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Geopolitical Tensions and EU–Southern Mediterranean Shipping

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Executive Summary

The European Union (EU) and Southern Mediterranean (SM) countries' maritime corridors are critical hubs in global shipping, with strategic chokepoints connecting Europe and the Global South. However, rising geopolitical tensions pose significant risks to maritime connectivity within this region. While a growing body of empirical literature examines the relationship between geopolitical tensions and trade or transport networks, there is limited evidence focusing specifically on maritime connectivity between the European Union and Southern Mediterranean countries. This paper addresses this gap using a gravity model of trade. The results indicate that geopolitical tensions significantly reduce maritime connectivity in the EU–Southern Mediterranean region. Based on these findings, policies aimed at fostering geopolitical stability to safeguard the efficiency and resilience of maritime transport networks in the region are recommended.

Content

Introduction

Maritime transport remains a driving force in economic development facilitating the movement of goods and services across countries and continents. Around 80 per cent of international trade by volume and 70 per cent by value is transported by sea.[1] Central to maritime transport is maritime connectivity – the integration of ports, shipping lines, and trade routes – which ensures the efficient flow of goods and the effective functioning of global supply chains.[2] Understanding the resilience of maritime connectivity is thus critical for maintaining the efficiency of global trade and ensuring sustainable economic development.

However, maritime connectivity is increasingly vulnerable to rising geopolitical tensions.[3] Geopolitical tensions such as conflicts, territorial disputes, political instability, trade disputes, and sanctions can disrupt trade routes, hinder port operations, reroute shipping, increase costs, and reduce the efficiency of maritime connectivity networks.[4] These disruptions pose significant risks to regional and global economic integration, reducing the effectiveness of maritime transport as an engine of growth.[5]

The impact of geopolitical tensions varies by region, with major transport and trade hubs being particularly vulnerable due to their strategic location and concentration of critical infrastructure. For example, transport chokepoints such as the Strait of Hormuz and the Suez Canal collectively account for nearly USD 200 billion in annual trade at risk, and disruptions at these locations can delay over 10 per cent of global shipments during extreme events.[6] This exposure arises because disturbances in strategically important regions can affect a disproportionate share of global trade and transport flows. The European Union (EU) and Southern Mediterranean countries (SMCs) are examples of such regions. European ports, including those in the Netherlands, Germany, Belgium, Greece, and Spain, serve as major gateways connecting Europe to Asia, Africa, and the Americas.[7] Around 74 per cent of goods entering and leaving Europe are transported by sea.[8] In addition, European ports are

[1] Jan Hoffmann, Lucia Rodriguez, Bruno Salo, and Adriana Teodoro, "New Context Calls for Changing How We Measure Maritime Connectivity," *UNCTAD*, March 15, 2024; UNCTAD Transport and Trade Facilitation Newsletter, no. 101 (First Quarter 2024, March 15, 2024); United Nations Conference on Trade and Development, *Review of Maritime Transport 2024: Navigating Maritime Chokepoints* (Geneva, 2024).
[2] Jan Hoffmann, Naima Saeed, and Sigbjørn Sødal, "Liner Shipping Bilateral Connectivity and Its Impact on South Africa's Bilateral Trade Flows," *Maritime Economics & Logistics* 22, no. 3 (2020): 473–499 ; UNCTAD, Transport and Trade Facilitation Newsletter; United Nations Conference on Trade and Development, *"Review of Maritime Transport 2024"*; Wei Yim Yap, Zhenqi Xiao, Zhengyan Fan, and Hongxiang Feng, "Shipping Network Disruption, Vulnerability and Resilience amidst Geopolitical Tensions," *Maritime Business Review* (2025): 1–22.
[3] Theo Notteboom and Hercules Haralambides, "Seaports in a Tense Geopolitical Environment: Key Agents or Sitting Ducks?," *Maritime Economics & Logistics* (2025): 1–24; UNCTAD, 2024.
[4] Notteboom/ Haralambides, "Seaports in a Tense Geopolitical Environment"; Wolfgang Drobetz, Konstantinos Gavriilidis, Sofia I. Krokida, and Dimitrios Tsouknidis, "The Effects of Geopolitical Risk and Economic Policy Uncertainty on Dry Bulk Shipping Freight Rates," *Applied Economics* 53, no. 19 (2021): 2218–2229; Rui Ke, Xiaowei Wang, and Peng Peng, "Analysis of the Impact of the Russia–Ukraine Conflict on Global Liquefied Natural Gas Shipping Network," *Journal of Marine Science and Engineering* 13, no. 1 (2024): 53.
[5] Felipe Bedoya-Maya, Joren Beckers, Javier Cant, José Martínez-Moya, Ellen van Hassel, and Thierry Vanelslander, "Container Port Competitiveness amid Disruptions: Insights from the European Maritime Network during the Red Sea Crisis," *Journal of Transport Geography* 128 (2025): 104304; Lin Cong, Huan Zhang, Peng Wang, Chao Chu, and Jian Wang, "Impact of the Russia–Ukraine Conflict on Global Marine Network Based on Massive Vessel Trajectories," *Remote Sensing* 16, no. 8 (2024): 1329; Kai Liu, and Qiang Fu, "How Does Geopolitical Risk Affect International Freight?" *Journal of Air Transport Management* 118 (2024): 102614.
[6] Jasper Verschuur, Jochem Lumma, and Jim W. Hall, "Systemic Impacts of Disruptions at Maritime Chokepoints," *Nature Communications* 16, no. 1 (2025): 10421.
[7] European Commission, *The EU Blue Economy Report 2025: Port Activities (Blue Economic Sectors)* (Luxembourg: Publications Office of the European Union, 2025); GoComet, "Ports of Europe: Top 13 Biggest and Largest Hubs in 2025," 2025.
[8] European Commission, *The EU Blue Economy Report 2025: Port Activities (Blue Economic Sectors)* (Luxembourg: Publications Office of the European Union, 2025).

situated along critical maritime chokepoints, such as the North Sea, Baltic Sea, Black Sea, and Mediterranean routes, amplifying their strategic importance for global trade.[9] Similarly, Southern Mediterranean countries play a pivotal role in EU maritime connectivity by serving as transshipment hubs that link Europe with Africa and the Middle East. This region contains key maritime chokepoints, such as the Suez Canal and the Strait of Gibraltar, which facilitate the movement of goods, energy, and investment between Europe and global markets.[10] This suggests that disruptions in the Southern Mediterranean could have immediate and significant consequences for European trade, supply chains, and regional integration.[11]

Historical events further illustrate how vulnerable the maritime connectivity of EU–Southern Mediterranean countries' is to geopolitical tensions. The Arab Spring and the subsequent conflicts in Libya and Syria increased geopolitical risks in the Southern Mediterranean and Middle East. These developments disrupted maritime transport by increasing route insecurity, insurance costs, and transit times along key corridors linking Europe with the Global South and the Middle East.[12] For example, conflict-related disruptions affecting the Red Sea and Suez Canal have led to a significant drop in shipping traffic and higher transport costs for Europe–Asia trade routes.[13] Civil conflict and political instability in Libya led to port blockades and interruptions of oil exports, directly disrupting trade routes between the EU and the Southern Mediterranean. Similarly, the conflict in Syria and its regional spillovers caused sanctions, shipping rerouting, and broader regional instability that impacted maritime flows along EU–Southern Mediterranean corridors. EU-imposed sanctions on Southern neighbors, particularly after the Arab Spring, further reduced maritime trade flows, weakening connectivity. Additionally, political instability and violence in North African countries, especially Libya and Tunisia, prompted EU naval and security operations within Mediterranean trade corridors, which – while aimed at stabilising the region – also temporarily interfered with maritime connectivity. These events underscore the critical interdependence of the EU and Southern Mediterranean maritime sectors, as well as the vital importance of geopolitical stability in sustaining efficient maritime networks.[14]

Despite the clear relevance of these issues, few studies have quantitatively examined how geopolitical tensions affect maritime connectivity between the EU and SMCs. This paper addresses this gap and contributes to the literature by quantifying the impact of geopolitical tension on maritime connectivity within the framework of the gravity model of trade and by highlighting the implications for regional economic integration and global trade. The gravity model of trade posits that bilateral trade flows increase with the economic size of trading partners and decrease with trade frictions such as geographic distance, transport costs, and other barriers. Focusing on this region is particularly important because (i) the EU–SMC corridors serve as vital trade gateways connecting Europe, Africa, and Asia vital chokepoints such as the Suez Canal and the Strait of Gibraltar, (ii) a significant share of EU energy imports and manufactured products transit this region, and (iii) the region is a key hub in global shipping networks. Disruptions here can proliferate across broader maritime

[9] European Commission, *EU Blue Economy Report 2025*.
[10] Ibid.; European Economic and Social Committee, *Trade Relations between the EU and Its Southern Mediterranean Partners and Their Potential Impact on Sustainable Development* (Brussels, 2025).; International Energy Agency, *Energy Cooperation in the Mediterranean: Challenges and Opportunities* (Paris, 2025).
[11] European Commission, *The New Pact for the Mediterranean: Strengthening EU-Southern Neighbourhood Relations* (Brussels: European Commission, 2025).
[12] United Nations Economic and Social Commission for Western Asia (UN ESCWA), *Economic Impact of the Red Sea Crisis on the Arab Region*, E/ESCWA/C.5/2024/7 (Beirut: United Nations, 2024); Verschuur/ Lumma/ Hall, "Systemic Impacts of Disruptions at Maritime Chokepoints".
[13] Notteboom/ Haralambides, "Seaports in a Tense Geopolitical Environment"; Verschuur/ Lumma/ Hall, "Systemic Impacts of Disruptions at Maritime Chokepoints".
[14] Notteboom/ Haralambides, "Seaports in a Tense Geopolitical Environment".

networks, affecting trade, investment, and supply chain stability far beyond local ports. Understanding these dynamics is crucial for policymakers aiming to enhance the resilience of maritime transport networks amidst increasing geopolitical uncertainty.

The remainder of the paper is structured as follows. Section 2 reviews related literature on the effects of geopolitical tension on maritime connectivity. Section 3 details the empirical approach and data. Section 4 presents results and discussion, and Section 5 concludes by outlining policy implications.

Literature Review

An emerging strand of literature has focused on the relationship between geopolitical tensions and maritime transport systems. These studies investigate how conflicts and geopolitical risks shape shipping networks, connectivity patterns, and freight markets, with particular emphasis on conflict-affected regions or countries.

Within this line of research, several recent studies have analysed the effects of specific geopolitical conflicts on maritime transport and shipping networks. For instance, Zhu et al. (2025), Martin et al. (2025), Cong et al. (2024), Ke et al. (2024), and Zhao et al. (2023) examined the impact of the Russia–Ukraine conflict on global maritime transport networks, seaport systems, and shipping, highlighting both regional disruptions and shifts in global network connectivity. They found that the conflict negatively affected the shipping and maritime transport network within Ukraine and Russia. One significant feature of the findings of Zhu et al. (2025) and Cong et al. (2024) was that during the conflict there was a decrease in maritime activities in the Black Sea and Adriatic Sea regions; however, the global maritime network expanded due to enhanced network connectivity. These studies used the Automatic Identification System (AIS) vessel data during and after the conflict and applied the network and resilience assessment approach for their analysis.

Zhang et al. (2021) found that the rise in the Israeli-Palestinian conflict led to a significant disruption in global shipping routes. Specifically, they found that attacks on commercial shipping by Houthi forces in the Red Sea significantly disrupted global shipping routes, reducing the number of vessels passing through the corridor and highlighting how regional conflicts can affect maritime connectivity. In terms of global impact, approximately 3.1 per cent of vessels were affected, leading to an increase in global sea transportation cost. Reutschler et al. (2025) also found that the Russia–Ukraine War and US–China trade tensions reshaped maritime transport networks and led to the emergence of the Trans-Caspian corridor, allowing countries to reduce dependencies.

Other strands of the literature examined the impact of the Red Sea conflict on shipping network disruption using network-based methodology. For example, Yap et al. (2025) and Yap et al. (2024) found that the Red Sea conflict led to a significant decline in global shipping routes. Similarly, Bedoya-Maya et al. (2025) reported that the Red Sea conflict caused vessels to reroute to non-conflict countries. Especially ports in proximity to the Suez Canal saw a decline in connectivity due to network reconfigurations. Pratson et al. (2023) assessed the impact of conflict on maritime shipping and found that the closure of key maritime trade routes – including the Panama Canal, the Suez Canal, the Strait of Gibraltar, and the South China Sea – led to a supply chain delay caused by decreased shipping network connections.

Chen et al. (2025), Georgoulas et al. (2025), Chen et al. (2024), Liu and Fu (2024), and Drobetz et al. (2021) analysed the effects of geopolitical risk on freight rates and shipping networks. Using the Geopolitical Risk Index constructed by Caldara and Iacoviello (2022), which quantifies the frequency of international conflict-related news, they found that higher geopolitical risk leads to increased freight rates and reduced shipping intensity. A key contribution of these studies is that they examine the effects of geopolitical risk across all three major modes of international freight: air, sea, and road transport.

Fernandez-Villaverde et al. (2025) and Fange et al. (2018) analysed the impact of trade and financial sanctions on shipping networks and container bulk shipping using automatic integration system analysis. They found that sanctions reduced shipping activity, disrupted

network connectivity, and led to evasive practices by shipping companies and shipowners, such as rerouting, use of alternative flags, and avoidance of sanctioned ports. These findings highlight the complex ways in which sanctions can alter maritime operations beyond simple declines in shipping volumes.

From the studies reviewed above, it is evident that geopolitical tension disrupts shipping and maritime transport networks, alters shipping routes, and influences freight rates. However, none of the studies reviewed focused on geopolitical tension and maritime connectivity indicators, such as liner shipping bilateral connectivity, which is the focus of the current study. Another key difference is that previous research did not focus on the EU and Southern Mediterranean countries or use the gravity framework for their analysis. Thus, this study addresses a major research gap and contributes to the literature by examining, the impact of geopolitical tension on maritime connectivity between the EU and the Southern Mediterranean countries.

Methodology and Data

Model and Empirical Strategy

To analyse the effect of geopolitical tension on maritime connectivity between the EU and Southern Mediterranean countries, the study relied on the standard gravity model as used by Anderson and van Wincoop (2003) as the main empirical specification. The gravity model has been widely used to explain bilateral trade flows.[15] It suggests that international trade flows between two countries are determined by their economic size, often characterized by the GDPs (Gross Domestic Products) of the exporting and importing countries, and trade costs, which are proxied by the distance between them. Because maritime connectivity is likewise shaped by countries' economic size and the frictions influencing shipping links, the gravity model offers a suitable framework for analysing variations in bilateral maritime connectivity.

This framework is extended to maritime connectivity, incorporating indicators of geopolitical tensions. Traditionally, the gravity model is augmented with observable trade cost variables such as trade agreements, contiguity, and common colonial ties. Following the work of Anderson and van Wincoop (2003), a theory-consistent gravity model estimation also requires accounting for unobserved multilateral resistance terms (MRTs). The MRT suggests that bilateral trade depends not only on bilateral factors but also on each country's relative position in the global trade network. Given that MRTs are unobserved and difficult to compute, dyadic fixed effects are used control for the MRT.[16] The dyadic fixed effects control for unobserved time-invariant heterogeneity that is likely to be correlated with maritime connectivity as well as bilateral characteristics (e.g., distance, common language, and common colonial ties). In addition, year/time fixed effects are included to capture time-specific shocks or global events across all country pairs in a given year, the omission of which could otherwise bias the estimated relationship between geopolitical tension and maritime connectivity. Accordingly, the main empirical model is presented in Equation (1) as

$$MC_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnDist_{ij(t)} + \beta_4 GPT_{ijt} + \beta_5 MV_{ij(t)} + \vartheta_{ij} + \pi_t + \mu_{ijt} \quad (1)$$

where MC_{ijt} measures maritime connectivity between countries i and j at time t; Y_{it} and Y_{jt} are the Gross Domestic Product (GDP) of the exporting (i) and importing (j) countries at time t; D_{ij} is the bilateral distance; ϑ_{ij} is the dyadic country fixed effects, π_t are the time/year dummies, and μ_{ijt} is the error term. Also included in Equation (1) are the variable of interest and the gravity variables typically used in empirical gravity models to capture unobservable trade costs that may affect maritime connectivity. Specifically, GPT_{ijt} is a vector of different measures of geopolitical tension; and $MV_{ij(t)}$ is a vector of trade cost control

[15] See for instance: João Santos Silva, and Silvana Tenreyro, "The Log of Gravity," *Review of Economics and Statistics* 88, no. 4 (2006): 641–658; Yotov et al., 2016, and Baier, Scott L., Jeffrey H. Bergstrand, and Michael W. Clance, "Heterogeneous Effects of Economic Integration Agreements," *Journal of Development Economics* 135 (2018): 587–608.

[16] Feenstra, Robert C., "Gravity Equation," in *The New Palgrave Dictionary of Economics* (London: Palgrave Macmillan, 2008), 1–6; Sakyi, Daniel, and Sylvanus Kwaku Afesorgbor, "The Effects of Trade Facilitation on Trade Performance in Africa," *Journal of African Trade* 6, no. 1 (2019): 1–15.

variables, namely membership in regional trade agreements (RTAs), common colonial ties, and contiguity.

Regarding the a priori expectations, and in line with the gravity model of trade, the GDP of exporting countries is theoretically expected to have a positive impact on trade flows, since countries with larger GDP tend to export more to world markets due to their greater production capacity and export potential. Similarly, the GDP of importing countries is expected to have a positive effect on trade flows, as countries with larger GDP possess greater demand capacity and therefore import more from abroad. In theory, long distances may hinder trade flows between countries due to higher transportation costs, longer delivery times, and other related factors; hence, distance is expected to have a negative effect on trade flows. The expected effect of contiguity on trade flows is positive, since sharing a border reduces trade costs and facilitates transport. Similarly, common colonial ties are often associated with shared institutions, legal systems, languages, and established trade networks; therefore, countries with such ties are expected to trade more with each other. With respect to RTAs, the expected effect on trade flows is positive, since RTAs facilitate trade, reduce tariffs, and harmonize standards between countries.

In the context of this study, where maritime connectivity is the dependent variable, the gravity model is adapted to analyse how geopolitical tensions, the GDPs of exporting and importing countries, distance, contiguity, common colonial ties, and regional trade agreements affect maritime connectivity. Geopolitical tensions are expected to have a negative effect on maritime connectivity, since they increase uncertainty and security risks, and may result in rerouting of shipping services, all of which disrupt established maritime networks and raise trade costs. The GDPs of exporting and importing countries, longer distance, and a shared border are expected to affect maritime connectivity in the same way as trade flows. Common colonial ties are expected to have a positive or negative effect on maritime connectivity, by either facilitating shipping through established trade networks and shared institutions or reducing connectivity due to outdated trade patterns and diminished relevance. Lastly, membership in a regional trade agreement is expected to influence maritime connectivity either positively or negatively: RTAs can enhance shipping links by reducing trade barriers and harmonizing standards; however, their impact may be limited or statistically insignificant when the agreements primarily focus on non-maritime trade.

Equation (1) is estimated using the pooled ordinary least squares (OLS) and pseudo-Poisson maximum likelihood (PPML) estimators. The OLS is used as the baseline approach results, while the PPML is employed as robustness check to the baseline regression results. According to Santos Silva and Tenreyro (2006), the PPML estimator effectively handles zero flows in bilateral trade data and is robust to general forms of heteroscedasticity. Although the measure of maritime connectivity contains no zero observations – making zero flows a non-issue – the use of PPML remains appropriate for robustness checks, as it addresses potential heteroscedasticity in the data. Moreover, PPML has become a standard approach in gravity model estimation due to its consistency and robustness.[17] Given these advantages, the PPML estimator provides reliable and efficient estimates for the gravity-based analysis of geopolitical tension and maritime connectivity.

[17] Silva/Tenreyro, "The Log of Gravity"; Inmaculada Martínez-Zarzoso, "The Log of Gravity Revisited," Applied Economics 45, no. 3 (2013): 311–327; Anderson, James E., Mario Larch, and Yoto V. Yotov, "GEPPML: General Equilibrium Analysis with PPML," The World Economy 41, no. 10 (2018): 2750–2782; Ignacio Del Rosal, "Maritime Connectivity and Agricultural Trade," Journal of Agricultural Economics 75, no. 1 (2024): 153–168.

Data

The sample used in the ensuing empirical analysis consists of 31 countries, of which 22 are European Union (EU) members and 9 are Southern Mediterranean countries.[18] These 31 countries were selected because they are central to maritime trade routes connecting Europe and the Southern Mediterranean, and because consistent and reliable data on shipping and trade were available for the EU–SM maritime corridor. The period under consideration is 2006 to 2021. The analysis is limited to the period 2006 to 2021 due to the availability of data on the variables of interest. Data on maritime connectivity proxied by the Liner Shipping Bilateral Connectivity Index (LSBCI) is from the United Nations Conference on Trade and Development (UNCTAD) database. The LSBCI measure provides comprehensive information about: (1) the number of transshipments required to get from country A to country B, (2) the number of direct connections common to both country A and B, (3) the number of common connections by country pair with one transshipment, (4) the level of competition on services that connect country A to country B, and (5) the size of the largest ship on the weakest route connecting country A to country B. Based on these five indicators, the LSBCI is computed by taking the simple average of the five normalized components. It ranges between 0 (minimum) and 1 (maximum). The use of LSBCI as a proxy for maritime connectivity offers bilateral-level insight into maritime connectivity between countries. Considering that the maritime connectivity variable used is an index and does not contain zeros, a logarithmic transformation is not applied. Three indicators are used to measure the main explanatory variable, geopolitical tension.

First, the number of political violence events by country is taken from the Armed Conflict Location and Event Data (ACLED) (2025). This dataset records all battles, explosions or remote violence and violence against civilians. Second, the Geopolitical Risk Index (GPRI) constructed by Caldara and Iacoviello (2022) is used to measure geopolitical tension. The GPRI incorporates geopolitical events with global repercussions, capturing threats related to military conflict, war, nuclear threats, terrorism, and overall geopolitical uncertainty. The third measure of geopolitical tension is sanctions, sourced from the Global Sanctions Database (GSDB), compiled by Felbermayr, Kirilakha, Syropoulos, Yotov, and Yalcin (2020). The GSDB provides bilateral data on trade sanctions, financial sanctions, arms sanctions, and military sanctions. This study focuses on trade and financial sanctions and construct a binary variable, sanction, which takes the value of 1 if either trade sanctions or financial sanctions are present and 0 otherwise. The justification for focusing on trade and financial sanctions is because they can have a direct impact on shipping connectivity. The imposition of trade sanctions – such as requiring exporter or importer compliance, limiting participation in sanction regimes, restricting ship entry for exporters or importers, and banning the shipment of major products from the exporter or importer country – can directly affect shipping connectivity and maritime trade. Similarly, financial sanctions, such as the exclusion of exporter or importer country banks from the SWIFT payment system, also have a direct impact, whereas the effect of arms and military sanctions tends to be more limited.

To provide additional clarity on the types of tensions captured by these measures, it is useful to highlight several key events reflected in the data. The ACLED-based indicator includes major episodes of political violence such as armed clashes, cross-border skirmishes, large-scale demonstrations, and attacks against civilians that occurred in countries across the Southern Mediterranean and European countries during the sample period. The

[18] The countries analysed are: Algeria, Belgium, Bulgaria, Croatia, Denmark, Egypt, Estonia, Finland, France, Germany, Gibraltar, Greece, Ireland, Israel, Italy, Latvia, Lebanon, Libya, Lithuania, Malta, Morocco, Netherlands, Palestine, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Syria, and Tunisia.

GPRI captures geopolitical shocks with broader international repercussions, including events related to regional conflicts, terrorism incidents, and escalatory military posturing involving both EU and Southern Mediterranean neighbouring states. Finally, the sanctions data include notable episodes of trade and financial restrictions imposed in response to political instability, conflict involvement, or human-rights violations, which are particularly relevant given their potential to disrupt shipping flows. These examples illustrate the range of geopolitical tensions that underpin the empirical analysis.

The remaining control variables are specified and defined along conventional lines and sourced from Centre d'Études Prospectives et d'Informations Internationales (CEPII) database. Table 1 provides brief descriptions and sources of all variables. Summary statistics of the variables are presented in Table 2.

Table 1. Brief Definition and Source of Variables Used in the Empirical Analysis

Variables	*Description*	*Notation*	*Source*
Dependent variable			
Maritime connectivity	Liner shipping bilateral connectivity index between exporting and importing country at time t	MC_{ijt}	UNCTAD
Geopolitical tension measures			
Violence	Number of political violence events by country measured at time t	$VLCE_{ijt}$	ACLED (2025)
Geopolitical risk	Geopolitical risk index of exporting/importing country measured at time t	$GPRI_{ijt}$	Caldara and Iacoviello (2022)
Sanction	Dummy=1 if either trade sanctions or financial sanctions are present between the pair of countries at time t; 0 otherwise	$SANCT_{ijt}$	GSDB
Gravity variables			
Gross domestic product	Exporting/importing countries GDP per capita expressed in current thousands of US$ at time t	Y_{ijt}	CEPII
Distance	Geographical distance between exporting and importing countries capital in km	$Dist_{ij}$	CEPII
Common colony	Dummy=1 if exporting and importing countries have the same colonial ties; 0 otherwise	$CCOL_{ij}$	CEPII
Regional trade agreement	Dummy variable= 1 if exporting and importing countries belong to the same RTAG at time t; 0 otherwise	$RTAG_{ijt}$	CEPII
Contiguity	Dummy=1 if exporting and importing countries share the same land border; 0 otherwise	CTG_{ij}	CEPII

Source: Authors' composition.

Table 2: Summary statistics of variables used in the empirical analysis

Variables	*Observation*	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
MC_{ijt}	15,856	0.242	0.0765	0.075	0.525
$VLCE_{it}$	5,198	473.7423	3027.101	0	30734
$VLCE_{jt}$	5,198	574.8423	3087.503	0	30734
$GPRI_{it}$	15,824	1.421	1.198	0.004	3.355
$GPRI_{jt}$	15,824	1.452	1.178	0.004	3.355
$SANCT_{ijt}$	1,962	0.932	0.251	0	1
Y_{it}	14,322	24.902	19.055	0.834	99.152
Y_{jt}	14,322	25.487	18.772	0.834	99.152
$Dist_{ij}$	14,896	2151.774	1151.579	72	5692
$CCOL_{ij}$	14,896	0 .041	0.198	0	1
CTG_{ij}	14,896	0.0580	0.233	0	1
$RTAG_{ijt}$	15,856	0.647	0.478	0	1

Source: Authors' calculation.

Regression Results and Discussion

Baseline Regressions

In this subsection, the baseline regression results using the pooled OLS technique are presented. Tables 3-5 summarize the results for each measure of geopolitical tension (conflicts in Table 3, geopolitical risk in Table 4, and sanctions in Table 5). In all the results tables, Column 1 shows results based only on the direct impact of geopolitical tension on maritime connectivity; Column 2 reports results for geopolitical tension and control variables without including time and dyadic fixed effects; Column 3 presents results for geopolitical tension and control variables while controlling for time fixed effects, and no dyadic fixed effects; and Column 4 shows results when dyadic fixed effects is accounted for by including time fixed effects. Including dyadic fixed effects and time fixed effects accounts for multilateral resistance and unobserved heterogeneity that could bias the estimates, thereby enhancing the accuracy of the results.

Table 3: Pooled OLS Estimates of Geopolitical Tension (Political Violence) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$VLCE_{it}$	-0.00227***	-0.00105***	-0.00133***	-0.00145***
	(0.000154)	(0.000190)	(0.000220)	(0.000193)
$VLCE_{jt}$	-0.00229***	-0.00111***	-0.00139***	-0.00152***
	(0.000155)	(0.000192)	(0.000222)	(0.000195)
Y_{it}		0.0123***	0.00885***	0.00190
		(0.00119)	(0.00127)	(0.00120)
Y_{jt}		0.0119***	0.00845***	0.00154
		(0.00118)	(0.00126)	(0.00119)
$Dist_{ij}$		-0.0139***	-0.0122***	
		(0.00205)	(0.00205)	
$CCOL_{ij}$		-0.0214***	-0.0237***	
		(0.00469)	(0.00507)	
CTG_{ij}		0.0721***	0.0726***	
		(0.00787)	(0.00776)	
$RTAG_{ijt}$		-0.0361***	-0.0365***	
		(0.00253)	(0.00257)	
Constant	0.248***	0.301***	0.307***	0.240***
	(0.00110)	(0.0163)	(0.0162)	(0.00498)
Observation	5198	4314	4314	4314
R-Squared	0.334	0.103	0.121	0.357
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

In Table 3, Columns 1–4, political violence is found to have a negative and statistically significant effect on maritime connectivity at the 1 per cent level. The estimated coefficients show that one additional political violence event in the exporting (importing) country reduces maritime connectivity by 0.105 per cent–0.227 per cent (0.111%–0.229%). Given that the average bilateral maritime connectivity in the sample is 0.242, this corresponds to a reduction of approximately 0.43 per cent–0.94 per cent for the exporting country and 0.46 per cent–0.95 per cent for the importing country. If multiple political violence events occur, the cumulative impact can become more substantial, potentially reducing connectivity by 4–9 per cent, indicating a moderate but economically non-negligible meaningful effect. These results suggest that heightened political violence in EU and Southern Mediterranean countries can disrupt maritime routes and decrease shipping links.

Table 4. Pooled OLS Estimates of Geopolitical Tension (Geopolitical Risk Index) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$GPRI_{it}$	-0.0198***	-0.0131***	-0.0133***	-0.0164***
	(0.000527)	(0.000570)	(0.000567)	(0.000564)
$GPRI_{jt}$	-0.0188***	-0.0129***	-0.0130***	-0.0156***
	(0.000526)	(0.000555)	(0.000551)	(0.000556)
Y_{it}		0.0106***	0.00974***	0.00539***
		(0.000806)	(0.000806)	(0.000775)
Y_{jt}		0.00969***	0.00886***	0.00459***
		(0.000821)	(0.000820)	(0.000779)
$Dist_{ij}$		-0.00848***	-0.00867***	
		(0.00121)	(0.00120)	
$CCOL_{ij}$		-0.0257***	-0.0263***	
		(0.00364)	(0.00365)	
CTG_{ij}		0.0889***	0.0887***	
		(0.00425)	(0.00419)	
$RTAG_{ijt}$		-0.0216***	-0.0212***	
		(0.00164)	(0.00161)	
Constant	0.303***	0.293***	0.286***	0.246***
	(0.00158)	(0.00993)	(0.00992)	(0.00369)
Observation	12960	11142	11142	11142
R-Squared	0.163	0.236	0.255	0.164
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

Turning to Table 4, the results indicate that a one-point increase in geopolitical risk in the exporting and importing countries has a significant negative relationship with maritime connectivity, as evident in Columns 1–4, at the 1 per cent significance level. The magnitude of the coefficients shows that a one-point increase in the exporting (importing) country's geopolitical risk reduces maritime connectivity by 1.31 per cent–1.98 per cent (1.29%–1.88%), corresponding to a reduction of approximately 5.4 per cent–8.2 per cent for the exporting country and 5.3 per cent–7.8 per cent for the importing country relative to the

average connectivity of 0.242. These results indicate that geopolitical risk in the exporting country has a slightly larger impact on maritime connectivity than in the importing country and that heightened geopolitical risk can substantially disrupt shipping links.

Table 5. Pooled OLS Estimates of Geopolitical Tension (Sanction) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$SANCT_{ijt}$	-0.0203***	-0.00756*	-0.00873*	-0.0145**
	(0.00620)	(0.00722)	(0.00717)	(0.00700)
Y_{it}		0.00682***	0.00721***	0.00322*
		(0.00176)	(0.00175)	(0.00171)
Y_{jt}		0.0157***	0.0174***	0.00457**
		(0.00224)	(0.00238)	(0.00214)
$Dist_{ij}$		-0.00517*	-0.00535**	
		(0.00273)	(0.00273)	
$CCOL_{ij}$		-0.00740	-0.00751	
		(0.00538)	(0.00544)	
CTG_{ij}		0.0250***	0.0235**	
		(0.00935)	(0.00915)	
$RTAG_{ijt}$		-0.0421***	-0.0426***	
		(0.00334)	(0.00345)	
Constant	0.254***	0.243***	0.245***	0.231***
	(0.00611)	(0.0228)	(0.0228)	(0.00873)
Observation	1690	1276	1276	1276
R-Squared	0.123	0.630	0.701	0.163
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

Regarding the effects of sanctions on maritime connectivity (Table 5), the results in Columns 1–4 show that the presence of trade and financial sanctions has a negative significant effect on maritime connectivity. The coefficient estimates indicate that the presence of trade and financial sanctions reduces maritime connectivity by 0.756 per cent–2.03 per cent, corresponding to a reduction of approximately 3–8 per cent relative to the average connectivity of 0.242. These results indicate that increased sanctions tend to substantially decrease maritime connectivity between the EU and Southern Mediterranean countries, highlighting their economic significance in disrupting shipping links.

With respect to the control variables in the gravity model (Columns 2–3), the results reported in Tables 3–5 show that the coefficient estimates for the gravity variables are generally consistent with theory. Maritime connectivity is inversely related to distance and positively related to Gross Domestic Product (GDP). The coefficient for colonial ties is negative and statistically significant, while contiguity has a positive and statistically significant effect on maritime connectivity. Additionally, membership in a regional trade agreement has a negative and statistically significant impact on maritime connectivity, suggesting that trade agreements may not always facilitate maritime activities and could, in some cases, create barriers within the regions concerned.

Robustness checks with PPML

As indicated earlier, the PPML is used as a robustness check to replicate the analysis, addressing the issue of heteroscedasticity and acknowledging that estimates from gravity models using PPML have been shown in the literature to produce consistent and robust coefficient estimates. The results are presented in Tables 6-8.

Table 6. PPML Estimates of Geopolitical Tension (Political Violence) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$VLCE_{it}$	-0.00874***	-0.00484***	-0.00462***	-0.00591***
	(0.00111)	(0.00164)	(0.00164)	(0.00164)
$VLCE_{jt}$	-0.00883***	-0.00512***	-0.00489***	-0.00618***
	(0.00111)	(0.00165)	(0.00165)	(0.00166)
Y_{it}		0.0491***	0.0495***	0.0173
		(0.0134)	(0.0134)	(0.0132)
Y_{jt}		0.0475***	0.0479***	0.0158
		(0.0134)	(0.0134)	(0.0131)
$Dist_{ij}$		-0.0567**	-0.0566**	
		(0.0230)	(0.0229)	
$CCOL_{ij}$		-0.104***	-0.103***	
		(0.0357)	(0.0358)	
CTG_{ij}		0.250***	0.252***	
		(0.0641)	(0.0637)	
$RTAG_{ijt}$		-0.146***	-0.143***	
		(0.0283)	(0.0283)	
Constant	-1.405***	-1.172***	-1.177***	-1.466***
	(0.0151)	(0.184)	(0.184)	(0.0497)
Observation	5198	4314	4314	4314
R-Squared	0.163	0.105	0.106	0.230
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

Table 7. PPML Estimates of Geopolitical Tension (Geopolitical Risk Index) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$GPRI_{it}$	-0.0799***	-0.0535***	-0.0533***	-0.0667***
	(0.00820)	(0.00815)	(0.00814)	(0.00812)
$GPRI_{jt}$	-0.0758***	-0.0526***	-0.0523***	-0.0639***
	(0.00820)	(0.00790)	(0.00789)	(0.00799)
Y_{it}		0.0418***	0.0420***	0.0232**
		(0.0111)	(0.0112)	(0.0113)
Y_{jt}		0.0380***	0.0382***	0.0198*
		(0.0113)	(0.0113)	(0.0113)
$Dist_{ij}$		-0.0357**	-0.0358**	
		(0.0171)	(0.0171)	
$CCOL_{ij}$		-0.0946**	-0.0961**	
		(0.0482)	(0.0482)	
CTG_{ij}		0.289***	0.259***	
		(0.0461)	(0.0460)	
$RTAG_{ijt}$		-0.0870***	-0.0876***	
		(0.0222)	(0.0221)	
Constant	-1.184***	-1.202***	-1.214***	-1.389***
	(0.0236)	(0.142)	(0.142)	(0.0533)
Observation	12960	11142	11142	11142
R-Squared	0.165	0.247	0.253	0.163
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

Reassuringly, the results essentially confirm the findings of the pooled OLS estimates, with no changes in the sign or statistical significance of the coefficients for the effects of geopolitical tension measures (political violence, geopolitical risk, and sanctions). More importantly, the PPML estimates show larger coefficients for these measures than the pooled OLS estimates, indicating that PPML suggests a stronger impact of geopolitical tension on maritime connectivity. The consistency of sign and significance across all columns (Tables 6–8) reinforces the robustness of these findings.

The estimated effects of geopolitical tension on maritime connectivity demonstrate varying magnitudes of impact. Specifically, an additional violent event in the exporting (importing) country reduces maritime connectivity by approximately 0.46 per cent–0.87 per cent (0.49%–0.88%), corresponding to a 1.9 per cent–3.7 per cent (2.0%–3.7%) reduction relative to the average connectivity of 0.242, indicating a modest but noticeable effect. A one-point increase in the geopolitical risk index reduces connectivity by 5.33 per cent–7.99 per cent (5.23%–7.58%), corresponding to roughly a 22 per cent–33 per cent (22%–31%) reduction relative to the average, reflecting a substantial and economically important impact. Finally, the presence of trade and financial sanctions decreases maritime connectivity by 3.23 per cent–8.35 per cent, equivalent to a 13 per cent–35 per cent reduction relative to the average, highlighting their strong disruptive effect on shipping links between the EU and Southern Mediterranean countries. These effects are statistically significant at the 1 per cent, 5

per cent, and 10 per cent levels. The effect sizes show that political violence has small per-incident effects, whereas geopolitical risk and sanctions cause larger, economically meaningful reductions in maritime connectivity.

Gross domestic product, distance, colonial ties, contiguity, and regional trade agreements also maintain their expected signs and remain significant, consistent with the pooled OLS estimates.

Table 8. PPML Estimates of Geopolitical Tension (Sanction) Effects on Maritime Connectivity

Variables	*1*	*2*	*3*	*4*
$SANCT_{ijt}$	-0.0835***	-0.0323*	-0.0468**	-0.0770***
	(0.0246)	(0.0292)	(0.0286)	(0.0257)
Y_{it}		0.0290***	0.0317***	0.00490
		(0.00742)	(0.00733)	(0.00717)
Y_{jt}		0.0660***	0.0796***	0.0246***
		(0.00941)	(0.0101)	(0.00891)
$Dist_{ij}$		-0.0219**	-0.0228**	
		(0.0111)	(0.0112)	
$CCOL_{ij}$		-0.0435*	-0.0403*	
		(0.0229)	(0.0232)	
CTG_{ij}		0.105***	0.0980***	
		(0.0372)	(0.0362)	
$RTAG_{ijt}$		-0.181***	-0.190***	
		(0.0141)	(0.0147)	
Constant	-1.369***	-1.415***	-1.406***	-1.330***
	(0.0241)	(0.0928)	(0.0924)	(0.0383)
Observation	1690	1276	1276	1276
R-Squared	0.123	0.621	0.740	0.485
Time fixed effects	Yes	No	Yes	Yes
Dyadic fixed effects	No	No	No	Yes

Robust Standard errors in parentheses

$^{+}$ $p < 0.10$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation.

Discussion

The results indicate that increased political violence, geopolitical risks, and sanctions are associated with reductions in maritime connectivity as measured by liner shipping bilateral connectivity. This outcome is not surprising and can be attributed to several pathways. Political violence in the form of battles, explosions or remote violence, and violence against civilians in the exporting or importing country can disrupt shipping routes, port operations, and infrastructure, making key maritime corridors unsafe for navigation. As a result, shipping companies may reroute vessels, increasing voyage times and operational costs, which ultimately reduces the frequency of maritime connections between trading countries. Also, heightened geopolitical risk such as military conflict, war, nuclear threats, terrorism, and overall geopolitical uncertainty in coastal countries can increase uncertainty for shipping companies, shipowners, and investors. This uncertainty may lead to a significant decrease

in maritime connectivity between pairs of trading countries because shipping companies, shipowners, and logistics providers may reduce their exposure by limiting or withdrawing calls to high-risk ports. Though the studies by Drobetz et al. (2021), Monge et al. (2025), and Liu and Fu (2024) investigate the effects of geopolitical risk on shipping freight rates and network disruption, their findings indirectly corroborate the negative impact of geopolitical risk revealed in this study.

Sanctions, specifically unilateral or multilateral trade and financial sanctions, usually restrict trade flows by limiting the number of goods, services and financial transactions permitted with targeted countries. These prohibitions can restrain shipping lines for keeping regular services to sanctioned states, ultimately decreasing maritime connectivity. Moreover, foreign shipping lines can exclude affected countries from vital regional and global shipping networks, thereby reducing their demand for ports services, further lowering maritime connectivity. This finding is in tandem with Singh (2023), Law (2023), Zhang et al. (2025), and Zhu et al. (2025) who show that sanction leads to a decline in maritime connectivity due to increased costs and inefficiencies in global shipping networks.

The gross domestic product (GDP) of exporting and importing countries is found to have a positive impact on maritime connectivity. This finding is not surprising, as higher GDP stimulates maritime connectivity by increasing trade volumes and the demand for efficient shipping services between countries, which is consistent with the studies by Bouazza et al. (2023) and Jouili (2019). As expected, the negative effect of distance on maritime connectivity means that economies farther apart tend to have weaker maritime connections due to increased transportation costs, longer transit times, and greater risks and logistical complexities. While there are no studies directly examining distance effects on maritime connectivity, the findings of Fugazza and Hoffmann (2017), Bouazza et al. (2023), Del Rosal and Moura (2022), Ayesu et al. (2024), and Del Rosal (2024) indirectly support this relationship by reporting a negative impact of distance on trade performance. The negative relationship between regional trade agreements (RTAs) and maritime connectivity, although unexpected, could be explained by trade diversion, where member countries prioritize intra-regional trade at the expense of external trade routes that heavily rely on maritime transport, thereby reducing overall connectivity.

The negative effect of sharing colonial ties on maritime connectivity is plausible, particularly for countries whose trade remains highly concentrated among former colonial partners. In such cases, historical affinities may limit the diversification of maritime routes, as shipping networks prioritize established bilateral flows rather than expanding to new markets. This effect is especially noticeable for countries in the sample that maintain strong trade links with former colonial powers but have relatively limited connections elsewhere.

In contrast, the positive impact of contiguity on maritime connectivity tends to apply to neighbouring countries, which benefit from shorter shipping distances, faster transit times, and lower transportation costs. In the sample used for the analysis, these advantages are evident among geographically adjacent pairs, where proximity facilitates more frequent and efficient maritime connections. Overall, the findings on colonial ties and contiguity indirectly confirm those of Fugazza and Hoffmann (2017), Del Rosal and Moura (2022), and Del Rosal (2024), who investigated the determinants of trade performance.

Concluding Remarks

Maritime connectivity is of increasing importance in the global economy; however, recent geopolitical tensions have emerged as a significant risk to maritime connectivity within the EU–Southern Mediterranean trade corridors. While previous research has explored geopolitical tensions and trade more broadly, there has been little empirical analysis specifically targeting maritime connectivity between the EU and Southern Mediterranean countries. This paper addresses this gap by analysing the relationship within the framework of the gravity model of trade.

The empirical results indicate that geopolitical tensions, as measured in this study, reduce maritime connectivity in the EU–Southern Mediterranean trade corridor. Among the different measures of geopolitical tension, political violence has a relatively small per-incident effect, whereas geopolitical risk and trade/financial sanctions have substantially larger impacts, reflecting economically meaningful disruptions. These findings suggest that, while all measures negatively affect maritime connectivity, geopolitical risk and sanctions are the most influential drivers of reductions in shipping links. Other drivers, such as GDP and distance, appear to be the most influential factors, consistent with the gravity model framework. Contiguity, regional trade agreements, and shared colonial ties have smaller, yet still statistically significant, effects.

Based on these findings, policymakers should pursue initiatives that foster geopolitical stability within the EU–Southern Mediterranean corridor to safeguard maritime connectivity. Specifically, policymakers and development partners in these regions should prioritise the prevention of political violence, peacebuilding, and institutional strengthening as integral components of strategies aimed at ensuring seamless maritime trade and connectivity. In addition, efforts should be made to streamline trade rules and enhance coordination between EU and Southern Mediterranean member countries to ensure that regional trade agreements facilitate rather than hinder maritime connectivity.

Despite its contributions, this study is not without limitations. In particular, the measure of geopolitical tension employed is broad and not directly linked to specific geopolitical events within the EU–Southern Mediterranean maritime trade corridors. Moreover, due to data constraints, not all countries in the region could be included in the analysis. Nevertheless, the study provides an important first empirical assessment of how geopolitical tensions influence maritime connectivity between the EU and Southern Mediterranean countries. Future research can build on this work by incorporating more granular, event-based measures of geopolitical tension and extending coverage as more comprehensive data become available.

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