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Article

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Stock market responses to economic sanctions: Evaluating the roles of national reserves and financial market access

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ABSTRACT

Economic sanctions significantly influence stock market capitalization and have critical implications for the national economy. This study investigates the impact of economic sanctions on stock market capitalization, focusing on the roles of national reserves and financial market access in mitigating these effects, utilizing a sample of 87 countries from 2000 to 2021 and employing a two-step system generalized method of moments (GMM) approach to analyze panel data. The findings reveal that economic sanctions, including trade and financial sanctions, significantly reduce stock market capitalization. However, this negative impact diminishes over time as markets adapt. Moreover, higher national reserves and enhanced financial market accessibility can mitigate the adverse effects of sanctions. Case studies in Russia, Iran, China, and Ukraine further validate these results. This study refines economic models, such as the capital asset pricing model (CAPM) and country risk model (CRM), by including sanction intensity, national reserves, and financial market accessibility, offering valuable insights for policymakers and investors dealing with international sanctions.

1. Introduction

Economic sanctions, which are increasingly used as tools of international diplomacy, have profound implications for global economic structures, particularly those affecting stock market capitalization. As nations employ these sanctions to influence geopolitical or economic outcomes, their effects extend beyond immediate political goals and deeply affect financial markets. Understanding the interplay between sanctions and financial markets is crucial for guiding investment strategies, assessing economic risks, and formulating policies to mitigate these impacts effectively. The example of Russia's post-Crimea crisis in 2014 illustrates how sanctions can reshape market dynamics. After sanctions were imposed, the Russian stock market experienced a dramatic decline, with the RTS Index plummeting by nearly 50% within a year from pre-crisis levels. This sharp drop in market capitalization underscores the direct impact of sanctions on a nation's economic stability and highlights the need to bolster investor confidence amid geopolitical tensions. These cases emphasize the importance of

examining the broader economic consequences of international sanctions.

This study analyzes the impact of economic sanctions on stock market capitalization by focusing on the moderating roles of national reserves and financial market access (FMA). Given the recent surge in economic sanctions owing to international crises, understanding their impact on financial markets is highly relevant and timely for policy-makers and economic stakeholders. Despite significant attention, the nuanced effects of trade and financial sanctions on market capitalization remain underexplored, with scant insights into the roles of moderating factors, such as national reserves and FMA. This study analyzes the direct effects of economic sanctions on stock market capitalization and explores how national reserves and financial market access (FMA) can alleviate these impacts. Our research builds on foundational studies, such as Biglaiser and Lektzian (2020), which examined data up to 2005. We extend this analysis to 2021, broaden the range of countries sampled, differentiate between types of economic sanctions, and study the effects of sanctions over time. This extension is essential, as it

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encompasses significant global financial changes and geopolitical events that have reshaped market reactions to sanctions. Technological advancements have transformed financial markets, improved trading mechanisms, increased transparency, and enhanced investors' access to real-time information. These developments require a re-evaluation of traditional models to assess the impact of economic sanctions on stock markets.

Significant geopolitical events, including the ongoing conflict in Ukraine, sanctions on Russia, escalating tensions and sanctions against Iran, and the trade war with China, have profoundly reshaped political landscapes and caused significant disruptions in global markets. These developments highlight the urgent need for updated analyses to evaluate the specific manner in which economic sanctions impact stock market capitalization in targeted countries. Our study emphasizes the strategic roles of national reserves and financial market access (FMA) in mitigating the adverse effects of sanctions on stock markets. In response to increasing sanctions, many countries have proactively strengthened their reserves to safeguard their stock markets against potential shocks, signaling a shift toward more resilient economic defense strategies in the face of growing geopolitical tensions.

This study reveals that economic, trade, and financial sanctions significantly and negatively impact stock market capitalization, although markets demonstrate resilience over time by adapting to these shocks. Case studies from Russia and China reinforce these findings by showing how the markets can recover through import substitution and diversification strategies. National reserves and access to financial markets are crucial factors in mitigating the adverse effects of sanctions. The results of this study have important implications for economic models such as the Country Risk Model (CRM) and Capital Asset Pricing Model (CAPM). By incorporating factors such as sanction intensity, national reserves, and accessibility to financial markets, this study improves the applicability and accuracy of these models in evaluating geopolitical risks and adjusting risk premiums. These empirically grounded adjustments offer more accurate assessments of systematic risks and expected returns, enhancing investment decision-making.

This study analyzes the impact of economic sanctions on stock market capitalizations in 87 countries from 2000 to 2021. We include a detailed case study that focuses on Russia, Iran, China, and Ukraine in light of recent developments. Our analysis utilizes a two-step system GMM to address the complexities of the panel data. We perform several checks to ensure the robustness of our findings, mitigating potential biases through three specific methodologies: a fixed effects model to account for unobserved heterogeneity; utilizing Financial Market Development Depth as an alternative measure of stock market capitalization; incorporating additional variables beyond the fundamental base controls to ensure the robustness of our analysis and gain a better understanding of the broader influences on market capitalization. Additionally, we explore the temporal dynamics of the impact of economic sanctions on stock market capitalization to assess whether the effects are enduring and whether markets adapt over time. The primary data for this study come from the Global Sanctions Database (GSDB) and the World Federation of Exchanges, complemented by economic indicators from the World Development Indicators (WDI). The dependent variable is stock market capitalization, whereas the independent variables include trade and financial economic sanctions. Control variables such as GDP, the inflation rate, and foreign direct investment provide a comprehensive analysis of their impact on market capitalization.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature, and Section 3 details the methodology and data sources used. Subsequently, Section 4 presents our empirical analysis and results, and Section 5 discusses these findings, including a case study of Russia, and explores the implications for economic models with key insights and directions for future research. Finally, Section 6 concludes the study.

2. Literature review and hypothesis formulation

2.1. Economic sanctions and market capitalization

The impact of economic sanctions on market capitalization has evolved significantly over the past century. Biglaiser and Lektzian (2020) noted that sanctions from developed economies significantly affect stock market valuations in the targeted nations, particularly if they are not heavily sanctioned. Their study focused on the 1990–2005 period and developed economies, highlighting the need for more current and diverse analyses. Similarly, Fedorova et al. (2023) sanctions negatively impact the capitalization of major firms in Russia's oil, gas, and telecommunications sectors. Drezner (2015) explored the transition from general trade embargoes to specific financial sanctions and their economic effects mainly from a theoretical standpoint, highlighting the need for empirical evidence. Ankudinov et al. (2017) noted heightened volatility in Russian stock indices after sanctions with no definitive link to structural breaks, suggesting the need for more research on long-term market impacts. Santalova (2018) explored the effects of sanctions on Russian companies, revealing a notable reduction in their market value and the pivotal need for alternative investment sources. Naidenova and Novikova (2018) reported negative effects on public companies in Russia. Goudarzi (2014) analyzed the Iranian stock market and found that its volatility is typical despite sanctions, indicating varied sanction effects in different contexts. In 2020, Webb explored the economic impact of sanctions on initiating countries, focusing on market volatility due to threats and uncertainty but not on the direct effects on capitalization Webb (2020). Gurvich and Prilepskiy (2015) studied the impact of Western financial sanctions on Russia, specifically on capital inflows and GDP. Ghasseminejad (2018) found that targeted firms, especially state-owned ones, experienced overall negative returns, with the severity of the impact differing by firm type and ownership. Based on this research, we propose the following hypothesis.

Hypothesis 1. Higher economic sanctions lead to a decrease in capitalization levels.

2.2. Reserves and capitalization during sanctions

The relationship between foreign exchange reserves and stock market capitalization has been examined extensively. Ray (2012) found that higher reserves positively impact stock market capitalization in India, enhancing investor confidence and market stability. However, the focus was on a single country. Alberola et al. (2014) highlighted that higher reserves reduce the adverse effects of financial shocks, showcasing reserves as a cushion and mainly focusing on capital flows. Kohli (2015) show that sufficient reserve holdings diminish exchange rate volatility, which helps stabilize stock markets. Nevertheless, the direct effect of reserves in lessening the impact of sanctions on capitalization requires further exploration. Wang (2017) discussed the complex relationship among reserves, stock markets, and price influences due to changes in money supply, focusing on China's economic conditions. Ewing and Thompson (2016) examine how reserves positively affect market valuations in the oil and gas industry, noting that reserves lower perceived risk. Liu and Lee (2022) discovered that dividends from capital reserves are viewed positively by markets, as they suggest enhanced stability, mainly focusing on capital distribution rather than overall market stability. Qian and Steiner (2012) found that increased reserves led to portfolio equity inflows and improved market depth, particularly in developing countries. The study emphasizes the importance of further research on the role of reserves in a wide range of economies, particularly under sanctions. Abakah and Abakah (2016) show that reserves positively affect stock market growth in Ghana—reserves support market capitalization during economic shocks, albeit with geographical limitations. Zhou et al. (2018) examined the ideal size of China's foreign exchange reserves for financial stability, suggesting a broader global

analysis to apply their conclusions universally. Based on the literature review, we propose the following hypotheses.

Hypothesis 2. Higher reserves mitigate the negative impact of economic sanctions on capitalization.

2.3. Financial market access and capitalization during sanctions

Financial Market Access, analyzed through principal component analysis, assesses diversity and accessibility in markets, considering factors such as market capitalization outside the top ten firms and debt issuers per 100,000 adults (Sviryzdenka, IMF, 2016). Based on this foundational definition, we delve into financial market access and market capitalization resilience during economic sanctions, referencing key studies, including that of Ankudinov et al. (2017), who found that improved financial market access mitigated market volatility and stabilized stock prices in Russia during sanctions, contributing to economic stability. Castagneto-Gissey and Nivorozhkin (2016) analyzed how sanctions affected the Russian stock market, noting that improved financial market access lessened the impact of global volatility. Santalova (2018) emphasizes the role of investor relations in mitigating the impact of sanctions on Russian companies' market value through strategic financial market access. Similarly, Salehi et al. (2019) found that improved access to financial resources in Iran positively impacted stock returns during the sanctions. Ghasseminejad and Jahan-Parvar (2021) noted that Iranian companies with superior access to financial resources manage their risk profiles more effectively during sanctions, softening the blow to stock performance. Sultonov (2020) observed that access to financial markets mitigates the negative effects of sanctions on Russian stock prices and volatility. Fedorova et al. (2023) find that Russian firms with superior financial market access are less adversely affected by sanctions. Xu and Xiong (2022) explored the impact of financial sanctions on the international monetary system, emphasizing the role of financial market access in upholding economic stability. Xu and Xiong (2022) found that Russian firms with better access to financial markets mitigate the effects of sanctions more effectively. Based on these studies, we propose the following hypothesis.

Hypothesis 3. Financial market access plays a significant role in mitigating the negative impact of sanctions on capitalization.

Our study addresses key gaps in the literature on economic sanctions and stock market capitalization. First, we fill a theoretical gap by examining the effects of trade and financial sanctions on stock market capitalization while considering how national reserves and financial market access can mitigate these effects. Previous studies have often overlooked these moderating factors. Second, we bridge the empirical gap using a comprehensive dataset of 87 countries spanning two decades (2000–2021), offering a broader and more global perspective than earlier studies, which typically focused on limited regions or periods. Third, we address the methodological gap by introducing additional control variables, such as political stability, electoral democracy, and natural resource income, to ensure more robust and valid results.

This study primarily examines the impact of economic sanctions on stock market capitalization and how this impact changes over time. Additionally, it explores how national reserves and financial market access can buffer these effects and provide practical insights for policymakers and investors. Our analysis shows that, while sanctions initially disrupt markets, their negative effects decrease over time as markets adapt. This underscores the resilience of financial markets, which eventually stabilizes and may even improve. Finally, our findings contribute to refining economic models such as the Capital Asset Pricing Model (CAPM) and Country Risk Model (CRM), making them more effective for assessing risks in geopolitically sensitive environments. This study will guide academic researchers and practitioners in dealing with international sanctions.

3. Data and methodology

This study primarily investigates the impact of economic sanctions on stock market capitalization and explore the moderating roles of national reserves and financial market access. This study utilizes a sample of 87 countries selected from an initial pool of 192 countries spanning 2000 to 2021. The sample selection and period were based on the availability and reliability of stock market capitalization data and related financial indicators. Moreover, these countries encompass diverse economic, financial, and political environments, offering a robust analytical framework for assessing the impact of sanctions. This period saw a noticeable intensification of the global deployment of sanctions. Appendix 1 presents a list of the countries included.

The analysis is guided by an econometric growth model that incorporates sanctions as independent variables and stock market capitalization as the dependent variable, as shown in Equation (1).

$$\text{Market_Cap}_{it} = \alpha_i + \beta_1 \text{Sanctions}_{it} + \sum_j \gamma_j \text{Controls}_{jit} + \epsilon_{it} \quad (1)$$

This model evaluates the effects of sanctions on market capitalization, where Market_Cap_{it} represents the stock market capitalization of country i ($i = 1, 2, \dots, 87$) in time t ($t = 2000, 2001, \dots, 2021$). Here, β_1 denotes the coefficient for sanctions Sanctions_{it} , and γ_j represents the coefficients for a set of control variables Controls_{jit} , indexed by j . These control variables include GDP (PPP), inflation rate, capital investment, unemployment rate, Foreign Direct Investment (FDI), real interest rate, broad money growth (Broad_money), and population size.

The primary dataset for this study was sourced from the Global Sanctions Database (GSDB)¹, curated by Felbermayr et al., 2020; Kirikakha et al., 2021, and Syropoulos et al., 2024. This dataset provides a detailed account of economic sanctions, offering insights into the parties imposed and those affected by the sanctions. Data on *Economic_Sanctions* are subdivided into *Trade_Sanctions* and *Financial_Sanctions*, enabling a nuanced analysis of their distinct impacts. This study quantifies economic sanctions as packages (or sets), counting trade and financial sanctions. This method is more informative than the simple binary (yes/no) approach because it measures the intensity of sanctions. The frequency of sanctions serves as a proxy for their severity, providing a foundation for a comprehensive analysis of their economic impact and illustrating the extent to which these measures affect targeted economies.

To assess the impact of economic sanctions on stock market capitalization, we use *Market_Cap*, which refers to the market capitalization of listed domestic companies sourced from the World Federation of Exchanges database. Additionally, the analysis incorporates several control variables identified in the existing literature. These variables include: *GDP*, GDP per capita based on purchasing power parity (PPP), Higher GDP per capita usually correlates with stronger market performance (Dube, 2020); *Inflation_Rate*, inflation as measured by the consumer price index, High inflation often negatively impacts stock markets by eroding purchasing power and increasing uncertainty (Chang et al., 2019); *Capital_Invest*, gross capital formation as a percentage of GDP (formerly gross domestic investment) which consists of outlays on additions to the fixed assets of the economy plus net changes in inventory levels, expressed as a percentage of GDP, essential for economic growth and market capitalization (Islam et al., 2017); *Unemployment*, the unemployment rate, High unemployment is generally associated with economic distress and negatively impacts market performance (Gómez & Irewole, 2024); *FDI*, foreign direct investment, represented as a percentage of GDP and indicating net inflows of investment to acquire a lasting management interest, It is often seen as a positive indicator of

¹ Sent by the GSDB Team (Sasha, Costas, Erdal, Gabriel, and Yoto) via. GSDB@drexel.edu. For more information, visit the GSDB website at www.globalsanctionsdatabase.com.s.

Table 1

Correlation between financial market development depth and market capitalization.

	Market_Cap
FinDevDepth	0.765***

Note: This correlation presents the relationship between financial market development depth and market capitalization. Financial market development depth is used as an alternative measure for capitalization during the robustness check. The significance level is indicated as ***p < 0.01.

economic health and stability, which can boost market capitalization (Bhengraj et al., 2023); *Interest*, the real interest rate adjusted for inflation as measured by the GDP deflator, Higher interest rates can reduce corporate profitability and market capitalization by increasing the cost of capital (Olokoyo et al., 2020); *Broad_money*, the annual percentage growth in broad money, encompassing currency, demand deposits, savings, time deposits, and other liquid assets, which supports market activities and capitalization (Depari, 2022); *Population*, the population size in millions, A larger population can drive higher economic output and market growth (Verma & Bansal, 2021). All data for these variables were sourced from the World Development Indicators (WDI).

Upon establishing the foundational variables and their roles within the econometric model, we employ a two-step system GMM approach to

address the methodological challenges inherent in panel data analysis. This model ensures robustness by handling the intricacies of the panel data and incorporating lagged market capitalization, $Market_Cap_{it-k}$, as shown in Equation (2).

$$Market_Cap_{it} = \alpha_i + Market_Cap_{it-k} + \beta_1 Sanctions_{it} + \sum_j \gamma_j Controls_{jit} + \epsilon_{it} \quad (2)$$

To enhance the robustness and accuracy of our findings, we conducted several checks and addressed potential bias using three specific methodologies. First, our study employs the fixed-effects model as an alternative econometric approach. The appropriateness of this model over the random-effects model was confirmed by a Hausman test, which yielded a chi-square value of 33.23 and a p value of 0.0002, compelling us to reject the null hypothesis. The fixed effects model was selected because it more effectively accounts for unobserved heterogeneity within countries, allowing for a more precise estimation of the effects of sanctions. The model is specified as follows, Equation (3):

$$Market_Cap_{it} = \alpha_i + \beta_1 Sanctions_{it} + \sum_j \gamma_j Controls_{jit} + \mu_i + \eta_t + \epsilon_{it} \quad (3)$$

In this model, μ_i captures unobserved country-specific effects and η_t represents the time-specific effects, providing a dynamic component to our analysis.

Second is Financial Market Development Depth (FinDevDepth): To further test the robustness of our conclusions, we utilized FinDevDepth as an alternative measure to stock market capitalization. This measure, sourced from the International Monetary Fund (IMF), is derived from a

Table 2

Impact of economic sanctions on stock market capitalization using two-step system GMM and fixed-effects models.

Market_Cap	Two-step system GMM			Fixed-effects		
	(1)	(2)	(3)	(4)	(5)	(6)
L.Market_Cap	0.812*** (0.018)	0.826*** (0.012)	0.814*** (0.014)			
Economic_Sanctions	−0.0154*** (0.001)			−0.0282** (0.013)		
Trade_Sanctions		−0.0175*** (0.004)			−0.0564** (0.028)	
Financial_Sanctions			−0.0394*** (0.004)			−0.0494* (0.026)
GDP	0.309*** (0.038)	0.296*** (0.039)	0.298*** (0.029)	2.604*** (0.234)	2.606*** (0.231)	2.603*** (0.234)
Inflation_Rate	−0.0151*** (0.002)	−0.0149*** (0.002)	−0.0155*** (0.002)	−0.0202 (0.014)	−0.0203 (0.014)	−0.02 (0.014)
Capital_Invest	−0.00034 (0.004)	−0.0024 (0.003)	−0.0017 (0.003)	0.0109 (0.014)	0.0107 (0.014)	0.011 (0.014)
Unemployment	−0.00216 (0.003)	−0.00326 (0.003)	−0.00173 (0.002)	−0.0477* (0.025)	−0.0475* (0.025)	−0.0480* (0.025)
FDI	0.000328*** (0.000)	0.000255*** (0.000)	0.000384*** (0.000)	0.00227* (0.001)	0.00226* (0.001)	0.00228** (0.001)
Interest	−0.0123* (0.006)	−0.0146** (0.007)	−0.0136** (0.006)	−0.0490* (0.029)	−0.0497* (0.029)	−0.0486* (0.029)
Broad_money	0.017 (0.012)	0.0205* (0.011)	0.0141 (0.010)	0.0393 (0.031)	0.0397 (0.031)	0.0393 (0.030)
Population	0.241*** (0.019)	0.225*** (0.016)	0.242*** (0.014)	2.138*** (0.469)	2.137*** (0.468)	2.138*** (0.470)
Constant	−2.812*** (0.503)	−2.638*** (0.483)	−2.678*** (0.360)	−27.67*** (2.114)	−27.67*** (2.090)	−27.65*** (2.122)
Observations	762	762	762	826	826	826
N	70	70	70	72	72	72
r2				0.664	0.664	0.664
AR1 (P-value)	0.000	0.000	0.000			
AR2 (P-value)	0.336	0.344	0.359			
Sargan test (P-value)	0.000	0.000	0.000			
Hansen test (P-value)	1.000	1.000	1.000			
Country fixed effects				YES	YES	YES
Time fixed effects				YES	YES	YES

Note: This table presents the impact of economic sanctions, trade sanctions, financial sanctions, and other control variables on stock market capitalization using GMM and fixed-effects models. The GMM model specifications include a lag structure of 1 to 1 period, with key control variables (GDP, Inflation_Rate, Population) specified as instruments due to their direct influence on market capitalization. Each model uses the two-step system GMM estimation method. Standard errors are in parentheses, and significance levels are indicated as ***p < 0.01, **p < 0.05, *p < 0.1.

Source: Authors' analysis using Stata 18.

principal component methodology incorporating several indicators, such as stock market capitalization to GDP, stocks traded to GDP, international debt securities of the government to GDP, and the total debt securities of both financial and non-financial corporations (Svirydzenka, 2016). Given the strong correlation (0.765) between FinDevDepth and stock market capitalization, as noted in Table 1, this approach allows for a comprehensive analysis of the size and resilience of financial markets, providing a substantial basis for assessing the impact of economic sanctions.

Third, we incorporate additional variables beyond the fundamental base controls to ensure the robustness of our analysis and better understand the broader influences on market capitalization. Subsequently, we delve into the temporal dynamics of the impact of economic sanctions on stock market capitalization. We aim to assess whether the effects of economic sanctions are enduring, or if markets adapt over time. Specifically, we focus on the delayed effects of economic sanctions by applying a lag effect in Equation (2) and establish a temporal framework to evaluate how markets respond to economic sanctions over time.

To achieve the second objective, we investigate the moderating roles of national reserves and financial market access in mitigating the impact of *Economic Sanctions* on *Market Cap*. We analyze their interactions with the primary variables of *Economic Sanctions*, *Trade Sanctions*, and *Financial Sanctions*. The purpose is to assess whether these moderating variables can significantly alleviate the negative impact of sanctions on market capitalization across different models and scenarios, as illustrated in Equations (4) and (5).

$$\text{Market_Cap}_{it} = \alpha_i + \text{Market_Cap}_{it-k} + \beta_1 \text{Sanctions}_{it} + \beta_2 \text{Reserves}_{it} + \beta_3 (\text{Sanctions}_{it} \times \text{Reserves}_{it}) + \sum_j \gamma_j \text{Controls}_{jit} + \epsilon_{it} \quad (4)$$

Reserves refer to foreign exchange reserves, including gold, in billions USD, sourced from the International Monetary Fund (IMF).

$$\text{Market_Cap}_{it} = \alpha_i + \text{Market_Cap}_{it-k} + \beta_1 \text{Sanctions}_{it} + \beta_2 \text{FMA}_{it} + \beta_3 (\text{Sanctions}_{it} \times \text{FMA}_{it}) + \sum_j \gamma_j \text{Controls}_{jit} + \epsilon_{it} \quad (5)$$

Here, Financial Market Access (FMA), measured through principal component analysis, considers factors such as the percentage of market capitalization outside the top ten largest companies and the total number of debt issuers (both domestic and external, from non-financial and financial corporations) per 100,000 adults. This indicates how open and accessible a financial market is for participants to raise capital and invest in and access financial services. FMA was sourced from the International Monetary Fund (IMF) (Svirydzenka, IMF, 2016).

Furthermore, we conduct case studies involving Russia, Iran, China, and Ukraine to validate our findings in a real-world context. These examples provide empirical support for our theoretical propositions and econometric models, illustrating how economic sanctions adversely affect stock market capitalization and revealing that the impact of sanctions varies across different countries, shedding light on the immediate effect and the observed subsequent recovery phases.

4. Results

4.1. Sanctions Impact on capitalization

We examined the impact of economic sanctions on stock market capitalization. The results in Table 2 highlight the effects of economic sanctions and other macroeconomic control variables on stock market capitalization. The findings from the two-step system GMM model (columns 1, 2, and 3) show that the coefficients for the lagged dependent variable (L. Market_Cap) are positive and highly significant across all models, ranging between 0.812*** and 0.826***. This indicates a strong autoregressive component, implying that past market capitalization values strongly influence current values. Economic sanctions have a negative and significant coefficient (−0.0154***), suggesting that higher economic sanctions lead to decreased stock market

Table 3

Impact of economic sanctions on financial market development depth.

FinDevDepth	(1)	(2)	(3)
L.FinDevDepth	0.909*** (0.009)	0.926*** (0.013)	0.901*** (0.007)
Economic_Sanctions	−0.00123*** (0.000)		
Trade_Sanctions		−0.00151** (0.001)	
Financial_Sanctions			−0.00363*** (0.001)
GDP	0.0226*** (0.005)	0.0205*** (0.004)	0.0235*** (0.005)
Inflation_Rate	−0.00159*** (0.000)	−0.00147*** (0.000)	−0.00159*** (0.000)
Capital_Invest	−0.000446 (0.000)	−0.000173 (0.000)	−0.000195 (0.000)
Unemployment	−0.0000321 (0.000)	0.000139 (0.000)	0.000186 (0.000)
FDI	9.91e-05*** (0.000)	7.25e-05*** (0.000)	0.000114*** (0.000)
Interest	−0.00131 (0.001)	−0.000722 (0.001)	−0.000334 (0.001)
Broad_money	0.00394*** (0.001)	0.00505*** (0.001)	0.00448*** (0.001)
Population	0.00985*** (0.002)	0.00957*** (0.002)	0.0105*** (0.002)
Constant	−0.200*** (0.050)	−0.197*** (0.044)	−0.219*** (0.048)
Observations	1031	1031	1031
N	74	74	74
AR1 (P-value)	0.000	0.000	0.000
AR2 (P-value)	0.598	0.566	0.573
Sargan test (P-value)	0.000	0.000	0.000
Hansen test (P-value)	1.000	1.000	1.000

Note: This table shows the effects of economic, trade, and financial sanctions on financial market development depth as an alternative measure for capitalization. The GMM model specifications include a lag structure of 1 to 1 period, with key control variables (GDP, Inflation_Rate, Population) specified as instruments due to their direct influence on market capitalization. Each model uses the two-step system GMM estimation method. Standard errors are in parentheses; significance levels are indicated as ***p < 0.01, **p < 0.05, *p < 0.1.

Source: Authors' analysis using Stata 18.

capitalization, which is consistent with Hypothesis 1. Trade sanctions also significantly and negatively impact stock market capitalization (−0.0175***), further supporting Hypothesis 1, indicating that economic restrictions adversely affect market performance. Similarly, financial sanctions have a negative and significant effect on market capitalization (−0.0394***), underscoring the detrimental impact of financial barriers on stock markets.

To substantiate the findings obtained from the GMM, we employ a fixed-effects model as an alternative econometric approach. The results in Columns 4, 5, and 6 of Table 2 are consistent with those of the GMM model. Specifically, the negative and statistically significant coefficients for economic, trade, and financial sanctions (−0.0282**, −0.0564**, −0.0494*, respectively) further validate the robustness of our findings.

The other control variables had the expected impacts. Higher GDP levels are associated with increased market capitalization, indicating that economic growth positively influences stock market performance. Higher inflation rates are negatively associated with market capitalization, suggesting that inflationary pressures can undermine market value. Capital investment did not show a significant effect—its impact may be complex and context dependent. Unemployment rates are negatively associated with market capitalization, implying that higher unemployment levels can signal economic distress and adversely affect market performance. Foreign Direct Investment (FDI) shows a positive and significant impact on stock market capitalization, which is consistent with the notion that greater investment inflows boost market performance. Higher interest rates are negatively associated with market capitalization because increased borrowing costs can reduce corporate

profitability. Broad_money, the annual percentage growth in broad money, has a positive effect, suggesting that higher economic liquidity supports stock market performance. Finally, population size positively correlates with market capitalization—larger populations can drive market growth through increased economic activity. These impacts are expected to align with existing economic theories and literature.

The AR1 (p-value) and AR2 (p-value) tests indicated no serial correlation in the residuals, whereas the Sargan and Hansen tests confirmed the validity of the instruments. Including country- and time-fixed effects helps to control for unobserved heterogeneity and time-specific factors, enhancing the robustness of our results.

4.2. Financial market development depth as an alternative measure for stock market capitalization

To confirm the robustness of our findings that economic sanctions lead to a decrease in stock market capitalization, we analyze the impact of economic sanctions on Financial Market Development Depth (FinDevDepth). Our analysis, presented in Table 3, underscores the significance of historical values in predicting the current levels of Financial Market Development Depth (FinDevDepth).

The consistently positive and highly significant coefficients for the lagged variable (L. FinDevDepth), which range between 0.901*** and 0.926***, confirm a strong autoregressive tendency in the data. This suggests that the depth of the financial market in previous periods is a reliable predictor of its current state. Additionally, the analysis highlights the adverse effects of economic sanctions on financial market depth, with a significantly negative coefficient of -0.00123^{***} for economic sanctions. This finding indicates that an increase in economic sanctions leads to a measurable reduction in market depth. The impacts of trade and financial sanctions are similarly detrimental, with coefficients of -0.00151^{**} and -0.00363^{***} , respectively, further demonstrating how these specific types of sanctions undermine the overall performance and value of financial markets. This consistent pattern across different sanctions reinforce the robustness of our findings.

Control variables such as GDP positively influence FinDevDepth, whereas the inflation rate negatively affects it, consistent with our primary analysis of stock market capitalization. Foreign Direct Investment (FDI) also has a positive and significant impact, reinforcing its role in enhancing financial market robustness. Other variables, including capital investment, unemployment rates, and interest rates, demonstrate complex interactions with financial market health as their effects vary across models.

4.3. Additional control variables for enhanced robustness and validity

We introduce additional variables beyond the fundamental base controls to ensure the robustness of our analysis and to better understand the broader influences on market capitalization. These include Political Stability and Absence of Violence/Terrorism (political _ stability) from the Worldwide Governance Indicators (WGI) and the Electoral Democracy Index (Electoral_Democracy) from V-Dem.² which measures how democratic a regime is on a scale from 0 to 1, with higher values indicating more democratic systems, and Income from Natural Resources as a percentage of GDP (Natural_Resources_Income) from the World Development Indicators (WDI), which adds value by capturing the broader sociopolitical and economic context within which financial markets operate. These variables were introduced sequentially to ensure that each contribution was clearly understood and that the model remained robust without overfitting.

Table 4 illustrates the effects of economic sanctions on market

Table 4

Impact of economic sanctions on market capitalization with additional controls.

Market_Cap	(2)	(3)	(1)
L.Market_Cap	0.814*** (0.019)	0.822*** (0.014)	0.817*** (0.012)
Economic_Sanctions	-0.0103^{***} (0.001)	-0.0142^{***} (0.001)	-0.0118^{**} (0.006)
Political_Stability	0.0399*** (0.013)		
Electoral_Democracy		-0.0431 (0.076)	
Natural_Resources_Income			0.00363*** (0.001)
Control variables	YES	YES	YES
Constant	-2.260^{***} (0.232)	-2.537^{***} (0.349)	-2.879^{***} (0.215)
Observations	743	722	762
N	68	70	70
AR1 (P-value)	0.000	0.000	0.000
AR2 (P-value)	0.693	0.889	0.342
Sargan test (P-value)	0.000	0.000	0.000
Hansen test (P-value)	1.000	1.000	1.000

Note: This table shows the impact of economic sanctions on market capitalization, with additional controls introduced sequentially to avoid overfitting. Standard errors are in parentheses; significance levels are indicated as ***p < 0.01, **p < 0.05, *p < 0.1. The base controls include (GDP, Inflation Rate, Capital Investment, Unemployment Rate, FDI, Interest Rate, Broad Money, and Population). Each model uses the two-step system GMM estimation method.

Source: Authors' analysis using Stata 18.

capitalization while sequentially introducing additional control variables. Across all models, the coefficient for Economic Sanctions remains negative and significant, indicating that sanctions consistently reduce market capitalization and that the introduction of additional control variables slightly alters the magnitude of this effect. However, this negative relationship remained robust, adding validity to our previous findings.

Political stability has a significant positive impact on market capitalization. This finding indicates that more stable political environments, characterized by the absence of violence and terrorism, contribute positively to financial market development. This relationship aligns at least partially with the finding that political stability enhances investor confidence, leading to increased investments and market growth (Uddin et al., 2017).

The negative but insignificant coefficient of Electoral Democracy suggests that democracy does not directly influence market capitalization, at least in this context. For example, according to the V-Dem Institute, despite their low democracy scores—0.01 for Saudi Arabia and 0.07 for China, both countries have seen notable market capitalization growth. Saudi Arabia's market cap surged by nearly 470%, from approximately \$439 billion in 2016 to around \$2.5 trillion in 2022, as reported by the CEIC.³ Similarly, China experienced a growth of approximately 54%, with its market cap increasing from roughly \$6.5 trillion in 2015 to over \$10 trillion in 2022, according to the World Bank.⁴ This indicates that economic outcomes in these nations are largely driven by state policies, resource wealth, and economic strategies, rather than democratic governance.

Including income from natural resources as a share of the GDP significantly boosts market capitalization, suggesting that economies rich in natural resources have more robust markets. This trend underlines the role of natural resources in driving economic growth and financial development, especially in middle-income countries, where rising natural resource income bolsters GDP and market capitalization

² Source: V-Dem (2024) V-Dem Institute, based at the University of Gothenburg in Sweden. Data available at <https://ourworldindata.org/grapher/electoral-democracy-index>.

³ Source: CEIC Data <https://www.ceicdata.com/en/indicator/saudi-arabia/market-capitalization>.

⁴ Source: World Bank <https://data.worldbank.org/indicator/CM.MKT.LCAP.CD?locations=CN>.

Table 5

Lagged impact of economic sanctions on market capitalization.

Market_Cap	(1)	(2)	(3)	(4)	(5)	(6)
L.Market_Cap	0.812*** (0.018)	0.814*** (0.018)	0.816*** (0.012)	0.830*** (0.008)	0.855*** (0.008)	0.879*** (0.014)
Economic_Sanctions	−0.0154*** (0.001)					
Economic_Sanctions (lag 1)		−0.0169*** (0.002)				
Economic_Sanctions (lag 2)			−0.0161*** (0.002)			
Economic_Sanctions (lag 3)				−0.0115*** (0.001)		
Economic_Sanctions (lag 4)					−0.00962*** (0.002)	
Economic_Sanctions (lag 5)						0.0144*** (0.002)
Control variables	YES	YES	YES	YES	YES	YES
Constant	−2.812*** (0.503)	−2.864*** (0.538)	−2.741*** (0.215)	−2.109*** (0.163)	−1.940*** (0.383)	−1.198*** (0.313)
Observations	762	762	722	686	654	617
N	70	70	70	70	68	66
AR1 (P-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR2 (P-value)	0.336	0.352	0.870	0.599	0.712	0.985
Sargan test (P-value)	0.000	0.000	0.000	0.000	0.000	0.000
Hansen test (P-value)	1.000	1.000	1.000	1.000	1.000	1.000

Note: This table illustrates the temporal impact of economic sanctions on market capitalization, revealing a decreasing negative effect over time. Standard errors are displayed in parentheses, and significance levels are denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The model incorporates key control variables, including GDP, Inflation Rate, Capital Investment, Unemployment Rate, FDI, Interest Rate, Broad Money, and Population. Each model uses the two-step system GMM estimation method.

Source: Authors' analysis using Stata 18.

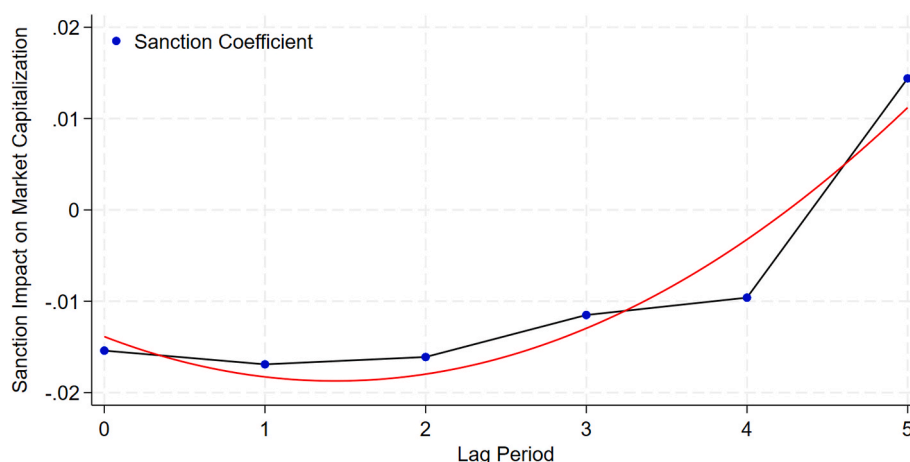


Fig. 1. Temporal Dynamics of Sanction Impacts on Market Capitalization Over Time.

Note: This figure shows the trajectory of the effects of economic sanctions on market capitalization across multiple lag periods. The blue dots represent the sanction coefficients and the red curve succinctly shows the trend direction. This demonstrates how the initial strong negative impacts gradually diminish, ultimately leading to positive adaptations in later stages. This visualization complements the table data by showing how market capitalization recovered from the initial shock and adapted to ongoing economic sanctions over time. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Source: Authors' analysis using Stata 18.

(Topcu et al., 2020).

4.4. Sanctions Impact on Market Capitalization Over Time

To determine whether economic sanctions consistently impact market capitalization or whether markets adjust over time, this study employs a two-step generalized method-of-moments (GMM) model. By analyzing the delayed effects of economic sanctions on market capitalization, we aim to create a framework for evaluating the temporal dynamics.

The results presented in Table 5 offer insights into the lagged impact of economic sanctions on market capitalization.

This pattern suggests that the negative impact of the sanctions diminishes over time. Initially, sanctions significantly impact the market; however, by the fifth lagged year, the effect becomes positive, indicating market adaptation or over-compensation for prior reactions, as shown in Fig. 1. This aligns with adaptive market hypothesis theories (Lo, 2004), which propose that markets learn and adjust to new information, such as policy shocks from sanctions. This trend implies that market participants may anticipate the effects of sanctions and adapt their strategies accordingly.

Table 6

Moderating role of national reserves on the impact of economic sanctions on stock market capitalization.

Market_Cap	(1)	(2)	(3)
L.market_Cap	0.715*** (0.019)	0.709*** (0.018)	0.710*** (0.019)
Economic_Sanctions	−0.107*** (0.024)		
Economic_Sanctions X reserves	0.0175*** (0.005)		
Trade_Sanctions		−0.199*** (0.072)	
Trade_Sanctions X reserves		0.0357** (0.015)	
Financial_Sanctions			−0.182*** (0.027)
Financial_Sanctions X reserves			0.0265*** (0.006)
Reserves	0.0734*** (0.016)	0.0673*** (0.018)	0.100*** (0.016)
Control variables	YES	YES	YES
Constant	−2.539*** (0.376)	−2.767*** (0.345)	−2.232*** (0.369)
Observations	743	743	743
N	68	68	68
AR1 (P-value)	0.000	0.000	0.000
AR2 (P-value)	0.779	0.847	0.783
Sargan test (P-value)	0.000	0.000	0.000
Hansen test (P-value)	1.000	1.000	1.000

Note: This table explores the moderating effect of national reserves on the relationship between economic sanctions and stock market capitalization. Standard errors are displayed in parentheses, and significance levels are denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The model incorporates key control variables, including GDP, Inflation Rate, Capital Investment, Unemployment Rate, FDI, Interest Rate, Broad Money, and Population. Each model uses the two-step system GMM estimation method.

Source: Authors' analysis using Stata 18.

4.5. Moderating role of national reserves

Table 6 explores the moderating role of national reserves in the relationship between economic sanctions and stock market capitalization. Interaction terms between economic sanctions and national reserves are incorporated to test Hypothesis 2, which proposes that higher national reserves mitigate the negative impact of economic sanctions on capitalization levels. The results confirm that national reserves significantly buffer the adverse effects of sanctions on market capitalization. The coefficients of these interaction terms are consistently positive and significant, suggesting that robust national reserves can effectively counteract the negative influence of economic sanctions.

Model (1) highlights the interaction between economic sanctions and national reserves, showing a significant moderating effect, with a coefficient of 0.0175***. This indicates that as national reserves increase, the negative impact of economic sanctions on market capitalization diminishes. Model (2) examines the interaction between trade sanctions and national reserves and presents a coefficient of 0.0357**, underscoring the substantial mitigating role of reserves against trade sanctions. Model (3) focuses on the interaction between financial sanctions and national reserves, with a coefficient of 0.0265***, further supporting the hypothesis that higher reserves can alleviate the impact of financial sanctions on market capitalization.

Control variables such as GDP, inflation rate, and population consistently affect market capitalization across all models. Overall, the findings reveal that while sanctions (economic, trade, and financial) negatively impact stock market capitalization, high national reserves can significantly moderate this effect. This suggests that countries with substantial reserves may be better positioned to protect their stock markets from the detrimental effects of sanctions.

Table 7

Moderating role of financial market accessibility (FMA) on the impact of economic sanctions on stock market capitalization (Market_Cap).

Market_Cap	(1)	(2)	(3)
L.Market_Cap	0.798*** (0.009)	0.688*** (0.014)	0.828*** (0.011)
Economic_Sanctions	−0.0561** (0.027)		
Economic_Sanctions X FMA	0.122* (0.071)		
Trade_Sanctions		−0.118*** (0.027)	
Trade_Sanctions X FMA		0.307*** (0.069)	
Financial_Sanctions			−0.0956*** (0.028)
Financial_Sanctions X FMA			0.194** (0.081)
FMA	0.426*** (0.078)	0.683*** (0.065)	0.399*** (0.091)
Control variables	YES	YES	YES
Constant	−2.484*** (0.201)	−3.134*** (0.349)	−1.992*** (0.378)
Observations	762	762	762
N	70	70	70
AR1 (P-value)	0.000	0.000	0.000
AR2 (P-value)	0.410	0.975	0.374
Sargan test (P-value)	0.000	0.000	0.000
Hansen test (P-value)	1.000	1.000	1.000

Note: This table examines the interaction between economic sanctions and financial market accessibility on stock market capitalization. Standard errors are displayed in parentheses, and significance levels are denoted as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The model incorporates key control variables, including GDP, Inflation Rate, Capital Investment, Unemployment Rate, FDI, Interest Rate, Broad Money, and Population. Each model uses the two-step system GMM estimation method.

Source: Authors' analysis using Stata 18.

4.6. Moderating role of financial markets' accessibility

Table 7 examines the moderating role of financial market accessibility (FMA) in the relationship between economic sanctions and stock market capitalization. By incorporating the interaction terms between economic sanctions and financial market accessibility, we evaluate Hypothesis 3, which proposes that accessible financial markets can reduce the negative impact of economic sanctions on capitalization levels.

The results confirm that financial market accessibility, which enables participants to raise capital, invest, and access financial services, significantly moderates the adverse effects of sanctions on market capitalization. The consistently positive and significant coefficients of these interaction terms indicate that well-developed financial markets can effectively neutralize the negative influences of economic sanctions.

Model (1) illuminates the interaction between economic sanctions and financial market accessibility, showing a significant moderating effect with a coefficient of 0.122*. This finding suggests that enhanced financial market accessibility reduces the negative impact of economic sanctions on market capitalization. Model (2) assesses the interaction between trade sanctions and financial market accessibility with a coefficient of 0.307***, highlighting the significant mitigating role of accessible financial markets in countering trade sanctions. Model (3) addresses the interaction between financial sanctions and financial market accessibility, yielding a coefficient of 0.194**, further supporting the hypothesis that improved financial market access alleviates the impact of financial sanctions on market capitalization. Control variables such as GDP, the inflation rate, and population consistently show significant effects on market capitalization across all models.

Overall, the findings indicate that while economic, trade, and financial sanctions negatively affect stock market capitalization, accessible financial markets can significantly moderate this effect. This

finding suggests that countries with well-developed financial markets may be better equipped to protect their stock markets from the detrimental effects of sanctions.

5. Discussion

This discussion explores the findings from our study, which investigated the impact of economic sanctions on stock market capitalization and examined the moderating roles of national reserves and financial market access. We hypothesized that increased economic sanctions would decrease stock market capitalization, that higher national reserves would mitigate this negative impact, and that enhanced access to financial markets would significantly buffer the adverse effects of sanctions.

5.1. Sanctions Impact on capitalization

This study primarily explored the direct impact of economic sanctions on stock market capitalization. The findings indicate that economic sanctions, including trade and financial sanctions, significantly and negatively impact stock market capitalization. This suggests that the economic restrictions imposed by sanctions can severely undermine the market performance of affected countries. The empirical evidence supports [Hypothesis 1](#), demonstrating that stronger economic sanctions lead to a notable decrease in market capitalization.

Several factors have contributed to these results. Economic sanctions introduce high levels of uncertainty and risk to markets. Investors are concerned about the future stability and profitability of their investments in sanctioned countries, which discourages investments and reduces overall investor confidence. This has been observed in multiple studies, highlighting the broad impact of sanctions on market behavior ([Biglaiser & Lektzian, 2020](#); [Ghasseminejad & Jahan-Parvar, 2021](#)).

Trade sanctions can severely disrupt supply chains and trade flows, leading to an economic downturn. This disruption affects the target country's overall economic health and reduces the operational efficiency and profitability of companies, which in turn leads to lower stock market valuations ([Sultonov, 2020](#)). Financial sanctions often restrict access to international financial systems and capital markets, hindering firms' ability to secure the necessary funding and engage in international transactions. This exacerbates economic instability and reduces market capitalization. This effect is particularly pronounced in Iran and Russia, where sanctions have led to significant financial constraints and increased market volatility ([Naidenova & Novikova, 2018](#)).

Our study identifies a discernible pattern in which the negative impact of economic sanctions on market capitalization weakens progressively over time. Initially, sanctions caused significant market disruptions; however, by the fifth year, a common turning point was observed across the sampled countries, although variations existed individually. The impact stabilized and exhibited positive effects. This suggests that the market adaptation phase or possible overcompensation for initial overreactions aligns with the Adaptive Market Hypothesis articulated by [Lo \(2004\)](#). Markets show remarkable adaptability to challenges, such as policy-imposed sanctions, adjusting their operations to mitigate risks, and maintaining stability. This resilience is well illustrated in the Russian market, which has seen substantial adaptation, reinforcing the themes of resilience identified [Tang et al. \(2019\)](#) in their analysis of stock market performance. Russia's coal industry, analyzed by [Goosen et al. \(2022\)](#), further emphasizes how companies have developed long-term strategies to withstand and capitalize on the disruptive effects of sanctions, demonstrating proactive market behavior and strategic planning.

In summary, economic sanctions lead to significant declines in stock market capitalization because of increased market uncertainty and risk, supply chain disruptions, restricted financial access, and broader economic downturns. These factors collectively undermine the performance of markets in the affected countries. However, markets have often

developed mechanisms to mitigate these adverse effects. Our findings reveal a progressive adaptation, in which markets stabilize and may demonstrate improved capitalization. This indicates markets' remarkable resilience and inherent capacity to adjust to new economic realities, showcasing their dynamic nature in response to external pressures.

5.2. Moderating role of national reserves

This study further examines the role of national reserves in mitigating the impact of economic sanctions on stock market capitalization. These findings reveal that national reserves play a crucial role in buffering the adverse effects of sanctions. The positive and significant interaction terms between economic sanctions and national reserves suggest that countries with substantial reserves are better equipped to withstand the economic pressure imposed by sanctions. National reserves provide a financial cushion to stabilize the economy during external shocks such as sanctions.

High levels of national reserves enable countries to defend their currencies against devaluation and support overall financial stability. For instance, during sanctions, the Russian Central Bank adjusted international reserves to reduce exposure to sanction risks, which helped maintain macroeconomic stability ([Kokorev, 2022](#)). Additionally, foreign reserves in emerging market economies are often accumulated to mitigate financial market shocks, strengthen domestic market resilience, and reduce volatility ([People's Bank of China, 2019](#)). Foreign exchange reserves also play a critical role in financing imports during sanctions and ensuring the availability of essential goods and services, which helps stabilize the economy and market sentiment ([Abakah & Abakah, 2016](#)).

In the global financial crisis context of the GFC, countries with higher pre-crisis reserve holdings were better able to sustain economic growth and avoid severe downturns, demonstrating the importance of reserves for maintaining economic stability during external shocks ([Chivakul et al., 2010](#)). Adequate reserve holdings can significantly reduce exchange-rate volatility and stabilize stock markets. This effect is particularly pronounced in developing countries, where reserves provide a buffer against external economic shocks ([Kohli, 2015](#)). In summary, national reserves mitigate the negative effects of economic sanctions by providing financial stability, supporting currency value, financing essential imports, and reducing market volatility. Higher reserves effectively counteract the detrimental impact of economic sanctions, supporting [Hypothesis 2](#).

5.3. Moderating role of financial markets' accessibility

In addition to national reserves, this study explores the moderating role of financial market accessibility in mitigating the negative effects of economic sanctions. Their results show that better access to financial markets significantly reduces the adverse effects of sanctions on stock market capitalization. The positive and significant interaction terms between economic sanctions and financial market access indicate that well-developed financial markets can serve as protective buffers against economic fallout due to sanctions. Enhanced development and accessibility of financial markets are crucial for countries to attract foreign investment, access international capital, and diversify their funding sources. This is essential for maintaining market stability and investor confidence, mitigating the negative impact of economic sanctions on stock market capitalization.

Financial market access, defined by indicators such as the percentage of market capitalization outside the top ten largest companies and the total number of debt issuers, enables countries to attract foreign investment and access international capital, which helps offset the negative effects of sanctions. For example, despite the significant impact of sanctions on Iran's stock market, firms with better access to international markets managed to mitigate some of these effects ([Ghasseminejad & Jahan-Parvar, 2021](#)). Access to international capital markets is crucial for maintaining liquidity and investment flows that

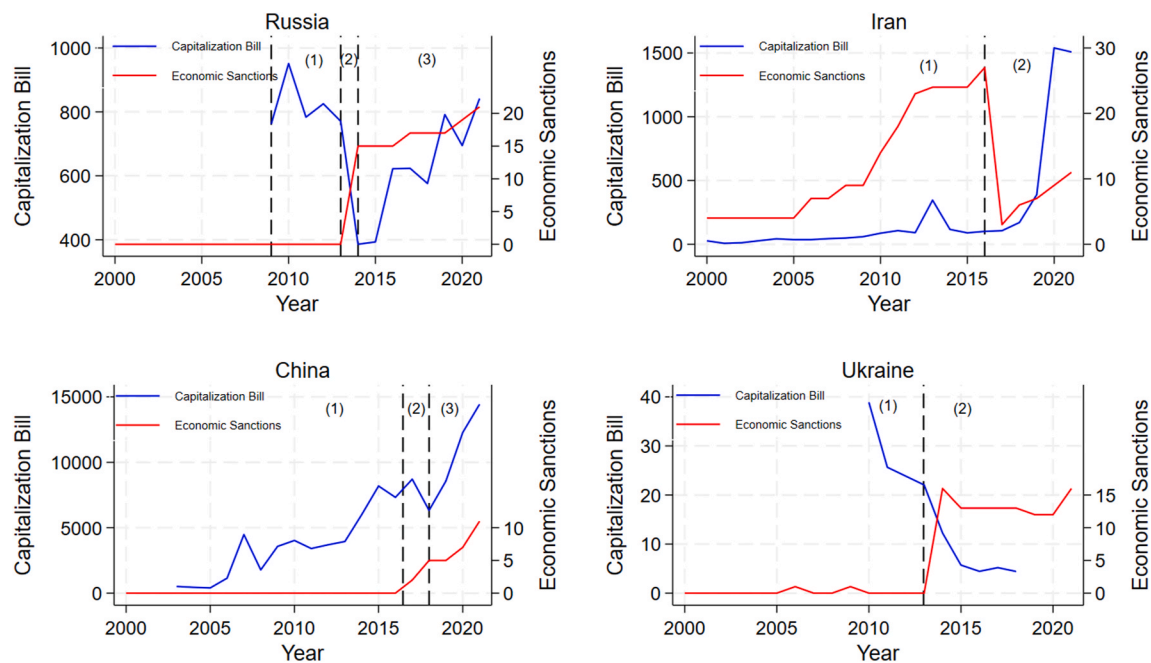


Fig. 2. Impact of Sanctions on Market Capitalization: A Comparative Analysis of Russia, Iran, China, and Ukraine.

Note: The figure presents trends in market capitalization and economic sanctions for Russia, Iran, China, and Ukraine, with parentheses (e.g., (1), (2), and (3)) referencing specific discussion periods.

Source: Authors' analysis using Stata 18.

support economic stability (Biglaiser & Lektzian, 2020).

Furthermore, countries with diversified funding sources are better equipped to manage the economic shocks induced by sanctions. For instance, the Russian financial market demonstrated resilience by leveraging its diverse funding avenues despite severe sanctions (Sultonov, 2020). Diversified funding sources allow countries to sustain economic activities and market operations even under external financial pressure (Althabity, 2011). Financial markets that remain open and accessible can better manage investor concerns and stabilize stock prices, even under sanctions (Shapran et al., 2022). Countries with robust financial markets adapt better to sanction conditions by leveraging their financial infrastructure to support domestic economic activities, as demonstrated by the adaptability and resilience of the Russian financial market in managing investor sentiments and maintaining liquidity (Rocheva et al., 2023).

5.4. Case of Russia, Iran, China, and Ukraine

To contextualize our findings in practical situations, we conducted a case study involving Russia, Iran, China, and Ukraine, chosen for their unique economic characteristics and diverse sanctions. This selection provides a solid foundation for examining the effects of sanctions on market capitalization. Fig. 2 presents market capitalization trends and sanctions over time, facilitating country-response comparisons. Discussion periods are denoted by numbers in parentheses (e.g., (1), (2), and (3)).

5.4.1. Russia

Between 2008 and 2013 (Fig. 2, Russia (1)), the Russian stock market experienced fluctuations in value because of economic uncertainty

rather than international sanctions. The sanctions against Russia remained consistently low, indicating minimal international pressure.

Following the 2014 Crimean crisis (Fig. 2, Russia, (2)), Russia's geopolitical landscape underwent a significant transformation as the United States, the European Union, and other Western nations implemented severe sanctions on the finance, energy, and defense sectors. These actions intensified sanctions considerably, leading to a decline in Russia's market value from roughly \$850 billion in 2013 to \$400 billion in 2015, marking a 53% decrease. Gurvich and Prilepskiy (2015) suggest that post-Crimea sanctions reduced Russia's GDP by 2.4% in 2014. These sanctions, along with a drastic decrease in oil prices, caused the Russian economy to contract by 3.7% in 2015 (World Bank, 2016). Additionally, the Russian ruble fell by approximately 50% against the U. S. dollar from 2014 to 2015 (International Monetary Fund, 2015).

Despite persistent sanctions (Fig. 2, Russia, (3)), Russia's market value showed signs of recovery after 2016, with market capitalization returning to approximately \$600 billion by 2019. This recovery indicates the market's ability to adapt and stabilize by incorporating sanction risks over time. A study by Ahn and Ludema (2020) corroborates this, suggesting that although sanctions initially significantly impacted the Russian economy, long-term effects softened through strategies such as import substitution and enhanced trade with non-Western countries. Furthermore, the Bank of Russia's measures, such as interest rate hikes and currency market interventions in 2018, were pivotal to economic stabilization.

In recent developments, the escalation of the Ukrainian crisis in 2022, followed by Russia's military engagement, led to a significant rise in sanctions, increasing by 138% compared with the previous year, as noted in Table 8. This increase in sanctions profoundly affected Russia's economy, with its market capitalization decreasing by 37%, from

Table 8

Sanctions and market capitalization trends (2021–2022) for Russia.

Country	Sanctions 2021	Sanctions 2022	% Increase in Sanctions	Market Cap 2021 (in billion USD)	Market Cap 2022 (in billion USD)	% Change in Market Cap
Russia	21	50	138%	841.85	530.1	−37%

Note: Data on sanctions is measured by sets or packages sourced from the Global Sanctions Database.

\$841.85 billion in 2021 to \$530.1 billion in 2022.

5.4.2. Iran

Before 2005 (Fig. 2, Iran, (1)), sanctions against Iran, sparked by the 1980s Iranian Islamic Revolution and the U.S. Embassy hostage crisis, aimed to isolate the country financially by limiting access to global markets and freezing foreign assets. This contributed to the underdevelopment of Iran's financial market, a situation worsened by domestic issues such as government intervention and a lack of investment in critical financial infrastructure (Salehi et al., 2019). Since 2005, sanctions have increased owing to concerns over Iran's nuclear program, yet Iran's market value has remained largely unchanged. This stability is attributed to Iran's preexisting economic isolation and minimal engagement with international financial markets, meaning that the new sanctions had a limited effect on its market involvement.

The 2015 Joint Comprehensive Plan of Action (JCPOA) was pivotal for Iran's economy, leading to the removal of key sanctions related to financial transactions, oil exports, and foreign investments (Fig. 2, Iran, (2)). Following the agreement, the U.S. Treasury and the European Union eased critical sanctions, enabling Iran to access over \$100 billion in frozen assets and reintegrate into the global oil market. Although there was a tangible increase in Iran's market value after the JCPOA, reflecting the agreement's positive effect and sanction relief, the growth in market value occurred gradually, contradicting the immediate negative impact typically observed when sanctions are imposed. This gradual response is not unique to Iran; similar patterns were observed in Myanmar following the 2012 sanction lift, where economic improvements were slow due to concerns over political stability and economic reforms, and in Sudan after the 2017 U.S. sanction lift, which saw a delayed market response attributable to ongoing uncertainties and economic challenges.

The disparity in market reactions, which rapidly declines in response to negative news but slowly recovers with positive updates, stems from tendencies towards capital flights and panic versus cautious optimism. For instance, Adnan et al. (2020) observed similar behavior during the arrival of COVID-19 in the Bangladeshi stock market, where panic selling and herding effects led to rapid market decline. However, as the initial shock subsided, the market began to recover gradually, reflecting investors' cautious optimism.

5.4.3. China

Before 2016 (Fig. 2, China (1)), China experienced steady market value growth, driven by rapid economic expansion and minimal international sanctions. Sanctions during this period were usually symbolic, focusing on arms embargoes or individuals rather than on the wider economy. This lack of severe sanctions has facilitated unimpeded growth in China's financial markets, as shown by the consistent increase in market capitalization.

Starting in 2016 (Fig. 2, China, (1)), the U.S. escalated sanctions against China owing to rising trade disputes and geopolitical tensions. According to the U.S. Department of Commerce and USTR, measures include tariffs on Chinese goods, restrictions on tech firms, and investment constraints. Although significant, these actions were less severe than those against Russia or Iran. For instance, despite imposing tariffs on over \$360 billion worth of Chinese goods, marking a major economic clash, the sanctions mainly targeted economic aspects without affecting critical sectors, such as finance or energy, differing from the comprehensive measures taken against Russia and Iran (Bown, 2019).

Despite heightened trade tensions, the impact on China's economy has lessened owing to its considerable size and diversity. Its varied economy, fueled by strong domestic consumption and diverse trade partners, has helped mitigate the effects of sanctions (Alvarez et al., 2021). Additionally, China's crucial role in global supply chains and its strategic economic position make it difficult for sanctioning entities to fully isolate themselves without experiencing mutual economic repercussions. China's deep integration into the global manufacturing

supply chains makes it a critical player in the global economy, and sanctions disrupt its economy, global trade, and investment flows (Zhang & Zhang, 2018, pp. 233–261).

Despite the sanctions, China's market value rebounded, similar to the trends seen in Russia (Fig. 2, China (3)). This resurgence indicates the adaptation of both markets to sanctions, with companies adjusting and markets becoming increasingly resilient to ongoing sanctions.

5.4.4. Ukraine

In the early 2000s (Fig. 2, Ukraine, (1)), Ukraine's economy grew, fueled by reforms and increased foreign investment, achieving an average annual GDP growth of 7.5% from 2000 to 2007 (European Bank for Reconstruction and Development, 2018). This growth saw a market capitalization peak supported by strong global commodity prices. However, the 2008 financial crisis had a profound impact, causing a 14.8% contraction in the GDP in 2009, primarily because of Ukraine's dependency on exports and foreign investment. Recovery was subsequently slow, hindered by political instability, corruption, and a severely impacted financial sector, which required governmental intervention, the International Monetary Fund (2023) noted.

Ukraine's economic and political landscape experienced a significant shift following the 2014 Crimea crisis and the subsequent conflict in the Donbas region (Fig. 2, Ukraine (2)). The European Union and United States imposed sanctions on Russia and its affiliates, indirectly affecting Ukraine by exacerbating the economic disruptions caused by the conflict. Russia's sanctions against Ukrainian exports, especially in the agricultural and industrial sectors, further diminished the Ukrainian economy. The conflict and sanctions precipitated a sharp decline in Ukraine's market capitalization post-2014 (Kudelia, 2020). Donbas, a critical industrial area, experienced major infrastructure damage and a drop in output, further depleting the economy. Implementing martial law in certain regions and ongoing military activities maintain a climate of uncertainty, adversely affecting market dynamics and discouraging investment due to heightened risk (Kuzio, 2020; Malyarenko & Wolff, 2018).

5.4.5. Key outcomes

Our analysis of economic sanctions applied to Russia, Iran, China, and Ukraine demonstrates the substantial impact of economic sanctions on market capitalization. The imposition of significant sanctions resulted in a sharp decline in Russia's market capitalization in 2014 and again in 2022. Conversely, Iran's market capitalization increased notably after lifting sanctions in 2015, illustrating the positive effects of removing economic restrictions. In 2016, the Chinese market experienced only a minor decline in market value, in line with the relatively light sanctions imposed. Ukraine also recorded a significant decrease in market capitalization after the initial sanctions in 2014. These findings align with the results in Tables 2 and 3, confirming that economic sanctions led to decreased capitalization levels.

Market resilience is evident in countries such as Russia and China, where market capitalization eventually recovers despite ongoing sanctions. This rebound can be attributed to companies adapting to new circumstances and implementing strategies, such as import substitution in Russia and diversification in China. These results align with our analysis in Table 5—markets are dynamic entities capable of absorbing shocks and stabilizing over time, and align with the principles of the Adaptive Market Hypothesis (Lo, 2004).

The impact of sanctions varies significantly depending on their intensity, as exemplified by the situations in Russia and China. Russia experienced profound market contractions due to intense sanctions targeting critical sectors such as finance, energy, and defense. Conversely, the sanctions placed on China were less severe, focusing on trade disputes and specific goods, resulting in only minor disruptions. This underscores how the severity of economic sanctions can influence market capitalization and concludes that utilizing a quantitative method to assess their intensity provides a more comprehensive understanding

of their effects and further supports our analysis outcomes.

5.5. Incorporating sanctions, reserves, and financial market accessibility into the capital asset pricing model (CAPM)

This study provides insights that can refine key economic models related to geopolitical risks. These insights are especially relevant for models such as the Capital Asset Pricing Model (CAPM) as they improve the Country Risk Premium (CRP) calculation. While the traditional CAPM works well for assessing general market risks, the CRP requires adjustments for country-specific risks such as economic sanctions. This is crucial in emerging markets or countries facing geopolitical challenges where these risks significantly affect systematic risk assessments. Static and oversimplified approaches limit traditional CRP calculation methods. Sovereign bond spreads fail to capture the evolving nature of geopolitical risks. Market perceptions that may diverge from economic fundamentals influence Credit Default Swap (CDS) spreads, particularly during unrest. Equity market-based methods can overestimate the CRP in volatile markets driven by short-term factors. Similarly, based on past data, historical risk-premium approaches often miss the current reality of fast-changing geopolitical situations. By integrating sanctions, reserves, and financial market accessibility into the CRP and, thereby, the CAPM, this approach offers a more accurate evaluation of country-specific risks in geopolitically sensitive environments.

In the context of international finance, particularly in emerging markets or countries facing specific risks such as sanctions, CRP is often included to account for these additional risks. The standard CAPM formula, as shown in Equation (6), is

$$E(R_i) = R_f + \beta_i \times [(E(R_m) - R_f) + CRP] \quad (6)$$

Where $E(R_i)$ is the expected return on asset i , R_f is the risk-free rate, usually the yield on government bonds, β_i is the asset's beta (its sensitivity to market movements), and $(E(R_m) - R_f)$ the market risk premium represents the extra return expected from the market over the risk-free rate.

Economic sanctions introduce an increased risk premium for the affected country, reflecting its higher uncertainty and potential financial instability. However, as markets adjust over time, the impact of sanctions weakens, which can be modeled using a time-decaying factor. This sanction effect and its time-decaying impact are incorporated, as shown in Equation (7):

$$E(R_i) = R_f + \beta_i \times [(E(R_m) - R_f) + CRP + S_0 \times e^{-\lambda t}] \quad (7)$$

Here, S_0 represents the initial impact of sanctions on the risk premium, λ is the decay rate, indicating how quickly the impact diminishes over time, and e represents time.

This study further reveals that reserves and Financial Market Access (FMA) mitigate the impact of sanctions. The reserve makeup, including foreign exchange, gold, and other financial assets, can vary. The capacity of these reserves to counteract sanctions is not absolute. Reserves in foreign jurisdictions are susceptible to freezing, which limits their effectiveness. To account for this, we introduce an accessibility factor. ϕ_j ranges from 0 (completely frozen) to 1 (fully accessible), where j indexes different types of reserves. The overall mitigation effect of the reserves, R_{total} , as shown in Equation (8), is represented by

$$R_{total} = \sum_j \alpha_j \times R_j \times \phi_j \quad (8)$$

Here, α_j is the proportion of each type of reserve relative to the total reserves, R_j is the accessibility factor, accounting for the risk of reserves being frozen.

Financial Market Accessibility (FMA), similarly scaled from 0 to 1, assesses the accessibility of a country's financial markets. A higher FMA score indicates improved market accessibility, which in turn counters

the negative impacts of sanctions more effectively.

By integrating sanctions, reserves, and the (FMA) into the calculation, the amended CAPM formula, shown in Equation (9), is presented as follows:

$$E(R_i) = R_f + \beta_i \times [(E(R_m) - R_f) + CRP + S_0 \times e^{-\lambda t} \times (1 - R_{total}) \times (1 - FMA)] \quad (9)$$

This augmented formula captures the findings of the study and proposes a dynamically refined method for evaluating country-specific risks, especially under significant geopolitical influences.

In summary, this study's findings demonstrate that economic sanctions, including trade and financial sanctions, significantly and negatively impact stock market capitalization. This study also revealed that the impact of sanctions varies depending on their intensity. Despite ongoing sanctions, market capitalization eventually recovered. Furthermore, additional sanctions have less impact—markets can adapt and stabilize over time, demonstrating their resilience and dynamic nature in response to external pressures. Factors such as national reserves and financial market accessibility can mitigate the adverse effects of sanctions. Countries with robust national reserves and accessible financial markets are better equipped to cushion economic shocks from sanctions and maintain more stable market capitalization. These findings provide valuable insights for policymakers and investors regarding how geopolitical actions affect financial markets. These findings are instrumental in refining key economic models, such as the Country Risk Model (CRM) and Capital Asset Pricing Model (CAPM), which are vital for managing geopolitical risks in international finance. By incorporating factors such as sanctions intensity and market accessibility, these models become more effective in assessing the risks associated with economic sanctions.

While this study provides valuable insights into the effects of economic sanctions, it also highlights its limitations and suggests areas for further research. The study relies on publicly available data, which may only capture part of the complexity of sanctions, particularly informal sanctions that are challenging to quantify. The potential influence of unobserved variables on the results was also noted. Future research should include more comprehensive data, such as proprietary financial information and qualitative data, to better understand the sector-specific impacts. Additionally, examining the role of digital currencies and the digital economy in offsetting the effects of sanctions, along with the distinction between the threat and actual imposition of sanctions, could provide valuable insights. Utilizing advanced econometric models to account for rapid geopolitical changes would refine the analysis and enhance our understanding of the dynamics between international sanctions and market behavior.

6. Conclusion

This study investigates the impact of economic sanctions on stock market capitalization by focusing on the influence of national reserves and financial market access. Our findings indicate that economic, trade, and financial sanctions have negative and statistically significant effects on market capitalization. Although sanctions initially lead to decreased market capitalization, this negative effect diminishes over time. Market rebounds can improve performance, demonstrate resilience, and suggest the ability to absorb shocks and adapt to new economic conditions. Furthermore, we emphasize the important role of national reserves in reducing the damaging effects of sanctions. Enhanced access to financial markets also alleviates the adverse effects of sanctions. Case studies from Russia, Iran, China, and Ukraine demonstrated these dynamics. They confirmed the findings of our data analysis, reinforced our results, and provided examples of how markets in different countries react to and overcome the challenges posed by economic sanctions. Despite sanctions in Russia and China, markets have improved, supported by import substitution and diversification. These adjustments highlight the

dynamic nature of markets, which increasingly resist the negative effects of additional sanctions over time.

These findings have important implications for academic research and policy making. Academically, this study provides contemporary evidence on the effects of sanctions, and offers a broad framework applicable to different geopolitical and economic situations. For policymakers and investors, integrating insights into models such as the Country Risk Premium (CRM) and Capital Asset Pricing Model (CAPM) can enhance strategies for mitigating the negative effects of sanctions. This improves their forecasts of geopolitical risks, bolstering decision-

making. This study contributes to our understanding of sanctions and provides a valuable reference for further research on the economic effects of international sanctions on global markets.

Declaration of competing interest

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Appendix

Table A.1

List of Countries Used in the Study

1. Argentina	23. Egypt	45. Malta	67. Slovakia
2. Australia	24. Finland	46. Mauritius	68. Slovenia
3. Austria	25. France	47. Mexico	69. South Africa
4. Bahrain	26. Germany	48. Morocco	70. South Korea
5. Bangladesh	27. Ghana	49. Namibia	71. Spain
6. Barbados	28. Greece	50. Netherlands	72. Sri Lanka
7. Belarus	29. Hong Kong	51. New Zealand	73. Sweden
8. Belgium	30. Hungary	52. Nigeria	74. Switzerland
9. Botswana	31. India	53. Norway	75. Tanzania
10. Brazil	32. Indonesia	54. Oman	76. Thailand
11. Bulgaria	33. Iran	55. Pakistan	77. Trinidad and Tobago
12. Canada	34. Ireland	56. Panama	78. Tunisia
13. Chile	35. Italy	57. Paraguay	79. Turkey
14. China	36. Ivory coast	58. Peru	80. USA
15. Colombia	37. Jamaica	59. Philippines	81. Ukraine
16. Costa Rica	38. Japan	60. Poland	82. United Arab Emirates
17. Croatia	39. Jordan	61. Portugal	83. United Kingdom
18. Cyprus	40. Kazakhstan	62. Qatar	84. Uruguay
19. Czechia	41. Kenya	63. Romania	85. Venezuela
20. Denmark	42. Kuwait	64. Russia	86. Vietnam
21. Ecuador	43. Lebanon	65. Saudi Arabia	87. Zambia
22. France	44. Luxembourg	66. Singapore	

Note: This study's initial data collection encompassed a broad dataset from 192 countries globally. This dataset underwent a filtering process whereby countries were selected based on the availability and reliability of stock market capitalization data and other related data. The final analysis includes a dataset comprising 87 countries, ensuring a diverse sample.

Table A.2

Variables' Descriptive Statistics

Variable	Obs	Mean	Std_dev	Min	Max
Economic_Sanctions	1914	0.655172	2.315024	0	27
Trade_Sanctions	1914	0.308255	1.209418	0	16
Financial_Sanctions	1914	0.346918	1.213198	0	11
market_Cap	1451	4.39468	2.35652	-3.50656	10.79032
FinDevDepth	1914	0.379701	0.296106	0.005	1
GDP	1848	9.895454	0.913216	7.222566	11.70063
Inflation_Rate	1877	5.232339	10.61737	-4.9	254.9
Unemployment	1914	7.270016	4.669466	0.1	28.77
Interest	1406	1.579473	0.947934	-4.60517	4.542443
FDI	1905	6.089979	22.9484	-117.37	449.08
Capital_Invest	1836	24.15022	6.190519	5.36	54.77
Broad_money	1558	2.335895	0.792441	-3.59407	5.390294
Population	1870	2.783053	1.656172	-1.34707	7.253017
FMA	1914	0.400962	0.27832	0.001	1
Reserves	1857	3.002615	1.824033	-2.30259	8.268743

Note: summary statistics for variables used in the study, including observations, mean, standard deviation, minimum, and maximum values.

Source: Authors' analysis using Stata 18.

Table A.3
Variance Inflation Factor for Multicollinearity Assessment

Variable	VIF	1/VIF
GDP	1.5	0.66512
Population	1.46	0.68469
Inflation_Rate	1.24	0.87035
Broad_money	1.15	0.87182
Capital Invest	1.14	0.87798
Unemployment	1.13	0.88369
FDI	1.08	0.92787
Economic_Sanctions	1.06	0.94273
Interest	1.04	0.96297
Mean VIF	1.2	

Note: This appendix presents the VIF values for the variables included in the models to assess multicollinearity. A mean VIF below 5 indicates acceptable levels of multicollinearity.

Source: Authors' analysis using Stata 18.

Table A.4
Heteroskedasticity Tests

Source	chi2	df	p
Heteroskedasticity	304.42	54	0
Skewness	40.54	9	0
Kurtosis	7.38	1	0.0066
Total	352.33	64	0

Note: This appendix presents results from the Breusch-Pagan/Cook-Weisberg and White's tests for heteroskedasticity. The Breusch-Pagan/Cook-Weisberg test shows a chi-squared value of 79.28 with a p-value of 0.0000, rejecting the null hypothesis of constant variance (homoskedasticity). White's test also indicates significant heteroskedasticity with a chi-squared value of 304.42 and a p-value of 0.0000.

Source: Authors' analysis using Stata 18.

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