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Friendship is as Important as Neighborhood: The impact of Geopolitical Distance on Bilateral Trade.

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Abstract: Newton's Law of gravitation, when applied to international trade, implies that just as particles attract each other in proportion to their size and mutual distance, trade flow between two bilateral pairs is proportional to their respective economic size and bilateral distance. The introduction of gravity models in economics has revealed the impact of physical distance on bilateral trade. However, distance might not be only physical. Considering the significant geopolitical changes affecting the world, this article examines whether geopolitical distance has an impact on bilateral trade. Using bilateral trade data for 141 countries between 1980 and 2021, the current study used a Pseudo-Poisson Maximum Likelihood and an Instrumental Variable approach to assess the impact of geopolitical distance between bilateral pairs on their bilateral trade flows. It provides evidence of the negative impact of geopolitical distance on bilateral trade. The study shows that in international relations, friendship between countries is as important as neighborhood. Furthermore, the results demonstrate that geopolitical distance exacerbates the negative impact of physical distance on bilateral trade. The results also show that the negative impact of geopolitical distance on bilateral trade is valid for trading partners from different income groups.

Keywords: Trade, geopolitics, distance, gravity

JEL code: F11; F13; F53

1. Introduction

Despite the decrease in transportation and transaction costs, distance remains a key determinant of international trade relations. Traditional gravity models, widely used to study bilateral trade, have shed light on the influence of physical distance and cultural ties on trade flows (Baltagi et al., 2003; Egger, 2000; Silva and Tenreyro, 2006; Zhou, 2011). However, since the 90s there has been a widespread perception that globalization waves have suppressed the negative impact of “distance” on bilateral trade. The decline in transaction costs, especially transportation costs led to a dispersion of economic activities around the world, favoring the phenomenon of global value chains and globalization and leading to the so-called death of distance (Cairncross, 1997). However, studies based on the traditional gravity model of international trade confirm that the negative association between distance and bilateral trade flows remains effective (Brun et al., 2005). More recently, (Antràs and De Gortari, 2020) through their theoretical approach showed that the optimal location of production at a given stage in a global value chain is shaped by the proximity of that location to the precedent and the subsequent desired locations of production. Thus, physical distance remains important even in a world characterized by fragmented production stages.

However, physical proximity does not always guarantee economic proximity and friendly relationships. Practical cases have shown that physical proximity is not always a determinant of economic proximity. Despite their proximity (or contiguity), countries can remain separated by ideological and geopolitical distances, historical conflicts, and cultural differences. For instance, countries such as South Korea and North Korea have limited economic interactions despite their physical proximity. However, South Korea is economically tied to the United States of America (USA) compared to North Korea. Similarly, despite geographical proximity and cultural similarities with China, South Korea, and Japan seem to be economically and geopolitically close to the USA compared to China (Ellen Kim and Victor Cha; Ho, 2018). Historical evidence which dates back from the Cold War also suggest that within Germany, West and East Germany's economic relationships were reduced despite their contiguity (American Embassy 1965; Ahlfeldt et al., 2015). All these cases suggest that distance can also be ideological/geopolitical, and this aspect of distance can also constrain international trade.

In an ever-changing and interlinked world marked by growing geopolitical tensions, the integration of geopolitics into economics is becoming essential. The world is currently facing a geopolitical fragmentation worsened and revealed by the invasion of Ukraine by Russia. In the face of dynamic global challenges, traditional factors of international trade, such as physical distance and cultural ties, seem insufficient to explain current trade relations. For instance, Janet Yellen¹ stresses the need for the USA to encourage "friend-shoring" of supply chains to ensure secure access to markets and reduce

¹ U.S. Treasury Secretary since January 25, 2021

economic risks (dmalloy, 2022)². This trend towards trade based on geopolitical proximity is strengthening, making it necessary to rethink the concept of distance in gravity models to account for geopolitical distance as a driver of bilateral trade. Thus, the analysis of bilateral trade requires a broader perspective integrating the impact of geopolitical distance in addition to physical distance, to better understand the challenges of contemporary trade.

The current empirical study takes note of this need to account for geopolitics and assesses the empirical impact of geopolitical distance on bilateral trade. While physical distance remains a significant determinant of bilateral trade, it is crucial to account for geopolitical distance which became essential as it has proven to be a pivotal factor in shaping international relationships. In this regard, the present study aims to examine the influence of geopolitical distance on bilateral trade, in addition to physical distance. Using bilateral trade data of 141 countries from 1980 to 2021, we relied on the augmented gravity model in which we consider the concept of distance as a function of physical distance, cultural links, and geopolitical distance to assess the impact of geopolitical distance on bilateral trade. To address the potential endogeneity of geopolitical distance, we adopt an Instrumental Variables (IV) approach, using the difference in the political system between bilateral pairs as an instrument, distinguishing between democracies and autocracies.

The findings suggest that friendship matters and geopolitical distance even deepens the negative impact of physical distance on bilateral trade. The findings of our study reveal interesting conclusions in line with the current events, highlighting the negative impact of geopolitical distance on bilateral trade, like that of physical distance. To explore these dynamics, we rely on a simple Ordinary Least Squares (OLS) model and a Pseudo-Poisson Maximum Likelihood (PPML) model, controlling for fixed effects and we further rely on an instrumental variable (IV) approach. Subsequently, we extend our analysis to examine the effects of geopolitical distance on different types of products, distinguishing between primary goods, mineral fuels, and industrial goods. The results highlight that geopolitical distance impacts the trade of primary products as well as the trade of mineral fuel, with a higher impact on mineral fuel trade. The study also reveals that geopolitical distance amplifies the negative impact of physical distance on bilateral trade. Interacting physical distance with geopolitical distance, the results indicate that as geopolitical distance increases, the negative impact of physical distance intensifies, thereby underscoring the interconnectedness of these two factors. Finally, our analysis reveals heterogeneity in the impact of geopolitical distance on trade relationships. In particular, the study shows that the negative impact of geopolitical distance on bilateral is valid for both advanced economies (AEs) and emerging and developing economies (EMDEs).

² Speech given to the Atlantic Council think tank on April 13, 2022. Speech available here <https://www.atlanticcouncil.org/news/transcripts/transcript-us-treasury-secretary-janet-yellen-on-the-next-steps-for-russia-sanctions-and-friend-shoring-supply-chains/> (consulted on August 9, 2023).

The rest of the paper is organized as follows: Section 2 presents a summary of a set of relevant literature on the topic. Section 3 presents the methodology followed by the study, highlighting how it integrates geopolitical distance in the gravity model as a determinant of global distance (or trade cost). Section 4 presents the results of the study and Section 5 concludes the study.

2. Literature review

The trade-geopolitics relationship has been addressed in several important scientific articles. These articles explored how geopolitical factors, such as trade policies, alliances, and international tensions, influenced trade between countries. They highlighted the importance of national interests, political relations, and geopolitical dynamics in determining trade policies and the functioning of the global trading system. These studies can be classified between aggregated simple country-level analyses and bilateral analyses.

First, several studies have assessed the impact of geopolitics on international relationships in a simple country-level analysis, relying on proxies for the measure of geopolitics. One of the periods in history marked by high geopolitical is the Cold War. The Cold War was a period of geopolitical tension marked by competition and confrontation between communist nations led by the Soviet Union and Western democracies including the USA, highlighted the impact of political intervention on trade during the Cold War. It reveals that countries receiving economic aid from the USA saw their exports increase, while those subject to economic sanctions experienced a decrease in exports. In addition, US companies have benefited from the political influence exerted by the USA, particularly in the energy and raw materials sectors. Investors have also benefited from access to confidential information on US political plans, which has influenced their investment decisions. These results, among the pioneers of studies on geopolitics, highlight the significant impact of geopolitics and political relations on trade and investment during the Cold War. More recently, (Ahir et al., 2022) presented the World Uncertainty Index (WUI), which measures global economic uncertainty by aggregating data from a variety of sources. The measure of uncertainty includes uncertainty caused by geopolitical tensions. It highlights the negative impact of this uncertainty on economic growth, investment, and international trade, particularly in low-income countries. Macroeconomic policies tailored to each country can mitigate these negative effects, but international support is needed to strengthen their capacity to cope with economic uncertainty. The WUI provides a valuable tool for assessing the impact of economic uncertainty on different sectors and countries, and for guiding economic policy decisions. Following the same approach, (Caldara and Iacoviello, 2022) highlight the importance of the geopolitical risk index (GPR) based on an analysis of international press articles. According to this paper, the GPR increases significantly during major geopolitical events, which have significant economic repercussions, particularly on international trade through stock market fluctuations and changes in interest rates. Indeed, geopolitical risk plays a crucial role in the volatility of crude oil prices on the international market, as (Fang et al., 2023) point out. Moreover, it has a significant impact on the efficiency of the gold market, which can have consequences for natural resources trade (including gold) in key economies such as India, the USA, and Brazil, as mentioned in (Bhatia, 2023). (Hoekman et al., 2023)

using a qualitative analysis method based on a review of existing literature and a conceptual analysis of current trends in international trade and global governance highlights the impact of current geopolitical tensions on the functioning of the WTO and proposes reforms to strengthen the organization. These reforms, with potentially important implications for developing countries, focused on improving transparency, strengthening dispute settlement mechanisms, and modernizing trade rules. The document also highlights the importance of international cooperation in tackling global challenges such as climate change and the COVID-19 pandemic. It stresses the need for broader reflection on global governance and ways of strengthening international cooperation in a context of increased geopolitical competition. In addition, (Ambrocio and Hasan, 2021) identify the link between political linkages and sovereign credit ratings and yields on sovereign bonds. The results of this study highlight the influence of political ties on the sovereign borrowing conditions of recipient countries, notably through high levels of regime similarity, diplomatic contacts, and coalition troop contributions. This political dimension of economic and financial relations between countries adds an important perspective to the overall understanding of international dynamics.

Second, some studies have also made efforts to assess the impact of geopolitics relying on bilateral data, showing how bilateral geopolitical relationships can impact international bilateral relationships. (Bao et al., 2020) highlights the impact of bilateral attitudes on international trade. They show that countries with positive attitudes towards each other tend to trade more, while negative attitudes lead to a decrease in trade. These robust results, obtained using different estimation methods, highlight the importance of bilateral attitudes in trade relations. (Kleinman et al., 2020) complements these findings by highlighting the correlation between bilateral political alignment and actual economic exposure between countries. It demonstrates that UN voting similarities and bilateral political alignment produce similar results. This positive relationship persists even after controlling for bilateral trade. Hub and authority measures are used to analyze changes in the centrality of countries in the network of real economic exposure. In addition, a measure of real economic exposure based on a constant elasticity trade model is developed, offering an interpretation of the underlying economic mechanisms. Geopolitical tensions can also be a source of geo-economic fragmentation, as the IMF points out in its analysis of the risks and benefits of geopolitical tensions and their impact on the global economy (Jakubik and Ruta, 2023). According to the IMF, the increased geopolitical vulnerability of emerging and developing economies could influence foreign direct investment flows and the economic performance of these countries. In a gravity model that controls for other potential drivers of FDI flows, the IMF shows in its economic outlook that the impact of geopolitical alignment is significant and economically relevant, particularly for EMDEs. They concluded by providing policy recommendations including the fact that multilateral efforts are needed to preserve global integration and reduce the economic costs of fragmentation. The exchange of information through multilateral dialogue can help to minimize political uncertainty and reduce cross-border economic consequences. In bilateral geopolitical relationships, some case studies (focusing on specific countries) appeared in the literature. (Tran, 2022) highlights the use of economic relations as a weapon to achieve

geopolitical and national security objectives. It mentions the technological disassociation between the USA and China, particularly in the semiconductor and telecommunications sectors. The US is increasingly dependent on imports of critical minerals controlled by China and Russia, while pressures on drug costs make it difficult to relocate pharmaceutical supply chains away from China. This concept of 'friend-shoring' can lead to further fragmentation of global supply chains and increased costs for companies. (ElGanainy et al., 2023) highlights the factors that influence foreign policy alignment with China. These factors include the importance of regime similarities, diplomatic contacts, and Chinese weapons' trade. Geopolitical and political considerations shape not only the choice of contractual partners but also the depth of economic integration policies according to the analysis of (Hinz, 2023) using a theoretical and then empirical approach. It suggests that economic integration can be used as a foreign policy tool, with significant variation between countries regarding their ability to do so. Larger countries consider political and economic motivations, while for smaller countries political importance and attitude towards the larger country are less determining.

While these studies have somewhat assessed the relevance of geopolitical relationships on international trade and investment, none of them have undertaken a direct approach. The new measure of geopolitical distance constructed by (Bailey et al., 2017) provides the opportunity to revisit the impact of geopolitical distance on bilateral trade, distinguishing from previous studies through the measure of geopolitics and the methodology used. The current study will rely on a gravity model and will align with studies such as (Cyrus, 2012) that examined the extent to which cultural proximity influences trade, using geopolitical distance as an independent variable.

3. Methodology and Data

The current study seeks to estimate the impact of geopolitical distance on trade. Using a sample of 141 countries over the period 1980-2021, the paper relies on a gravity model and shows that distance is not only physical but also ideological/geopolitical.

3.1. Conceptual framework of the gravity model

Several trade studies have relied on gravity models for their empirical specifications. The basic model explains trade flows between two countries ("i" and "j") by their size or wealth (GDP) and, inversely, the geographic distance between the two countries. The concept of distance and proximity includes physical distances, historical proximity, and cultural distance (common language, common border, and other factors affecting trade barriers). The model was used in the 1960s by (Hasson, 1964) and (Pöyhönen, 1963) to study trends in global trade. It was first introduced in the economics world by (Isard and Peck, 1954). The gravity model of trade is defined most simply as:

$$X_{ij} = \frac{KY_i^\alpha Y_j^\theta}{Dist_{ij}^\beta} \quad (1)$$

Including the concept of geopolitical distance to equation (1) and considering distance as a function of physical and geopolitical distance, equation (1) becomes:

$$X_{ijt} = \frac{KY_i^\alpha Y_j^\theta}{DistPhys_{ij}^{\beta_1} DistGeopol_{ijt}^{\beta_2}} \quad (2)$$

Linearizing equation (2), we obtain the following results:

$$\ln(X_{ijt}) = \ln K + \alpha \ln(Y_{it}) + \theta \ln(Y_{jt}) - \beta_1 \ln(DistPhys_{ij}) - \beta_2 \ln(DistGeopol_{ijt}) \quad (3)$$

Following the traditional approach of the gravity model of trade, this paper relied on an augmented gravity model with additional variables, such as common official language, common colonizer, common borders, trade agreements, and geopolitical distance. Thus, our empirical model based on the augmented gravity model is presented as follows:

$$\begin{aligned} \ln(X_{ijt}) = & \ln K + \alpha \ln(Y_{it}) + \theta \ln(Y_{jt}) - \beta_1 \ln(DistPhys_{ij}) - \beta_2 \ln(DistGeopol_{ijt}) \\ & + \beta_3 \ln(Lang_{ij}) + \beta_4 \ln(Col_{ij}) + \beta_5 \ln(Contig_{ij}) + \beta_6 \ln(TA_{ij}) + \varepsilon_{ij} \end{aligned} \quad (4)$$

Where X_{ijt} stands for bilateral trade value between i and j during the period t ; Y stands for the value of nominal GDP of the trading partners; $DistPhys_{ij}$ is the absolute physical distance between the trading partners; $DistGeopol_{ijt}$ is the geopolitical distance between the trading partners $Lang_{ij}$ represents common official language; Col_{ij} represents colonial links; $Contig_{ij}$ represents bilateral pairs with common borders; TA_{ij} represents trade agreement between i and j , including regional trade agreements and currency unions. K is a constant.

Equation (4) is estimated using the OLS estimator and the Poisson Pseudo-Maximum Likelihood (PPML) estimator applied to the nonlinear form of equation (4) is used for robustness check. The use of the PPML estimator for our robustness checks is a strategic choice that responds to a common problem generally faced by gravity models. In bilateral trade data, pair countries that did not trade in a given period reported values of zero. So, if bilateral trade between nations is zero and if we estimate them using a conventional log-linear model, these zero observations are dropped from the sample as undefined. Consequently, the number of observations decreases. In addition, the PPML estimator is a robust approach in the presence of heteroskedasticity (Tenreyro and Silva, 2006). This method can be applied to the levels of trade, thus estimating the non-linear form of the gravity model directly.³ However independent of the problem mentioned, our independent variable namely geopolitical distance may be impacted by reverse causation raising the problem of endogeneity.

³ In a PPML specification, the dependent variable is trade, not the logarithm of trade, whereas the explanatory variables can still be in log forms. A major requirement of PPML estimation is that the variable should have only positive values.

3.2. Endogeneity

The impact of geopolitical distance on bilateral trade is not exogenous and may suffer from endogeneity. Geopolitical distance can impact trade while engaging in more trade with a specific partner can lead to geopolitical convergence or divergence. For instance, the economic and trade ties between India and Russia have bolstered their geopolitical cooperation (Desai, 2007). The current study has considered the potential problem of endogeneity and proposed two approaches to solving it. First, we relied on lagged geopolitical distance in the estimation to counter the reverse causation in the relation between bilateral trade flow and bilateral geopolitical disagreement⁴. This approach helps reduce the reverse causation. Second, we used an instrumental variable (IV) approach to solve the endogeneity problem (Wooldridge, 2002; Poppo et al., 2016; Zhou and Li, 2012; Li and Zahra, 2012; Tang and Wezel, 2015). The IV approach will use the difference in the natural political systems between the bilateral pair as an instrument. By doing this, we are considering the level of geopolitical distance generated by differences in political systems between countries, making it exogenous to international trade.



The polity2 score provides a measure of the political system of a country (autocracy vs. democracy). The difference between the polity2 score will be used as an instrument since it allows the identification of democracies and autocracies. The idea behind this instrument is to identify the impact of external changes in bilateral geopolitical distance on bilateral trade. To do so we rely on changes induced by the difference in the governance system in place in bilateral pair countries as an instrument. Generally, these systems are the results of long history and cultural facts. This instrument is exogenous and exclusive. The only way the difference in governance systems can impact bilateral trade is through its impact on countries' relationships (bilateral geopolitical distance). One can argue in favor of the fact that democracies are associated with economic growth and trade. However, the studies investigating the impact of democracy present mixed results (e.g., Pozuelo et al., 2016). Also, in terms of relevance, differences in governance systems are highly correlated with bilateral geopolitical distance. Most of the time, there are natural geopolitical tensions between countries with different governance systems (e.g., USA vs. Russia or USA vs. China).

⁴ The use of lagged independent variables is frequently applied to alleviate the concerns inherent in the endogeneity induced by simultaneous phenomena (e.g. (Tang et al., 2014); (Griffith et al., 2017)). This strategy consists in introducing a time lag between the variables concerned, thus enabling a finer distinction to be made between short- and long-term repercussions, while reducing the biases arising from concomitant fluctuations. However, proper selection of time lags and precise model formulation remain imperative to guarantee eminently accurate results. In our case study, we postulate that policy measures and decision-making influencing geopolitical configurations require a time interval to be implemented and generate a measurable impact on bilateral trade. The use of a one-period lag could thus reflect this implementation delay and help capture gradual effects over time, while allowing for greater apprehension of immediate economic responses.

3.3. Data sources and stylized facts

3.3.1. Variables definition and sources

Most of the variables used in our estimations come from the CEPII databases. The dependent variable comes from CEPII databases on bilateral trade. The independent variable that captures uncertainty comes from (Bailey et al., 2017). All control variables are obtained from the CEPII databases. Trade agreement data are obtained from Mario Larch's Regional Trade Agreements Database (Table 1).

Table 1. Variables and data sources

Variable	Sources
Gross Domestic Product (GDP)	CEPII and World Bank Group
Geopolitical distance	Constructed by (Bailey et al., 2017) ⁵
Physical distance	CEPII database
Cultural & Colonial links	CEPII database
Trade agreements	Mario Larch's Regional Trade Agreements Database ⁶

Focusing on the control variables, their potential impact on trade is presented as follows: **(i)** GDP captures the country's economic size and wealth. It also gives information on the ability of governments to manufacture export-oriented products and their capacity to import. It is a proxy of economic development. Thus, this variable should have a positive effect on bilateral trade. **(ii)** The distance variable represents bilateral physical distance. A higher physical distance affects transportation costs, raising the unit price of the final product for sale and reducing its demand. Therefore, distance should negatively impact bilateral trade. **(iii)** Similarly, to physical distance, geopolitical distance was also included in the model to account for the level of geopolitical distance between bilateral pairs. This variable is complementary to the physical distance variable. An increase in geopolitical distance is expected to reduce bilateral trade. **(iv)** Colonial and cultural links also matter in explaining bilateral trade. We, therefore, expect a positive impact of some of these variables. **(v)** Finally, trade agreements (regional agreements and currency unions) should help increase trade volume. Thus, partner countries that are in the same regional trade agreement or currency union should trade more.

3.1.1. Geopolitical distance and trade

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Trade (US\$ million)	433,797	730	6,317	0	479,700
GDP (US\$ million)	778,540	319,936	1,324,284	111	22,996,100
GDP per capita (US\$)	778,540	8,826	14,470	65	100,819
Geopolitical distance	685,496	0.98	0.79	0	5.3
Distance	759,214	7,304	4,240	8	19,939

Source: Authors' calculations based on CEPII databases

⁵ This is founded upon the voting records at the United Nations General Assembly spanning from 1946 to 2021. The approach commences by initially estimating an ordered logit model across the three potential voting choices (affirmative, abstention, negative), where the selection hinges on the model's parameters combined with a latent country-specific voting preference for any given year. The latent process is gauged by imposing Bayesian precedence on the preferences and subsequently employing a Metropolis-Hastings/Gibbs sampling algorithm to deduce the parameters of the logit model, followed by the posterior distribution of the latent preference parameters. The distance between two countries in each year is then calculated as the absolute magnitude of the discrepancy between the inferred vote-specific preference parameters. The database is available via this link: <https://dataverse.harvard.edu/dataverse/Voeten> which provides the most updated version of geopolitical distance (Voeten et al., 2023).

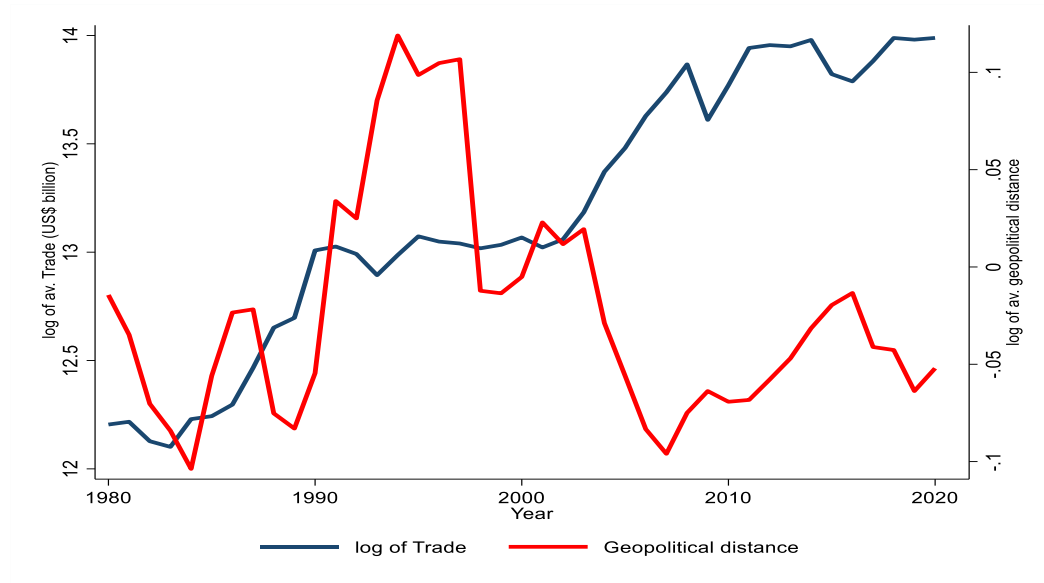
⁶ Trade agreements data: <https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html> (consulted on June 22, 2023).

The current study uses an unbalanced panel of bilateral data between 141 countries over the period 1980-2021. The average trade value is around US\$ 730 million over the period. The average GDP of countries in the sample is US\$ 319, 9 billion, with an average GDP per capita of US\$ 8,826. The geopolitical distance goes from 0 to 5.3 with an average geopolitical distance of 0.98 (Table 2). The highest level of geopolitical distance corresponds to the geopolitical distance between Libya and the USA in 1995. This high level of diplomatic disagreement was the result of repressions against Libya, which refused to cooperate with investigations into terrorist acts against Pan Am Flight 103 over Lockerbie, Scotland, in 1988, and France's Union de Transports Aériens (UTA) flight 772 over the Niger in 1989. As a result, the UN Security Council imposed sanctions on Libya in 1992 to press Tripoli to hand over two suspects wanted for the 1988 bombing of the US Pan American Airways airliner. Additional sanctions were adopted in the 1996 US Congress on firms doing business with Iran and Libya. These events explain the high level of geopolitical distance between the two countries. However, the lowest level of geopolitical distance is between Panama and Papua New Guinea, two small states with less involvement in geopolitics.

The link between international relationships and geopolitics is an old concern. In this section, we presented the trade trend and average geopolitical distance trend over the years (from 1980 to 2020). Figure 1 provides details on the joint evolution of trade (aggregated from bilateral trade data) and average geopolitical distance. The figure shows in some cases a clear negative association between trade and the average geopolitical distance between countries. By 2003-2004 we observed a spectacular divergence between global trade and global average geopolitical distance. This observation means somewhat that the spectacular trade increase observed during this period was also accompanied by an important decrease in geopolitical distance. While this association is not a causation, it gives an idea of the evolution of these two variables. However, Figure 1 does not show the bilateral dimension and does not allow us to appreciate the impact of geopolitical distance on trade.

We further divided geopolitical distance observations into quartiles depending on the distribution of the variable for the whole sample, the first quartile corresponding to friendly relationships while the fourth quartile corresponds to less friendly or conflictual relationships. Figure A1 shows the trade trend with bilateral partners belonging to the first and fourth quartiles. The figure shows that in some cases, bilateral trade with friends is higher than bilateral trade with non-friends. However, this difference seems to be not significant and depends on the period (Figure A1), witnessing the existence of heterogeneity in the impact.

Figure 1. Trends in trade and geopolitical distance



Source: Authors' calculations based on CEPII data

To consider these heterogeneities and look more in detail at the relationship between trade and geopolitical distance, we further considered specific cases to assess the bilateral impact of geopolitical distance on trade. Relying on the world's top traders namely the USA, China, and Germany as well as some important actors in international geopolitics including Russia, the United Kingdom (UK), and France, we look at the value of international trade between these countries and their partners depending on the percentiles of geopolitical distance with these partners as described in [Figure A2](#) to [Figure A6](#). In other words, we represented these countries' global trade with their friendly (first quartile of geopolitics) and less friendly partners (fourth quartile of geopolitics). [Figure A2](#) to [Figure A6](#) show that for countries such as the USA, France, and the UK, an important share of their international trade occurs with the friendliest partners (partners belonging to the first quartile). This trend is mitigated for Russia and China. This first look at the relationship between geopolitics and trade highlights the existence of a negative impact of geopolitical distance on trade. However future estimates are necessary for such a conclusion.

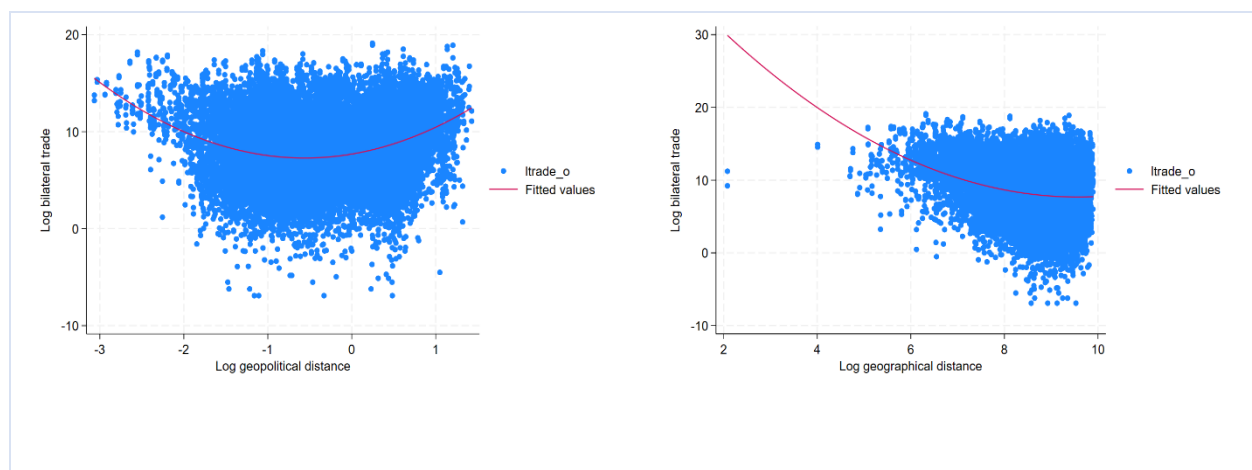
4. Estimations Results

4.1. Results of the baseline estimation

Figure 2. Scatter– relationship between trade and distance (geopolitical and physical distance)

Figure 2A- Trade and Geopolitics

Figure 2B- Trade and Distance



Source: Authors' calculations based on CEPII data.

While distance is negatively associated with trade, the relation between geopolitical distance and trade presents a U-shape form. Figure 2 shows the relation between trade and both physical and geopolitical distance. Trade is negatively correlated with distance. The higher the distance between countries, the lower the value of bilateral trade between them (Figure 2B). While Figure 2 shows a simple correlation between trade and distance, it aligns with years of findings from gravity models linking trade and distance. Figure 2A shows that the relationship between trade and geopolitical distance is in the form of a U-shape, with distance having a negative impact until a certain threshold of geopolitical distance. More estimations are necessary to assess the causal impact of geopolitical impact on trade.

In addition to physical distance, geopolitical distance matters in explaining bilateral trade flows.

The current paper assesses the relationship between bilateral trade and geopolitical distance. Using the OLS and PPML approaches, the results of the basic model show that friendship is just as important as neighborhood. While Adam Jakubik and Michele Ruta in an IMF working paper (Jakubik and Ruta, 2023) showed similar findings relying on the impact of trade uncertainty on bilateral trade with diplomatic distance being an aggravating factor, the current paper directly pointed to the negative impact of geopolitical distance on bilateral trade. Table 3 shows that a 1 percent increase in geopolitical distance reduces bilateral trade by 0.085 percent (0.029 when using OLS) (columns [1] and [4]). When considering both physical and geopolitical distance, the PPML findings highlight that a 1 percent increase in geopolitical distance reduces bilateral trade by 0.01 percent, while a 1 percent increase in physical distance

reduces bilateral trade by 0.57 percent (column [6]). This finding confirms the importance of geopolitics in international trade relations but also highlights that physical distance still matters even more than geopolitical distance. The finding suggests that the basic gravity model data follows the expectations: GDP in the exporting country and GDP in the importing country are positively associated with bilateral trade. In addition, a common official language, belonging to the same regional trade agreement, and contiguity, positively impact bilateral trade as expected ([Table 3](#)).

Table 3. Results – Impact of geopolitical distance on bilateral trade

VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]
	OLS			PPML		
	ltrade_o	ltrade_o	ltrade_o	trade_o	trade_o	trade_o
lgeopol_dist	-0.0290*** (0.0105)		0.0424 (0.00984)	-0.0851*** (0.00486)		-0.0118** (0.00586)
lphys_dist		-1.030*** (0.0207)	-1.096*** (0.0211)		-0.572*** (0.0106)	-0.574*** (0.0101)
lgdpcap_o	0.0478*** (0.0135)	0.0427*** (0.0131)	-0.00835 (0.0133)	0.00435 (0.00905)	-0.0329*** (0.00789)	-0.0785*** (0.00822)
lgdpcap_d	-0.0329** (0.0144)	-0.0406*** (0.0135)	-0.0736*** (0.0138)	0.0618*** (0.00729)	0.0218*** (0.00615)	-0.0208*** (0.00648)
lgdp_o	1.093*** (0.0105)	1.158*** (0.00992)	1.176*** (0.01000)	0.789*** (0.00606)	0.804*** (0.00583)	0.837*** (0.00595)
lgdp_d	0.804*** (0.0110)	0.855*** (0.0104)	0.871*** (0.0105)	0.758*** (0.00567)	0.775*** (0.00531)	0.805*** (0.00533)
comcol	0.809*** (0.0775)	0.684*** (0.0689)	0.627*** (0.0714)	0.785*** (0.0617)	0.848*** (0.0438)	0.621*** (0.0559)
col45	1.132*** (0.144)	1.118*** (0.133)	1.103*** (0.137)	0.750*** (0.0329)	0.694*** (0.0286)	0.608*** (0.0270)
col_dep_ever	0.761*** (0.115)	0.555*** (0.104)	0.607*** (0.106)	-0.108*** (0.0237)	-0.243*** (0.0237)	-0.190*** (0.0220)
col_dep	-1.161*** (0.117)	1.896*** (0.397)	-0.732*** (0.116)	-0.851*** (0.0396)	1.546*** (0.0611)	-0.542*** (0.0376)
contig	2.874*** (0.0835)	1.352*** (0.0825)	1.306*** (0.0822)	1.239*** (0.0195)	0.596*** (0.0271)	0.618*** (0.0265)
comlang_off	0.707*** (0.0519)	0.616*** (0.0464)	0.598*** (0.0468)	0.141*** (0.0184)	0.171*** (0.0216)	0.0941*** (0.0223)
rta	1.706*** (0.0397)	0.566*** (0.0361)	0.666*** (0.0365)	0.881*** (0.0150)	0.247*** (0.0198)	0.400*** (0.0198)
Constant	-26.03*** (0.259)	-18.92*** (0.273)	-18.91*** (0.279)	-17.50*** (0.182)	-12.79*** (0.203)	-13.95*** (0.192)
Observations	399,980	427,253	399,980	399,980	427,253	399,980
R-squared	0.573	0.605	0.611	0.8518	0.8568	0.8806

Note: *lgeopol_dist* is geopolitical distance/ diplomatic disagreement; *lphys_dist* is the logarithm of distance; *lgdpcap_o* is the logarithm of the exporter's GDP per capita; *lgdpcap_d* is the logarithm of the importer's GDP per capita; *lgdp_o* is the logarithm of exporter's GDP; *lgdp_d* is the logarithm of importer's GDP; *comcol* is a dummy that equals to 1 if bilateral pair had a common colonizer post-1945; *col45* is a dummy that equals to 1 if bilateral pair was in a colonial relationship post-1945; *col_dep_ever* is a dummy that equals 1 if the bilateral pair have ever been in a colonial or dependency relationship; *col_dep* is a dummy that equals 1 if the bilateral pair are in a colonial or dependency relationship; *contig* if the two partners are contiguous; *contig* is a dummy that equals 1 if the bilateral pair share the same border; *comlang_off* is a dummy that equals 1 if the bilateral pair have a common official or primary language and *rta* is a dummy that equals to 1 if bilateral pairs in the same regional trade agreement. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

These findings hold significant importance, although they might be susceptible to model specification errors. Indeed, bilateral data often exhibit correlations, as exchanges between two countries

can be influenced by common or shared factors. Additionally, each country possesses unique attributes that can impact its bilateral exchanges with the rest of the world, not to mention country-specific temporal variations. Incorporating fixed effects becomes crucial for more accurate modeling of the inherent complexity of international trade. By accounting for country-specific factors and mitigating potential biases arising from unobserved heterogeneity, these fixed effects enhance the representation of reality. The estimation results, presented in [Table 4](#), encompass various fixed effects, including those related to the importer, exporter, time, and bilateral pairs in some cases. Thus, we consider the unobservable elements linked to countries, time, and the bilateral pair elements that may not have been considered. It is noteworthy that the conclusions remain consistent, indicating that geopolitical distance, in addition to physical distance humpers trade between countries. This finding holds in both methodological approaches (OLS and PPML). Specifically, employing the more robust PPML approach, we observe that a 1% increase in geopolitical distance leads to a trade reduction of approximately 0.0053% (column [6]).

Table 4. Results – Impact of geopolitical distance on bilateral trade – including fixed effects.

VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]
	OLS-FE			PPML-FE		
	ltrade_o	ltrade_o	ltrade_o	trade_o	trade_o	trade_o
lgeopol_dist	-0.111*** (0.00840)		-0.0228*** (0.00525)	-0.0300** (0.0143)		-0.00539** (0.00274)
lphys_dist		-1.393*** (0.0225)	-0.261 (0.225)		-0.650*** (0.0236)	-0.482*** (0.0690)
Observations	399,980	427,253	399,314	399,980	427,253	399,314
R-squared	0.700	0.740	0.864	0.910	0.926	0.984
Exporter FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	No	No	Yes	No	No	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: *lgeopol_dist* is geopolitical distance; *lphys_dist* is the logarithm of distance. *** p<0.01, ** p<0.05, * p<0.1. Standard gravity model variables have been included.

4.2. Results of the IV approach

The current study employs two approaches to mitigate potential endogeneity stemming from potential simultaneity bias. The first approach involves delaying the independent variable, and the second, using an IV method, as described in [section 3.2](#). By introducing a one-period lag to the geopolitical distance variable, we find that similarly to physical distance, the impact of geopolitical distance aligns closely with our main findings, with significance levels of 1 percent for most of the findings. According to the findings, a 1 percent increase in geopolitical distance results in a 0.004 percent decrease in trade, as opposed to a 0.496 percent decrease in physical distance ([Table 5](#), column [3]). However, the use of lagged geopolitical distance to address endogeneity through simultaneity bias carries several limitations. While they may help mitigate bias, they can also lead to inappropriate extrapolations, loss of temporal information, and reduced estimation efficiency. Issues of serial correlation and sensitivity to the specifications of lagged variables can

also impact the results. Also, in case the lagged variable remains endogenous, the endogeneity problem is only partially resolved. To meet these challenges, we apply a secondary instrumental variable approach, utilizing the differences in the political system between bilateral pairs as an instrument for geopolitical distance. This method yields more robust and coherent estimations of the causal impact of geopolitical distance on trade. First, the first-stage results suggest that the instrument is valid. The difference in the political system is significantly associated with geopolitical distance, indicating that the instrument is pertinent in explaining geopolitical distance. In addition, the model is exactly identified, and the F test is significant. The results align closely with our core findings: both geopolitical and physical distances exert a significantly negative impact on bilateral trade. However, the IV approach suggests a more important impact of geopolitical distance compared to the OLS approach. A 1 percent increase in geopolitical distance results in a trade reduction of 1.2 percent, as opposed to a decline of 0.883% for physical distance (Table 5, column [6]).

Table 5. Impact of geopolitical distance on bilateral trade – PPML and Instrumental Variable.

VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]
	PPML-FE			IV		
	trade_o	trade_o	trade_o	ltrade_o	ltrade_o	ltrade_o
Panel A: Result of PPML and IV						
lgeopol_dist (t-1)	-0.0307** (0.0143)		-0.00476* (0.00279)			
lgeopol_dist				-1.338*** (0.140)		-1.178*** (0.144)
lphys_dist		-0.650*** (0.0236)	-0.496*** (0.0714)		-1.393*** (0.00547)	-0.883*** (0.0644)
Panel B: Results of the first stage estimates						
Difference Pol System	-	-	-	0.0078*** (0.00048)	-	0.0071** (0.00047)
Observations	393,156	427,253	392,486	297,222	427,253	297,222
First step F – test	-	-	-	255.78***	-	226.57***
Exporter FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	No	No	Yes	No	No	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: *lgeopol_dist* is geopolitical distance; *lphys_dist* is the logarithm of distance; the *Difference Pol System* is the difference between the exporter and the importer level of democracy. For the IV approach, the model is exactly identified. *** p<0.01, ** p<0.05, * p<0.1. Standard gravity model variables have been included.

4.3. Commodities and Energy most Influenced by geopolitical disagreement.

We further investigate the impact of geopolitical distance on bilateral trade by type of product/industry. The findings complement the baseline results and show that geopolitical distance negatively impacts the bilateral trade of commodities and mineral fuel. The results show that energy trade (mineral fuel) is more

sensitive to geopolitical tensions (**Table 6**). The use and production of fossil fuels are unbalanced across the world, making energy trade between countries necessary to support demand and provide revenue for exporters. The international energy market is complex and subject to several distortions. However, it is now evident that as economies grow, energy demand increases (Apergis and Tang, 2013). Oil-exporting nations of OPEC are aware of this necessity, and they discovered in the 1970s that their energy resources gave them the ability to put major pressure on larger, richer energy importers (“Dennis Tänzler | Wilson Center,” n.d.)⁷. Therefore, energy has been used for a long time as an instrument of pressure by oil exporters in their diplomatic relationships (“Milestones: 1969–1976 - Office of the Historian,” n.d.)⁸. Several studies have assessed the link between energy trade and geopolitics. For instance, (Li et al., 2021) show that geopolitics has a significant negative impact on the import and export of the energy trade, and the inhibition of the export is greater than that of the import. Thus, the result of the current section lies in previous findings in the literature and complements the general observation of the importance of geopolitical links in trade relations between countries.

Table 6. Impact of geopolitical distance on bilateral trade by type of product/industry (PPML-FE).

VARIABLES	[1] Log Commodity Trade	[2] Log Commodity (No Fuel) Trade	[3] Log Mineral Fuel Trade	[4] Log Industrial products Trade
<i>lgeopol_dist</i> (t-1)	-0.0128*** (0.00409)	-0.0139*** (0.00384)	-0.0267*** (0.00879)	-0.00440 (0.00355)
<i>lphys_dist</i>	-0.256 (0.173)	0.00350 (0.162)	0.0928 (0.323)	-0.480*** (0.159)
Observations	324,252	319,937	141,867	361,657
R-squared	0.827	0.837	0.743	0.886
Exporter FE	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Note: *lgeopol_dist* is geopolitical distance; *lphys_dist* is the logarithm of distance. *** p<0.01, ** p<0.05, * p<0.1. Standard gravity model variables have been included.

4.4. Geopolitical distance deepens the negative impact of physical distance.

We also investigated whether the traditional impact of physical distance on bilateral trade depended on geopolitical distance. To answer this question, we introduced a multiplicative term (interaction between physical and geopolitical distance) into equation (4). This analytical approach enables us to better understand the complex mechanisms of international trade from a more realistic point of view, by taking into account elements that go beyond the simple geopolitical or physical distance. The main question that

⁷ <https://www.wilsoncenter.org/article/new-geopolitics-decarbonizing-world> (consulted on October 17, 2023).

⁸ *In October 1973, following the Yom Kippur War between Israel and several Arab countries, OPEC members, including Saudi Arabia and Iran, imposed an oil embargo on Western countries supporting Israel. Oil prices quadrupled, leading to a global economic crisis and energy shortages in many importing nations. This crisis bolstered the negotiating power of oil-exporting countries on the international stage <https://history.state.gov/milestones/1969-1976/oil-embargo> (consulted on October 17, 2023).

*In January 2009, a dispute between Russia and Ukraine over gas prices led to a disruption of Russian gas deliveries to Europe through the Ukrainian pipeline. This created gas shortages in some European countries and raised concerns about the reliability of Russian gas supplies (Stern et al., 2009).

we seek to answer in this section is whether the impact of physical distance on bilateral trade depends on the level of geopolitical distance. **Table 7** presents the results of estimates for this new specification. The coefficients in front of physical distance and the interaction between physical distance and geopolitical distance are negative and statistically significant, indicating that distance negatively impacts bilateral trade, but this negative impact is aggravated as geopolitical distance increases.

Table 7. Impact of geopolitical distance on bilateral trade – multiplicative impact.

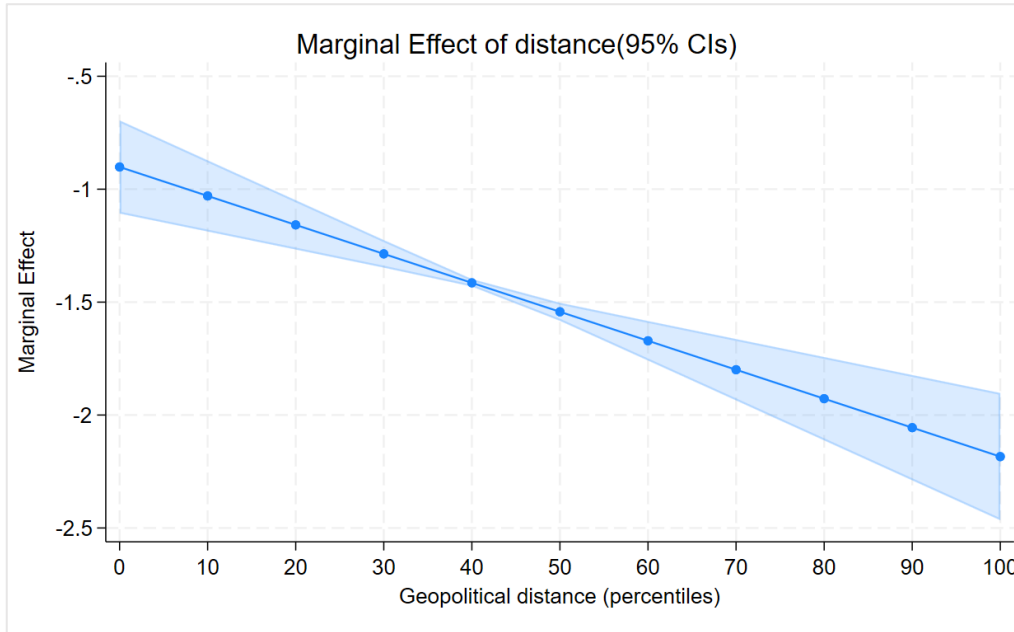
VARIABLES	[1]	[2]	[3]	[4]
	PPML trade	IV Log trade	PPML trade	IV Log trade
<i>lgeopol_dist</i>	0.0711** (0.0335)	3.654*** (0.585)		
<i>lgeopol_dist</i> × <i>lphys_dist</i>	-0.0106** (0.00424)	-0.426*** (0.0692)		
<i>lphys_dist</i>	-0.539*** (0.200)	-1.784*** (0.0577)	-0.466** (0.193)	-0.902*** (0.105)
<i>lgeopol_dist</i> percentile			0.00743* (0.00445)	0.114*** (0.0214)
<i>geopol_dist</i> percentile × <i>lphys_dist</i>			-0.00106** (0.000532)	-0.0128*** (0.00249)
Observations	399,314	366,727	399,314	366,727
Exporter FE	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes
Pair FE	Yes	No	Yes	No
Time FE	Yes	Yes	Yes	Yes

Note: *lgeopol_dist* is geopolitical distance; *lphys_dist* is the logarithm of distance. *** p<0.01, ** p<0.05, * p<0.1. Standard gravity model variables have been included.

Figure 3 presents the marginal impact of physical distance depending on geopolitical distance. We examine the impacts at different percentiles of geopolitical distance. A 1 percent increase in physical distance results in a 1.2 percent decrease in bilateral trade between countries positioned at the 25th percentile of geopolitical distance (close or “friendly” countries) compared to the average, and a 0.91 percent decrease between countries positioned at the 1st percentile (very close with substantial geopolitical convergence). However, the same increase in physical distance leads to a reduction of around 1.86 percent in bilateral trade between countries at the 75th percentile of geopolitical distance (geopolitical rivals) relative to those at the mean, and a more important decrease in trade (2.2 percent) between countries positioned at the 99th percentile (higher rivalry or “non-friends”).

These findings support the assumption that geopolitical distance deepens the negative impact of physical distance. The adverse effects of distance on trade are less perceived or less painful when countries trade relatively more with “friendly” partners. In other words, in trade relationships between friends, distance still matters but it becomes a more serious obstacle to trade as soon as strong rivalries arise and relations between partner countries deteriorate.

Figure 3. Average marginal impact: Trade impact of physical distance deepens with geopolitics.



Source: Authors' calculations based on estimates results.

4.5. The impact of geopolitical distance is valid for all income groups.

We delve deeper into our analysis by investigating the presence of heterogeneity, particularly concerning income-based disparities. The impact of geopolitical distance on trade relationships could vary depending on income groups. Advanced economies, for instance, often share close geopolitical ties due to their economic, political, and security interconnections. They also possess the capacity to wield political and diplomatic influence over emerging and developing economies, potentially shaping their trade decisions and economic policies.

Table 8. Impact of geopolitical distance on bilateral trade – AEs vs. EMDEs.

	[1]	[2]	[3]	[4]	[4]	[5]	[6]	[7]
	PPML				IV			
Exporter ->	AE	AE	EMDE	EMDE	AE	AE	EMDE	EMDE
Importer ->	AE	EMDE	AE	EMDE	AE	EMDE	AE	EMDE
VARIABLES	trade_o	trade_o	trade_o	trade_o	ltrade_o	ltrade_o	ltrade_o	ltrade_o
<i>lgeopol_dist</i>	-0.0124*** (0.00336)	-0.0625*** (0.0138)	-0.0720*** (0.0169)	-0.0187*** (0.00434)	1.132 (2,485)	-0.119*** (0.0456)	0.0918 (0.145)	-3.098*** (0.600)
<i>lphys_dist</i>	-0.221*** (0.0853)	-0.758*** (0.0140)	-0.652*** (0.0205)	-0.104 (0.128)	-8.454 (162.3)	-1.419*** (0.0126)	-1.468*** (0.0299)	-0.949*** (0.134)
Observations	27,675	104,468	73,768	193,457	26,051	96,569	68,407	175,700
Exporter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair FE	Yes	Yes	Yes	Yes	No	No	No	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *lgeopol_dist* is geopolitical distance; *lphys_dist* is the logarithm of distance. AE represents Advanced Economy while EMDE represents Emerging Market or Developing Economy. *** p<0.01, ** p<0.05, * p<0.1. Standard gravity model variables have been included.

To ascertain this divergence in the influence of geopolitical distance on trade relationships across income categories, we divided our sample into two main groups: advanced economies (AE) and emerging and developing economies (EMDE), categorized based on their roles as importers or exporters. The results obtained using the PPML approach and instrumental variable method are documented in [Table 8](#). The findings reveal that geopolitical distance negatively affects trade, regardless of the income category to which the trading partners belong. Nevertheless, the magnitude of this impact remains more pronounced when partners do not belong to the same category⁹.

5. Conclusion

Our analysis uses bilateral trade data from 141 countries from 1980 to 2021 to investigate the impact of geopolitical distance on bilateral trade. By leveraging gravity models and considering geopolitical distance as a trade cost and a substantial part of the global distance between nations, this research unveiled significant findings regarding geopolitics and bilateral trade. In the wake of Russia's invasion of Ukraine, this research paper is important and discusses a topic that has long been a determinant in international relationships. It also raises the importance of missing variables in gravity models using bilateral distance as a determinant of bilateral trade, while omitting to consider geopolitical distance which is also important.

First and foremost, the study demonstrates that "friendship" between countries, as well as their geographical proximity, plays a pivotal role in the dynamics of international trade. This observation underscores the importance of diplomatic ties and the convergence of foreign policy preferences in the development of trade exchanges.

Specifically, the analysis of the effects of geopolitical distance yielded relevant conclusions. The negative impact of geopolitical distance on bilateral trade of raw materials and mineral fuels is noteworthy, particularly pronounced in the energy sector where geopolitical distance can carry substantial consequences. Moreover, it has been demonstrated that the unfavorable effect of physical distance on trade is exacerbated when geopolitical distance is greater. Furthermore, geopolitical distance negatively impacts trade regardless of the income category to which trading partners belong. This highlights that even when countries have varying levels of economic development, geopolitical distance remains a disruptive factor in their trade relations.

Thus, this study sheds light on the importance of considering geopolitical distance in the analysis of bilateral trade relations. The obtained results provide valuable insights for policymakers and economists, underscoring potential challenges related to geopolitical distance and suggesting ways to mitigate its negative effects on international trade.

⁹ Within the PPML approach, an increase of 1% in geopolitical distance leads to a decrease of 0.062% and 0.072% in bilateral trade for AE-exporter and EMDE-importer relationships, as well as for AE-importer and EMDE-exporter connections (columns [2] and [3]). This contrasts with a trade reduction of less than 0.019% observed among countries falling within the same category.

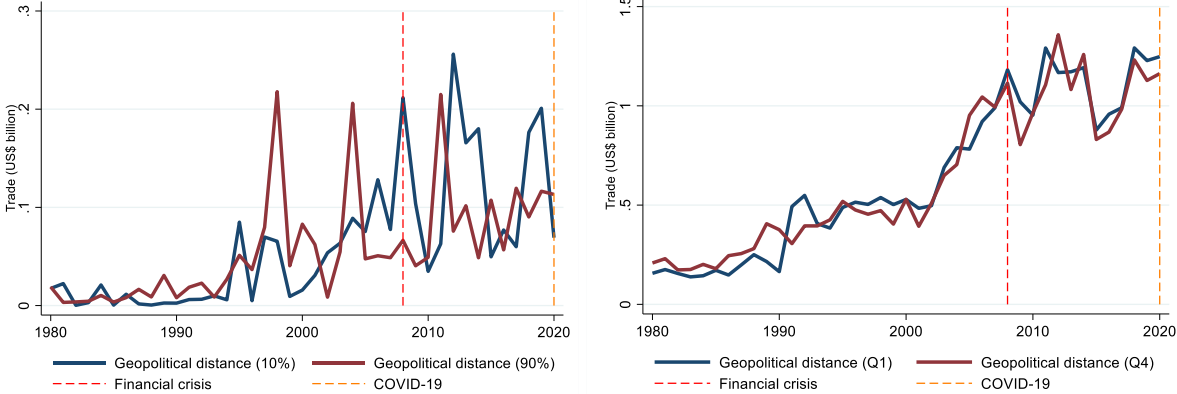
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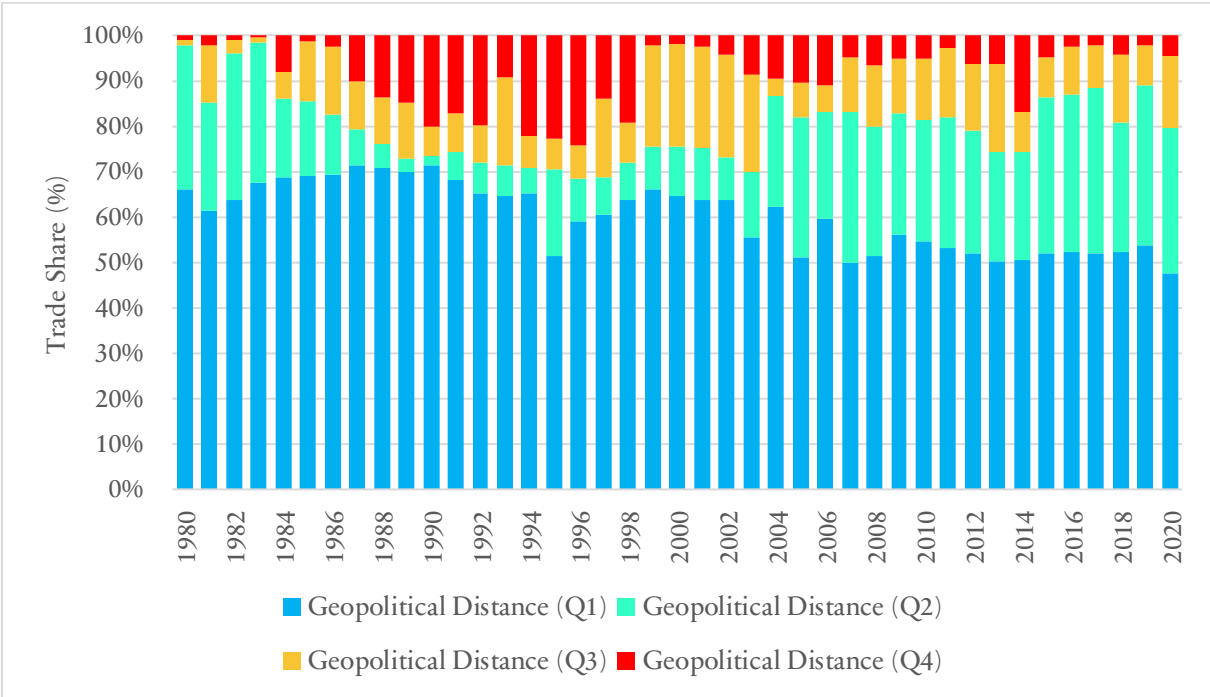
Supplemental Materials

Figure A1. Global Export share by quartiles/percentiles of bilateral pair geopolitical distance



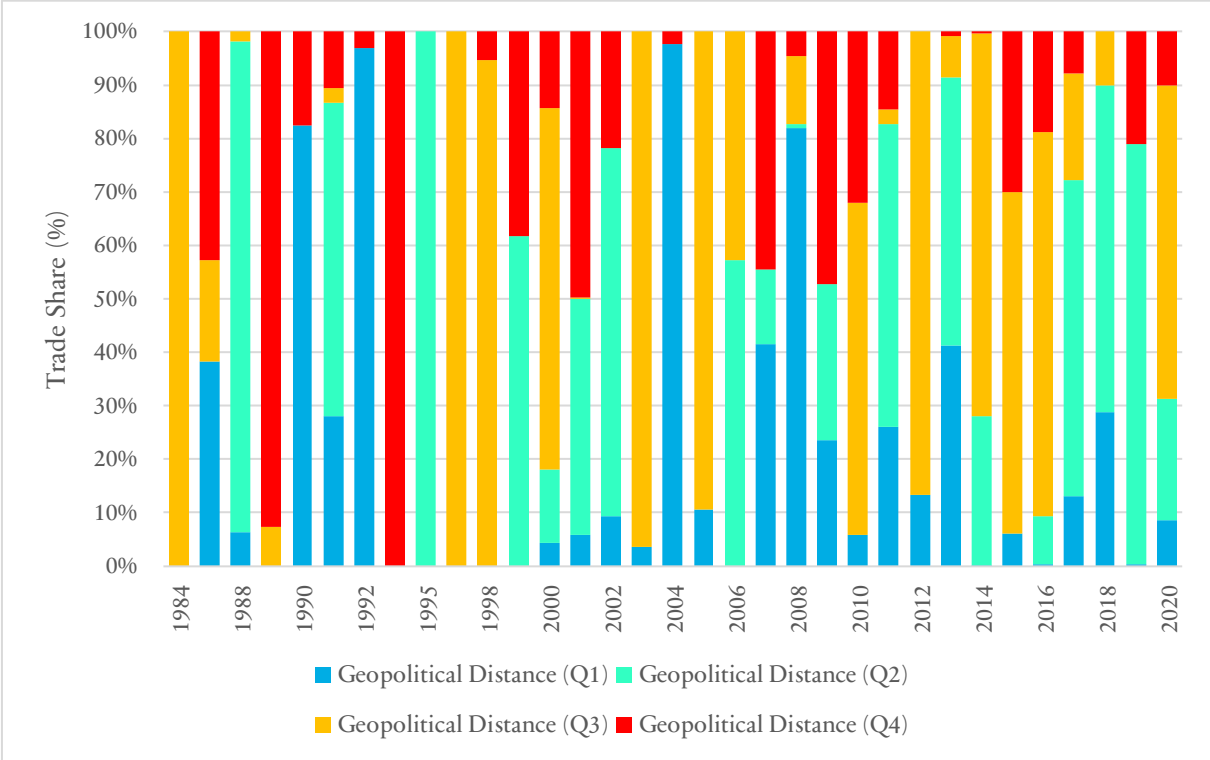
Source: Authors’ calculations based on CEPII data.

Figure A2. United States of America Export share by quartiles of geopolitical distance



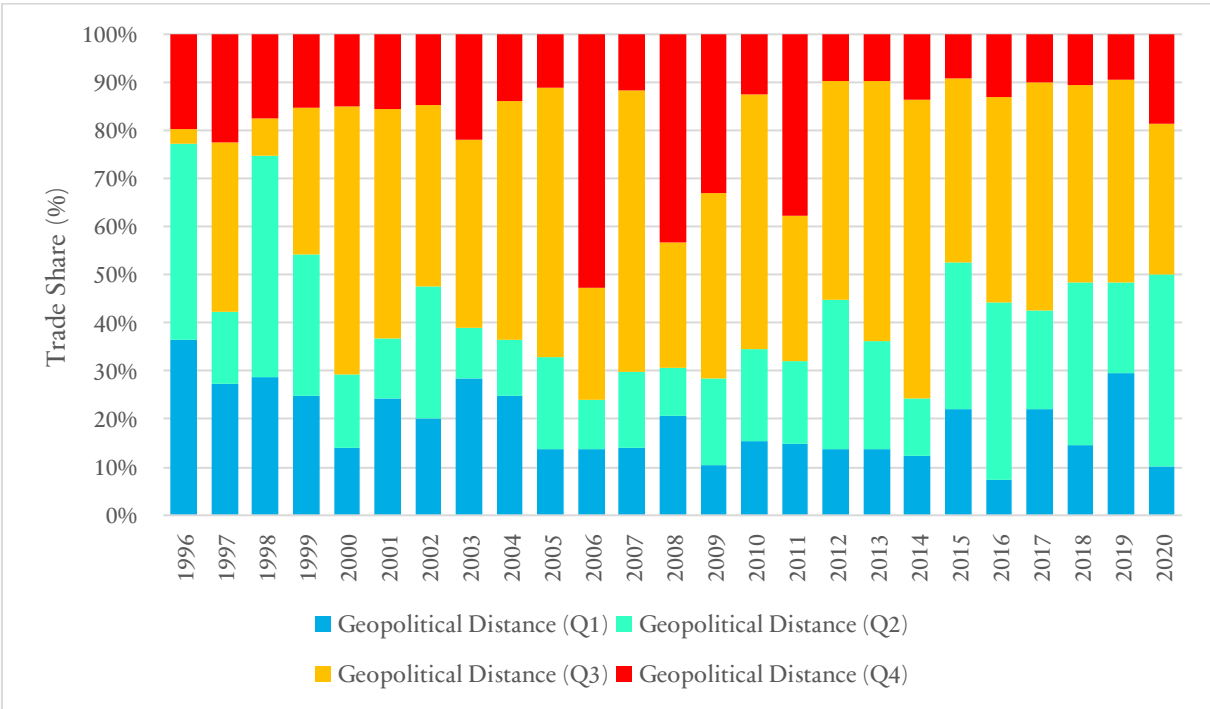
Source: Authors’ calculations based on CEPII data.

Figure A3. China's Export share by quartiles of geopolitical distance



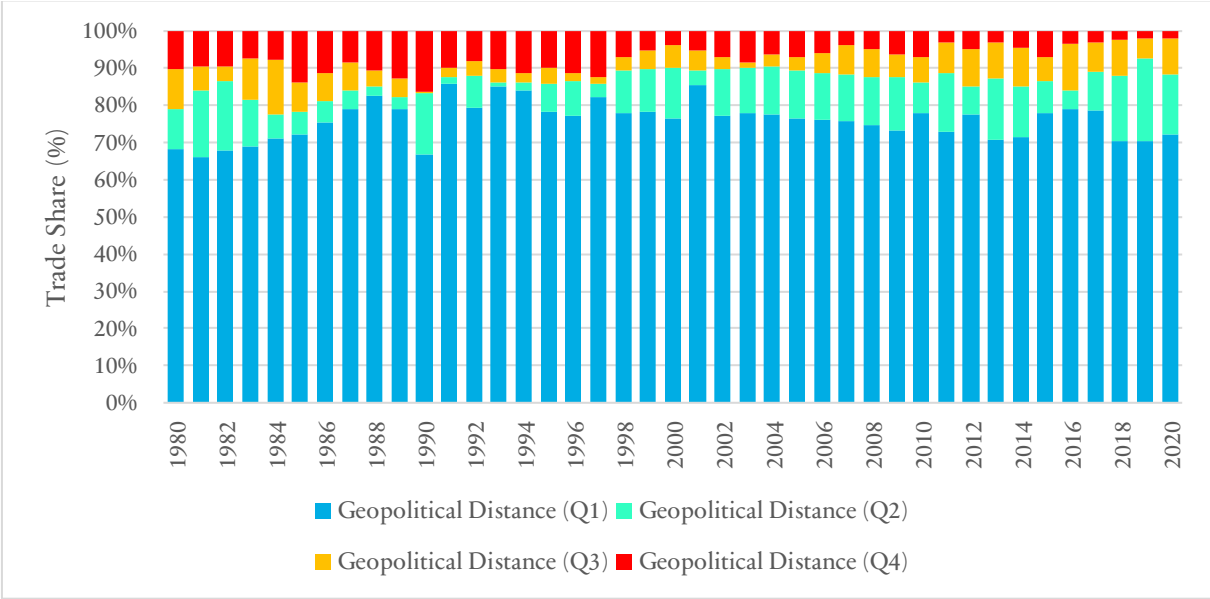
Source: Authors' calculations based on CEPII data.

Figure A4. Russia's Export share by quartiles of geopolitical distance



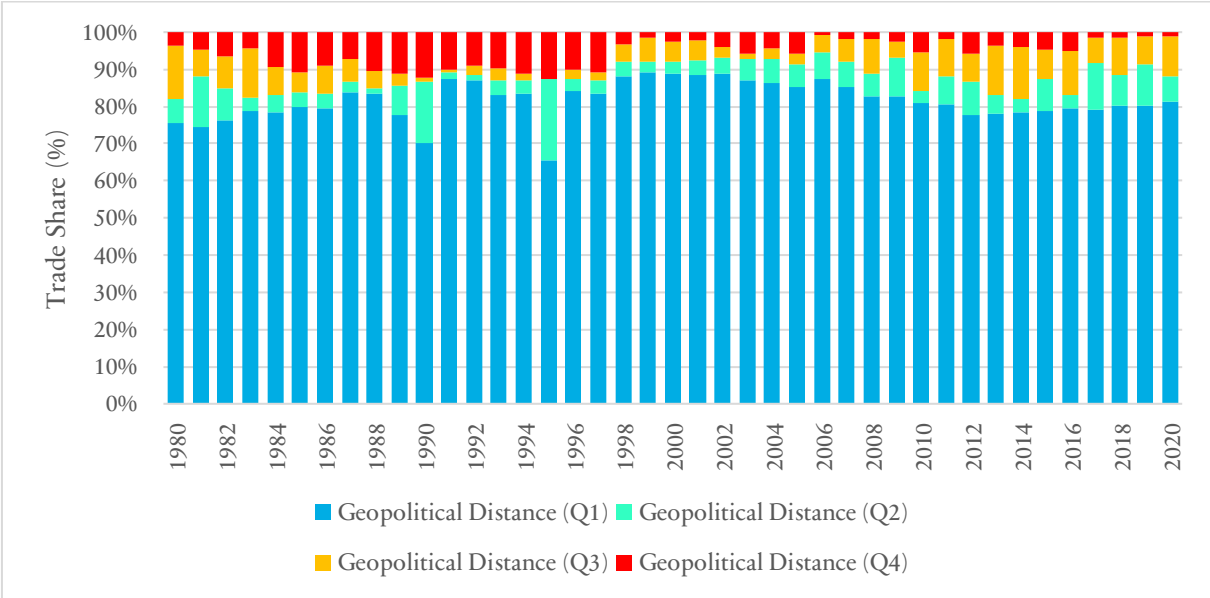
Source: Authors' calculations based on CEPII data.

Figure A5. France’s Export share by quartiles of geopolitical distance



Source: Authors’ calculations based on CEPII data.

Figure A6. United Kingdom’s Export share by quartiles of geopolitical distance



Source: Authors’ calculations based on CEPII data.