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Can Institutional Integration of Western Balkans' Stock Exchanges Strengthen Monetary Transmission?

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Abstract

This paper asks how institutional stock-market integration reshapes the transmission of monetary policy through asset prices in small open economies. Motivated by the persistent segmentation of Western Balkan capital markets, we develop a two-stage counterfactual transmission framework to identify how stock-exchange consolidation would alter the elasticity of market valuations to monetary shocks.

First, a synthetic-control simulation constructs a counterfactual integrated Western Balkan stock exchange comprising Bosnia and Herzegovina, North Macedonia, and Serbia, benchmarked to the Baltic OMX merger, thereby quantifying the structural valuation gains of institutional integration. Second, we identify exogenous monetary-policy innovations using a Taylor-rule framework augmented with inflation and output forecasts, as well as reserve adjustments. These shocks are then embedded within a Local Projections estimator à la Jordà (2005) to trace the dynamic responses of market capitalisation under fragmented and integrated market regimes.

The results point to a systematic amplification of monetary-policy transmission through the asset-price channel once markets are unified. Following a policy tightening of about 100 basis points, equity valuations fall roughly twice as strongly under integration as under fragmented markets. Additionally, we find that integration alters the sensitivity of monetary transmission itself: the initial pass-through intensifies, but its marginal responsiveness to further integration declines over time, signalling the consolidation of a new steady-state regime.

Keywords: Monetary policy transmission, Asset-price channel, Financial integration, Stock exchange merger

JEL: E44, E52, F36

1. Introduction

The fragmentation of equity markets in the Western Balkans remains one of the most persistent structural weaknesses of the region's financial architecture. Despite two decades of institutional transition and broader integration efforts such as the Stabilisation and Association Process, CEFTA, the Common Regional Market, and the Open Balkans Initiative, financial integration has lagged behind other dimensions of economic convergence. While trade and banking linkages have become increasingly cross-border, domestic equity markets remain nationally segmented, shallow, and institutionally isolated. Regulatory frameworks have largely converged toward the European acquis, yet the region still lacks a unified framework for investment, intermediation, and risk-sharing. As a result, domestic exchanges are too small to support meaningful diversification, cross-border trading remains minimal, and capital markets play only a limited role in transmitting macro-financial signals. This structural gap limits both financial stability and monetary-policy traction, rendering these economies bank-centric.

Experience from the early 2000s in Europe suggests that stock-exchange consolidation can generate gains beyond micro-level efficiency improvements. The merger of the Baltic exchanges into the OMX system in 2004, along with similar initiatives in Central and Eastern Europe, was followed by deeper liquidity, lower transaction costs, and enhanced information efficiency (Jazepcikaite, 2008; Dorodnykh, 2013). These outcomes motivate a broader question: can institutional stock-market integration also reshape the macroeconomic transmission mechanism, that is, the elasticity of asset prices to monetary shocks? In principle, integrated markets should transmit policy signals more swiftly and price information more efficiently, thereby strengthening the asset-price channel of monetary policy (Ehrmann & Fratzscher, 2004; Meier, 2013). In this sense, the institutional integration of stock exchanges becomes not only a financial-development strategy but also a macroeconomic transmission reform.

In the Western Balkan context, however, this hypothesis remains untested. No regional exchange merger has taken place, and the data do not contain a clear policy event that would allow for standard identification strategies such as difference-in-differences or event studies. Moreover, heterogeneous institutional quality and partial euroisation complicate causal inference. Addressing these challenges requires a framework capable of constructing a credible counterfactual for exchange integration and tracing its implications for monetary-policy transmission.

This paper develops such a framework through a two-stage counterfactual transmission design. In the first stage, we employ the Synthetic Control Method (SCM) (Abadie & Gardeazabal, 2003; Abadie et al., 2010) to simulate how the market capitalisation of a hypothetical Western Balkans exchange comprising Serbia, Bosnia and Herzegovina, and North Macedonia (WB3) would have evolved had these markets consolidated. The Baltic OMX merger serves as an institutional and quantitative benchmark. In the second stage, we estimate Taylor-rule-based monetary-policy shocks, incorporating forward-looking inflation and output forecasts, as well as official-reserve adjustments, to reflect the hybrid and partially

euroised policy regimes typical of the region. These shocks are then embedded in a Local Projections (LP) model à la Jordà (2005) to assess how monetary-policy innovations affect equity valuations under two counterfactual configurations: fragmented national exchanges and a unified Western Balkans (WB3) stock exchange.

This combined SCM-LP framework captures both the static valuation effects of integration and the dynamic transmission effects, that is, how monetary shocks propagate over time under integration. To capture these dynamics, we introduce an integration-sensitivity coefficient (g_h), a horizon-dependent semi-elasticity that measures how the responsiveness of market capitalisation evolves as financial linkages deepen.

The results point to a consistent narrative. The synthetic simulations indicate that a hypothetical WB3 merger of stock exchanges would have produced a moderate yet persistent uplift in market capitalisation, interpreted as a credibility-driven and structurally anchored gain rather than a short-lived valuation surge. Building on this, the Local Projections results show that integration strengthens the asset-price channel of monetary policy, that is, a 100-basis-point tightening produces a deeper and more persistent decline in equity valuations under integration, with responsiveness increasing by roughly 30-50 percent at peak horizons.

To our knowledge, this is the first paper to quantify the effects of a prospective stock-exchange merger in the Western Balkans and to empirically test the transmission of monetary-policy shocks within a counterfactual integrated-market environment. By combining SCM and LP within a unified empirical framework, the paper bridges the institutional-finance and monetary-transmission literatures, offering an applied link between financial integration and macroeconomic performance in transition economies.

The implications are twofold. First, institutional consolidation of exchanges can yield durable gains in credibility, transparency, and investor confidence, provided that sufficient absorptive capacity and regulatory coherence exist. Second, financial integration can serve as a monetary-transmission reform, enhancing the responsiveness of financial variables to the policy stance and improving the efficiency of information diffusion.

The remainder of the paper is structured as follows. Section 2 reviews the literature and situates the analysis within the experience of transition economies. Section 3 outlines the methodological rationale for combining the SCM and LP frameworks and describes the data. Section 4 presents the synthetic baselines, comparative benchmarks, and simulated merger effects. Section 5 examines the monetary-policy transmission mechanism, while Section 6 concludes.

2. Literature Review

2.1 Stock Exchange Mergers and Integration

Stock-exchange mergers occupy an important place in the broader debate on financial-market integration, particularly in post-liberalization environments where exchanges moved from state-controlled structures toward privatized and increasingly technology-driven systems. The literature has focused on the evolution of emerging stock markets (Claessens et al., 2000), the

institutional and regulatory conditions conducive to mergers (Dorodnykh, 2014), and the effects of consolidation on liquidity, efficiency, and market reach (Pagano et al., 2002; Pagano et al., 2005; Nielsson, 2009). Early debates emerged in response to governance bottlenecks in mutual exchanges, whose member-owned structures faced inefficiencies and conflicts of interest as markets became more complex and competitive (Steil & Aggarwal, 2002; Phillips et al., 2014; Aggarwal & Dahiya, 2006). Demutualisation allowed exchanges to modernize infrastructure, access external capital, and compete internationally (de Passos Homem de Sá, 2009), while digitalisation and regulatory changes, including the EU's Investment Services Directive, further eroded geographic segmentation and pushed smaller exchanges toward consolidation (Domowitz & Steil, 1999; Macey & O'Hara, 2002; Cospormac, 2009).

In Europe, competitive pressure and EMU-driven financial integration catalysed a wave of mergers. Two dominant models emerged: horizontal integration through mergers of trading venues and vertical integration of clearing and settlement systems (Di Noia, 1998; Floreani & Polato, 2010). Empirical evidence generally confirms reduced trading costs, enhanced liquidity, and economies of scale (Floreani & Polato, 2010; Dorodnykh, 2013), while the EMU and globalisation reinforced cross-border financial linkages (Hardouvelis, 2007; Kim et al., 2005; Bhagwati, 2014; Dorodnykh, 2013). The literature distinguishes regional integrations such as Euronext, the Nordic Exchange, and BME from later transatlantic linkages such as NYSE-Euronext (Dorodnykh, 2013; Polato & Floreani, 2010). The expected gains include higher liquidity, reduced investment frictions, better resource allocation, and improved growth potential (Vasila, 2003; Dorodnykh, 2013), as well as technology transfer, governance harmonisation, and institutional learning (Pagano et al., 2002; Gomes-Casseres et al., 2006; Hasan et al., 2010). Yet evidence remains mixed. Euronext lowered trading costs and improved liquidity, but gains were uneven: Portugal realized smaller benefits due to scale limitations, and improvements were concentrated among larger issuers (Pagano & Padilla, 2005; Slimane, 2010; Nielsen, 2009). Hence, realised gains depend on market size, depth, and pre-merger institutional capacity. While the micro-level effects of consolidation are relatively well documented, the literature remains largely silent on whether such mergers alter the transmission of monetary policy (Pagano & Padilla, 2005; Nielsen, 2009; Phillips et al., 2014). To date, no study has examined how monetary transmission differs before and after consolidation, including in the cases of Euronext or OMX Nordics and Baltics.

2.2 Stock Markets in Emerging Economies

The emergence of stock markets in post-socialist economies reflected the broader process of rebuilding financial institutions after decades of central planning. Transition economies sought to replace mono-bank systems with two-tier structures and to establish capital markets capable of supporting private ownership and investment, yet outcomes were uneven and shaped by macroeconomic stabilization, privatization design, and the credibility of regulatory reform (Claessens et al., 2000; Kornai, 1992; Theodoropoulos & Vojinović, 2005). By the turn of the millennium, most had established formal stock exchanges, though most remained shallow and poorly integrated into the financial system. Only Estonia and Hungary achieved market-capitalization-to-GDP ratios comparable to those of other emerging markets (World

Bank, 2001). In many cases, exchanges functioned mainly as vehicles for ownership transfer rather than capital formation; in North Macedonia, for example, turnover ratios in 2000 were below 10 percent, while more than 95 percent of transactions were concentrated in fewer than 5 percent of listed companies (Claessens et al., 2001).

The literature identifies two broad models of post-socialist market formation. The first, privatization-driven markets, emerged in countries such as Bulgaria, Slovakia, and North Macedonia, where voucher schemes spread ownership thinly across large populations, weakened incentives to trade, and constrained the use of equity for financing. The second, IPO-led markets, developed in Estonia, Hungary, and Poland, where public listings and foreign investors anchored market development, while clearer listing standards, stronger legal frameworks, and earlier alignment with international norms encouraged higher turnover and stronger market confidence (Claessens et al., 2000; Blommestein, 2000). The broader lesson is that financial development depends fundamentally on institutional reform. Where credible monetary policy, transparent governance, and enforceable investor rights were established early, capital markets became meaningful components of the financial system. Where reforms were delayed or inconsistent, exchanges remained peripheral. The transition experience therefore shows that creating an exchange is not sufficient to create a market: liquidity and credibility emerge only when regulatory stability and investor confidence are secured.

2.3 Comparative Analysis of the Baltic States and the Western Balkans

The post-socialist transition in Eastern Europe followed markedly different paths across regions. Both the Baltic States and the Western Balkans experienced severe output contractions and high inflation in the early 1990s, but the speed and credibility of stabilization diverged. The Baltic countries moved early to establish macroeconomic discipline, independent central banks, and exchange-rate anchors. By 1995, Estonia, Latvia, and Lithuania had reduced inflation from four-digit levels in 1992 to below 10 percent, restored positive growth, and stabilised expectations (EBRD, 2001).

Most Western Balkan economies, by contrast, delayed fundamental reforms. Hyperinflation episodes in Yugoslavia and its successor states reached several thousand percent, while fiscal imbalances persisted well into the late 1990s. Adjustment was further complicated by political instability and post-war reconstruction. Croatia and North Macedonia were early stabilizers, but Serbia and Bosnia and Herzegovina lagged behind due to institutional fragmentation and weaker policy coordination.

Differences in fiscal, trade, and institutional indicators reinforced this divergence. By 2000, Baltic fiscal deficits averaged below 3 percent of GDP, while in the Western Balkans they often exceeded 5 percent. The Baltics also reoriented trade rapidly toward the European Union, whereas Western Balkan trade remained more regionally concentrated. Institutional reform further widened the gap: by 2001, Estonia and Latvia achieved EBRD scores above 4 for enterprise restructuring and competition policy, compared to 2-3 in Serbia and Bosnia and Herzegovina (EBRD, 2001). Early EU alignment allowed the Baltics to strengthen property rights, streamline privatization, and improve investor protection, whereas the Western Balkans progressed more slowly in corporate governance and capital-market oversight.

These contrasts translated into different capital-market trajectories. The Baltic States entered the 2000s as small but credible economies with stable macroeconomic frameworks and improving institutional quality. The Western Balkans remained more fragmented, fiscally constrained, and dependent on bank-based intermediation. This helps explain why the Baltics became viable candidates for regional exchange consolidation, whereas the Western Balkans preserved national exchanges that remained too small and illiquid to perform similar functions.

2.4 Overview of Capital Markets

Capital markets provide an additional lens through which to observe this divergence. In both the Baltic States and the Western Balkans, exchanges initially emerged not to foster capital formation but to reallocate ownership under mass privatization (Ginevičius and Tvaronavičienė, 2003). This non-organic origin produced fragile markets characterised by illiquidity, weak oversight, limited secondary trading, and dominant bank intermediation (Claessens et al., 2000).

From this common starting point, developments diverged after the mid-1990s. As of the late 1990s, Baltic exchanges still resembled Western Balkan markets in terms of small size, low turnover, limited foreign participation, and fragmented regulation. Yet empirical indicators suggest that Baltic markets began improving earlier. Estonia's market capitalization rose from 12 percent of GDP in 1998 to over 32 percent by 2003, while Latvia and Lithuania reached 8 percent and 15.7 percent. Turnover improved, and technological upgrades such as Estonia's adoption of the HEX platform signalled alignment with Nordic and EU practices.

Western Balkan markets evolved more slowly and in greater isolation. Several exchanges, including Bosnia and Herzegovina and Montenegro, lacked consistent reporting until the early 2000s. North Macedonia and Serbia remained operational but illiquid. Slovenia was a partial exception, though turnover remained below 10 percent and foreign participation limited.

By the early 2000s, the divergence had become structural. The Baltics benefited from EU-anchored convergence, stronger disclosure, and better investor protection. The decisive break came in 2004, when the Baltic exchanges merged under the OMX umbrella, harmonizing listing rules, centralizing depository functions, and reducing transaction costs. This yielded measurable gains in liquidity and transparency: turnover in Estonia exceeded 30 percent after 2003, while capitalization-to-GDP surpassed 25 percent in Estonia and Latvia (Ginevičius and Tvaronavičienė, 2003). Western Balkan exchanges remained small, segmented, and administratively constrained.

Overall, post-socialist stock-market development was shaped less by organic firm growth than by the sequencing of privatization, regulatory convergence, and integration. The limited effectiveness of standalone exchanges in small economies strengthens the case for regional consolidation. Theodoropoulos and Vojinović (2005) argue that fragmented exchanges are inherently suboptimal because of scale limitations and technology costs. This is consistent with the broader consolidation literature (Kokkoris and Olivares-Caminal, 2008; Click and

Plummer, 2005), which emphasizes liquidity pooling, lower transaction costs, and broader investor bases as the main efficiency channels. Fragmentation therefore represents not only operational inefficiency but also a structural barrier to transparency and integration, reinforcing insider networks and closed-shop market behaviour (Blommestein, 2000).

Comparative indicators of capital-market development in both regions are presented in Table A4 of the Online Appendix.

3. Methodology and Data

3.1 Two-Stage Counterfactual Transmission Design

This paper develops a two-stage counterfactual transmission design linking institutional stock-market integration to the dynamics of monetary-policy pass-through. The approach combines the Synthetic Control Method (SCM) and Local Projections (LPs) within a unified empirical framework, enabling the joint evaluation of both (i) structural effects of exchange consolidation on market capitalisation levels and (ii) dynamic effects on the propagation of monetary-policy shocks through the asset-price channel.

The design addresses a key identification problem: since no actual merger of Western Balkan stock exchanges has occurred, standard quasi-experimental tools such as difference-in-differences (DiD) or event studies cannot be applied. These methods require an observable treatment event and pre-intervention parallel-trends conditions not satisfied in a region characterised by institutional discontinuities, shallow markets, and heterogeneous reform trajectories (Campos and Coricelli, 2002; Kovtun et al., 2014). To address this, Stage 1 constructs a counterfactual of stock-market integration via SCM, while Stage 2 embeds that counterfactual into an LP framework to trace how monetary shocks propagate through equity valuations under integrated versus fragmented structures.

The SCM, developed by Abadie and Gardeazabal (2003) and extended by Abadie, Diamond, and Hainmueller (2010), constructs a synthetic version of the treated unit from a convex combination of donor economies. The synthetic control is selected to match the pre-intervention trajectory of the treated unit on outcome variables and predictors, thereby approximating the counterfactual path of the Western Balkans. When pre-treatment dynamics are closely reproduced, deviations between the observed and synthetic series can be interpreted as the causal effect of the intervention.

A complication arises because the consolidation of the Baltic stock exchanges coincided with EU accession in 2004, generating a compound treatment effect. To address this, the analysis incorporates a comparative SCM using other 2004 EU accession countries without stock-market mergers as a partial control group. A parallel SCM is therefore constructed for Slovakia, Slovenia, and Poland, allowing changes attributable to EU integration to be separated from those associated with stock-exchange consolidation.

This layered design approximates a difference-in-differences inference strategy. By comparing the synthetic trajectory of the Baltics (EU accession and exchange consolidation) with that of the EU03 group (EU accession only), the model isolates the incremental

contribution of exchange integration to outcomes such as market liquidity, investor participation, and capital formation.

In parallel, the study evaluates whether a consolidated market structure would strengthen the monetary-policy transmission mechanism. The empirical literature suggests that stock-market integration can amplify the propagation of monetary shocks through equity markets, particularly in small open economies with shallow financial systems (Ehrmann and Fratzscher, 2006; Meier, 2013). A Local Projections model à la Jordà (2005) is therefore used to trace the dynamic responses of market capitalisation to a standardised 100-basis-point policy-rate shock under two configurations: fragmented national exchanges and a counterfactual integrated WB3 exchange derived from the SCM simulation.

Hence, the paper employs two complementary empirical strategies:

- **Stage 1:** a Synthetic Control Method simulation assessing the impact of a hypothetical merger on market capitalisation and depth; and
- **Stage 2:** a Local Projections framework evaluating how exchange consolidation alters the elasticity of equity valuations to monetary-policy shocks.

3.1.1 Stage1: Synthetic Control Method

We study three aggregates: the Baltics and EU03 (both "treated" in 2004) and WB3 (treated only in a scenario sense). Primary outcomes are the natural logs of market capitalization in euros $Y_t \in \{lmc\_eur\}$. For each treated aggregate $u \in \{Baltics, EU03 \text{ and } WB3\}$, the synthetic control method (SCM) forms a convex combination of donors that minimizes the pre-treatment distance between the observed path and a synthetic path built from predictors and lagged outcomes.

Let $\hat{Y}_t^{0,\hat{u}}$, denote the synthetic counterfactual and $gap_t^u \equiv Y_t^u - \hat{Y}_t^{0,u}$, the log gap.

Pre-treatment windows are 1998-2003 for the Baltics and EU03 and 2001-2008 for WB3. Predictor sets include standard market-development covariates (i.e., firm population in logs, trade openness, log GDP, regulatory quality) and outcome lags over the pre-period. Pre-fit adequacy is summarized by RMSPE, i.e., the root mean squared prediction error of $Y_t^u - \hat{Y}_t^{0,u}$ in the pre period, and by the post/pre RMSPE ratio, i.e., $RMSPE_{pre}$ and $RMSPE_{post}$.

Model adequacy is assessed using the Root Mean Squared Prediction Error (RMSPE), computed as the average pre-treatment deviation between actual and synthetic paths, and by the post/pre RMSPE ratio, which provides a relative measure of fit stability across periods.

3.1.2 Baseline Estimates and Accession Netting

We estimate two standard SCM baselines allowing us to *net out* movements plausibly common to 2004 accession peers.

1. **Baltics baseline (treat = 2004).** We obtain $\hat{Y}_t^{0,Balt}$ and $\text{gap}_t^{\text{Balt}}$ on the full sample window, with pre-fit diagnostics (i.e., pre-RMSPE and post/pre ratios) and standard placebos.

2. **EU03 baseline (treat = 2004).** We analogously obtain $\hat{Y}_t^{0,\text{EU03}}$ and $\text{gap}_t^{\text{EU03}}$.

To isolate the component specific to **Baltic stock-exchange integration** rather than generic EU accession, we compute the **Baltics-minus-EU03 net gap:**

$$\text{net\_gap}_t \equiv gap_t^{Balt} - gap_t^{EU}, t \geq 2004,$$

We index this profile by *relative time* around the 2004 treatment, i.e., r = t - 2004 (so r = 0, 1, 2 ...). Then define the transferred profile as the Baltics-EU03 gap in that year:

$$\delta^r = \text{net\_gap}_{(2004+r)},$$

δ^r is measured in log point deviations of market capitalisation. We report pre-fit (1998-2003) RMSPE for the net series, the post/pre ratio over primary and extended windows, and placebo-in-space diagnostics for the Baltics experiment, screened by pre-fit quality (i.e., K-screen).

3.1.3 WB3 Baseline and Transfer Mapping

Because WB3 has not undergone an actual exchange merger, we estimate only its no-merger baseline and then apply a transfer mapping as a simulated scenario.

- **WB3 baseline** (pseudo treat = 2009). We estimate $\hat{Y}_t^{0,\text{WB3}}$ over 2001-2008 with the same predictor logic and pre-fit checks. The 2009 pseudo date defines WB3 relativetime r = t - 2009.
- **Transfer mapping** (descriptive scenario, not a new causal estimate). We *import only the shape* of the Baltics-specific net profile in relative years, i.e.,

$$Y^{\text{sim}}t(s) \equiv \begin{cases} \hat{Y}_t^{0,WB3}, & t \geq 2009, \\ [2pt]\, \hat{Y}_t^{0,WB3} + s \cdot \delta t - 2009, & t \geq 2009, \end{cases}$$

with transfer share $s \in \{1.0, 0.5\}$ for 100 percent and 50 percent variants. The simulated gap is then $\text{gap}^{\text{sim}}t(s) = s \cdot \delta t - 2009$ for $t \geq 2009$ and zero before. This preserves WB3's own level and trend and adds only the incremental divergence shape observed for the Baltics after removing movements shared with EU03.

Because the Baltics and WB3 pre windows differ (i.e., 1998-2003 versus 2001-2008), we optionally harmonize scales via

$$\text{scale}_{\text{SD}} \equiv \frac{sd(gap_t^{WB3}\ in\ WB3\ pre)}{sd(net\ gap\ t, in\ Baltics\ pre)}, \text{ and use } \quad \delta_r \leftarrow \text{scaleSD} \cdot \delta_r,$$

This ensures proportionality between transferred and native pre-treatment variances.

To contextualise the WB3 scenario without inferring significance, we overlay a placebo-in-space band (5th-95th percentile) computed from good-fit Baltic placebos in relative time. The band is expressed as:

$$Y_t^{band,lo} = Y_t^{0,WB3} + p^5{}_t - 2009 \text{ and } Y_t^{band,lo} Y_t^{0,WB3} + p^{95}{}_t - 2009$$

Hence the WB3 transfer is a *scenario*, i.e., an external-validity thought experiment. We *do not* claim that $gap_t^{sim}(s)$ is a causal estimate for WB3. The exercise asks, if WB3 had experienced a Baltics-specific pattern (i.e., the part not shared with EU03), how would its path have compared to its no-merger baseline?

3.1.4 Donor-set Disclosure and Disjointness for Transfer

To avoid target-in-source circularity, we exclude WB3 and its constituents from the donor pools used to construct the Baltics and EU03 synthetic controls that feed δ_r In SCM the post-treatment counterfactual is a fixed convex combination of donors; if WB3 entered those donor pools, the gap_t^{Balt} - gap_t^{EU} would mechanically embed WB3's realized path. Transferring δ_r back to WB3 would therefore re-import its own information, generating **reflection bias** and inflating apparent fit.

This also conflicts with the clean-controls idea of no interference, i.e., donors should be unaffected by the treatment being studied over the evaluation window, and it can distort placebo-in-space diagnostics by letting WB3's own noise leak through donor weights.

We therefore impose a disjoint-donor rule for transfer: when an effect profile is intended for application to a target unit *U, U* and its constituents are excluded from every donor pool used to construct that profile.

3.2. Stage 2: Local Projections of Monetary Transmission

To assess whether a hypothetical integration of Western Balkan stock exchanges enhances the transmission of monetary policy via the asset-price channel, we estimate a series of local projections (LPs) à la Jordà (2005). This approach allows the estimation of impulse-response functions (IRFs) to a monetary-policy shock without imposing the dynamic restrictions of VAR frameworks, which is particularly advantageous in settings characterised by short panels and heterogeneous adjustment dynamics such as the Western Balkans.

Whereas the Synthetic Control Method (SCM) provides counterfactual paths for market-capitalisation levels, the LP framework isolates short-to-medium-term responses to exogenous monetary shocks, allowing us to infer how stock exchange integration alters the elasticity of financial valuations to policy impulses. The dynamic response of market capitalisation to monetary-policy shocks is estimated using the following local-projection equation for each horizon $h = 0,1,\ldots\ldots 24$

$$\Delta y_{t+h} = \beta_h MPshock_{i,t} + \gamma_h + \mu_t + \varepsilon_{i,t+h,} \quad (1)$$

Where $\Delta y_{t+h,}$ denotes the **h-period-ahead cumulative change** in the log of stock-market capitalisation and $MPshock_{i,t}$ is the standardized monetary-policy innovation obtained from the Taylor-rule residuals described below. X_t is a vector of contemporaneous control variables, including inflation, output growth, and changes in official reserves, while μ_t captures deterministic trends.

The coefficient β_h measures the cumulative response of market capitalisation to a one-standard-deviation monetary-policy tightening. Estimations are performed separately for the **baseline** and **integrated** counterfactuals, and the difference

$$\Delta \beta_h = \beta_h^{int} - \beta_h^{base} \tag{2}$$

where β_h^{int} and β_h^{base} denote the estimated responses under the integrated and baseline scenarios, respectively. A negative and statistically significant $\Delta\beta_h$ implies that market capitalisation declines more strongly following a policy tightening under integration, indicating that stock-market integration increases the intensity of transmission through the asset-price channel. The analysis also extends the framework by allowing the effect of monetary shocks to vary with the degree of stock-market integration. This yields an additional coefficient, ghg_hgh, measuring the sensitivity of transmission to integration intensity, and its differential form $\Delta g_h = g_h^{int} - g_h^{base}$, discussed in the main results.

Monetary-policy shocks are derived from an **amended Taylor rule** that explicitly accounts for the hybrid exchange-rate and intervention regimes typical of small open and partially euroised economies. Following Petreski et al. (2025) and Brandão-Marques et al. (2020), we estimate for each country *k*:

$$i_{k,t} - i_{k,t-1} = \alpha_{0,k} + \alpha_{1,k} g^F_{k,t+1} + \alpha_{2,k} \pi^F_{k,t+1} + \alpha_{3,k} g_{k,t-1} + \alpha_{4,k} \pi_{k,t-1} + \alpha_{5,k} f_{k,t-1} + \alpha_{6,k} i_{k,t-1} + u_{k,t} \tag{3}$$

where $i_{k,t}$ is the domestic lending rate; $g_{k,t,}$ and $\pi_{k,t,}$ denote real GDP and inflation growth; $g^F_{k,t+1}$ and $\pi^F_{k,t+1}$ represent one-year-ahead forecasts; and $f_{k,t-1}$ is the lagged change in official reserves.

This augmented formulation introduces the reserves term to capture exchange-rate stabilisation motives and balance-of-payments pressures, which standard Taylor rules typically omit. By including lagged real-activity and inflation terms, the specification mitigates simultaneity bias while maintaining a sufficiently parsimonious structure for short samples.

Residuals $u_{k,t}$ represent the unanticipated component of monetary policy, innovations not explained by systematic reactions to observable macroeconomic conditions. These residuals are standardized within each country to account for differing volatility levels, such that a one-unit shock corresponds to a one-standard-deviation policy innovation.

$$z_{k,t} = s_k \frac{u_{k,t} - \bar{u}_k}{\sigma_k}, \qquad s_k = \text{sign}(\text{corr}(\Delta i_{k,t}, u_{k,t})) \tag{4}$$

where $\bar{u}_k$ and σ_k denote the mean and standard deviation of $u_{k,t}$ over the estimation window, and $\Delta i_{k,t} = i_{k,t} - i_{k,t-1}$. The s_k sign ensures positive shocks correspond to tightening.

The standardized country shocks are then averaged across Bosnia and Herzegovina, North Macedonia, and Serbia to obtain the aggregate Western Balkans monetary-policy shock series used in the local-projection estimations.

$$\hat{E}_t^{WB3} = \sum_{k\in(BIH,SRB,MKD)} w_k Z_{k,t}, \qquad \sum w_k = 1 \tag{5}$$

with equal weights $w_k = \frac{1}{3}$ unless otherwise specified. Finally, to maintain comparability across horizons, the aggregate shock is re-standardized:

$$\hat{E}_t^{WB3} = \frac{\varepsilon_t^{WB3} - \hat{E}^{WB3}}{\sigma_k(\varepsilon^{WB3})} \tag{6}$$

The variable $\hat{E}_t^{WB3}$ is used as the shock regressor in the local-projection estimations, ensuring that all impulse-response coefficients β_h are interpretable as the cumulative effect of a one-standard-deviation tightening in the regional policy stance.

The obtained coefficients offer a direct empirical mapping to the asset-price channel of monetary policy. Contractionary shocks raise the discount rate and lower expected future earnings, thereby reducing equity valuations (Bernanke & Kuttner 2005; Mishkin 2007). Under fragmented exchanges, this adjustment is often attenuated due to shallow market structure, illiquidity and delayed information diffusion. Whereas, under integration, we would expect to observe improved market depth, harmonised disclosure, and a larger investor base enable faster and more complete price realignment, resulting in a more elastic response of market capitalisation to policy changes.

For completeness, the estimated regression coefficients underlying these monetary-policy rules are reported in **Table A1 — Taylor-Rule Estimates by Country (Full Specification) in Appendix 1**, for readers interested in the country-specific policy reaction parameters.

3.3 Data and Variables

The primary outcome variable in the SCM model is **stock market capitalization**, defined as the total value of shares traded. The first set of predictors captures the macroeconomic environment. **Trade openness** is included as a key driver of financial integration: greater openness facilitates cross-border capital flows and market convergence (Pretorius, 2002), while trade liberalization is widely viewed as a precursor to broader globalization and financial integration (Arribas et al., 2006; Walti, 2005). **GDP** controls for country size and development, as richer economies tend to exhibit stronger international stock-market integration (Edison et al., 2002; Prasad et al., 2003; Vo, 2005; Mishkin, 2007).

A second group of predictors captures stock-market development. **Market size**, measured as the number of listed firms per 10,000 inhabitants, proxies market breadth and investor

participation (Beck et al., 2010; Allen et al., 2012). **Turnover**, defined as the inflation-adjusted annual value of shares traded in EUR, captures exchange liquidity. A third group reflects institutional quality. Since institutional constraints and capital controls are major barriers to integration (Vo, 2006), the model includes the **Regulatory Quality Index** from the World Bank. Finally, stock-exchange-specific characteristics are captured through **absolute and relative market capitalization**, which influence equity-market co-movements (Buttner and Hayo, 2011), while **capitalization structure** shapes how integration gains are absorbed (Tan et al., 2010; Slimane, 2010). Variable definitions and data sources are reported in Table A6 of the Online Appendix.

The second stage relies on monthly data for 2004-2023 (Table A6) and covers the same WB3 economies, while extending the variable set to capture short-term monetary and real-sector fluctuations typical of small, open, and partially euroised economies. **Inflation** and **real GDP growth**, together with their one-year-ahead forecasts, are drawn from the IMF's *World Economic Outlook* (WEO). Forecasts are taken from the October release of the preceding year. The **short-term interest rate** comes from the IMF's *International Financial Statistics* (IFS), where the lending rate is used as a proxy for the policy rate to ensure a consistent and sufficiently long sample. This is informative in economies operating under fixed or hybrid exchange-rate arrangements, although it may also reflect banking-sector-specific factors. **Official reserve data** are likewise taken from the IFS and reported in nominal U.S. dollars.

Additional robustness exercises, including placebo tests, alternative donor specifications, and sensitivity analyses, are reported in the Online Appendix and confirm that the main findings are not driven by specific sample choices or modelling assumptions.

4. Synthetic Control Results and Merger Simulation

To benchmark the Western Balkan counterfactual, we first examine the 2004 integration of the Baltic stock exchanges within the OMX network, which occurred concurrently with their accession to the European Union. This episode provides a relevant reference case, that is, a coordinated institutional consolidation in a group of small transition economies with initially shallow but reform-oriented capital markets. The Synthetic Control Method (SCM) produces a close pre-treatment alignment between the observed and synthetic Baltics over 1998-2003, indicating that the donor pool successfully reproduces the region's pre-accession financial trajectory. Following 2004, the treated series diverges upward from its counterfactual, suggesting a moderate but persistent increase in market capitalisation relative to the synthetic benchmark.

To distinguish the effects of stock-exchange consolidation from those associated with EU accession itself, we estimate a parallel SCM for a group of 2004 EU entrants that did not undergo exchange mergers, that is, Slovenia, Slovakia, and Poland (EU03). The EU03 baseline similarly displays a close pre-treatment match and a post-2004 uplift in market capitalisation relative to its synthetic path, reflecting the financial-development premium typically associated with EU accession and institutional convergence.

Comparing these trajectories allows us to isolate the incremental contribution of exchange

consolidation. We therefore construct a Baltics-EU03 net gap, defined as the difference between the treated-minus-synthetic deviations of the two groups. This measure captures the component of post-2004 divergence that cannot be attributed to accession alone but instead reflects the structural integration of the Baltic exchanges under the OMX framework.

Figure 1 presents this consolidation premium. The net series turns positive immediately after 2004, indicating that Baltic market capitalisation expanded more strongly than that of the EU03 group relative to their respective counterfactual paths. The magnitude of the gap peaks in the early post-accession years and remains positive throughout most of the subsequent period, suggesting that the OMX integration produced an additional valuation uplift beyond the accession effect. This pattern is consistent with the theoretical and empirical literature linking stock-exchange consolidation to improved liquidity, reduced transaction costs, and stronger investor confidence (Pagano et al., 2002; Floreani & Polato, 2010; Dorodnykh, 2013; Pagano & Padilla, 2005; Nielsson, 2009).

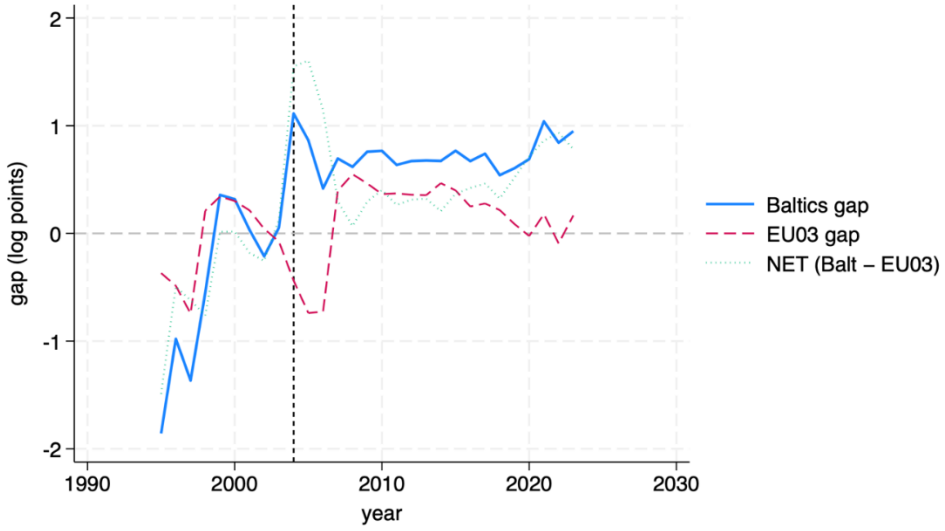

Figure 1. Net Gap Baltics vs. EU03

Source: Author's Calculations

In applied interpretation, the results point to a moderate but economically meaningful consolidation premium. The Baltics' early integration within the OMX system likely accelerated financial-market development by pooling liquidity and harmonising trading infrastructure at a time when comparable exchanges in Central and Eastern Europe remained institutionally fragmented. Over time, the magnitude of the gap narrows as other EU markets converge within the single-market regulatory framework, suggesting that part of the initial advantage reflected a first-mover effect.

The Baltics-EU03 net gap therefore provides a practical benchmark for evaluating the potential effects of regional exchange consolidation. In the next section, this consolidation premium is transferred to the Western Balkans to simulate how the market capitalisation of a unified WB3 exchange might have evolved under a similar integration scenario.

Detailed predictor balance tables, donor weights, RMSPE diagnostics, robustness checks, and supplementary figures for both the Baltic and EU03 estimations are reported in Online Appendix A2 and A3.

4.1 Simulated Merger Effects: Western Balkans, Transfer Exercise

4.1.1 Key Results

The simulated merger exercises provide a structured assessment of how stock-exchange consolidation might influence market-capitalisation in the Western Balkans. To do this, we transfer the post-merger effect observed in the Baltic exchanges after their integration within the OMX system to the Western Balkan Three (WB3), namely Serbia, Bosnia and Herzegovina, and North Macedonia. The simulations are designed to capture both the direct valuation impact (i.e., the difference in market capitalisation between the treated and synthetic series) and the broader structural effects that such consolidation may entail. The latter are inferred from the persistence and trajectory of the simulated uplift **(Figure 2),** which, if sustained, would be consistent with improvements in liquidity, transparency, and market efficiency typically associated with institutional integration (Pagano and Padilla, 2005; Dorodnykh, 2013). To ensure comparability, the transferred Baltic effect is standardised by the pre-treatment standard deviation of WB3's own market volatility, so that the simulated uplift reflects proportional rather than absolute variation.

To ensure comparability, the transferred Baltic effect is standardised by WB3's pre-treatment standard deviation of market volatility, ensuring that the simulated uplift reflects proportional rather than absolute variation. The results reveal a moderate but persistent divergence between the simulated "with-merger" and baseline synthetic paths, peaking in the early post-simulation period and remaining positive thereafter. This suggests that a hypothetical WB3 consolidation would likely have produced a sustained, credibility-driven increase in market capitalisation rather than a short-lived speculative surge.

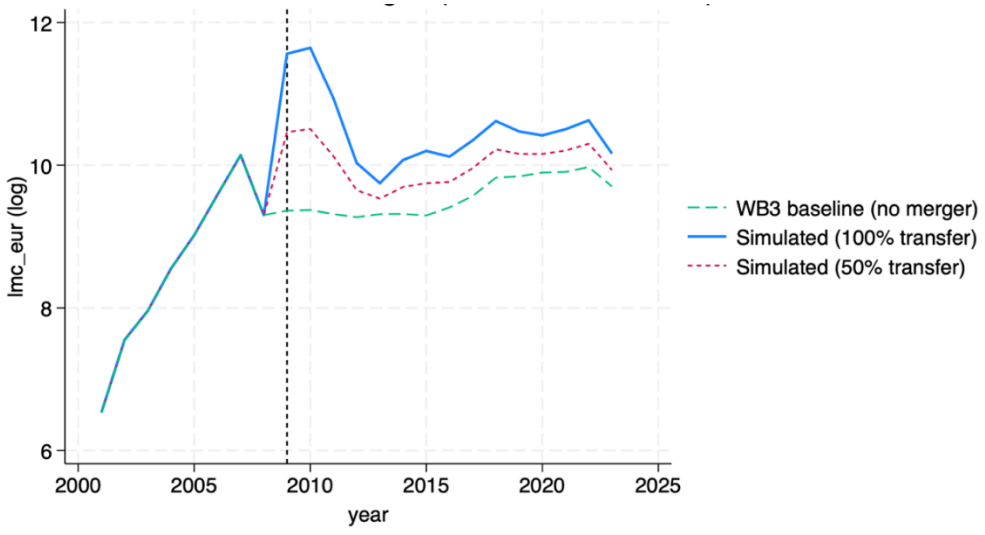

Figure 2. WB3, Simulated 'with merger' (transfer of Baltics NET)

Source: Author's Calculations

4.1.2 Discussion of Simulated Effects

The results suggest that a WB3 stock-exchange merger would have acted primarily as an institutional lift-off mechanism, providing a credibility signal within the region's fragmented financial systems. Prior research indicates that exchange integration can serve as a policy anchor for broader institutional modernisation, particularly where markets suffer from limited liquidity and investor confidence (Pagano and Padilla, 2005; Dorodnykh, 2013). The simulated uplift observed for WB3 can therefore be interpreted as a credibility-enhancing response consistent with improved expectations regarding market continuity, policy commitment, and regulatory coherence. Institutional integration would also reduce informational and operational fragmentation between the domestic exchanges. The Baltic experience after their inclusion in the OMX system illustrates this mechanism: unified trading standards and clearing procedures improved informational efficiency and facilitated cross-border participation (Dorodnykh, 2013; Jazepčikaite, 2008).

In small transition economies, credibility and coordination often precede liquidity deepening (Hasan et al., 2010; Pagano et al., 2001). Once an integrated exchange is perceived as stable and reform-oriented, broader investor participation can follow, strengthening market depth. The simulated post-merger uplift may therefore represent the early stage of a credibility cycle, in which institutional reform induces renewed investor confidence and incremental valuation growth.

The persistence of this effect depends on the region's absorptive capacity, i.e., its ability to internalise integration gains given existing structural and institutional constraints. The literature shows that consolidation effects vary with liquidity levels, regulatory quality, and investor participation (Slimane, 2010; Polato and Floreani, 2010). Smaller exchanges typically exhibit lower absorption capacity due to thinner trading volumes, fewer listed firms, and limited investor bases. The WB3 economies share several of these characteristics, which may limit the transmission of integration-related efficiency gains. Integration also requires coordination of trading technology, disclosure standards, clearing arrangements, and supervisory practices. Without these complementary capacities, structural effects may remain constrained. Evidence from Euronext illustrates this dynamic: Slimane (2010) finds that the Lisbon exchange struggled to internalise liquidity spillovers from larger partners due to weaker investor demand for equities.

Overall, the simulated merger suggests that exchange integration could act as a catalyst for gradual financial deepening in the WB3, expanding the capitalisation base without implying rapid convergence toward more developed European markets. Such dynamics reflect the incremental nature of institutional change in transition economies, where credibility gains and liquidity accumulation precede structural transformation (EBRD, 2006; Hasan et al., 2010). The persistent divergence between simulated and synthetic trajectories after 2009 indicates a sustained, though contained, improvement in perceived market stability and transparency.

From a policy perspective, even moderate increases in market capitalisation may enhance the role of equity markets in resource allocation and risk sharing within bank-dominated financial systems (Mishkin, 2007). While this does not imply a structural transformation comparable to

that observed in the Baltics, it represents a meaningful improvement in the financial landscape of the region.

The analysis also employs a placebo-adjusted simulation to assess whether the estimated uplift exceeds the variation typically observed among comparable economies without a merger. The placebo-in-space procedure (Figure 3) shows that the WB3 "with-merger" trajectory lies above the placebo range during most of the post-2010 period, suggesting that the simulated uplift reflects a systematic structural effect rather than random fluctuations.

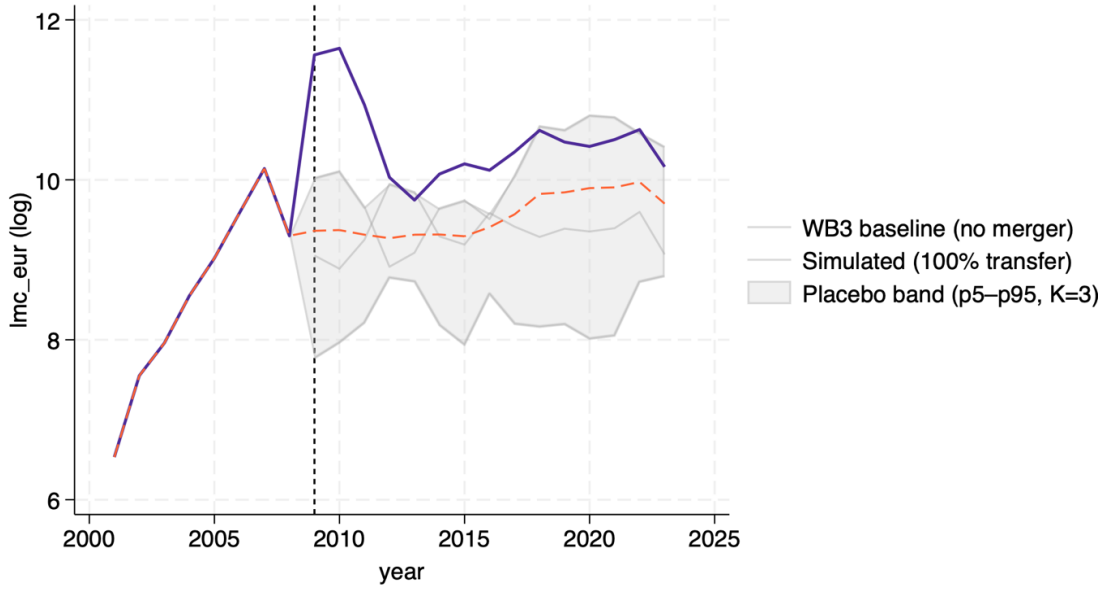

Figure 3. Simulated paths with placebo band

Source: Author's Calculations

Building on these findings, the next section explores whether the same institutional integration would enhance the effectiveness of monetary policy, .particularly through the asset-price channel. Hence we seek to answer what integration does to market depth to how it changes the way policy transmits through those markets.

5. Monetary Policy Transmission

5.1 Key Results

Building on the simulated-merger exercise, this section examines whether the market deepening implied by exchange integration strengthens the transmission of monetary policy through the asset-price channel. The analysis estimates local projections of market-capitalisation responses to a standardised 100-basis-point policy-rate shock under two settings: *(i)* fragmented domestic exchanges and *(ii)* a counterfactual integrated WB3 exchange.

Market capitalisation is used as a proxy for market depth and valuation capacity, capturing

the extent to which equity markets react to macro-financial shocks. The shock is normalised to ensure an equivalent initial impact across the two scenarios, so that any divergence in responses reflects differences in structural characteristics rather than in the magnitude of the disturbance.

Figure 4 illustrates that monetary tightening leads to a modest short-term fall in market capitalisation under fragmentation, but the effect is more pronounced and persistent once stock exchanges are integrated. The divergence becomes visible within the first two years and peaks around horizons 3-4, when the integrated trajectory lies roughly 0.4-0.6 log points below the baseline. Both paths subsequently converge back toward equilibrium, consistent with the transitory nature of the underlying shock.

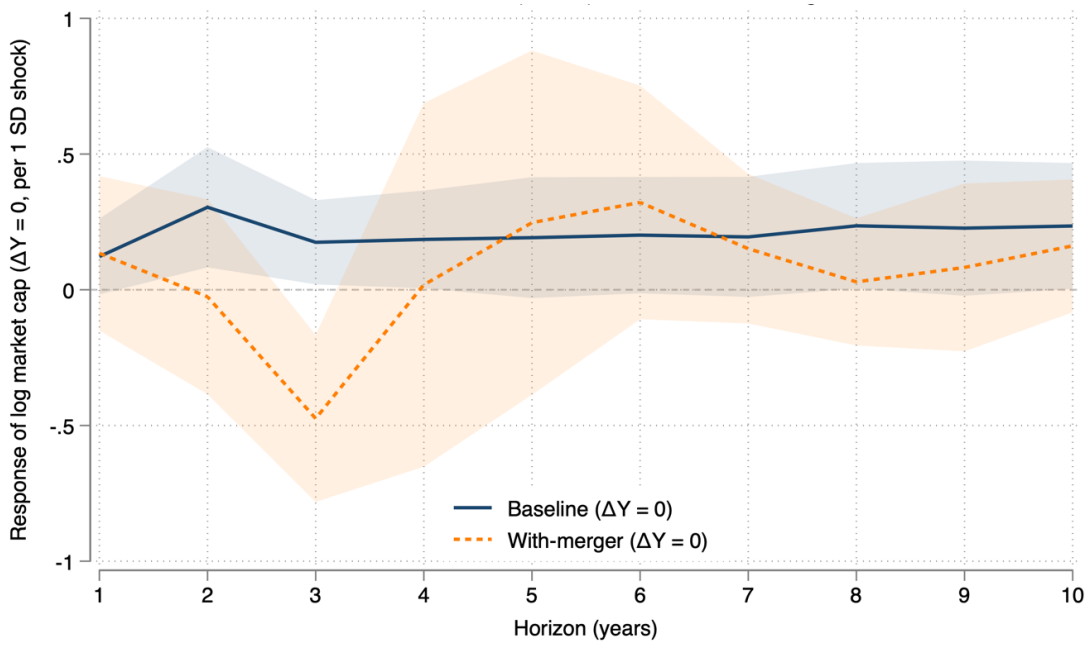

Figure 4. Impulse response of WB3 market capitalization to a 1-SD monetary policy shock under baseline (fragmented) and integrated-exchange scenario

Source: Author's Calculations

Note: Shaded areas denote 90% confidence intervals.

The results align with the idea that integrated markets adjust more effectively to policy shocks. Under a unified institutional framework, valuation responses unfold more swiftly and persist over longer horizons, suggesting that integration strengthens monetary transmission without changing its overall direction.

To visualize the marginal benefit of integration. **Figure 5** traces how the sensitivity of market capitalization to monetary-policy shocks changes as stock exchanges become more integrated. The coefficient Δg_h declines steadily for roughly three years after consolidation, falling by about 1.5 log-points per one-standard-deviation increase in integration intensity. This

trajectory suggests that most liquidity and information-efficiency gains are realized early, as unification channels capital toward deeper and more responsive markets.

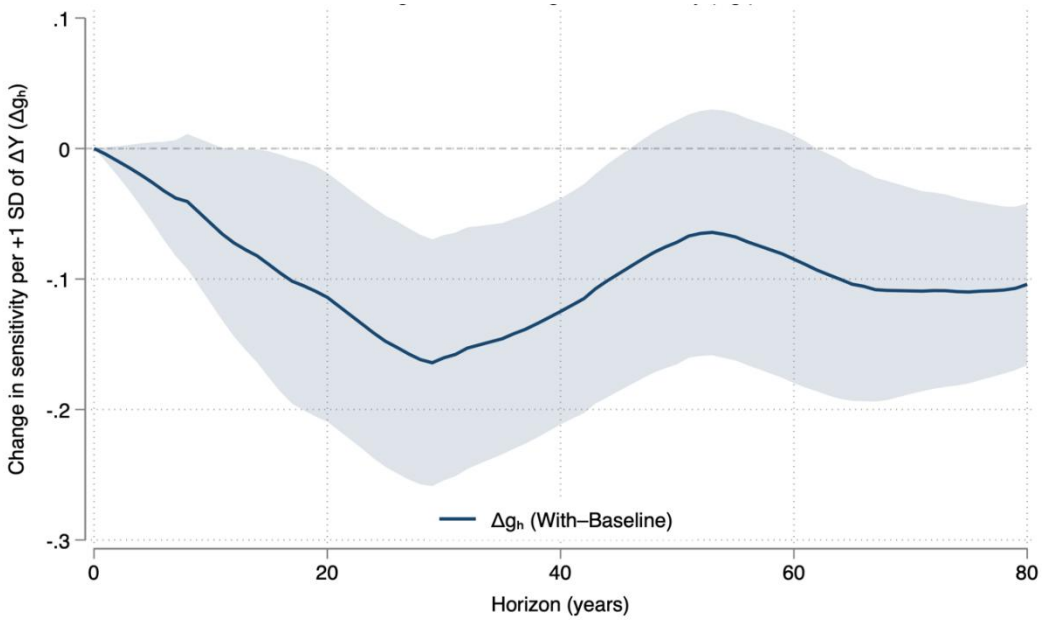

Figure 5. Merger effect on integration sensitivity (Δg_h), 90 % CI

Source: Author's Calculation

After this initial adjustment, Δg_h stabilizes around -1, indicating that the marginal benefit of further integration diminishes. In effect, the system reaches a more complete and liquid configuration in which monetary shocks are transmitted swiftly and symmetrically across assets. The process therefore reflects a structural deepening that strengthens the initial pass-through of monetary policy while compressing the scope for additional amplification thereafter. The evidence points to a front-loaded transmission gain i.e., rapid at first, then self-limiting once integration matures.

5.2 Discussion of Transmission Amplification

Table 9 quantifies the pattern observed in i.e., the sensitivity of market capitalisation to monetary shocks evolves after integration. The coefficient Δg_h is close to zero in the immediate aftermath of unification, but it declines steadily over the next three years, from −0.01 at horizon 3 to about −0.25 by month 36, a result significant at conventional levels.

This pattern suggests that most of the liquidity and information-efficiency gains from consolidation are realised early. Markets initially become far more responsive to policy changes, but as trading deepens and pricing efficiency improves, the incremental effect of further integration diminishes. Beyond the third year, the coefficients stabilise around −0.20 log-points, indicating that the system approaches a new steady-state in which monetary shocks are transmitted quickly and symmetrically. In practical terms, integration yields a front-loaded transmission gain indicating a new steady state regime.

Table 9. Differential Integration Sensitivity of Monetary Transmission (Δg_h)

Horizon (months)	Δg_h (log pts)	90 % CI
1	−0.00 (0.00)	(−0.01, 0.00)
3	−0.01 (0.01)	(−0.03, 0.00)
6	−0.03 (0.02)	(−0.07, −0.01) *
12	−0.07 (0.04)	(−0.14, 0.00) *
24	−0.26 (0.06)	(−0.24, −0.05)**
36	−0.25 (0.05)	(−0.23, −0.05)**
48	−0.19 (0.05)	(−0.17, 0.01)
60	−0.20 (0.05)	(−0.18, 0.01)
72	−0.20 (0.04)	(−0.18, −0.03)**
Source: Author's Calculations		

Note: Negative values indicate that, following integration, the marginal sensitivity of market capitalisation to monetary-policy shocks declines. Standard errors are shown in parentheses. * denotes significance at the 10 % level (based on 90 % confidence intervals using Newey-West robust variance estimates).

Results are consistent with the theoretical prediction that contractionary policy shocks reduce equity valuations by increasing discount rates and lowering expected future earnings (Bernanke & Kuttner 2005; Mishkin 2007). Under market fragmentation, this mechanism is attenuated by shallow liquidity and slower information transmission; integration improves informational efficiency, allowing asset prices to internalise policy signals more fully and promptly.

Taken together, we find that even partial integration could improve the responsiveness of stock markets to central-bank actions, enhancing transparency and predictability in the region's monetary framework. The Western Balkans would thus move closer to the behaviour of mid-tier European markets, where equity valuations meaningfully transmit policy stance to investment and consumption decisions. Taken together these findings suggest that institutional integration of stock exchanges strengthens market credibility and depth, which in turn increases the sensitivity of asset prices to monetary shocks. The result should therefore be viewed as a feasible structural enhancement i.e., capturing how integration transforms equity markets from passive absorbers into active transmitters of monetary impulses.

6. Conclusion

This paper set out to examine whether stock-market integration through stock-exchange consolidation could enhance the transmission of monetary policy through the asset-price channel in the Western Balkans. Employing a two-stage counterfactual transmission design that combines the Synthetic Control Method (SCM) and Local Projections (LP), the paper quantified both the structural and dynamic effects of financial-market integration on equity valuations and their responsiveness to monetary-policy shocks. The framework is particularly relevant for the Western Balkans, where capital markets are fragmented, thin, and nationally segmented, limiting their ability to convey policy signals efficiently.

Three central findings emerge from the analysis. First, the simulated merger exercise indicates that consolidating regional stock exchanges would likely have raised market

capitalization in a sustained and credible manner, reflecting improved investor confidence rather than speculative excess. The magnitude of this gain is moderate but persistent, suggesting that institutional integration would strengthen expectations of policy consistency and market continuity.

Second, the local-projection estimates point to a clearer and faster transmission of monetary policy once markets are unified. A standard 100-basis-point policy tightening produces a sharper and more persistent decline in equity valuations under integration, with responsiveness rising by roughly 30-50 percent at the peak horizon. In other words, asset prices adjust more promptly and fully to changes in policy stance when information, liquidity, and investor participation are improved through institutional unification.

Third, the behaviour of the integration-sensitivity coefficient (Δg_h) offers insight into how the strength of monetary transmission evolves as integration proceeds. Its downward trajectory suggests that most of the efficiency gains from integration occur relatively early in the process. During the first two to three years after consolidation, Δg_h declines by about 1.5 log-points per one-standard-deviation increase in integration intensity, implying that improvements are largely internalised in the initial adjustment phase, with diminishing incremental effects thereafter.

In aggregate, the findings imply that exchange consolidation could enhance the informational and institutional coherence of regional capital markets, thereby improving their responsiveness to monetary-policy signals. In small, bank-dominated economies such as those of the Western Balkans, this may represent a qualitative adjustment rather than a structural break, i.e., an incremental strengthening of the link between monetary policy, financial conditions, and investment behaviour. The observed increase in sensitivity of asset valuations to policy rates thus points to a gradual evolution in the role of capital markets, from primarily reflective intermediaries to partial transmitters of macro-financial information.

The policy implications are direct and pragmatic. For the Western Balkans, stock-exchange integration could represent an institutional lever to improve both monetary-policy effectiveness and financial-market depth. However, the extent of the potential benefits is conditional on the region's absorptive capacity and institutional readiness, i.e., its ability to ensure sound governance, investor protection, regulatory coherence, and supervisory coordination. Without these preconditions, the integration effect may remain confined to credibility signalling rather than translating into sustained liquidity or valuation gains.

More broadly, the findings reinforce a central principle of monetary economics: institutional structure shapes policy transmission. Strengthening the infrastructure of financial markets enhances the reach and reliability of policy signals, even in economies where banking remains the dominant channel. For the Western Balkans, gradual but credible progress toward exchange consolidation could therefore play a meaningful role in supporting convergence, improving financial resilience, and deepening the integration of monetary policy with real-sector outcomes.

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Author contributions

The author was solely responsible for the conception and design of the study, data collection, data analysis, interpretation of the findings, drafting of the manuscript, and revision of the manuscript. The author read and approved the final version of the manuscript.

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Informed consent

Not applicable.

Ethics approval

Not applicable.

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Data availability statement

The data underlying this study are derived from public secondary sources. Further information on the data sources used in the study is provided in the manuscript.

Data sharing statement

No additional data are available.

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Online Appendix

Appendix A1 - Taylor Rule Estimate and Discussion

The Appendix provides the country-specific estimates of the Taylor rule described in Equation (1) of the main text. While the main analysis employs these coefficients to recover unanticipated monetary-policy shocks at the country level, the table also serves an expository purpose, demonstrating how policy rules operate in small, developing, and partially euroized economies.

Each country's regression relates the domestic policy (lending) rate to lagged inflation and output growth, one-year-ahead forecasts of inflation and output, and the lagged change in foreign-exchange reserves. By including lagged values of real activity and inflation, the specification limits potential simultaneity bias, though some endogeneity may remain, particularly if policy authorities adjust rates in anticipation of expected financing conditions or external developments. The inclusion of the reserves term partly accounts for balance-of-payments pressures and exchange-rate considerations, which may be relevant in the Western Balkan context. The results are broadly consistent with the expected Taylor-rule structure. Lagged inflation generally exhibits a positive association with the policy rate, while the output term shows weaker and sometimes negative relationships, reaching statistical significance only in the case of Bosnia. The coefficients on expected inflation and output retain the anticipated sign.

Overall, these estimates form the basis for deriving the Taylor-rule residuals, interpreted as the unanticipated component of monetary-policy decisions. The standardized residuals are then aggregated to obtain the WB3 monetary-policy shock series used in the local-projection framework.

Table A1. Taylor-Rule Estimates by Country (Full Specification)

Dependent variable is the change in domestic (lending) rate.			
	BIH	**NMK**	**SRB**
Lag(Inflation π_{t-1})	**0.063*** (0.019)**	**0.086*** (0.032)**	0.040 (0.150)
Lag(Output g_{t-1})	−0.004 (0.055)	0.026 (0.051)	0.106 (0.119)
Exp.(Inflation π^f_t)	0.067 (0.061)	0.031 (0.097)	0.312 (0.194)
Exp.(Output g^f_t)	**−0.121* (0.071)**	−0.319 (0.599)	−0.013 (0.214)
Lag(Δ Reserves$_{t-1}$)	**−0.590*** (0.157)**	1.552 (0.950)	1.141 (4.304)
N	19	19	15
HAC lag	2	2	2
R^2	0.63	0.44	0.38
Source: Author's Calculations			

Source: Author's Calculations. Newey-West standard errors (lag length = HAC lag) are reported in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. All specifications include lagged inflation (π_{t-1}), lagged output growth (g_{t-1}), one-year-ahead inflation and output forecasts (π^f_t, g^f_t), and the lagged change in foreign-exchange reserves (Δ Res$_{t-1}$).

Online Appendix A2 - Baltics SCM Estimations

Pre-treatment balance and donor composition

The baseline SCM produces a credible pre-treatment alignment, replicating the Baltics' financial path prior to the 2004 integration. The synthetic Baltics consist of Croatia (about 60 percent), Romania (about 25 percent), and Bulgaria (about 15 percent). This configuration is economically coherent given the shared post-socialist background but differing reform intensities. Croatia contributes institutional maturity and a more advanced financial infrastructure, Romania and Bulgaria introduce variation in liquidity and market scale, i.e., the latter two capture the structural features of larger but less developed exchanges. The donor mix therefore provides a balanced counterfactual that mirrors the Baltics' pre-accession reform environment without duplicating its EU-oriented trajectory.

With only three donors, weight concentration is unavoidable, i.e., Croatia's share is large. This can raise concerns about single-donor dependence. Two points mitigate this: first, the purpose is to approximate the treated unit's pre-trend in the outcome, not to replicate every predictor; second, the fit is evaluated transparently via the pre-period RMSPE and lag matching. As long as the lag structure is closely reproduced and diagnostics are reported, high weights on the most similar donor are standard in small, regionally coherent pools.

Table A2 summarises the predictor balance for 1998-2003. The synthetic unit tracks the treated series closely across the lagged outcome (log market capitalisation), with deviations narrowing from 0.32 to 0.02 log points. This indicates that the pre-treatment trend is well replicated. Some differences appear in macro predictors: the consumer price index is substantially higher in the synthetic (around 7.8 percent) than in the Baltics (around 2 percent), reflecting donors' delayed monetary stabilisation and weaker inflation-anchoring frameworks in the early 2000s. Trade openness (trade-to-GDP) is roughly 20 percentage points lower, which corresponds to the Baltics' earlier and deeper reorientation to EU markets, i.e., over 65 percent of exports already headed to the EU by 2000 compared to lower shares in the donors. These gaps are consistent with broader regional differences: the Baltics entered the 2000s with stronger institutions, tighter fiscal discipline, and higher regulatory convergence, while the donors still faced residual inefficiencies from slower privatisation and weaker governance (EBRD, 2001).

Table A2. Predictor balance and donor weights, Baltics

Metric	Treated	Synthetic	Difference
cpi	1,80	7,77	-5,97
lmc_eur(1998)	6,95	6,83	-0,12
lmc_eur(2000)	7,96	7,75	0,12
lmc_eur(2001)	8,00	7,76	0,23
lmc_eur(2003)	8,84	8,56	0,28
ln_firm_pop	-2,36	-2,24	-0,12
log_gdp	10,93	10,56	0,31
lturnover_eur	6,74	6,49	0,25
reg_q	0,96	0,60	0,31
trade_gdp	100,57	80,13	20,45

Source: Author's calculations

The CPI and openness gaps could bias levels of market capitalisation independently of the treatment, i.e., tighter anchors and greater external exposure are typically pro-valuation. We address this by prioritising the match on outcome lags, which carry the strongest identifying content in SCM when predictor sets are short and samples are volatile. In addition, later robustness checks (placebo-in-space, leave-one-out) are used to see whether the post-2004 divergence is unique to the Baltics or reproducible among donors with these higher-CPI, lower-openness profiles.

Other variables such as log GDP, turnover, firm density, and regulatory quality show moderate gaps of about 0.25 to 0.31 log units. These are consistent with regional heterogeneity noted in transition reports, i.e., the Baltics entered the 2000s with stronger institutions, tighter fiscal frameworks, and more advanced disclosure, while donors still faced residual inefficiencies from slower privatisation and weaker governance. In the context of SCM, such deviations are acceptable when the lag structure is tight, since outcome lags receive the greatest weight in the optimisation and the objective is to recover the counterfactual path of the dependent variable rather than exact equality on every covariate.

In practical interpretation, the synthetic Baltics can be viewed as a plausible delayed-integration scenario, i.e., a counterfactual representing how the region's capital markets might have evolved under slower institutional reform and later integration. The pre-RMSPE of 0.33 confirms a solid pre-fit, indicating that residual variation is minimal and the counterfactual provides a solid basis for evaluating post-accession divergence.

RMSPE and magnitude of divergence

Quantitatively, the pre-RMSPE of 0.33 (**Table A3)** indicates a solid pre-treatment alignment. The post/pre RMSPE ratio increases to 2.62 for 2004-2006 and 2,26 for 2004-2023, showing that model error roughly doubled in the short-run window and remained moderately elevated over the full horizon. Ratios of this scale suggest an **economically relevant but not conclusive** deviation, particularly given the small donor pool and macro-financial setting. Overall, the results imply that following EU accession and the regional stock-market consolidation, the Baltics' combined market capitalisation expanded by roughly twice the amount that would have been expected under a no-accession, no-merger counterfactual represented by the synthetic control. However, since the ratio lies in the lower range i.e., around two rather than four or higher, the evidence should be viewed as suggestive rather than conclusive.

Table A3. Pre-and post-intervention RMSPE values and ratios, Baltics

pre_RMSPE	post_RMSPE_0406	post/pre_0406	post_RMSPE_0423	post/pre_0423
0,3329	0,8728	2,621	0,7548	2,2672

Source: Author's Calculations

Interpretation and discussion

Overall, the baseline SCM indicates a modest yet persistent rise in the Baltics' market capitalisation following EU accession and the OMX merger. The close pre-treatment alignment lends credibility to the counterfactual, while post-2004 divergence though moderate in scale, is consistent across horizons and within the range typically regarded as suggestive in small-N SCM applications (Billmeier & Nannicini, 2013).

However, several limitations qualify this finding. The short calibration period (1998-2003) constrains matching precision, and minor predictor imbalances on inflation and trade openness suggest that the synthetic represents a slightly less open, more inflation-prone counterfactual. These caveats imply that while the effect is directionally robust, it should be interpreted as indicative rather than conclusive.

Taken together, the results point to an economically meaningful uplift in market valuation i.e., likely reflecting improved investor confidence, institutional credibility, and liquidity conditions under the merger, followed by gradual normalisation. The next subsection tests the stability and distinctiveness of this pattern through placebo and leave-one-out robustness checks.

Observed and synthetic paths

Figure A1 plots the observed and synthetic paths of log market capitalisation for the Baltics over 1998-2023. The pre-2004 trajectories overlap closely, consistent with the solid pre-treatment fit reported above. A visible divergence emerges after the 2004 accession and OMX integration, with the treated series rising above the synthetic in the early post-accession years and remaining at a higher level thereafter. This pattern suggests a persistent upward shift in market capitalisation relative to the counterfactual.

Figure A2 reports the treated-minus-synthetic gap. The effect appears immediately after 2004, peaks at roughly 0.3-0.4 log points in the early post-treatment years, and then stabilises at a positive level. This trajectory is consistent with a structural valuation uplift rather than a temporary boom, i.e., one likely associated with improved liquidity, stronger institutional credibility, and lower market fragmentation.

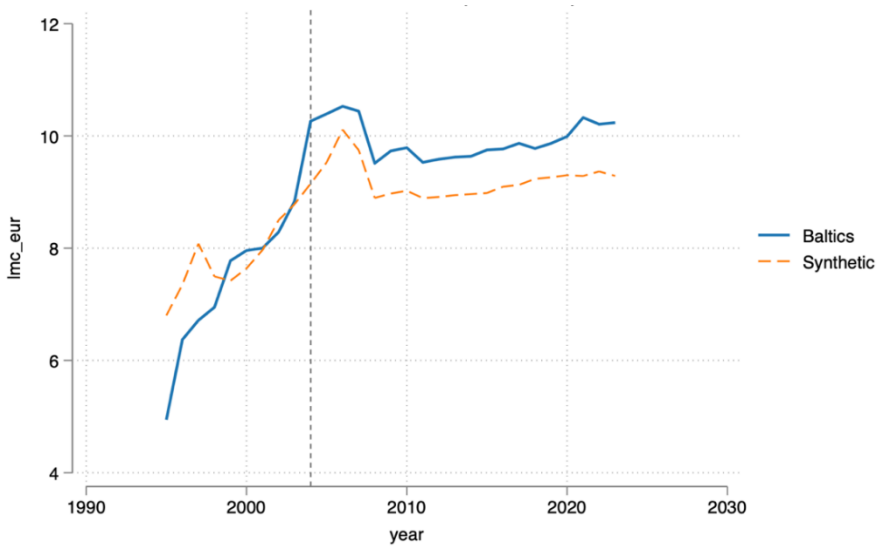

Figure A1. Actual vs. synthetic log market capitalization, 1998-2023
Source: Author's Calculations

Online Appendix A3 EU03 - SCM Estimates and Discussion

Pre-treatment balance and donor composition

The baseline SCM for EU03 delivers a **robust** pre-treatment fit, effectively reproducing the treated group's financial trajectory prior to EU accession in 2004. The synthetic composite is primarily built from **Croatia (≈55%), Romania (≈27%),** and **Bulgaria (≈18%),** reflecting geographic proximity and similar post-transition reform paths. This composition is economically plausible in light of transition-era differences in market depth and institutional quality (e.g., EBRD, 2003; Berglöf & Bolton, 2002), with Croatia providing higher institutional/regulatory alignment and Romania/Bulgaria supplying scale/liquidity variation.

Table A3. Predictor balance and donor weights, EU03

Metric	Treated	Synthetic	Difference
lmc_eur(1998)	8,02	7,40	0,63
lmc_eur(2000)	8,05	7,55	0,51
lmc_eur(2001)	8,18	7,79	0,40
lmc_eur(2002)	8,51	8,23	0,28
lmc_eur(2003)	8,58	8,35	0,24
ln_firm_pop	-2,72	-2,27	-0,46
log_gdp	12,52	11,61	0,91
lturnover_eur	7,39	6,33	1,05
reg_q	0,68	0,11	0,56
trade_gdp	75,04	70,02	5,02

Source: Author's calculations

As reported in **Table A3**, deviations in log market capitalisation narrow steadily from 0.63

(1998) to 0.24 (2003), confirming the synthetic's ability to track the treated unit's upward path. Residual predictor gaps, in particular lower log GDP (11.6 vs 12.5) and regulatory quality (0.11 vs 0.68) imply that the counterfactual represents a smaller, less institutionally developed market. In practice, this means that the treated economies entered accession from a stronger macro-institutional base, making their post-2004 improvement appear comparatively amplified.

Turnover differences (≈1.05 log points) signal deeper trading activity in the treated group, while firm-density gaps (≈0.46 log units) remain within the acceptable imbalance thresholds for SCM (Kaul et al., 2018). Trade openness aligns closely (75 % vs 70 %), strengthening the plausibility of the donor mix. The pre-RMSPE of 0.23 indicates tight pre-fit precision, suggesting that residual variance is minimal and the constructed counterfactual is credible.

Overall, the donor composition yields a coherent benchmark; one that approximates a delayed-accession scenario within the same regional and institutional context against which the post-treatment divergence of EU03 can be interpreted.

RMSPE and Magnitude of Divergence

The RMSPE diagnostics confirm the credibility of this pattern and help gauge the strength of the estimated divergence. The pre-RMSPE of 0.23 demonstrates excellent pre-treatment alignment, well within the < 0.35 threshold commonly used for small-sample SCMs.

Post-accession, model error rises moderately: the post/pre RMSPE ratio equals 2.8 for 2004-2006 and 1.7 for 2004-2023. These values fall squarely within the range regarded as economically meaningful yet methodologically stable (Billmeier & Nannicini, 2013; Becker & Klößner, 2018). Hence, the divergence captured in Figure 4 reflects a genuine policy effect rather than noise or poor pre-fit. Taken together, the RMSPE results corroborate the visual evidence: EU03 experienced a pronounced short-run accession premium that gradually settled into a higher steady state of market capitalisation.

Interpretation and Discussion

The SCM evidence for EU03 indicates a moderate yet durable divergence in market capitalisation after EU entry, mirroring the Baltics' experience in direction though not in magnitude. The short-run spike (ratios ≈ 2.8) denotes an initial acceleration driven by improved confidence and cross-border capital mobility, while the long-run moderation (≈ 1.7) suggests stabilisation at a higher equilibrium of financial depth rather than a reversion.

However, several caveats apply. The short pre-treatment period (1998-2003) limits the precision of the baseline alignment, and the small-N donor base, three countries, two of which later joined the EU reduces the model's statistical power. Hence, the counterfactual should be interpreted as a delayed-integration trajectory rather than a pure "non-accession" path. In this sense, the treatment captures absolute acceleration up to 2007 and relative effect afterwards.

In applied terms, the results imply that EU03's capital markets experienced an early expansion that would likely have been slower without membership, followed by convergence

through structural integration as markets matured. The effect resembles a sustained EU membership premium i.e., strong initial inflows and valuation gains that were subsequently consolidated within an integrated financial framework.

Overall, the evidence points to a persistent and economically meaningful increase in market capitalisation associated with accession, absorbed into a longer-run process of structural financial deepening. Given the limited donor pool, overlapping accession among comparators, and brief pre-window, the results should be viewed as indicative yet directionally robust.

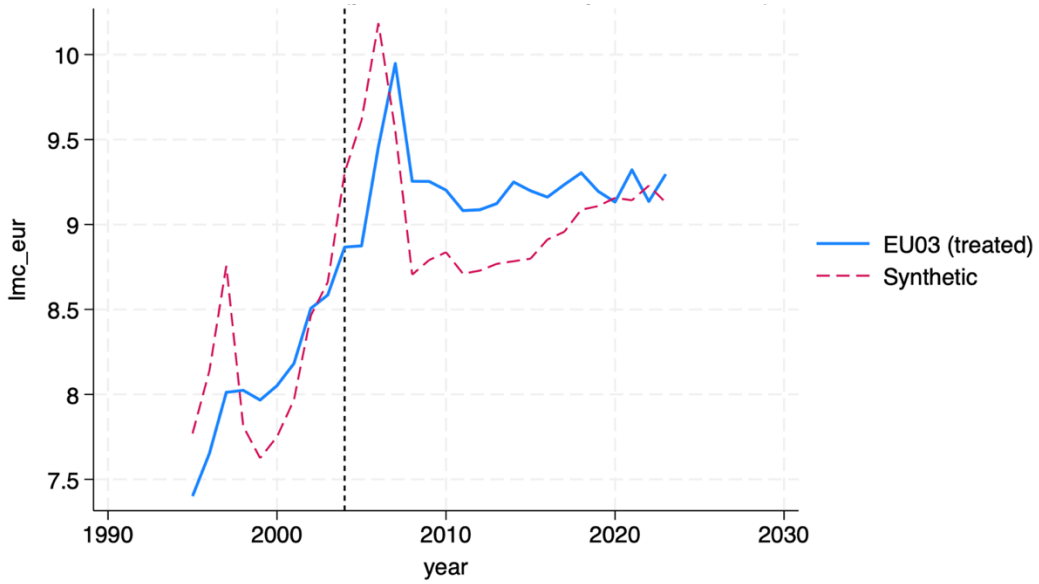

Figure A2. Actual vs. Synthetic log market capitalization, 1998-2023, EU03

Source: Author's Calculations

Online Appendix A3

Robustness checks for the Baltics

The robustness analysis complements the baseline SCM by assessing the internal validity of the estimated effect of the 2004 EU accession and OMX merger on Baltic stock-market capitalisation. Following established practice (Abadie et al., 2015; Hope, 2016), three diagnostic exercises are conducted: (i) placebo-in-space tests whether the estimated effect is unique to the treated unit; (ii) placebo-in-time verifies that the pattern does not arise spuriously from temporal shocks; and (iii) leave-one-out tests (LOO) assess the sensitivity of the results to the composition of the donor pool.

Placebo-in-space

The placebo-in-space (**Table 10**) exercise re-estimates the SCM by alternately treating each donor country (Bulgaria, Croatia, Romania) as if it had experienced the 2004 EU accession and OMX stock-exchange merger. The logic is straightforward: if the Baltic divergence were simply a regional or transition-economy pattern, similar spikes in post-2004 market

capitalization would appear in at least one of these placebo economies. In that case, the estimated effect would reflect a broader trend rather than a treatment-specific response.

Table 10. Placebo-in-space summary and RMSPE ratios, Baltics

Treated	preR	postR_0406	ratio_0406	postR_0423	ratio_0423
Bulgaria	0,64	0,57	0,89	0,76	1,19
Croatia	0,31	0,37	1,19	0,55	1,76
Romania	0,32	0,42	1,32	0,65	2,04

Source: Author's Calculations

Across all three placebo cases, the pre-treatment fits (preR) range between 0.31 and 0.64, satisfying the Kaul et al. (2018) K-screening criterion for K = 3, meaning that each placebo's pre-RMSPE is no more than three times that of the Baltics (≈ 0.33). The short-run post/pre RMSPE ratios (2004-2006) for all placebo units (Table 7), lie between 0.9 and 1.3, substantially below the Baltics' 2.6. This implies that none of the donor economies experienced a comparable short-term divergence following 2004.

Over the longer 2004-2023 horizon, the placebo ratios remain modest (1.2-2.0), with only Romania (≈ 2.0) approaching the Baltics' 2.26. This pattern suggests mild long-run variability among donor economies but no case replicating either the magnitude or persistence of the Baltic effect. When applying the permutation test with K = 3 (Table 11), the Baltics rank first among admissible comparators, yielding a one-sided p ≈ 0.25 (= 1 / (K + 1)). This result indicates that while the effect does not meet strict conventional significance thresholds, it stands out relative to all valid placebos, consistent with an economically meaningful, though not statistically definitive, post-accession divergence (Abadie et al., 2015; Hope, 2016).

Table 11. Permutation test results (Baltics, placebo-in-space, K = 3)

Balt_pre	Balt_post	Balt_ratio	k	N_placebos	N_ge	p_right	%<=Baltics
0,34	0,63	1,85	3,00	3,00	0,00	0,25	100

Source: Author's Calculations

The treated unit therefore comfortably passes the K = 3 screen. Under a stricter K = 2, inference becomes borderline because Bulgaria's higher pre-RMSPE (0.64) lies close to the admissible limit (2 × 0.33 = 0.66). This proximity makes its inclusion sensitive to rounding and specification choices, modestly reducing the robustness of inference under tighter criteria.

Placebo-in-time

The placebo-in-time exercise re-estimates the Synthetic Control for the Baltics using fictitious treatment years preceding the true 2004 event. The purpose is to check whether similar post-treatment divergences appear when no real intervention occurred.

Table 12. Placebo-in-time, summary and RMSPE ratios, Baltics

fake	preR	postR_0406	ratio_0406	postR_0423	ratio_0423
2002	0,32	0,87	2,45	0,43	1,34
2003	0,34	0,91	2,56	0,47	1,38

Source; Author's Calculations

Table 12 shows that in both placebo years the pre-RMSPE remains low and similar to the baseline specification, confirming a tight pre-fit. The post/pre RMSPE ratios around 2.4-2.6 for the short window (2004-2006) and roughly 1.3-1.4 for the extended window, show limited divergence compared to the true treatment year, where the short-run ratio exceeds 2.6.

Leave-one-out (donor-exclusion) analysis

The leave-one-out (LOO) analysis assesses the sensitivity of the Baltic synthetic control to individual donors by sequentially excluding Bulgaria, Croatia, and Romania from the donor pool and re-estimating the synthetic path. In line with established SCM practice, acceptable robustness is typically inferred when leave-one-out replications alter the post/pre RMSPE ratio by less than ±25-30 percent and the pre-treatment fit deteriorates by no more than about 50 percent relative to baseline (Abadie et al., 2015; Billmeier & Nannicini, 2013; Kaul et al., 2018).

Table 13. Leave-one-out RMSPE ratios, Baltics

Dropped_donor	pre_RMSPE	postR_0406	ratio_0406	postR_0423	ratio_0423
Bulgaria	0,39	0,80	2,08	0,67	1,75
Croatia	0,44	1,19	2,68	0,79	1,78
Romania	0,36	1,02	2,85	0,63	1,76

Source: Author's Calculations

Pre-treatment fits remain tight, with pre-RMSPE values between 0.36 and 0.44, comparable to the baseline value of 0.33. This confirms that predictive accuracy is largely preserved even when one donor is excluded. In the short-run window (2004-2006), post/pre RMSPE ratios range from 2.08 to 2.85, which is close to the baseline benchmark of 2.62. The largest deviation occurs when Romania is excluded (ratio = 2.85), suggesting that Romania contributes most to stabilizing early post-accession alignment. Dropping Croatia yields a ratio (2.68) nearly identical to the baseline, indicating that the observed effect does not hinge on any particular donor composition.

Over the longer 2004-2023 horizon, ratios narrow modestly (1.75-1.78), consistent with the gradual post-2004 convergence seen in the baseline specification (2.26). The persistence of above-unity ratios across all three runs indicates that the post-accession divergence remains present and economically relevant even when donor composition changes.

Hence, the Baltic LOO results remain well within these thresholds, with all post/pre ratios deviating by less than 25 percent and the pre-RMSPE remaining close to 0.33. This confirms

that the estimated post-2004 divergence is not donor-driven but reflects a structurally consistent pattern across specifications.

Alternative post-treatment windows

Finally, robustness was evaluated with post-window treatment, which we extended sequentially to longer horizons (2004-2006, 2010, 2015, 2019, 2022). The post/pre RMSPE ratio declines monotonically from 2.62 in the immediate aftermath of accession to 1.30 by 2022. This steady convergence implies that the largest deviation between the treated and synthetic paths occurred shortly after the 2004 accession and OMX merger, followed by gradual stabilization during the 2010s.

In applied SCM practice (e.g., Abadie et al., 2015; Becker & Klößner, 2018), ratios between 1.5 and 2.5 are typically viewed as economically meaningful but not definitive. Ratios above 3 often signal a strong and distinct treatment effect, while values below 1.3-1.4 are considered weak or statistically indistinct from noise, especially when donor pools are small.

Table 14. RMSPE ratios under alternative post windows, Baltics

Window	preR	postR	ratio
2004-2006	0,33	0,87	2,62
2004-2010	0,33	0,59	1,78
2004-2015	0,33	0,55	1,64
2004-2019	0,33	0,50	1,50
2004-2022	0,33	0,43	1,30

Source: Author's Calculations

By these standards, the Baltic short-run effect (2.6) is clearly above the conventional relevance threshold, while the medium-term ratios (1.5-1.8) remain borderline but acceptable, indicating a moderate and persistent effect rather than a random variation. The long-horizon ratio (1.3) sits at the lower bound of interpretability, consistent with post-shock consolidation rather than complete reversal.

Taken together, the robustness checks corroborate the baseline interpretation that the 2004 integration produced a genuine, moderately persistent level shift in the Baltics' market capitalization. The placebo-in-space exercise confirms that the pattern is not reproduced among comparators; the placebo-in-time rules out spurious timing; and the leave-one-out tests affirm that no single donor drives the result. While small sample size limits formal statistical power, the directional consistency across all diagnostics supports a cautious but credible inference of a structural market response to EU accession and exchange consolidation.

EU03 Robustness Checks

Placebo-in-space

Table 15 reports short-run results; (2004-2006) ratios between 1.23 and 1.41, well below the treated benchmark of 2.8, confirming that EU03's early post-accession divergence is not a

generic regional outcome. Over the full 2004-2023 horizon, placebo ratios range from 1.41 to 1.84, compared with 1.72 for the treated unit. Hence, while the divergence is not extreme, EU03's deviation remains larger and more persistent than that of any placebo economy.

Table 15. Placebo-in-space summary and RMSPE ratios, EU03

Treated	preR	postR_0406	ratio_0406	postR_0423	ratio_0423
Croatia	0,4954	0,6972	1,4075	0,8902	1,7869
Romania	0,3290	0,4083	1,2412	0,4630	1,4074
Bulgaria	0,3192	0,3940	1,2341	0,5889	1,8388

Source: Author's Calculations

Pre-treatment fits (approximately 0.3 to 0.5) are satisfactory, meeting the K-screening requirement of Kaul et al. (2018) for K = 3. The permutation test yields p ≈ 0.25, placing EU03 near the upper end of the placebo distribution. Given the small donor pool and overlapping accession timelines among comparators, the evidence is suggestive rather than conclusive. This long-run convergence is largely expected, since by the 2010s most comparator economies had themselves joined the EU or harmonised with EU regulatory standards, naturally reducing post-treatment contrasts.

Table 16. P-value permutation test (K=3), EU03

EU03_pre	EU03_post	EU03_ratio	k	N_placebos	N_ge	p_right	%<=EU03
0,23	0,66	2,80	3,00	3,00	0,00	0,25	100,00

Source: Author's Calculations

Taken together, the findings indicate a genuine but moderate accession effect. EU03 (Slovenia, Slovakia, and Poland) experienced a post-2004 rise in market capitalisation that was larger and more sustained than that of its regional peers, consistent with a front-loaded integration dividend driven by regulatory alignment, capital inflows, and investor revaluation. However, as one placebo (Bulgaria) approaches the treated long-run ratio and the test's statistical power remains limited, the results should be interpreted as economically meaningful at best.

Leave-one-out (donor-exclusion) analysis

Table 19 shows that the post/pre RMSPE ratios remain broadly stable across donor exclusions, ranging between 1.56 and 2.74 for the 2004-2006 window and between 1.28 and 1.76 for the 2004-2023 horizon. Excluding Croatia, which carries the largest baseline weight (approximately 55 per cent), slightly worsens the pre-treatment fit (pre-RMSPE ≈ 0.36) and reduces post-treatment accuracy, but does not alter the qualitative pattern. Dropping Bulgaria or Romania produces only marginal changes, with the treated-synthetic gap persisting across all variants.

Table 20. Leave-one-out RMSPE ratios, EU03

Dropped_donor	pre_RMSPE	postR_0406	ratio_0406	postR_0423	ratio_0423
Croatia	0,3569	0,7001	1,9615	0,5586	1,5650
Bulgaria	0,2747	0,6001	2,1848	0,4840	1,7623
Romania	0,2397	0,6575	2,7426	0,3076	1,2830

Source: Author's Calculations

The results confirm that the estimated divergence is not driven by any single donor, although Croatia's contribution remains central for achieving a close pre-treatment alignment. The stability of ratios under sequential donor exclusions supports the robustness of the baseline specification. However, given that all donor countries either joined the EU or entered advanced pre-accession stages by 2007-2010, the observed convergence is likely structural rather than model-induced. The diminishing contrast between treated and synthetic paths therefore reflects the region-wide effects of EU integration, rather than an entirely isolated EU03-specific shock.

Placebo in time

The placebo-in-time results (**Table 17**) confirm that the divergence observed after 2004 is not driven by pre-treatment noise. Both placebo years (2002 and 2003) yield comparable pre-treatment fits but smaller post/pre RMSPE ratios relative to the baseline, implying the absence of structural breaks before the true event. The observed adjustment thus corresponds to the timing of the Baltic merger and accession, reinforcing the credibility of the baseline identification.

Table 17. Placebo-in-time, summary and RMSPE ratios, EU03

fake year	preR	postR_0406	ratio_0406	postR_0423	ratio_0423
2002	0,24	0,60	2,50	0,47	2,00
2003	0,25	0,64	2,60	0,45	1,90

Source: Author's Calculations

Alternative post-treatment windows

Table 21 reports RMSPE ratios for alternative post-treatment horizons. The ratio declines steadily from 2.80 (2004-2006) to 1.76 (2004-2022), indicating that the largest divergence occurred immediately after EU accession, with a gradual re-alignment thereafter. This pattern implies a front-loaded integration effect, consistent with early capital inflows, valuation adjustments, and regulatory harmonisation, followed by convergence as market structures matured (Hardouvelis 2007; Kim et al. 2005).

Table 18. Alternative post-treatment windows

Window	preR	postR	ratio
2004-2006	0,23	0,66	2,80
2004-2010	0,23	0,59	2,50
2004-2015	0,23	0,51	2,16
2004-2019	0,23	0,45	1,91
2004-2022	0,23	0,41	1,76

Source: Author's Calculations

The stabilisation observed after 2015 suggests that much of the accession-related premium had been absorbed into steady-state dynamics well before the COVID-19 period. The post-2020 years do not reveal renewed divergence, implying that EU03 markets entered the pandemic with relatively synchronised fundamentals vis-à-vis the synthetic counterfactual. In this sense, the post-COVID evolution reflects system-wide shocks rather than treatment-specific effects.

Overall, the temporal profile confirms that the EU03 impact was short-lived and front-weighted: pronounced in the early-accession years, fading through the 2010s, and broadly neutral by the 2020s.

Taken together, the robustness exercises point to a directionally consistent and economically coherent pattern. The placebo-in-space results indicate that EU03's post-accession response is distinct relative to its donor pool, while the p-value (≈0.25) reflects the inherent limits of inference in a small-N setting. The leave-one-out analysis confirms internal stability: excluding individual donors alters the fit only marginally and does not affect the overall trajectory. The gradual decline in RMSPE ratios across extended horizons signals convergence rather than reversal, consistent with integration effects that attenuate over time.

Overall, the diagnostics suggest that EU accession generated a measurable, front-loaded surge in market capitalisation associated with confidence gains, capital inflows, and policy harmonisation. As integration deepened and donor economies themselves entered the EU, differences narrowed, by the post-2015 and post-COVID periods, treated and synthetic paths evolve in near-parallel. This temporal profile supports the interpretation of an early accession premium.

Robustness of Differential Transmission Effects

Figure 9 provides an additional robustness check by comparing the estimated response of market capitalization to monetary-policy shocks across the integrated and baseline configurations. The figure plots the difference in the semi-elasticities, $\Delta\beta_h$, for a one-standard-deviation tightening, with the shaded area showing the 90-percent confidence interval, displaying how much **stronger (or weaker)** the overall impact of monetary policy becomes after integration.

The curve dips modestly below zero in the first few months following a shock, indicating that

integration tends to amplify the immediate effect of monetary policy on equity prices. As the horizon lengthens, the difference narrows toward zero, implying that the amplification is short-lived. The persistence of this short-term dip across alternative specifications suggests that the stronger pass-through observed under integration is not an a random pattern.

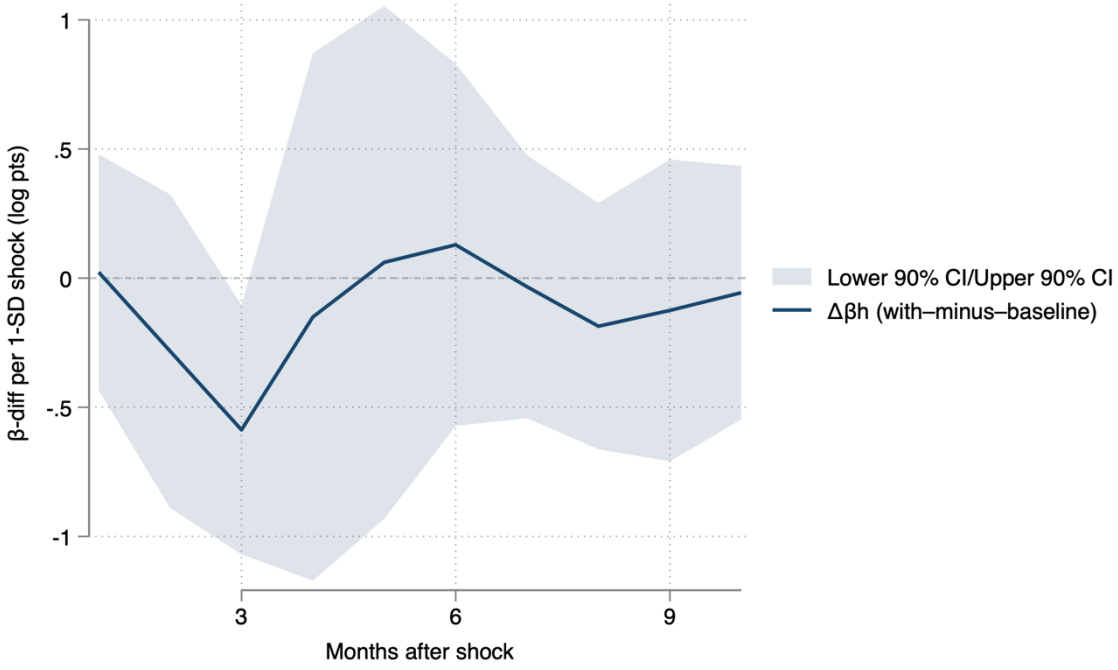

Figure A3. Differential elasticity of monetary transmission (Δβh): difference in responsiveness coefficients across horizons

Source: Author's Calculations

Appendix 2

Table A2. Key Empirical Studies on Stock Exchange Mergers

Study	Focus	Method	Findings	Limitations
Claessens et al. (2000)	Emerging stock markets post-liberalization	Comparative institutional analysis	Stock market development shaped by transition from state to private ownership; institutional conditions critical.	Focuses on emerging markets generally, not mergers specifically.
Dorodnykh (2013, 2014)	Legal/regulatory conditions; integration outcomes	Theoretical and descriptive	Consolidation enhances efficiency; institutional alignment and governance are essential.	Lacks empirical testing in underdeveloped markets.
Pagano et al. (2002, 2005)	Euronext merger; efficiency and cost savings	Empirical evaluation	Substantial cost savings and liquidity improvements; uneven benefits across countries.	Less applicable to smaller exchanges or low-volume firms.

Nielsson (2009)	Firm-level liquidity effects in Euronext	Fixed-effects panel regression	Large and international firms gained liquidity; smaller/domestic firms saw no significant change.	Limited generalizability; case-specific to Euronext.
Steil & Aggarwal (2002); Aggarwal & Dahiya (2006); Phillips et al. (2014)	Governance inefficiencies in mutual exchanges	Descriptive case analysis	Mutual governance structures failed to meet modern market demands; demutualisation supported.	Primarily theoretical; lacks quantitative validation.
Hardouvelis (2007); Kim et al. (2005)	EMU effects on market integration	Macroeconomic causality tests	EMU promotes financial integration; macroeconomic convergence reinforces interlinkages.	Focused on macroeconomic linkages rather than micro-level exchange outcomes.
Beck et al. (2000); Passad et al. (2003); Carrieri et al. (2007)	Financial integration in developing countries	Theoretical + empirical support	Integration improves resource allocation and reduces volatility.	Does not focus specifically on stock exchange mergers.
Pownall et al. (2013)	Euronext institutional harmonization	Descriptive institutional study	NSC trading platform and harmonized rulebook facilitated integration across jurisdictions.	Focuses on a single institutional case; qualitative insights only.

Table A3. Comparative Macroeconomic Indicators of the Baltic States and Western Balkans during the Transition Period (1990s-early 2000s)

Indicator	**Baltic States**	**Western Balkans**
Initial GDP Contraction (early 1990s)	Output declined by approximately 30-50% following transition shocks (EBRD, 1999).	Output declined by 40-60%, with severe contraction in conflict-affected economies such as FR Yugoslavia (EBRD, 2001).
EBRD Transition Score: Enterprise Reform	Averaged between 3.5-4.0; reflecting substantial progress in governance, restructuring, and market competition.	Averaged between 2.5-3.0; reflecting slower privatization and persistence of state-owned enterprises.
Real GDP Growth (1996-2000, avg.)	Sustained recovery with average annual growth of 4-5%, supported by early reforms and EU-oriented trade.	Growth remained volatile and subdued (~2-3%), hindered by delayed stabilization and post-war reconstruction.
Peak Inflation Rate	Hyperinflation exceeding 1,000% in 1992; stabilized to <10% by 1997 through credible monetary policy (EBRD, 1999).	Extreme hyperinflation in Serbia, reaching 3,000%+ in 1993; stabilization delayed until late 1990s (EBRD, 2001).
Fiscal Balance (2000)	Budget deficits contained below 3% of GDP; Estonia recorded ~-1.7% of GDP (EBRD, 2001).	Higher deficits: Serbia recorded a general government deficit of -6.2% of GDP in 2000; others ranged -3% to -5% (EBRD, 2001).
Export Orientation (EU Share by 2000)	Over 65% of exports directed to EU markets, facilitated by early trade agreements and structural reforms.	Export structures remained regionally concentrated; EU export share below 40% in most cases.
Foreign Direct Investment (FDI)	Relatively high FDI inflows; exceeded 5% of GDP in certain years, especially	FDI inflows lower, typically <3% of GDP; deterred by regulatory risks and

	in Estonia and Latvia.	political instability.
Trade Integration Instruments	EU Association Agreements signed early; rapid WTO accession; customs and standards harmonization initiated by mid-1990s.	CEFTA and Stabilisation and Association Agreements adopted later; institutional reforms remained uneven.
Exchange Rate Regime	Currency boards (Estonia, Lithuania), pegs (Latvia) maintained monetary stability and anchored expectations.	Mixed regimes: euroisation (Montenegro, Kosovo), soft pegs (North Macedonia), managed floats (Serbia).

Source: EBRD Transition Reports (1996, 1999, 2001)

Table A4. Comparative Capital Market Indicators of the Baltic States and Western Balkans

Indicator	**Baltic States**	**Western Balkans**
Initial Market Purpose	Ownership redistribution via privatization (non-capital raising)	Same
Market Capitalization-to-GDP (2003)	Estonia: 32%Latvia: 8%Lithuania: 15.7%	Slovenia: 17%Croatia: 14.7%North Macedonia: 13.6%Others: <5% or no data
Turnover Ratio (2003)	Estonia: >15% Latvia: ~8%Lithuania: ~5.5%	Slovenia: 5-9%Croatia: ~6%Others: negligible or unreported
Number of Listed Companies (2003)	Estonia: 14 Latvia: 56Lithuania: 45	Slovenia: 170+Croatia: 157North Macedonia: 45Others: negligible or unknown
Foreign Company Listings	Present but limited	Rare or absent
Foreign Investor Participation	Estonia/Latvia: >40% ownership (2003)	Croatia: moderate Serbia/Bosnia: limited, Others: unreported
Institutional Investors	Present and increasingly active (e.g., pension funds)	Largely absent or nascent
Trading Infrastructure (pre-2004)	Early platform integration (e.g., HEX in Estonia)	Fragmented or underdeveloped systems
Regulatory Alignment	Broadly aligned with EU acquis by 2004	Partial and uneven across jurisdictions
Integration Outcome	OMX Baltic merger in 2004 (harmonized trading and clearing)	No integration; national exchanges remain fragmented

Source: Ginevičius & Tvaronavičiene (2003); EBRD Transition Reports (2000-2004); Ljubljana SE Statistical Reports (2000-2001); National stock exchange yearbooks and author's dataset

Table A5. List of covariates employed in model estimation

Variable	**Description / Role in Model**	**Relevance to Merger Simulation**
Number of Listed Companies	Total number of firms listed on the domestic exchange(s)	Indicates market breadth and investor options. Reflects confidence and functionality.
Value Traded (real EUR, 2000 base)	Total value of shares traded annually, adjusted for inflation and in EUR	Direct measure of exchange liquidity. Evaluates if integration increases actual trading activity.
Market Size (firms per 10k pop)	Market size adjusted for population	Normalizes breadth across countries. Important for comparing smaller vs. larger economies.
GDP (constant prices)	Total real GDP in EUR or USD	Control for economic scale. A key macroeconomic baseline.
Trade Openness (%	(Exports + Imports) / GDP	Captures degree of economic integration with

GDP)		global markets
Inflation (CPI, % annual)	Consumer price inflation rate	High inflation may affect investor decisions and stock market stability
Regulatory Quality Index	Governance indicator of regulation quality and policy formulation	Stronger institutions are likely to support more successful market integration

Source: World Federation of Exchanges (WFE), **Stock Exchange Annual Bulletins** and **Annual Reports**

Table A6. List of covariates employed in model estimation

Variable	Description	Source
Lending rate	The bank rate that typically reflects the short- and medium-term financing conditions faced by the private sector. It is used both in its level (lagged value) and in its change compared to the previous period.	International Financial Statistics
GDP growth	GDP growth rate in real terms. It is used in its lagged value to capture the output gap component of the Taylor rule.	World Economic Outlook
GDP growth forecast	One-year-ahead forecast of the GDP growth rate in real terms. Represents policymakers' expectations of future output conditions.	World Economic Outlook
Inflation rate	Average consumer-price inflation rate. It is used in its lagged value to account for the backward-looking component of monetary policy reactions.	World Economic Outlook
Inflation forecast	One-year-ahead forecast of the average inflation rate. Captures forward-looking behaviour of monetary authorities.	World Economic Outlook
Change in reserves	Annual change in official foreign-exchange reserves, including monetary gold, SDRs, and IMF holdings under the control of monetary authorities. It is used in its lagged value to capture external-balance considerations and exchange-rate management motives.	International Financial Statistics