansen-modelleket alkalmazták a szerzők. Emellett elemezték a kulcsfontosságú makrogazdasági tényezőket, hogy nyomon követhessék a befektetési feltételek alakulását. Eredményeik azt mutatják, hogy a részvénypiacok közötti korrelációk idővel csökkentek, kivéve a COVID-19 időszakot. A SEE-Link önmagában nem elegendő a forgalom és a piaci kapitalizáció növeléséhez. A gazdasági környezet javulása ellenére, a tartós strukturális, szabályozási és technikai akadályok továbbra is korlátozzák az érdemi integrációt.

Kulcsszavak: **tőzsdei együttmozgások, Délkelet-Európa, DID (difference-in-differences) módszer, cointegrációs modell**

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An essential driver of economic growth is a well-developed financial system composed of specialized organizations and institutions that facilitate payment transfers and intermediate the flow of savings and investments. As emphasized by Demirgüç-Kunt et al. (2012), the role of financial markets becomes increasingly important relative to banks as economies advance. However, factors such as market size significantly influence the efficiency of capital markets. For instance, an IFC survey found that "the stock markets do not seem to grow in countries with a GDP below 20 billion" (Demekas & Nerlich, 2020, p. 5). One way to mitigate this constraint is through partial or full market integration, which can generate economies of scale. A specific form of such integration is virtual integration of stock exchanges, defined as the establishment of a technological and regulatory framework that enables investors and brokers to access and trade securities across multiple national stock exchanges through a single platform, without merging the exchanges into a single legal entity. An integrated capital market broadens the spectrum of available financial instruments, thereby enhancing portfolio diversification opportunities and improving the risk–return trade-off for investors. For issuers, integration facilitates access to new markets and investor bases, increases demand for shares, and can potentially lower financing costs while boosting firm value (Espinosa-Méndez et al., 2017).

Capital market integration is also a central concern for policymakers in the European Union. The Capital Markets Union Action Plan, adopted in 2015, emphasizes the need to deepen capital markets, particularly in countries with significant catching-up potential such as those in Central, Eastern, and Southeastern Europe (CESEE). The Report on Capital Market Union, prepared by the European Bank Coordination Initiative, outlined additional measures to increase cross-border cooperation. These include facilitating foreign listings and market access, fostering cooperation between stock exchanges, establishing "cross-border links between local market infrastructures (such as central securities depositories (CSDs) and central counterparties (CCPs)), and harmonizing legislation at the regional level" (EBCI, 2018, p. 1).

The countries of CESEE are small open economies with strong economic ties to larger EU members but relatively underdeveloped capital markets. In response, three cross-border stock market cooperation clusters have emerged, each differing in its level of integration as well as its legal and operational structures. The most advanced is the Nasdaq Baltic Market, which integrates the stock exchanges of Estonia, Latvia, and Lithuania under a unified framework. Another example was the CEE Stock Exchange Group (CEESEG). This unique integration brought together the stock exchanges of Prague, Ljubljana, Budapest, and Vienna as subsidiaries of equal standing within the holding company CEESEG AG. However, in 2015, the Ljubljana and Budapest exchanges were sold, leading to their withdrawal from the group (EBCI, 2018). SEE Link represents a virtual form of cooperation and connection, an innovative regional platform supported by the European Bank for Reconstruction and Development (EBRD). Established in 2016, SEE Link connects the stock exchanges of six countries–Bulgaria, Bosnia and Herzegovina, Croatia, North Macedonia, Slovenia, and Serbia–by facilitating cross-border trading while preserving the independence of local markets.

While policy interest in SEE Link has increased, empirical evidence on its effectiveness in promoting integration across small and emerging CESEE capital markets remains limited. Existing studies primarily examine volatility transmission and short-term linkages, but there is little systematic evidence on how these exchanges have evolved following integration.

This study addresses the gap in the literature by analysing the impact of the SEE Link trading platform on the characteristics of stock exchanges in small and less developed participating countries, as well as the degree of integration achieved.

Our first research question (RQ1) asks: *How have the SEE Link stock exchanges evolved since their integration?* To answer this, we employ a difference-in-differences (DID) research design over 10 years. DID is widely used for causal inference in policy evaluation, particularly when a subset of units is exposed to an intervention while comparable units serve as controls (Angrist & Pischke, 2009; Stata.com, 2022a). In our study, Croatia, Bulgaria, and Slovenia constitute the treated group (SEE Link participants), while Romania, Hungary, and Poland serve as control countries. All selected countries are EU members with accessible and comparable yearly capital market data (such as stock market capitalization to GDP), which strengthens the validity of the counterfactual comparison. *We hypothesize that the treated group experienced greater improvements in these indicators following the introduction of the SEE Link.*

Financial integration indicators can be categorized into three main types: price-based, quantity-based indicators, and regulatory or institutional measures (Park, 2013; Billio et al., 2017). The stock exchange literature employs a range of methodologies to evaluate integration levels, volatility spillovers, and diversification dynamics before and after the introduction of integration initiatives. For example, Espinosa-Méndez et al. (2017), studying the Latin American Integrated Market (MILA), found that integration produced short-term benefits but that these gains tended to dissipate in the longer term. Similarly, Jiang et al. (2017) analysed interdependence and lag–lead relationships among ASEAN trading link participants between 2009 and 2016, underscoring the complex dynamics of regional stock market integration. Within the SEE region, several scholars have analysed the degree of integration among stock markets of SEE Link countries (Zdravkovski, 2016; Stoykova & Paskaleva, 2018; Pirgaip et al., 2021).

Park (2013, p. 15) emphasizes that "the greater the degree of financial integration, the more closely correlated the movements of prices of assets of similar risk profiles." Consistent with this view, Espinosa-Méndez et al. (2017) assessed financial integration through time-varying

correlations of market returns, employing the dynamic conditional correlation (DCC) model–a widely recognized approach for capturing evolving co-movements.

Accordingly, our second research question (RQ2) is addressed through two complementary perspectives:(i) *RQ2a: Have stock index returns become more closely correlated following the participation of exchanges in SEE Link in the short term? (ii) RQ2b: Have the values of stock indices exhibited stronger long-term cointegration since the participation of exchanges in SEE Link?*

To investigate these questions, we examine stock market co-movements among the six SEE Link member countries over the period 2011–2019. For RQ2a, we focus on natural logarithmic returns of stock indices, using a combination of statistical approaches: static Pearson correlation to capture general relationships and Engle's (2002) DCC model to analyse short-term dynamics. For RQ2b, we retain the index levels in natural logarithms and apply the Johansen cointegration framework to assess long-term equilibrium relationships among the markets. *Our hypothesis is that, following SEE Link participation, markets with the return of similarly risk-profiled indices have become more closely correlated in the short run, and index levels in natural logarithms demonstrate stronger long-term co-movement, reflecting a higher degree of financial integration in the region.*

The remainder of this article is organized as follows. Section 2 reviews the relevant literature, focusing on the relationship between capital markets and economic growth, the degree of stock market integration, and the SEE Link trading initiative. Section 3 provides an overview of the participating countries and introduces the SEE Link project. Section 4 describes the data and variables used in the analysis. Section 5 presents the empirical methodology and results, beginning with the DID analysis, followed by correlation and cointegration tests between the return and the natural logarithm level of indices of participating stock exchanges. Finally, Section 6 concludes by summarizing the key findings, discussing implications for policymakers and future research, and highlighting the study's limitations.

## Selected Literature Review

### Relationship between Capital Market and Economic Growth

Scholars have long examined the relationship and causality between financial system development and economic growth. Levine (2004) reviewed research on the links between financial system operations and economic growth. His study also addressed the debated question of the relative merits of capital market-based systems, characteristic of Anglo-Saxon economies, versus bank-based systems. During economic development, the respective functions of banks and securities markets are subject to structural evolution. "As countries develop economically, (1) the size of both banks and securities markets increases relative to the size of the economy, (2) the association between an increase in economic output and an increase in bank development becomes smaller, and (3) the association between an increase in economic output and an increase in securities market development becomes larger" (Demirgüç-Kunt et al., 2012, p. 1).

More recently, Molnár & Csiszárik-Kocsir (2022) found that stock markets can serve as leading indicators of economic activity. Empirical results indicate that the growth of the BUX index Granger-caused the expansion of the Hungarian economy. The literature also examines the relationship between varying degrees of capital market integration and economic growth. The deeper integration of capital markets in the European Union is necessary to support accelerated economic growth (Orlowski, 2020).

### The Degree of Financial Integration and Its Benefits

Park (2013) notes that financial integration lacks a universally agreed-upon definition or unique quantitative metric, yet it is commonly associated with financial openness and the mobility of capital. De jure measures capture legal restrictions, whereas de facto measures are commonly classified as either price-based or quantity-based: the latter capture actual financial flows and cross-border asset holdings, whereas the former rely on the "law of one price," under which greater integration is reflected in stronger correlations among asset prices with comparable risk profiles. Billio et al. (2017) add a third category: regulatory or institutional measures.

Both short-term and long-term welfare improvements may arise from financial integration. Higher integration enhances risk-sharing, allows for more efficient consumption smoothing, lowers trading costs, diversifies investor portfolios, and can stabilize consumption patterns (Espinosa-Méndez et al., 2017; Park, 2013). Financial integration also enables domestic investment to be funded externally, directing capital from surplus to deficit countries and, in principle, raising returns in the latter. However, increasing global integration reduces the benefits of international portfolio diversification due to stronger cross-country correlations and may limit the effectiveness of domestic policy (Billio et al., 2017).

Park (2013) identifies two main reasons capital does not always flow to capital-scarce countries. First, capital market imperfections and differing stages of financial development cause flows to respond to risk-adjusted rather than nominal returns; higher perceived risk in capital-scarce countries reduces actual flows. Second, institutional factors such as property rights protection, corruption, government stability, and bureaucratic quality further impede capital movement. Integration also increases risk through asset price volatility and potential abrupt reversals in capital flows (Martin & Taddei, 2013).

### Integration via Trading link

Several cross-border stock market initiatives provide insights into the effects of integration on market co-movement and diversification opportunities. The Latin American Integrated Market (MILA), created by the exchanges of Colombia, Chile, and Peru in 2009 and

joined by Mexico in 2014, officially began operations in 2011 as the second-largest market in Latin America. Espinosa-Méndez et al. (2017) used a dynamic conditional correlation (DCC) model and found that MILA increased return correlations among member countries, primarily due to higher trading volumes in the least developed markets. While short-term benefits were evident, long-term gains in returns and risk metrics dissipated over time, and trading volumes were negatively affected.

Similarly, the Shanghai-Hong Kong Stock Connect led to greater financial liberalization and increased volatility spillovers from Shanghai to Hong Kong, improving integration but reducing diversification benefits (Huo & Ahmed, 2017). The ASEAN Trading Link, launched in 2012 among Malaysia, Singapore, and Thailand, operated until 2017. Jiang et al. (2017) found that interdependence among ASEAN markets was strongest in the short term, especially following external shocks, and co-movement effects diminished within approximately two years.

In Europe, the CEE Stock Exchange Group (CEESEG) integrated the Budapest, Ljubljana, Prague, and Vienna exchanges, mainly through shared IT systems, branding, and data dissemination. Following the sale of the Budapest and Ljubljana exchanges in 2015, co-movement among the remaining exchanges continued to be high, thereby limiting diversification opportunities (Reboredo et al., 2015).

The South-Eastern Europe Link (SEE Link) connects six regional stock exchanges to facilitate cross-border trading. Pirgaip et al. (2021) employed various methodologies, including dynamic correlation models and regression analyses, utilizing daily returns from the Zagreb and Bulgarian exchanges (2005–2019). They found decreasing correlations over time, indicating the existence of diversification opportunities. Stoykova & Paskaleva (2018) examined the interactions among Bulgaria, Serbia, Slovenia, Romania, Montenegro, North Macedonia, Banja Luka, and Sarajevo, along with three reference markets, over the period 2005–2015. Through the application of VAR methodology, supported by variance decomposition and impulse response functions, evidence was found of weak to moderate positive linkages between the capital markets of Turkey, Greece, and Croatia and the other markets analysed. The results additionally indicate that the Bulgarian equity market is highly correlated with other Southeast European markets, notably Serbia, Romania, and Croatia. Similarly, Zdravkovski (2016) investigated the short- and long-term linkages among the Macedonian, Croatian, Slovenian, Serbian, and Bulgarian stock markets from 2005 to 2015, with a particular focus on the impact of the 2008 financial crisis. The study segmented the period into three phases: pre-crisis, crisis, and post-crisis. Johansen's co-integration test revealed evidence of co-integration during the 2008 financial crisis; three co-integration vectors emerged. These findings suggest that the global financial crisis (GFC) and the subsequent euro crisis strengthened the interconnection among the examined Balkan stock markets.

## SEE LINK

### Overview of the SEE Link Countries

The SEE Link countries share a common legacy of transitioning from command to market economies during the 1990s. Prior to the GFC, these markets attracted substantial foreign investment. By 2008, foreign banks- predominantly Western European institutions- controlled over 80% of banking sector assets (Arakelyan, p. 42018). Foreign portfolio investors, mainly from Europe and the United States, were also active and dominated the stock markets. This inflow of foreign capital contributed to financial development, facilitated technology transfer, and enhanced financial literacy across the region.

However, the 2008 financial crisis exposed the vulnerability of these markets. Foreign investors experienced substantial losses and reduced exposure by selling assets, which contributed to a decline in stock exchange indicators. Market growth prior to the crisis largely reflected speculative activity rather than fundamental economic improvements (Rakocevic, 2016). Based on data from the World Bank Development Indicators Database, portfolio equity net inflow– particularly in equities–declined sharply following the global financial crisis. In Serbia, for instance, foreign participation in the stock exchange fell from about 50% before the crisis to just 10% in 2021. By contrast, foreign direct investment (FDI) has remained relatively stable and even increased during the COVID-19 pandemic. In 2021, Serbia recorded the highest inflows (USD 4.07 billion), while Bosnia and Herzegovina and North Macedonia received the lowest (approximately USD 0.6 billion each). Unlike portfolio equity investment, FDI plays a crucial role for non-financial corporations by providing long-term capital and managerial expertise.

Despite improvements in macroeconomic indicators over the past decade, structural challenges persist in the region. Real GDP growth has remained positive, averaging above 2%, and GDP per capita has increased, with Croatia and Slovenia achieving the highest levels (USD 17,700 and USD 29,100, respectively, in 2021). Institutional indicators, such as the Rule of Law and the Corruption Perceptions Index, have shown modest progress; however, non-EU countries continue to lag behind EU benchmarks. Credit ratings for EU member states (Bulgaria, Slovenia, and Croatia) are generally within the investment-grade category, whereas those for non-EU countries remain below investment grade.

Capital markets in the region stay underdeveloped, with only a limited number of Initial Public Offerings (IPO) conducted annually. Non-financial corporations continue to rely predominantly on bank financing. Market capitalization as a share of GDP is well below the EU average of 54.2%, ranging from 33% in Croatia to 10% in Serbia and 13% in Slovenia. Market liquidity is low, with annual turnover as a share of capitalization below 10% in most markets, creating a self-reinforcing cycle of limited investor participation (Reininger & Walko, 2020). The pension fund to GDP indicator was relatively high in

Croatia (33.79%), Bulgaria (14.42%), and Slovenia (8%), but in the case of Serbia, it was 0.85% in 2020.

Currency volatility generally has a restricted effect on stock markets, except in Serbia and, historically, in Croatia. Several countries exhibit de facto or de jure euroization: Bosnia & Herzegovina and Bulgaria peg their currencies to the euro; Croatia adopted the euro in 2023; North Macedonia's denar is pegged to the euro; and Serbia operates a managed floating regime with central bank interventions (Országhova, 2015).

Overall, while the SEE Link countries have experienced macroeconomic and institutional improvements over the past decade, capital markets remain shallow, illiquid, and highly dependent on foreign investors.

### SEE Link Platform

Since the transition to market economies, the European Bank for Reconstruction and Development (EBRD) has played a key role in supporting the development of financial markets in the Western Balkans (EBRD, 2016). Despite these efforts, capital markets in the region remain underdeveloped. To address these challenges, the EBRD supported regional integration efforts through its "Local Currency and Capital Markets Initiative", which led to the establishment of the SEE Link platform. The EBRD provided a €540,000 grant to implement an electronic order routing system, enabling trading across multiple markets and improving access to integrated capital markets for investors and local brokers (SEE LINK, 2025c). SEE Link was initially established in 2014 by three stock exchanges: Bulgaria, Croatia, and North Macedonia. The company, SEE Link d.o.o., is headquartered in Skopje, with each founding exchange holding 33.33% of the €80,000 share capital. Governance has included representatives from the Bulgarian, Croatian, and Macedonian exchanges, with subsequent participation by the Belgrade (Serbia), Ljubljana (Slovenia), Banja Luka, and Sarajevo exchanges in 2015. The Zagreb Stock Exchange later acquired full ownership of the Ljubljana Stock Exchange and nearly 30% of the Macedonian Stock Exchange (ZSE,2015).

Operations began in March 2016, alongside the launch of two regional indices, SEE LinX and SEE LinX EWI, which track the ten most actively traded companies from participating exchanges. The indices initially included companies from Croatia, Bulgaria, Macedonia, Slovenia, and Bosnia & Herzegovina (EBRD, 2016). In May 2020, SEE Link launched the Listed SME Research Hub, funded by the Taiwan-Business EBRD Cooperation Fund, to enhance research coverage of small and medium-sized enterprises.

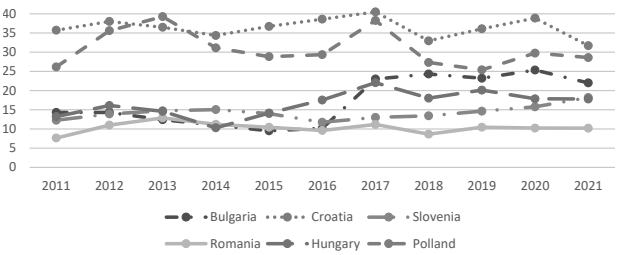
As of 2021, SEE Link connects seven stock exchanges, with a combined market capitalization exceeding USD 50 billion and over 1,200 listed securities. Cross-border transactions are executed through authorized brokers, while central securities depositories remain unlinked; settlement and clearing are facilitated by brokers. The platform aims to support investor diversification in Southeast Europe by increasing cross-border visibility and investment options. In 2018, SEE Link entered a strategic partnership with Raiffeisen Bank International, whose GSS Operations Centre provides settlement services for trades executed on the platform (SEE Link, 2025a). *As of September 2025, the latest available monthly statistics remain those of June 2023 (*SEE Link, 2025b)*; no subsequent data have been released*. Moreover, no information is available regarding the indices, including SEE LinX and SEE LinX EWI.

## Dataset

This study addresses two main research questions. The first is: "*How have the SEE Link stock exchanges evolved since their integration?*" To answer this, we rely on annual indicators of financial market development: (i) stock market capitalization to GDP (DM1), (ii) total value traded to GDP (DM2), (iii) stock market turnover ratio (EM1), and (iv) portfolio equity, net inflow (Portfolio). Annual data for DM1, DM2, and EM1, covering the period from 2011 to 2021, were obtained from the World Bank's Global Financial Development Database (World Bank, 2022). Portfolio equity net inflow data were sourced from the World Development Indicators Database (World Bank Group, 2025). Where gaps existed–such as stock turnover, capitalization, or IPO activity–supplementary information was collected from stock exchange annual reports, Trading Economics, and CEIC. These annual series provide harmonized, cross-country measures of long-term capital market development and were essential for the application of the difference-in-differences (DID) methodology. Figure 1 presents the most important indicator of the stock market, namely, stock market capitalization to GDP, for the period 2011–2021.

Figure 1

**The Stock Market Capitalization to GDP from 2011 to 2022**




*Source: World Bank Group (2022), own elaboration*

Two complementary perspectives are employed to examine the second research question. The short-term perspective asks whether stock index returns have become more closely correlated following the participation of exchanges in SEE Link. The long-term perspective investigates whether the values of stock indices exhibit stronger cointegration since the exchanges joined the platform. To examine these questions, we use daily closing price indices from Refinitiv/Eikon for seven markets: Serbia (BELEX15), Croatia (CROBEX), Bulgaria (SOFIX), Slovenia (SBI TOP), Bosnia and Herzegovina (SASX 10

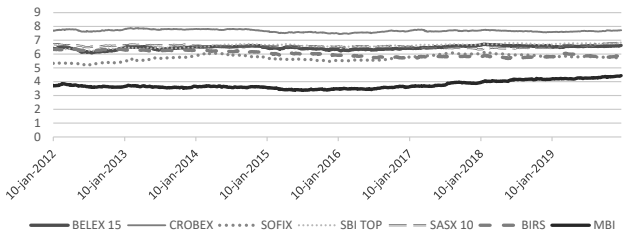
and BIRS), and North Macedonia (MBI). Basic information on Southeastern European stock markets is provided in Table 7 in the Appendix. National stock indices typically comprise large, liquid companies across diverse sectors, including telecommunications, banking, utilities, mining, oil and gas, and pharmaceuticals. The number of firms included in these indices is relatively small in most countries, ranging from approximately 9 to 22 (Horvath & Petrovski, 2013). The sample period spans 2012–2019, providing consistent, high-frequency data that capture market dynamics without major external disruptions such as the COVID-19 pandemic.

For RQ2a, we calculate logarithmic returns, defined as the first differences of the natural logarithms of the index values. This transformation produces stationary series that are suitable for correlation analysis and reveal short-run co-movements among markets. For RQ2b, we retain the index levels in natural logarithms to assess long-term equilibrium relationships through Johansen cointegration tests. This approach allows us to investigate whether SEE Link participation strengthened structural integration across regional stock markets.

Daily observations are particularly valuable, as they capture both short-term interactions and the potential for long-run linkages. Figure 2 illustrates the natural logarithmic daily returns of SEE Link member stock indices from January 2012 to December 2019.

Figure 2

**Natural Logarithms of the Stock Exchange Indices of SEE Link members, from 2012 to 2019.**




*Source: Refinitiv/Eikon, own elaboration*

A key challenge was ensuring the consistency and high quality of cross-country data, which required supplementing official sources with databases and annual reports. Combined, the datasets offer complementary insights: annual indicators (2011–2021) capture the structural evolution of the market, while the daily series (2012–2019) reveal short-run interdependencies and long-run integration.

## Methodology and Empirical Results

### The impact of SEE Link Development on the Stock Exchanges

To address the first research question– *"How have the SEE Link stock exchanges evolved since their integration?"* –we employ a difference-in-differences (DID) framework, comparing temporal changes between SEE Link participants and a control group of comparable CEE EU member states. The treatment group consists of Slovenia, Croatia, and Bulgaria, selected based on their participation in the SEE Link, EU membership, and the availability of complete data. The control group includes Hungary, Poland, and Romania, which, although not members of the SEE Link, share EU membership as well as comparable historical and institutional characteristics. The primary outcome variables are stock market capitalization to GDP (DM1), total value traded to GDP (DM2), the stock market turnover ratio (EM1), and portfolio equity net inflow (portfolio). The analysis is divided into two periods: the pre-SEE Link period (2011–2015) and the SEE Link period (2016–2021), with 2016 marking the start of SEE Link operations. The dataset is compiled from multiple sources, and descriptive statistics for the variables are presented in Table 1.

Table 1

**Descriptive Statistics of Stock Market Indicators**

| | Observation | | Mean | | St. Deviation | |
|---|---|---|---|---|---|---|
| | Before 2016 | After 2016 | Before 2016 | After 2016 | Before 2016 | After 2016 |
| **Treated group** | | | | | | |
| DM1 | 18 | 15 | 20.8 | 24.1 | 11 | 10.1 |
| DM2 | 18 | 15 | 0.9 | 0.48 | 0.38 | 0.23 |
| EM1 | 18 | 15 | 4.4 | 2.5 | 2.3 | 1.8 |
| Portfolio | 18 | 15 | -1.0 | 1.0 | 2.38 | 1.69 |
| **Controlled group** | | | | | | |
| DM1 | 18 | 15 | 18.8 | 19.1 | 10.3 | 8.7 |
| DM2 | 18 | 15 | 7.0 | 6,1 | 5 | 4.6 |
| EM1 | 18 | 15 | 34.1 | 26.1 | 22 | 13.0 |
| Portfolio | 18 | 15 | -3.53 | 3.66 | 7.39 | 6.51 |

*Source: World Bank (2022), own elaboration*

For the treated group, the stock market capitalization-to-GDP ratio (DM1) increased on average from 20.8% in the pre-2016 period to 24.1% after 2016. By contrast, the stock market total value traded-to-GDP ratio (DM2) declined from 0.9% to 0.48%. Similarly, the stock market turnover ratio (EM1) decreased from 4.4% to 2.5%, indicating a reduction in market liquidity. Portfolio equity net inflow, however, improved, shifting from a negative average value (–1.0) before 2016 to a positive value (1.0) in the subsequent period. In the control group, DM1 remained broadly stable (18.8% to 19.1%), while DM2 declined from 7.0% to 6.1%. Market turnover (EM1) also fell sharply, from 34.1% to 26.1%. Portfolio equity net inflow rose markedly, increasing from –3.53 to 3.66. These preliminary findings are partly consistent with our hypothesis that integration through the SEE Link exerts a positive influence on market capitalization and "portfolio equity net inflow" in the treated countries.

We first estimate DID models using the raw levels of each indicator to assess the absolute effects of SEE Link integration. To capture proportional changes, we then measure relative growth dynamics using the natural log differences of the indicators (LDM1, LDM2, and EM1). Finally, to account for macroeconomic conditions, we extend the DID specifications by including GDP growth as a control variable, isolating the effect of SEE Link from broader economic fluctuations. All models incorporate country and time fixed effects to absorb unobserved heterogeneity and common shocks, with standard errors clustered at the country level to address serial correlation. This sequential approach–levels, log-differences, and GDP controls–ensures robustness and allows evaluation of both absolute and relative changes in market development associated with SEE Link integration.

To verify the credibility of the DID design, we conduct a placebo (falsification) test by assigning a fictitious pre-treatment period before the actual introduction of SEE Link. If the parallel trends assumption holds, the interaction term in this placebo specification should be statistically insignificant, indicating that treated and control countries evolved similarly prior to SEE Link integration. We employed Stata 18. Although relatively small (66 observations, six clusters), the dataset is well-suited for DID estimation using Stata's didregress command. The panel structure enables the exploitation of both cross-country and temporal variation, providing meaningful insights; however, caution is warranted when interpreting cluster-robust standard errors with a small number of clusters.

Formally, the DID specification is given by:

$$Y_{it}=\alpha+\beta(Treated_i\times Post_t)+\gamma Treated_i+\delta Post_t+X_{it}+\mu_i+\lambda_t+\varepsilon_{it} \quad (1)$$

- $Y_{it}$: outcome of interest (DM1, DM2, EM1, Portfolio) for country i at time t.
- $Treated_i$: binary indicator equal to 1 if country i belongs to the treatment group (β: effect of SEE Link integration), zero otherwise.
- $Post_t$: binary indicator equal to 1 for periods after the introduction of SEE Link, and 0 for pre-integration periods (γ: pre-existing level differences between groups).
- $Treated_i\times Post_t$: DID interaction term, capturing the effect of SEE Link integration( δ: common time shocks after integration).
- $X_{it}$: vector of control variables (GDP growth).
- $\mu_i$: denotes country fixed effects, absorbing time-invariant heterogeneity across countries.
- $\lambda_t$: denotes time fixed effects.
- $\varepsilon_{it}$: idiosyncratic error term.

Table 2 presents the DID estimates for key financial indicators, both in their original levels and log-transformed forms, with and without controlling for GDP growth. Overall, the results provide mixed evidence, with several outcomes being sensitive to model specification, particularly the inclusion of GDP as a control variable. For *market capitalization to GDP (DM1)*, both the level and log specifications yield small, positive coefficients, but none reach statistical significance ($p > 0.16$). This suggests that while the point estimates indicate a modest upward effect, there is no robust evidence that the treatment has a material influence on market capitalization. Turning to *the total traded value to GDP (DM2) ratio*, the level specification initially shows a positive and statistically significant effect ($p < 0.001$) when GDP is not controlled for. However, once GDP is included, the effect weakens and loses significance ($p = 0.28$). The log specification consistently produces minor, non-significant effects across models. These patterns indicate that the initial significance in DM2 is likely attributable to GDP-related confounding rather than a genuine treatment effect.

For the *turnover ratio (EM1)*, the level specification suggests a significant positive effect in the absence of GDP controls ($p < 0.001$). However, the effect becomes non-significant when GDP is included, with considerably larger standard errors. By contrast, the log specification shows consistent positive effects, with statistical significance achieved once GDP is controlled ($p = 0.034$). This provides relatively more robust evidence among the outcomes: EM1 appears to increase meaningfully in percentage terms, and this effect remains robust under the preferred log specification. For the portfolio, we do not report a log specification; the level results are unstable–positive but non-significant without GDP ($p = 0.22$) and negative with GDP, remaining highly uncertain with wide

Table 2

**DID Results**

| Outcome | Type | DID Coefficient (No GDP) | Std. Error | p-value | DID Coefficient (GDP controlled) | Std. Error | p-value |
|---|---|---|---|---|---|---|---|
| DM1 | Level | 2.49 | 3.51 | 0.509 | 2.86 | 3.47 | 0.448 |
| LDM1 | Log | 0.127 | 0.092 | 0.272 | 0.142 | 0.088 | 0.166 |
| DM2 | Level | 0,47 | 0.69 | <0.001 | 0.547 | 0.448 | 0.277 |
| LDM2 | Log | 0.030 | 0.078 | 0.712 | 0.082 | 0.067 | 0.279 |
| EM1 | Level | 6.4 | 2.82 | <0.001 | 6.72 | 7.53 | 0.413 |
| LEM1 | Log | 0.0549 | 0.0445 | 0.272 | 0.090 | 0.031 | 0.034 |
| Portfolio | Level | 12.69 | 9.07 | 0.221 | -1.5e9 | 3.10e9 | 0.562 |

*Source: World Bank (2022), own elaboration*

confidence intervals. This instability suggests that portfolio outcomes are not reliably affected by the treatment and are highly sensitive to macroeconomic conditions. Overall, the turnover ratio (EM1) emerges as the most reliable indicator of SEE Link's impact. While descriptive statistics show a decline in turnover across both groups, the DID results indicate that integration mitigated this decline among treated countries.

### The Co-movement of the Stock's Return

For our econometric analysis, daily returns are defined as the continuously compounded rate of return for country *i* at time *t* (Horvath &Petrovski, 2013). The sample covers two four-year periods, comprising 865 observations from 2012 to 2015 and 854 observations from 2016 to 2019. Descriptive statistics and preliminary test results for the return series are presented in Table 3.

The results show that index returns are negatively skewed during both periods for BELEX15, SBITOP, SASX10, and BIRS. In both periods, the distributions are leptokurtic, further indicating departures from normality. Stationarity was examined using the Augmented Dickey–Fuller (ADF) test. Across both subperiods, the null hypothesis of a unit root is rejected at the 5% significance level, confirming that all return series are stationary. To assess the presence of white noise, the Portmanteau (Q) statistic was applied. The null hypothesis of white noise is rejected for BELEX, SOFIX, and BIRS during the period 2012–2015 at the 5% significance level, whereas for other cases, the null hypothesis cannot be rejected. This suggests that the series generally do not behave as pure white noise processes. Overall, the evidence confirms that the return series exhibit the standard stylized features of financial time series: non-normality, stationarity, and limited evidence of white noise

Table 3

**Descriptive Statistics of Return**

| | Mean | | Standard Deviation | | Skewness | | Kurtosis | | ADF Test lag 1 | | Portmanteau (Q) statistic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2012-2015 | 2016-2019 | 2012-2015 | 2016-2019 | 2012-2015 | 2016-2019 | 2012-2015 | 2016-2019 | 2012-2015 | 2016-2019 | 2012-2015 | 2016-2019 |
| *BELEX15* | -.005 | .032 | 1.00 | .847 | -0.039 | -.183 | 4.66 | 6.155 | -10.719 | -21.175 | 79.4 | 50.5* |
| *CROBEX* | -.019 | .022 | 0.83 | .784 | 0.69 | -.265 | 8.295 | 5.954 | -11.457 | -21.318 | 41.6* | 30.6* |
| *SOFIX* | .027 | .021 | 1.108 | .831 | .058 | -.208 | 6.172 | 6.845 | -11.742 | -19.862 | 64,46 | 38,0* |
| *SBITOP* | .024 | .037 | 1.05 | .633 | -.016 | .171 | 4.997 | 6.342 | -13.658 | -19.692 | 36.3* | 38,7* |
| *SASX 10* | -.019 | .021 | .763 | .935 | -.219 | -.101 | 8.86 | 10.176 | -13.276 | -21.011 | 40,6* | 49.5* |
| *BIRS* | -.050 | -.006 | .972 | 1.089 | -.155 | -.192 | 6.423 | 9.510 | -13.721 | -20.964 | 96,3 | 35.9* |
| *MBI* | -.027 | .108 | .961 | .901 | .612 | .471 | 8.069 | 6.864 | -10.772 | -19.860 | 40.4* | 45,1* |

*Source: own elaboration*

Table 4

**Pearson Correlation**

| 2012-2015 | Belex15 | CROBEX | SOFIX | SBITOP | SASX10 | BIRS | MBI |
|---|---|---|---|---|---|---|---|
| BELEX15 | 1 | | | | | | |
| CROBEX | 0.45*** | 1 | | | | | |
| SOFIX | 0.37*** | 0.43*** | 1 | | | | |
| SBITOP | 0.10 | 0.18 | 0.11 | 1 | | | |
| SASX10 | 0.04 | 0.04 | -0.06 | -0.04 | 1 | | |
| BIRS | 0.09 | 0.10 | 0.89 | 0.016 | 0.054 | 1 | |
| MBI | 0.26 | 0.29 | 0.28 | -0.00 | 0.02 | 0.15 | 1 |
| *2016-2019* | Belex15 | CROBEX | SOFIX | SBITOP | SASX10 | BIRS | MBI |
| BELEX15 | 1 | | | | | | |
| CROBEX | 0.41*** | 1 | | | | | |
| SOFIX | 0.40*** | 0.44*** | 1 | | | | |
| SBITOP | 0.12 | 0.18 | 0.11 | 1 | | | |
| SASX10 | -0.02 | -0.02 | -0.02 | 0.01 | 1 | | |
| BIRS | 0.05 | 0.05 | 0.10 | -0.05 | 0.04 | 1 | |
| MBI | 0.30 | 0.32 | 0.29 | 0.04 | -0.00 | 0.03 | 1 |

*Source: own elaboration *** significant 1%*

behavior. We investigate market co-movements using two complementary approaches: (i) static Pearson correlations, (ii) Dynamic Conditional Correlation (DCC) models. We hypothesize that correlations between stock market returns increased in the latter period, reflecting closer integration following the implementation of the SEE Link.

## Pearson correlations

To examine short-term interdependencies among SEE stock markets, we first compute *unconditional (Pearson) correlations* of daily stock index returns. While the normality assumption is not fully satisfied, the large number of observations (865 in the first period; 850 in the second period) ensures that the Pearson correlation estimates remain robust (Cohen et al., 2009).

Table 4 reports the Pearson correlations for 2012–2015 and 2016–2019. During 2012–2015, correlations were generally weak, indicating limited pre-SEE Link integration. The strongest relationships were observed between BELEX15–CROBEX and CROBEX–SOFIX, whereas MBI exhibited lower-than-average positive correlations with other indices. Following the implementation of the SEE Link (2016–2019), correlations did not increase substantially. BELEX15 correlations weakened, while CROBEX, SOFIX, and MBI showed slight improvements, suggesting a limited impact of SEE Link on unconditional short-term co-movement.

## Dynamic Conditional Correlations

To capture time-varying interdependencies among SEE stock markets, we estimate a Dynamic Conditional Correlation (DCC) model following Espinosa-Méndez et al. (2017), Horváth & Petrovski (2013), and Gjika & Horváth (2013). Table 5 reports the estimated conditional correlations, with statistical significance evaluated using Wald tests (insignificant correlations unmarked).

The results reveal heterogeneous and generally weak short-term linkages. BELEX15, CROBEX, SOFIX, and MBI exhibit several significant conditional correlations, suggesting partial co-movement, whereas SASX10 remains entirely disconnected from the region. SBI TOP and BIRS show only sporadic significant linkages, underscoring the incomplete nature of regional integration. Overall, these findings indicate that short-term co-movements remain fragmented, consistent with the static Pearson correlations, and that the SEE Link has not generated strong convergence in the market's return dynamics.

## Johansen multivariate cointegration test

To investigate long-run interdependence among SEE stock markets, we employ the Johansen multivariate cointegration test within a Vector Error Correction Model (VECM) framework, based on the natural logarithms of the stock indices. The VECM framework allows us to capture both long-term equilibrium relationships and short-term deviations, providing a comprehensive picture of inter-market linkages. Prior to cointegration analysis, we test for stochastic non-stationarity using the Augmented Dickey-Fuller (ADF) unit root test. The results indicate that the natural logarithm level of all stock indices–BELEX15, CROBEX, SOFIX, SBITOP, SASX10, BIRS, and MBI–are non-stationary in levels but stationary in first differences across both periods (2012–2015 and 2016–2019). This confirms that all series follow a unit root process (I(1)), and first differencing is required for VAR modeling. These findings are consistent with Zdravkovski (2016), who documented similar behavior in SEE stock markets.

The VECM is specified as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum \Gamma_i \Delta Y_{t-i} + \mu + \varepsilon_t \quad (2)$$

where

- $\Delta Y_{t:}$ $Y_t - Y_{t-1} \rightarrow$ the first difference of the vector of index returns
- $Y_{t-1:}$ vector of stock index levels at the previous time step.
- Π: matrix that captures the long-run relationships among the variables.
- $\Gamma_i$ : matrices capturing short-term interactions among the variables. (Zdravkovski, 2016).
- $Y_{t-i:}$ lagged changes in the stock indices.
- μ: vector of constants, accounting for fixed trends or mean levels in the data.
- $\varepsilon_t$: residual or shock term,

The rank of Π indicates the number of cointegrating vectors, reflecting the number of long-run equilibrium relationships. Optimal lag length for the VAR component of the VECM was determined using AIC, HQIC, FPE, and

Table 5

**Summary of Conditional Correlations from the DCC model**

| | BELEX 15 | CROBEX | SOFIX | SBI TOP | SASX 10 | BIRS | MBI |
|---|---|---|---|---|---|---|---|
| BELEX 15 | 1.00 | | | | | | |
| CROBEX | 0.45*** | 1.00 | | | | | |
| SOFIX | 0.41*** | 0.48*** | 1.00 | | | | |
| SBI TOP | 0.15*** | 0.19*** | 0.14*** | 1.00 | | | |
| SASX 10 | 0.03 | 0.01 | -0.01 | -0.01 | 1.00 | | |
| BIRS | 0.09*** | 0.11*** | 0.12*** | 0.00 | 0.02 | 1.00 | |
| MBI | 0.32*** | 0.32*** | 0.31*** | 0.06 | 0.03 | 0.12*** | 1.00 |

*Source: owned elaboration Notes: *** significant at 1%*

likelihood ratio tests, consistently suggesting one lag. This indicates that a first-order VAR adequately captures short-term dynamics among the indices, ensuring that the VECM specification is well-posed.

Table 6 presents the results of the Johansen cointegration tests with a constant trend. Both the trace and maximum eigenvalue statistics fail to reject the null hypothesis of zero cointegrating vectors at the 5% significance level in either period (2012–2015 and 2016–2019). This suggests that no stable long-run equilibrium relationships exist among the SEE stock indices over the examined periods.

Table 6

**Result of the Johansen Co-integration Test**

| Panel | Eigenvalue | Trace Test | Critical Value | Max test | Critical Value | Eigenvalue | Trace Test | Critical Value | Max test | Critical Value |
|---|---|---|---|---|---|---|---|---|---|---|
| *Panel 2012-2015* | | | 5% | | 5% | *Panel 2016-2019* | | | | |
| R=0 | | 105* | 124 | 33 | 41 | | 95* | 124 | 24 | 45 |
| R=1 | 0.04 | 73 | 94 | 25 | 36 | 0.03 | 69 | 94 | 21 | 39 |
| R=2 | 0.03 | 47 | 68 | 19 | 30 | 0.02 | 48 | 68 | 20 | 33 |
| R=3 | 0.02 | 28 | 47 | 14 | 23 | 0.02 | 28 | 47 | 12 | 27 |
| R=4 | 0,02 | 14 | 29 | 9 | 17 | 0,01 | 15 | 29 | 10 | 20 |
| R=5 | 0.01 | 5 | 15 | 5 | 11 | 0.01 | 6 | 15 | 6 | 14 |
| R=6 | 0.01 | 1 | 3.7 | 1 | 3 | 0.01 | 0 | 3.7 | 0 | 3.76 |
| R=7 | 0 | | | | | 0 | | | | |

*Notes: R denotes the number of cointegrating vectors. Trace and maximum eigenvalue statistics are compared with 5% critical values. Source: own elaboration*

These results indicate that while SEE stock indices may show weak short-term co-movements (as indicated by Pearson and DCC correlation analyses), they do not share stable long-run relationships. The absence of cointegration suggests that short-term shocks dominate, and long-term market integration remains limited. The introduction of the SEE Link trading platform in 2016 did not materially alter this pattern; neither the number nor the strength of cointegrating relationships increased post-2016.

## Discussion and Conclusion

Harmonized with the EU Capital Markets Union Action Plan, the EBRD supported the creation of the SEE Link trading platform to strengthen local capital markets in Southeastern Europe, where small exchanges, following the Global Financial Crisis (GFC), lacked sufficient depth and resilience to attract foreign investors. This study evaluates the impact of SEE Link on market development and financial integration among its partner stock exchanges.

Regarding market evolution, difference-in-differences analysis indicates that SEE Link member countries (Slovenia, Croatia, and Bulgaria) experienced modest improvements relative to the control group (Hungary, Romania, and Poland). Stock market capitalization to GDP and total value traded to GDP showed no statistically significant changes after SEE Link introduction, even when controlling for GDP growth. By contrast, turnover ratios exhibited a small but significant increase in relative trading activity, suggesting incremental gains in market liquidity. Portfolio equity net inflows remained largely unaffected. Overall, the hypothesis is partially supported: SEE Link appears to have modestly enhanced trading activity but has not generated transformative improvements in market depth or cross-border investment.

Short-term co-movements of returns among SEE stock markets remain weak to moderate. Pearson correlations indicate limited pre- and post-SEE Link integration, with the strongest linkages observed among CROBEX, SOFIX, and BELEX15, whereas SASX10 remains largely isolated. Dynamic Conditional Correlation estimates reinforce this heterogeneity, showing partial co-movement primarily among larger exchanges, while smaller or less liquid markets remain disconnected.

Long-term relationships, assessed via Johansen cointegration tests, indicate that SEE stock indices do not share stable long-run equilibrium relationships in either 2012–2015 or 2016–2019, as trace and maximum eigenvalue statistics fail to reject the null of zero cointegrating vectors. This suggests that short-term co-movements may occur, but long-term interdependence is weak, and the SEE Link platform has not materially strengthened integration. Consequently, the hypothesis that SEE Link participation would enhance both short- and long-term co-movement must be rejected. These findings align with Zdravkovski (2016), who documented temporary cointegration among Balkan markets during the 2008 financial crisis, indicating that systemic shocks can strengthen linkages, whereas structural factors continue to limit long-term integration under normal conditions.

Several factors may explain the limited impact of SEE Link. Key determinants of market attractiveness, including credit ratings, the rule of law, corruption levels, and GDP growth, remain relatively low. Market capitalization is stagnant, and in some markets (e.g., Croatia), free float is limited. Structural and technical barriers–including high transaction costs, fragmented clearing and settlement systems, divergent regulations, and multiple currencies–further constrain integration. Limited visibility, data access,

and maintenance of the SEE Link platform and its associated indices have also reduced practical engagement, with the platform providing no updated information since June 2023.

This study has several limitations. First, the analysis relies on a constrained set of quantitative measures, primarily stock market indices, which may not fully capture broader market dynamics. Second, data availability for smaller SEE exchanges is limited, restricting both temporal coverage and cross-country comparability. Third, the study focuses on relatively short pre- and post-SEE Link periods (2012–2015 vs. 2016–2019), which may not capture longer-term effects or high-frequency dynamics. Finally, qualitative factors such as institutional coordination, regulatory enforcement, and investor sentiment were not directly assessed, potentially overlooking important drivers of market integration.

Future research could address these gaps by incorporating institutional and qualitative dimensions, including interviews, surveys, and case studies with market participants, regulators, and institutional investors, to better understand operational, regulatory, and behavioral barriers to integration.

To strengthen regional integration and attract long-term capital, policymakers should pursue a comprehensive strategy. Regulatory harmonization, aligning clearing, settlement, and listing rules across SEE exchanges, would reduce transaction costs and operational barriers. Enhancing market transparency and visibility can increase platform credibility and participation. Institutional strengthening, including improvements in corporate governance, the rule of law, and investor protection, would bolster foreign investor confidence. Finally, closer integration with broader EU initiatives, particularly the Capital Markets Union, could facilitate cross-border investment and support regulatory convergence, creating a more robust and cohesive regional financial market.

In summary, SEE Link has produced only modest improvements in market activity but has had a limited impact on long-term integration among SEE LINK stock exchanges. Persistent structural, regulatory, and technical barriers, combined with limited operational transparency and the absence of updated information since June 2023, underscore the need for targeted policy measures to achieve meaningful regional financial integration.

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## Appendix

Table 7.

**SEE Link Stock Markets**

| Index name | Country of the Index | Stock exchange name | Year of establishment | Number of constituents | Constituents in 2022 December |
|---|---|---|---|---|---|
| SASX 10 | Bosnia and Herczegovina | Sarajevo Stock Exchange | 2007 | 10 | ASA Banka dd Sarajevo, Badeco Adria Sarajevo JSC, Bh Telecom, Bosnalijek Sa, Centrotrans Tranzit, Elektropriv Bi, Elektropriv Hz, Pobjeda dd Tesanj, Sarajevo Osig Tvornica Cemen |
| BELEX 15 | Serbia | Belgrade Stock Exchange | 2005 | Initially 15, now 10 | Aerodrom Nikol, Alfa Plam Vran, Dunavosiguranj, Energoprojekt, Fintel Energija ad Beograd, Impol Seval, Jedinstvo Sevo, Metalac, NIS AD, Tehnoga |
| CROBEX | Croatia | Zagreb Stock Exchange | 1997 | Initially 22, now 18 | Adris Grupa, Arena Hospitality Group, Atlantic Grupa, Atlantska Plovidba, Ericsson Nikola Tesla, Hpb, Ht ,Ingra, Jadroplov, Koncar, Ftb Turizam, Plava Laguna, Podravka, Valamar, Riviera, Span, Tankerska Next Generation, Brodogradiliste Viktor Lenac, Zagrebacka Banka |
| SBI TOP | Slovenia | Ljubljana Stock Exchange | 2006 | 9 | Cinkarna Celje, Krka, Luka Koper, Nlb, Petrol, Pozavarovalnica Sava, Telekom Slovenije, Unior, Zavarovalnica Triglav |
| SOFIX | Bulgaria | Bulgarian Stock Exchange | 2000 | 15 | Sopharma AD-Sofia, Eurohold Bulgaria AD-Sofia, Allterco AD-Sofia, M+S Hydraulic AD-Kazanlak, Holding Varna AD-Varna, CB First, Investment Bank AD-Sofia, Advance Terrafund REIT-Sofia, CB Central Cooperative Bank AD-Sofia, Chimimport AD-Sofia, Doverie United Holding PLC-Sofia, Telelink Business Services Group AD-Sofia, Neochim AD-Dimitrovgrad, Bulgarian Real Estate Fund REIT-Sofia, Sirma Group Holding AD-Sofia, Elana Agrocredit AD-Sofia |
| MBI 10 | North Macedonia | Macedonian Stock Exchange | 2005 | 10 | Alkaloid Skopje, Stopanska banka Skopje, Granit Skopje, Komercijalna banka Skopje, Makpetrol Skopje, TTK Banka Skopje, Makedonski Telekom Skopje, Makedonijaturist Skopje, NLB Banka Skopje, Stopanska banka Bitola |
| BIRS | Bosnia and Herczegovina | Banja Luka Stock Exchange | 2004 | 14 | Cistoca ad Banja Elektro Doboj Elektro-Bijelj Elektrokrajina Hidroelek Na T Hidroelektrane Na Drini Hidroelektrane Vrbasu Mrkonjic Mtel Banja Luka ad Nova Banka Rafinerija Ulja ad Modrica Rite Gacko Rite Ugljevik Zeljeznice Rs Ztc Banja Vruc |

*Source: Investing.com (2022), own elaboration*