Makale Türü: Araştırma Makalesi ......................................... Research Type: Research Paper

# GEOPOLITICAL RISK, FOREIGN DIRECT INVESTMENT AND EXPORT PERFORMANCE: EVIDENCE FROM THE BRICS-T COUNTRIES

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# JEOPOLİTİK RİSK, DOĞRUDAN YABANCI YATIRIM VE İHRACAT PERFORMANSI: BRICS-T ÜLKELERİNDEN KANITLAR

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## Abstract

*This study examines the effects of geopolitical risk (GPR) and foreign direct investment (FDI) on exports (EX) in BRICS-T countries (Brazil, Russia, India, China, South Africa, and Turkey) using annual data from 1990 to 2024 and employing panel econometric methods to do so. Second-generation tests, which account for cross-sectional dependence and heterogeneity, identified a long-term cointegration relationship among the variables. According to the AMG (Augmented Mean Group) estimation results, FDI positively and statistically significantly affects exports (0.227), while geopolitical risk has a negative and significant effect on exports (−0.146). At the country level, the export-boosting effect of FDI is strong in Brazil, India, China, and South Africa, while this effect is limited in Turkey and Russia. Overall, it was concluded that the sustainability of foreign trade in BRICS-T countries depends not only on economic fundamentals but also on political stability and risk management capacity. In this context, strengthening the investment environment, increasing institutional confidence, and reducing geopolitical uncertainty are crucial to sustainable export performance.*

***Keywords:*** *Exports, Foreign direct investment, Geopolitical risk, Cointegration*

***Jel Code:*** *F21, F14, C33.*

## Öz

*Bu çalışmada, BRICS-T ülkelerinde (Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye) 1990–2024 dönemine ait yıllık verilerle jeopolitik risk (GPR) ve doğrudan yabancı yatırımların (DYY) ihracat (EX) üzerindeki etkilerini panel ekonometrik yöntemlerle incelenmektedir. Yatay kesit bağımlılığı ve heterojenliği dikkate alan ikinci nesil testler, değişkenler arasında uzun dönemli bir eşbütünleşme ilişkisinin varlığını tespit etmiştir. AMG (Augmented Mean Group) tahmin sonuçlarına göre DYY, ihracatı pozitif ve istatistiksel olarak anlamlı bir şekilde etkilerken (0.227), jeopolitik riskin ihracat üzerindeki etkisi negatif ve anlamlıdır (−0.146). Ülke düzeyinde, DYY'nin ihracatı artırıcı etkisi Brezilya, Hindistan, Çin ve Güney Afrika'da güçlü olarak görülürken Türkiye ve Rusya'da ise bu etkinin sınırlı olduğu görülmüştür. Genel olarak, BRICS-T ülkelerinde dış ticaretin sürdürülebilirliği sadece ekonomik temellere değil, aynı zamanda politik istikrara ve risk yönetimi kapasitesine bağlı olduğu sonucuna ulaşılmıştır. Bu bağlamda, yatırım ortamının güçlendirilmesi, kurumsal güvenin artırılması ve jeopolitik belirsizliklerin azaltılması, sürdürülebilir bir ihracat performansı oldukça önemlidir.*

***Anahtar Kelimeler:*** *İhracat, Doğrudan yabancı yatırımlar, Jeopolitik risk, Eşbütünleşme*

***Jel Kodu:*** *F21, F14, C33.*

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# 1. INTRODUCTION

Global economic and trade relations have become more complex and significant in recent years owing to increasing financial and trade integration links. Direct foreign investment (DFI) is considered an important factor in increasing production capacity and promoting foreign trade by supporting technology transfer, especially in developing countries (Borensztein et al., 1998; Alfaro et al., 2004). However, the sustainability of foreign trade and investment is closely linked to macroeconomic indicators, global uncertainty, and geopolitical risks. Geopolitical risks generally encompass factors such as war, terrorism, regional conflicts, sanctions, and political instability, ultimately increasing trade costs and undermining investor confidence in the country (Caldara and Iacoviello, 2022).

Recent studies have shown that geopolitical risks have a significant, restrictive, and negative impact on trade. For example, Glick and Taylor (2010) found that major wars significantly reduce the volume of international trade. Similarly, Martin et al. (2008) concluded that conflicts in the regional sphere weaken foreign trade and gradually weaken economic ties between countries. Furthermore, various researchers have emphasized that terrorist attacks reduce exports by increasing the trade costs (Bandyopadhyay et al., 2018). From this perspective, geopolitical risk is considered an important factor in determining the course of countries in today's global economy and foreign trade.

BRICS-T countries (Brazil, Russia, India, China, South Africa, and Turkey) are suitable examples for examining the relationship between exports, geopolitical risk, and FDI because of their high growth potential and strategic locations. In these countries, exports, geopolitical risks, and FDI are closely intertwined. Recent developments, such as the sanctions following the Russia-Ukraine war, China's rise in global trade, India's service sector-focused opening, and Turkey's sensitivity to regional crises, demonstrate how these countries deal with capital movements and commercial risk factors (Nguyen and Do, 2021; Yagi and Managi, 2023).

This study aims to contribute new empirical insights to the literature by analyzing the impact of FDI and geopolitical risk on exports in BRICS-T countries for the period 1990-2024 using annual data, panel cointegration, and coefficient estimation methods. In doing so, it evaluates both the contribution of investments to foreign trade and the limiting effect of geopolitical risk factors, aiming to provide comprehensive insights for policymakers.

This study examines the effects of geopolitical risks (GPR) and foreign direct investment (FDI) on exports in BRICS-T countries using annual data from 1990 to 2024. Second-generation panel data methods that consider inter-country dependence and heterogeneity were used. The CIPS test was applied for stationarity, the Westerlund cointegration test for long-term relationships, and the Augmented Mean Group (AMG) method for estimating coefficients. This study distinguishes itself from similar research in the literature by covering the current period up to 2024, analyzing the BRICS-T country group together, and using methodologically advanced panel techniques. This study aims to contribute to the literature in terms of its topicality and methodology by emphasizing that the sustainability of foreign trade depends not only on economic factors but also on geopolitical stability.

This study investigates the effects of foreign direct investment (FDI) and geopolitical risk on export performance in BRICS-T countries within an integrated empirical framework. In an era of heightened geopolitical uncertainty and global economic volatility, understanding how investment flows and risk factors jointly shape export dynamics has become a critical policy concern. While the export–FDI nexus has been widely examined in the literature, relatively limited attention has been paid to the role of geopolitical risk in explaining cross-country differences in export performance.

The main hypothesis of the study is that FDI positively affects exports, whereas geopolitical risk exerts a negative impact on export performance, with these effects varying across countries

depending on their economic structures and institutional capacities. The study contributes to the literature by employing a recent and extended data set covering the period 1990–2024, applying second-generation panel econometric methods that account for cross-sectional dependence and heterogeneity, and providing country-specific evidence for the BRICS-T economies.
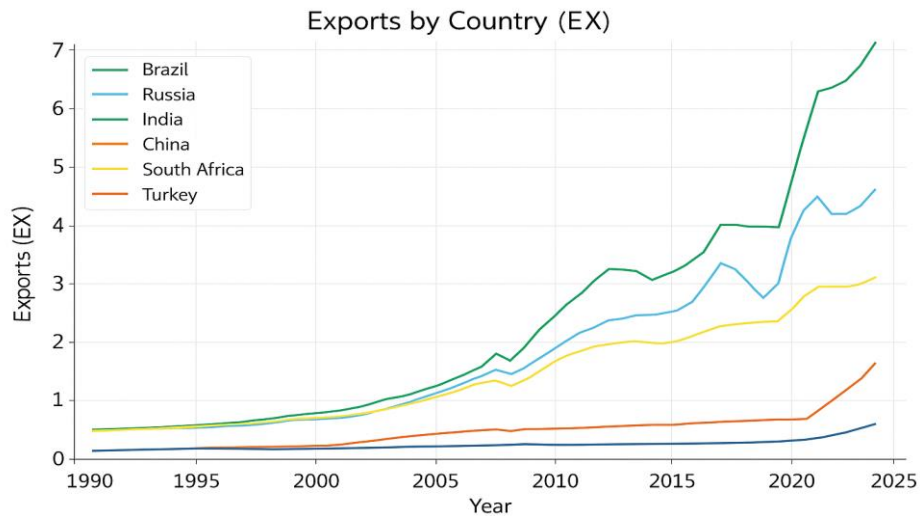
The remainder of the paper is structured as follows. Section 2 presents the economic and conjunctural background of the BRICS-T countries. Section 3 reviews the relevant literature. Section 4 describes the data and methodology. Section 5 reports and discusses the empirical findings, and the final section concludes with policy implications.

## 2. CONTEXT

The BRICS-T countries exhibit heterogeneous economic structures, growth strategies, and exposure to geopolitical and macroeconomic shocks. Brazil and South Africa are characterized by commodity-based export structures, making their foreign trade performance highly sensitive to global price fluctuations and external demand conditions. Russia's economy is largely dependent on energy exports, which increases its vulnerability to geopolitical tensions, sanctions, and energy price volatility. In contrast, China and India follow more diversified growth models. China's export-oriented industrialization strategy, integration into global value chains, and strong state-led institutional framework enable it to mitigate geopolitical risks more effectively. India's growth model, supported by service exports, digital transformation, and gradual liberalization policies, provides a relatively flexible adjustment mechanism against external shocks. Turkey represents a hybrid structure, combining manufacturing-based exports with strong regional trade linkages. However, its proximity to geopolitical hotspots, exchange rate volatility, and financial fragilities increase the sensitivity of exports and foreign capital inflows to geopolitical risk shocks. These structural and conjunctural differences play a crucial role in explaining the heterogeneous country-level coefficients obtained from the AMG estimation and highlight the importance of considering country-specific dynamics when assessing the trade–FDI–geopolitical risk nexus.

Figure 1 shows the export (EX) performance of each country by year. The export trends by country are summarized below.

**Figure 1.** Export figures for BRICS-T countries (1990-2024)



Source: Stata17 and Gauss6 (World Bank Data)

The upward trend in Brazil's exports over the years can be attributed to globalization, trade agreements, and industrialization. In particular, the outward-oriented policies and international diplomatic initiatives implemented since the 1990s have played a significant role in increasing Brazil's export capacity. Furthermore, global economic crises and increased geopolitical risks during certain periods have caused a serious decline in Brazil's exports. This demonstrates the fragility of the country's foreign trade structure in the face of global shocks and its significant vulnerability to risk factors (Pereira, 2013; Nassif and Castilho, 2020).

Russia's growth strategy, which relies heavily on energy exports, has been a decisive factor in increasing the country's foreign trade revenues. However, global financial crises, fluctuations in energy prices, and geopolitical risks have reduced Russia's export performance. Consequently, foreign trade is affected by risk factors such as global shocks and political uncertainties (Gurvich & Prilepskiy, 2015; Yagi and Managi, 2023).
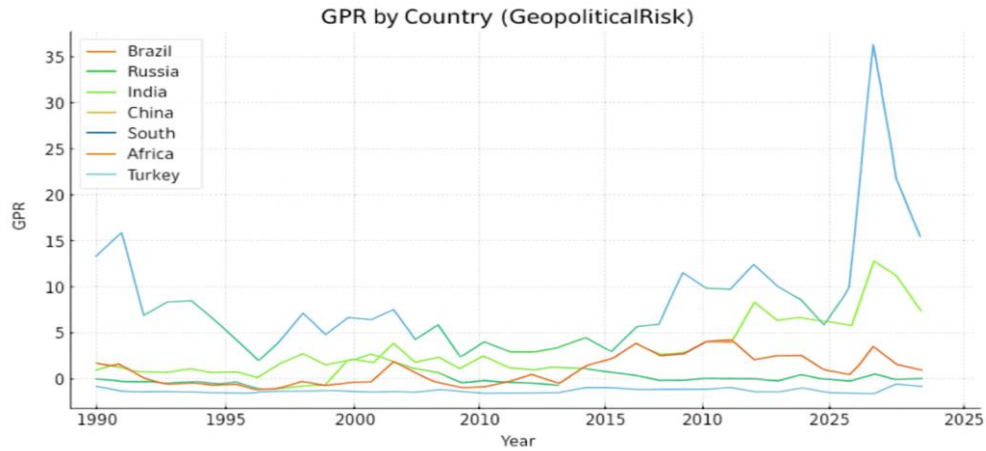
India's export volume has generally followed an upward trend for the past 30 years. The reasons for this increase include liberalization policies, regional and global trade agreements, and transformations in the industrial and service sectors. In addition, fluctuations in exports have been observed during periods of global economic stagnation, decline in global demand, and years of increased geopolitical tensions. Therefore, India's foreign trade structure is vulnerable to uncertainties and risk factors in international markets (Panagariya, 2008; Banga, 2013).

China's export performance has shown remarkable long-term growth. This rise has been supported by strategies such as the opening-up policies implemented since the 1980s, membership in the World Trade Organization (WTO), and integration into global value chains. The decline in external demand during periods of crisis, trade wars, and increased geopolitical tensions has caused slowdowns in China's exports. These developments show that the country's foreign trade is directly affected by global uncertainties and risk factors (Lardy 2019; Liu et al. 2024).

South Africa's export structure has shown significant long-term growth, particularly in mineral products and agricultural raw materials. Regional integration initiatives, free trade agreements in Africa, and the country's production capacity based on natural resources have been key determinants of this process. However, sudden fluctuations in commodity prices, global financial crises, and political instability have led to declines in trade. Consequently, South Africa's exports are highly sensitive to uncertainties in global markets and geopolitical risks (Edwards and Jenkins, 2015; Frederik, 2017).

Turkey's exports have increased over many years, with the opening-up policies after 1980, the Customs Union agreement, and the diversification of industrial production being the key determinants of this process. Global financial crises, fluctuations in exchange rates, and geopolitical tensions in the region have caused a decline in Turkey's exports. Turkey's foreign trade structure is sensitive to both regional and global uncertainties and geopolitical risks, demonstrating that these risk factors play a significant role in export performance (Akça et al., 2017; Demir and Razmi, 2020).

Figure 2 shows the geopolitical risk (GPR) trends for Brazil, Russia, India, China, South Africa, and Turkey for the period 1990–2024. These indicators are based on an index developed by Caldara and Iacoviello, 2022, which measures the frequency of words such as "war," "threat," "conflict," and "crisis." An examination of the graph reveals that significant periodic fluctuations occurred in each of the countries studied.

**Figure 2.** Geopolitical risk index of BRICS-T countries (1990-2024)



Source: Stata17 and Gauss6 (Caldar and Iacoviello)

The GPR index in Brazil occasionally shows sudden changes. These changes can generally be attributed to political uncertainty, domestic political developments, and global economic crises, particularly in Latin America. As Barros et al. (2023) point out, fluctuations caused by geopolitical risk shocks have also been seen to negatively affected the production and trade performance of the Brazilian economy.

In Russia, the GPR indicator shows greater volatility than in other countries owing to fluctuations in energy markets and tensions in foreign policy. Significant increases in the GPR index were observed, particularly after the 2014 Crimea crisis and the 2022 Ukraine War. This situation reveals that Russia's energy export-based structure is highly sensitive to geopolitical risks (Caldara and Iacoviello, 2022; Zaghdoudi, 2025).

Although the GPR risk level in India has mostly remained low, periodic increases caused by military tensions on the Pakistan border and diplomatic crises in South Asia indicate that geopolitical risks in developing Asian countries have a serious impact on financial markets and trade (Hoque and Zaidi, 2020; FTI Consulting, 2025).

In China, the GPR risk level began to increase after 2018. The reasons for the increase in geopolitical risk levels include trade wars, tensions with Taiwan, and uncertainties in foreign trade caused by the constant competition in the global technology sector. Furthermore, geopolitical risk and economic policy uncertainty have significantly impacted China's financial and monetary systems (Singh, 2020; Su et al., 2025).

Although the GPR indicator in South Africa generally remains stable compared to other countries, volatility in commodity prices, problems in energy supply, and domestic political developments cause increases during certain periods. This situation confirms the impact of geopolitical volatility on foreign trade in countries dependent on natural resources, specifically South Africa (Loewald, 2024; Gupta et al., 2019).
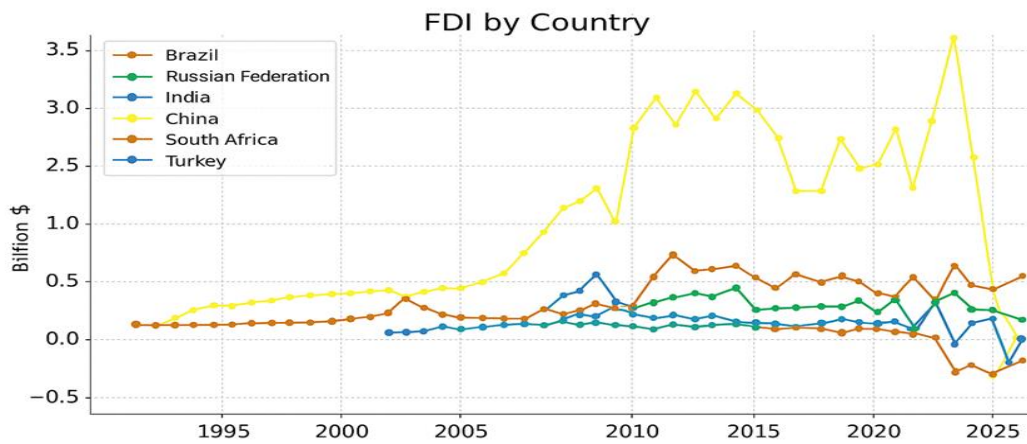
In Turkey, the GPR index began to rise significantly after 2010, and the undeniable impact of these increases on macroeconomic indicators and the significant finding of the relationship between geopolitical risk and CDS premiums have been confirmed in some studies conducted specifically on Turkey (Irmak, 2025; Ünlü, 2025; Akçayır, 2023).

In general, the findings in Figure 1 show that countries' geopolitical risks are closely linked to factors such as political developments, regional conflicts, energy dependence, and trade relations. The dynamic nature of the GPR proves that geopolitical uncertainties in the global economy and trade can have lasting effects on sustainable stability.

Foreign investment is defined as the acquisition of capital by residents of a country in foreign nations. In Turkey, Law No. 4875 on Foreign Direct Investments, which entered into force on June 17, 2003, defines foreign direct investment as capital, machinery-equipment, and reinvested earnings brought by foreign individuals or entities (Dursun, 2021:355).

The graph below shows foreign direct investment (FDI) inflows for Brazil, Russia, India, China, South Africa, and Turkey for the period 1990-2024.

**Figure 3.** FDI revenues of BRICS-T countries (1990-2024)



Source: Stata17 and Gauss6

As shown in Figure 3, China has attracted the highest amount of foreign direct investment (FDI) throughout the analysis period. The reasons for foreign capital flowing into China, especially after 2000, include low labor costs, a large domestic market, and incentive policies implemented by the Chinese government (World Bank, 2010; IMF, 2024).

Brazil has attracted high levels of foreign direct investment (FDI), particularly in the 2000s, owing to its agriculture, energy, and natural resource wealth. Brazil's large market in Latin America and its foreign trade relations are important indicators that make Brazil attractive to foreign investors. However, Brazil's economic stagnation and political uncertainties in recent years have limited FDI inflows (Casanova and Miroux, 2022; UNCTAD, 2024).

Owing to its energy-based economic and commercial structure, Russia attracted a significant amount of foreign direct investment (FDI) in the early 2000s. However, the 2008 Global Crisis and, in particular, the geopolitical tensions and economic sanctions imposed after 2014 reduced foreign investor confidence and caused significant fluctuations in FDI inflows (Gurvich and Prilepskiy, 2015; UNCTAD, 2023).

India has become an attractive investment center for foreign capital with the liberalization policies it has implemented since the 1990s. Developments in the information technology, software, and service sectors, in particular, are important factors that have enabled a steady increase in foreign direct investment (FDI) inflows into the country (Athukorala 2009; UNCTAD 2024).

China's foreign direct investment (FDI) inflows have steadily increased since the 2000s. The reasons for this include an export-oriented industrialization policy, low labor costs, a large domestic market, and strong government incentive policies. In addition, factors such as developed

infrastructure investments for foreign investors, free trade zones, a production structure open to technology transfer, and long-term growth potential have increased the country's attractiveness. Since 2000, China has been one of the countries with the highest FDI inflows not only within the BRICS-T group but also globally (UNCTAD, 2024; Casanova and Miroux, 2022).

Foreign direct investment inflows in South Africa fluctuate periodically due to commodity price fluctuations, energy supply problems, and political uncertainty. Although the country's natural resource wealth offers the potential to attract investment, the structural problems experienced by the country have limited this potential (Loewald, 2024; Gupta et al., 2019).

Turkey's foreign direct investment (FDI) inflows have increased significantly since the early 2000s. The reasons for the increase in FDI inflows include the EU negotiation process, structural reforms, and privatization. After 2010, however, geopolitical risks, financial fluctuations, and geopolitical uncertainties limited the flow of investments in Turkey. Despite these negative factors, Turkey continues to be an attractive country for foreign investors because of its strategic location and large domestic market (Alptürk et al., 2021; UNCTAD, 2024).

## 3. LITERATURE

Studies examining the impact of foreign direct investment (FDI) and geopolitical risk on foreign trade generally demonstrate that FDI tends to increase foreign trade, whereas geopolitical risks tend to reduce exports. Research conducted using different country groups, periods, and methods presents findings on the relationships between these variables. In general, FDI supports foreign trade in the long term, whereas geopolitical risks reduce the volume of foreign trade. However, the intensity of the relationship varies depending on the method, period, and country.

Sultan (2013) used the Johansen cointegration test method in his analysis of India and examined the existing relationship between FDI and exports. As a result, he found that the variables affected each other in the long term. Akadiri et al. (2019) used the Westerlund and Panel Granger tests for 25 African countries and determined the existence of a long-term cointegration relationship between FDI and foreign trade. Çelik et al. (2020) used the AMG method in their study of G8 countries and found that FDI positively affects imports and exports.

Banday et al. (2021) used the Panel ARDL method for BRICS countries and determined that FDI and foreign trade move together in the long term. Aztimur and Kaya (2022) found a positive relationship between FDI and exports in their study of Turkey using cointegration analysis. Uğur and Taş (2022) identified a long-term relationship between variables in Turkey using Johansen and Granger analysis. Uğur and Oğul (2022) confirmed a positive relationship between the variables in their study on the G-20 countries using the LM Bootstrap and AMG methods. Farid et al. (2023) used cointegration analysis in their analysis specific to Pakistan and found that FDI positively affects exports.

In their study on Turkey, they confirmed the positive effect of FDI on exports using the ARDL and Granger methods. Kumar et al. (2025) identified a positive relationship between FDI and exports for Central and Eastern European countries using Panel ARDL and panel cointegration tests. Most studies indicate that FDI supports long-term exports. Examples from India (Sultan, 2013), Turkey (Uğur & Taş, 2022; Ceyhan, 2024), and Pakistan (Farid, 2023) confirm this result, while similar findings have been obtained in Africa (Akadiri et al., 2019) and the BRICS countries (Banday et al., 2021) have similar findings. Panel data analyses (Kumar et al., 2025) support these results; however, methodological differences affect the strength of the relationship.

In studies on the relationship between geopolitical risk and exports, Wang et al. (2020) used panel regression and gravity models for China and 134 trading partners to find that a decrease in country risk increases trade volume. Atacan and Açık (2023) identified one-way causality from

geopolitical risk to trade for 15 countries using the Hatemi-J asymmetric causality test. Leitão (2023) found that geopolitical risk negatively affects exports in Portugal and 11 other countries using the panel quantile regression method. Özçelik (2023) showed that geopolitical risk shocks reduce exports in 11 developing countries using the NARDL method. Jamsheed (2024) determined that geopolitical risk negatively affects exports in 16 countries using panel regression and GMM methods. Kasal (2024) found that an increase in geopolitical risk reduces foreign trade volume in his VAR analysis of Turkey. Yilmazkuday (2024) showed that geopolitical risk reduces exports in the US using a VAR model. Deng and Jiang (2025) stated that geopolitical risk negatively affects trade using panel regression and robust analysis for 41 countries. Khalil (2025) concluded that increases in geopolitical risk reduce exports and imports using Panel ARDL, Westerlund, and Dumitrescu-Hurlin tests for 20 developing countries.

Liu et al. (2025) identified a negative relationship between geopolitical risk and exports for China and 40 other countries using panel regression and GMM methods. Yan and Piao (2025) revealed that geopolitical risk reduces trade relations in their regression analysis of 191 countries. The findings on the impact of geopolitical risk are similar across countries and periods. Examples include China (Wang et al., 2020; Liu et al., 2025), Portugal (Leitão, 2023), Turkey (Özçelik, 2023; Kasal, 2024), and the United States (Yilmazkuday, 2024). Panel data analyses also support this result (Jamsheed, 2024; Khalil, 2025; Yan and Piao, 2025) and confirm that the general trend is negative.

As can be understood from the literature review, FDI supports exports in the long term, but geopolitical risk reduces foreign trade. However, the lack of sectoral-level analyses and limited comparative tests between country groups constitute fundamental gaps in the literature. Addressing these gaps will enable the development of stronger and more inclusive policy recommendations for the future.

## 4. DATA AND METHODOLOGY

This study utilizes annual export (EX), foreign direct investment (FDI), and geopolitical risk (GPR) data for BRICS-T countries for the period 1990–2024. Export and FDI data were obtained from the World Bank WDI database, and geopolitical risk data were compiled from the GPR index developed by Caldara and Iacoviello (2022). The natural logarithms of the export and FDI variables were included in the analysis.

The Geopolitical Risk Index (GPR) data were published monthly by Caldara and Iacoviello (2022). However, because the other macroeconomic variables used in the study are annual data, the GPR series was converted to annual average values to ensure time consistency between variables in the analysis.

This conversion was performed by taking the arithmetic mean of the 12 monthly observations for every year. This process minimizes data loss and preserves the overall trend of the data series.

**Table 1.** Information about the variables

| Variable Short Name | Variable Name |
|---------------------|---------------|
| LNEX | Export Data (World Bank, WDI) |
| LNFDI | Foreign Direct Investment (World Bank Data) |
| GPR | Geopolitical Risk Index (Caldar and Iacoviello) |

The model established within the scope of this study is shown in Equation (1).

$$LNEX_{it} = \beta_0 + \beta_{i1}LNFDI_{it} + \beta_{i2}GPR_{it} + \varepsilon_{it} \qquad (1)$$

In this equation:

$LNEX_{it}$: Export revenues of country i in period t,

$LNFDI_{it}$: Direct investment expenditures,

$GPR_{it}$: Geopolitical Risk Index,

$\varepsilon_{it}$: Error term,

$\beta_0$: Constant term,

$\beta_1$, $\beta_2$: Coefficients of the independent variables in the model,

i: Country index (i = 1, 2, ..., N),

t: Time index (t = 1, 2, ..., T) are represented.

First, Pesaran's (2004) cross-sectional dependence test was used to examine cross-sectional dependence among countries, and dependence at the 1% significance level was detected between cross-sections. Subsequently, the Swamy (1970) homogeneity test was used to determine whether the coefficients were heterogeneous.

To determine the stationarity levels of the variables, the CIPS unit root test developed by Pesaran (2007), a second-generation unit root analysis that considers cross-sectional dependence, was applied, and all variables were found to be stationary at the I(1) level. This result allows us to test for the existence of a cointegration relationship between the variables in the long run. According to Westerlund 's(2007) cointegration test results, a long-term relationship was found between exports, FDI, and geopolitical risk.

The AMG estimator (Eberhardt and Bond, 2009), which considers cross-sectional dependence and heterogeneity, was used to estimate the long-term coefficients of the variables. In the AMG analysis, both the overall panel coefficient estimation and separate country-specific coefficient estimations were conducted.

The equation related to the Cross-sectional Dependency shown in Table 2 is as follows Pesaran, M. H. (2004);

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{\hat{i}=1}^{N-1} \sum_{j=i+1}^{N} \hat{P}_{ij} \qquad (2)$$

$\hat{P}_{ij}$= the simple correlation coefficient between the error terms (residuals) of units i and j,

N: number of Cross-sectional Dependency (country, sector, company, etc.),

T: indicates the number of periods.

**Table 2.** Cross-sectional Dependency Test Results

| Variables | CD Test | Probability |
|-----------|---------|-------------|
| LNEX | 21.13 | 0.000*** |
| LNFDI | 18.43 | 0.000*** |
| GPR | 7.26 | 0.000*** |

**Note:** ***, **, * indicate 1%, 5%, and 10% probability, respectively.

The CD test developed by Pesaran (2004) tests whether there are common shocks or strong dependence relationships among the countries in the panels. The findings indicate cross-sectional dependence among LNEX, LNFDI, and GPR. This result indicates that the countries in the panel are simultaneously affected by economic and risk factors. Theoretically, this implies that international capital movements, trade integration, and global risk perceptions are transmitted from one country to another through cross-country spillover. Therefore, second-generation panel methods (CIPS, Westerlund, and AMG) were preferred in the analysis to ensure methodological consistency.

Research Type: Research Paper

The Swamy (1970) test was used in this study, and the test statistic equation is expressed as follows:

$$\hat{S} = X_k^2{}_{(N-1)} = \sum_{i=1}^{N} (\hat{\beta}_i - \bar{\beta}^*)' \hat{v}_i^{-1} (\hat{\beta}_i - \bar{\beta}^*) \tag{3}$$

**Table 3.** Results of the Homogeneity Test

| Swamy | Chi-Square Test Statistic Value | Probability |
|---|---|---|
| | 631.21 | 0.000*** |

**Note:** ***, indicate 1%.

Swamy's (1970) homogeneity test attempts to determine whether the coefficients associated with units in panel data models are homogeneous. The null hypothesis (Ho) of the test indicates that the coefficients are homogeneous, implying that similar structural relationships exist across all countries. The alternative hypothesis (H1) states that the coefficients are heterogeneous, implying that there are differences between countries.

According to the findings in the table, the probability value was significant at the 1% significance level. Based on this result, Ho was rejected. In other words, the coefficients among the BRICS-T countries in the panel were not homogeneous but rather heterogeneous.

The CIPS test is calculated as the arithmetic mean of the CADF test statistic applied to each section of the panel (Tatoğlu, 2020).

$$CIPS = N^{-1} \sum_{i=1}^{N} CADF_i \tag{4}$$

According to the CIPS test results developed by Pesaran (2007), the calculated test statistic was compared with the critical values. If the calculated value is greater than the critical value in absolute terms, the Ho hypothesis is rejected, and the series are determined to be stationary. If the absolute value is less than the critical value, Ho cannot be rejected, and in this case, the series are determined to be non-stationary (Pesaran, 2007).

**Table 4.** CIPS Unit Root Analysis Results

| Variables | Level | First Difference | Decision |
|---|---|---|---|
| LNEX | -2.430 | -5.038*** | I(1) |
| LNFDI | -2.777 | -5.662*** | I(1) |
| GPR | -2.172 | -4.176*** | I(1) |
| | | **Critic Values:** %1: -3.06, %5: -2.84 | |

**Note:** ***, indicate 1%.

Pesaran's (2007) CIPS test determines the stationarity levels of variables that take cross-sectional dependence into account. The findings in Table 4 show that none of the series are stationary at the level, but they become stationary when their first differences are taken. This indicates that the series has I(1) properties. The fact that the series are I(1) allows the cointegration test to be applied under the assumption that there may be a long-term relationship between variables. Therefore, it would be appropriate to apply the Westerlund test in the next stage of the study.

As shown in Equation (5), Westerlund's (2007) cointegration test is based on the error correction model (Sain and Berber, 2024:83).

$$\Delta y_{i,t} = \hat{\delta}_i' d_t + \hat{\alpha}_i' y_{i,t-1} + \hat{\lambda}_i' x_{it-1} + \sum_{j=1}^{pi} \hat{\alpha}_{ij}' \Delta Y_{i,t-j} + \sum_{j=0}^{pi} \hat{\gamma}_{ij}' \Delta X_{i,t-j} + \hat{\varepsilon}_{it} \tag{5}$$

**Table 5.** Westerlund Cointegration Analysis

| Statistics | Value | Z-Value | Probability |
|---|---|---|---|
| Gt | -2.791 | -3.293 | 0.001*** |
| Ga | -10.696 | -2.182 | 0.015** |
| Pt | -12.297 | -7.527 | 0.000*** |
| Pa | -17.921 | -7.708 | 0.000*** |

**Note:** ***, ** indicate 1%, 5% probability, respectively.

Westerlund (2007) panel cointegration test examines whether there is a long-term relationship between the series. According to the findings in Table 5, both group and panel statistics were significant. This result indicates a long-term cointegration relationship between LNEX, LNDYY, and GPR. This implies that exports, direct investments, and geopolitical risks converge to equilibrium in the long run, even if they are exposed to geopolitical risks and shocks in the short term. In other words, the "trade–capital–risk triangle" prominent in the international economics literature is empirically confirmed for BRICS-T countries.

Equations (6) and (7) show the equations for the Augmented Mean Group (AMG) predictor (Eberhardt and Bond, 2009).

$$\delta Y_{it} = \Psi_i + \delta_i \delta X_{it} + \theta_i f_t + \sum_{t=2}^{T} \pi_i \delta D_t \qquad (6)$$

The second stage of the AMG predictor is as follows:

$$\hat{\delta}_{AMG} = N^{-1} \sum_{i=1}^{N} \hat{\delta}_i \qquad (7)$$

**Table 6.** AMG Coefficient Predictor

| LNEX | Katsayı | Probability |
|---|---|---|
| LNFDI | 0.227 | 0.000*** |
| GPR | -0.146 | 0.036** |

**Note:** ***, **, indicate 1%, 5% probability, respectively.

The AMG (Augmented Mean Group) estimator developed by Eberhardt and Bond (2009) and Eberhardt and Teal (2010) estimates long-term coefficients by taking into account heterogeneity and cross-sectional dependence across countries. According to the results, foreign direct investment (FDI) positively affects exports (EX) and is statistically significant at the 1% level in the short run. A 1% increase in FDI increases exports by approximately 0.23%. This finding supports the approach in international trade theory that "investments support foreign trade through technology transfer, increased production capacity, and export diversification." Furthermore, the geopolitical risk (GPR) coefficient is both negative and significant. A one-unit increase in the GPR variable decreases exports by approximately 0.15%. This reveals the restrictive effects of political uncertainty, security issues, and geopolitical tensions on foreign trade volume. Therefore, creating a safe environment for investors and a low-risk macroeconomic environment in the long term is crucial to improving export performance.

**Table 7.** AMG Coefficient Results by Country

| LNEX | LNFDI | GPR | Constant Coefficient |
|---|---|---|---|
| Brezilya | 1.756*** | -1.067 | -17.136* |
| Rusya | 0.289 | -0.144*** | 19.145*** |
| Hindistan | 0.223*** | -0.303 | 22.699*** |
| Çin | 0.324*** | -0.384 | 19.414*** |
| Güney Afrika | 0.054*** | -0.160* | 24.222*** |
| Türkiye | 0.203 | -0.389*** | 16.332*** |

**Note:** ***, **, * indicate 1%, 5%, and 10% probability, respectively.

Table 7 shows that the AMG coefficients for different countries yield varying results. According to the results, foreign direct investment (FDI) significantly increased exports in Brazil, India, China, and South Africa, while it was statistically insignificant in Turkey and in Russia. This shows that in countries where FDI has a significant impact, capital inflows increase production and technology capacity in export strategies. However, in Turkey and Russia, FDI does not contribute sufficiently to exports. The coefficient of the geopolitical risk (GPR) variable showed a negative effect in most countries, and this effect was found to be statistically significant, particularly for Turkey (-0.389), Russia (-0.144), and South Africa (-0.160). This situation reveals that foreign policy instability and regional tensions weaken and reduce trade relations between the two countries. In contrast, the insignificance of the GPR coefficients in India and China indicates that these countries can balance risks owing to their economic diversity and market flexibility. Overall, the impact of FDI on exports varies by country, and geopolitical risks are found to be a factor suppressing exports, particularly in economies experiencing regional tensions, such as Turkey and Russia.

## 5. EMPIRICAL RESULTS AND DISCUSSIONS

This study examines the relationships between geopolitical risk (GPR), foreign direct investment (FDI), and exports (EX) using annual data from 1990 to 2024 for BRICS-T countries through panel data cointegration and coefficient estimation analysis. The study continued with second-generation analyses that considered cross-sectional dependence and the heterogeneity of the panel data. According to the CIPS unit root test results, all variables were stationary at the I(1) level, and according to Westerlund's (2007) cointegration test, the variables moved together in the long term.

In this context, BRICS-T countries must align geopolitical risk management with their economic policy frameworks to increase their economic power. The examples of Turkey and Russia show that geopolitical risks limit trade and investment channels, whereas in countries such as China and India, strong institutional structures and market diversity balance these risks. This demonstrates that economic and political stability must be addressed together for the sustainability of foreign trade.

The findings of this study are closely related to both theoretical expectations and the existing literature. International trade and investment theories, particularly economic integration theory (Helpman and Krugman, 1985) and endogenous growth models (Romer, 1990; Grossman & Helpman, 1991), argue that FDI supports export growth. In line with this theoretical framework, FDI is expected that FDI will improve production technology, facilitate knowledge transfer, and provide easier access to foreign markets through economies of scale.

From an empirical literature perspective, the findings of this study are consistent with those identified in analyses conducted in India (Sultan, 2013), Africa (Akadiri et al., 2019), the BRICS countries (Banday et al., 2021), and Turkey (Ceyhan, 2024; Uğur and Taş, 2022). The results obtained in terms of geopolitical risk also support this general trend. Studies by Wang et al. (2020), Leitão (2023), Özçelik (2023), Khalil (2025), and Liu et al. (2025) have found that increases in geopolitical risk reduce foreign trade volume and negatively affect exports. Similarly, this study found that the GPR negatively and significantly affects exports (Caldara and Iacoviello, 2022; Su et al., 2025).

According to the findings of this study, while foreign direct investment increases exports, geopolitical risks negatively affect foreign trade performance. In this context, the following policy steps are important for sustainable exports in BRICS-T countries.

1. Strengthening the investment environment: Institutional confidence, legal predictability, and market stability should be improved.

2. Geopolitical risk management: Overreliance on specific regions for trade should be reduced, and market diversification should be ensured.

3. High value-added production: A shift towards technology-intensive sectors should be encouraged to increase the impact of FDI.

4. Financial protection mechanisms: Export insurance and risk-hedging instruments should be promoted.

5. Diplomatic stability: A peaceful foreign policy and regional cooperation should support economic resilience are required.

In conclusion, measures such as geopolitical stability, institutional strengthening, and trade diversification are fundamental to sustainable export growth in BRICS-T countries.

**Declaration of Research and Publication Ethics**

This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

**Researcher's Contribution Rate Statement**

I am a single author of this paper. My contribution is 100%.

**Declaration of Researcher's Conflict of Interest**

There is no potential conflicts of interest in this study

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