The Fog of News: How News-Based Geopolitical Risk Clouds Bilateral trade

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List of Acronyms

CES	Constant Elasticity of Substitution
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GEE	General Estimating Equation
GPA	Geopolitical Acts
GPR	Geopolitical Risk
GPT	Geopolitical Threats
HS	Harmonized System
MID	Militarized Interstate Dispute
MR	Multilateral Resistance
OLS	Ordinary Least Squares
PPML	Poisson Pseudo-Maximum Likelihood
TPP	Trans-Pacific Partnership
TSLS	Two-Stage Least-Squares
WTO	World Trade Organization
WUI	World Uncertainty Index

Abstract

The hyper-globalization paradigm after the Cold War is disintegrating and is giving way to a new arena of strategic competition in which economic efficacy and national security rival each other. Although the devastating influence of active war on trade is not much of a secret, the consequences of the ubiquitous threat of war the fear and perception of geopolitical tension remain little known. This study investigates how dyadic geopolitical risk (GPR), measured through news media interpretation of conflicts and tensions, influences bilateral trade flows. The results reveal a critical temporal dynamic: geopolitical risk does not disrupt trade contemporaneously. Instead, it exhibits a significant "phasing-in" effect, with negative impacts materializing after a one-year lag and accumulating over a three-year period. A joint geopolitical risk shock leads to a cumulative trade reduction of approximately 6.5%. These results underscore the late but consistent nature of the geopolitical uncertainty and how risk perception may erode world economic integration even in the absent of actual conflict situations.

Relevance to Development Studies

The study is important to the development research as it establishes the impact of geopolitical risk on bilateral trade flows during an age characterized by an upsurge in economic disaggregation. The results show that geopolitical risk is an invisible trade inhibitor, which systematically shifts trade flows, and which might defeat any development strategy based on global market integration. The determined effect of phasing-in demonstrates that trade disruption is not experienced immediately but in phases, which are important in the formulation of development policy. This time aspect enables policy analysts in the developing economies to develop proactive policies in order to reduce trade vulnerability and enhance resilience in the economy. These dynamics are of particular use to countries that aim to cope with the intricate trade-offs between investing in global markets and controlling geopolitical dependencies in an increasingly fragmented world economy.

Keywords: Geopolitical Risk, Bilateral Trade, Dyadic Analysis, Gravity Model, Phasing-In Effect, News-Based Index

Chapter 1 Introduction

1.1 Background of the Study

The post-World War II world experienced a dramatic change in global trade patterns. International trade, first divided into competing geopolitical blocs, was deeply integrated from the latter part of the twentieth century on. Cross-border trade boomed at an unprecedented rate as a result of technological diffusion, multilateral trade liberalization, and declining transportation costs, with the value of global trade increasing almost 382 times its 1950 level. This strong economic interdependence led to a widespread belief in the liberal peace hypothesis - the idea that trade, by increasing the costs of conflict, makes peace between countries inevitable.

However, the last decade has been bringing constant shocks to this paradigm of hyper-globalization. The COVID-19 pandemic, armed conflicts, a resurgence of sanctions and export controls and the fundamentally changed calculus of international economic policy due to the increasing great-power rivalry. As per Steinberg (2023), the world is moving towards a neo-mercantilist phase where national security, technological dominance and strategic resilience are becoming more significant than pure economic efficiency. Brexit, the U.S. withdrawal from Trans-Pacific Partnership (TPP), and the Russia-Ukraine war are some of the events that have indicated a dramatic policy change towards fragmentation of the economy. Moreover, growth in trade among geopolitically distant blocs has started to slow relative to that among blocs, which is a warning sign of a reallocation of world supply chains along geopolitical lines (WTO 2023). In this new reality, geopolitics in its spatial and strategic aspects can no longer be separated from the discourse of international trade.

1.2 Problem statement

At the centre of this geopolitical reordering is an essential and under-theorized contingency, the geopolitical risk (GPR). Whereas the negative impact of war on trade flows is well documented, the effects of less visible and more pervasive risks associated with the threat of war, diplomatic disputes and terrorism are less well understood. These risks create an atmosphere of uncertainty which may act as an implicit tariff on trade and thus interfere with the movement of commodities, even in the absence of any formal barriers or active hostilities. An accurate description of the nature, size and temporal properties of this disruptive effect is therefore essential.

The main research problem identified in this research is the lack of a refined and empirically rigorous analysis of the role that dyadic geopolitical risk plays in determining bilateral trade. A lot of the literature isolates risk variables, ignoring the fact that trade is a bilateral interaction in which the risk perceptions of both trading partners are simultaneously relevant. Furthermore, the dynamic structure of the trade response channel to risk is still not clear. Do trade agreements decay instantly as soon as danger first materializes or do they deteriorate gradually over time as uncertainty builds up? What remains elusive to these questions by policy makers and enterprises is an unambiguous framework of analysis that may lead

to misguided policy interventions and inadequate risk mitigation measures in a context of increasing global instability.

1.3 Research gaps

This study seeks to address several gaps that remain underexplored in the existing literature on the relationship between geopolitical risk and bilateral trade flows:

The Dyadic Gap: Most of the literature conceptualises geopolitical risk as an exogenous shock that is country-specific. Nonetheless, trade is a dyadic relationship between exporter and importer, and simultaneous exposure of trading partners to higher risk may create compounded effects, which are ignored by one-sided metrics. The literature is thus characterised by a strong lack of investigation of such joint geopolitical risk shocks.

The Temporal Gap: The temporal dimension of geopolitical risk' impact is under-studied. Most static analytical frameworks do not distinguish between effects that appear instantaneously, those that appear with some delay, and those that appear over time. Thus, possible "phasing-in" effects, where adjustment proceeds gradually as a result of contract rigidity and sunk costs, are ignored.

The Linearity and Threshold Gap: A lot of the existing literature assumes a linear relationship between risk and trade. In practise, economic agents are likely to react non-linearly; they may only respond when risk exceeds some threshold level of severity. Such threshold-dependent non-linear effects have not been fully investigated.

Measurement and Usage Gap: The new news-based Geopolitical Risk Index constructed by Caldara and Iacoviello (2022) has not been adopted widely in trade research. Gupta et al. (2019) is an interesting exception; however, this analysis was limited by the index's restricted country coverage as well as a static modelling approach that compromised key fixed-effect controls.

1.4 Contribution of the study

This research aims to contribute to the international political economy literature by bridging the above gaps

Developing a Dyadic Risk Framework This work represents the pioneering creation and empirical testing of a dyadic geopolitical risk metric, which is only activated when both the exporter and the importer are concurrently facing a high-risk episode. The result shows that such an approach can provide more realistic, relational accounts of risk spreading across trade relations.

Illuminating Temporal Dynamics: Using a time dynamic panel data model with lagged effects, the analysis is able to move beyond static associations and plot the phasing in of risk influence. Findings reveal that it is not the case that the greatest trade reductions occur at the same time as each other, but with a lag of between one and three years - with important implications for forecasting and policy formulation.

Methodological Rigor and Enhanced Application: Implementing an updated version of the Caldara-Iacoviello GPR index in a theoretically motivated

structural gravity model estimated by Poisson Pseudo-Maximum Likelihood (PPML) and with a complete set of high dimensional fixed effects, this study provides a strong and causally identified evaluation of the GPR-trade nexus. The methodology controls for time-varying multilateral resistance and all-time invariant pair specific heterogeneity which mitigates omitted variable bias.

The study goes as follows: In Chapter 2, the theoretical underpinnings of the study are laid out by providing a systematic review of the literature on geopolitics, risk, conflict on different levels and trade. Chapter 3 outlines the empirical data set and analytical framework and includes the introduction of a gravity model and the construction of a new dyadic gravity-predictive-risk (GPR) variable. Chapter 4 presents the main empirical findings, starting from baseline estimations and moving towards the development of dynamic specifications that reveal the phasing-in effect that risk has on trade. Finally, Chapter 5 explains the implications of these findings, embraces methodological limitations, and ends in arguing the relevance of these findings for policy and decision-making.

Chapter 2 Literature Review

This chapter aims at developing a coherent framework on the relationship between geopolitical risk and bilateral trade flows. It tries to shed more light on the corresponding definitions, discuss the mechanics that lie behind the geopolitical risk impacting trade and the most suitable empirical framework in the analysis of the relationship between the two. Section 2.1 explains the concepts that are relevant and presents the key variable of GPR. Section 2.2 concentrates on the channel of uncertainty where geopolitical events affect trade flows and Section 2.3 concentrates on the reciprocal effect of the armed conflicts and wars. Lastly, Section 2.4 provides the development of the gravity model and how the political variables have been included into the model as a critical field of study.

2.1 Concepts and Definitions

2.1.1 Geopolitics

At its most naïve understanding, the term geopolitics can be considered as the study about geography and politics. Indeed, the term geopolitics was first introduced by Rudolf Kjellén in 1899, who described it as "the theory of the state as a geographical organism or phenomenon in space." Later, German Karl Haushofer specified this term as "a doctrine on the spatial determinism of all political processes, based on the broad foundations of geography, especially of political geography". Taken together, these arguments can simply explain that geopolitics is a geographical study of how politics interacts with other political entities.

Historically, geography has been inseparably associated with the concepts of space and destination which included aspects like resource endowment, strategic bottlenecks and maritime routes which defined the place and the strength of a nation. It is based on this that the term geopolitics was coined to refer to the process of competition among states towards their influence and dominance of territory. In a more recent perspective, Criekemans (2007) defines geopolitics as a disciplinary nexus between political geography and international relations, which focuses on the interconnection between political actors and their surrounding territoriality. This view is further supported by Cohen (2014), who views geopolitics as the analysis of interactions between geographical setting and perspectives and political processes. In his recent interpretation, Cohen states that that the concept of "geographical settings" has been broadened beyond its physical features include spatial patterns, multilayered regions and domestic and international forces that shape international behaviour. From the standpoint of critical geopolitics, O' Tuathail writes that "geopolitics does not refer to a single, essential meaning or identity; the discourse that geopolitics encompasses is culturally and politically diverse, describing, representing, and writing about geography and international politics." These views hold that contemporary geopolitics should be viewed as an evolving and dynamic field rather than a static and unchangeable definition. In conclusion, the primary purpose of the research on geopolitics is to comprehend the impact of geography and territory on political

authority, yet simultaneously it holds a consciousness that the meaning and practice of geopolitics is in its turn influenced each country's unique cultural, historical, and political context.

2.1.2 Globalization, De-globalization, and Geopolitical Risk

In academic discussions, globalization generally understood as the increasing integration of national economies and societies. Teitel (2005), for example, describes globalization as the "phenomenon of increased integration of the world economy," chiefly through the increasingly larger movement of trade, investment, and capital. In general academic consensus, there is little disagreement about its basic meaning. Globalization is generally understood as the process whereby countries have become more connected and interdependent, through such things as trade, finance, technology, and migration, to the point at which developments in one economy can more strongly influence others.

By contrast, de-globalization relates to a reversal or weakening of those links. Witt (2019) defines de-globalization as simply "the process of weakening interdependence among nations." In the practical sense, deglobalization means that countries rely less on each other on average (e.g. smaller trade/GDP or investment/GDP ratios) and back away from integration.

Crucially, the literature highlights that globalization is not an automatic process, but is contingent on politics and so it is possible for increased geopolitical risk or political tension to drive a deglobalizing turn. In theoretical and conceptual accounts, scholars point out that political forces are the "key driver of (de-)globalization." For example, Witt (2019) emphasizes that although technology might create opportunities for integration, "politics determines whether firms and individuals can take advantage of the opportunities". He argues that previous waves of globalization had stopped when governments stepped in for geopolitical reasons, rather than technological failure. Accordingly, modern deglobalization is often associated with geopolitical realignments. In his research, Witt sets out two competing theories: liberalism predicts that domestic political backlashes, such as labour or nationalist resistance, will stall globalization, while realism predicts that great-power rivalry (e.g. rise of China vs. U.S. hegemony) will lead states to form trading blocs and decouple.

Empirical and conceptual studies of globalization nowadays regularly include uncertainty at the political level. For instance, Zahoor et al (2023) document that the past few years have witnessed increasing trade protectionism, particularly in the US and Europe, which they interpret as a form of de-globalization. The literature describes this shift a "geoeconomic turn", in which economic instruments such as tariffs, export controls and subsidies have become increasingly used as tools of geopolitical strategy. Within this framework, the interplay between geopolitics, protectionism and inward-looking policies is seen to actively underpin the contemporary trends of de-globalization.

In conclusion, the academic literature describes globalization as increasing cross-border linkages and de-globalization as the retreat of these linkages. Importantly, most analyses of these do not see them as mere economic processes, but as politically embedded processes. Political tensions and uncertainty - whether from populist backlash or interstate rivalry - are recognized as among the fundamental forces that can reverse or slow globalization in theoretical frameworks. As such, geopolitical risk is not considered an incidental detail but

central to whether global integration moves forward or backward in contemporary models of the international economy.

2.1.3 Geopolitical Risk

There is not yet a single, uniform and commonly accepted definition of "geopolitical risk." Depending on the field and situation, the concept is subject to various interpretations. Here, it is analysed following the operational definition of the term suggested by Caldara and Iacoviello (2022), who created a quantifiable form of geopolitical risk on the basis of media reporting about geopolitical tensions, threats and conflicts. Different to a wide, dynamic idea of power struggles and competition over territories. The GPR index itself meant to capturing the uncertainty relating to the non-peaceful outcomes. Caldara and Iacoviello formally define GPR as "risk associated with wars, terrorist acts and tension between states that affect the normal and peaceful course of international relations", and develops this indicator on the basis of a tally of newspaper articles, using automated text-searchers of millions of articles from major English-language newspapers to count the number of articles that have talked about predefined geopolitical events and risks. The GPR is divided into two subindexes. The "Recent GPR" (1985-present) counts articles from 10 major outlets, including Chicago Tribune, Daily Telegraph, Financial Times, Globe & Mail, Guardian, Los Angeles Times, New York Times, USA Today, Wall Street Journal, Washington Post. While the "Historical GPR" series (1900–2019) uses archives of three papers including New York Times, Washington Post, and Chicago Tribune to extend the series back to 1900. Each month, the index computes the share of all published articles that discuss adverse geopolitical events and threats.

The method is based on a dictionary of keywords and query rules. Based on the original ideas of Saiz and Simonsohn (2013) and Baker, Bloom and Davis (2016), each article is classified as positive for geopolitical risk in case they include words in predefined sets that indicate the threat of conflict or an act of terrorism (e.g. "war" "conflict" "revolt" "threat" "tension" "risk" and so on). Caldara and Iacoviello identify eight categories of queries that include threats of war, disruption of peace, military buildups, threats of nuclear disarmament, threats of terrorism, and war initiation The excluded words (e.g. film, game, sports, price war, real estate, etc.) are also listed cautiously to prevent false positive hits that are not related to the geopolitical situation.

From its construction, the GPR index can captures both the perceived likelihood of new geopolitical events and the risk associated with the escalation of ongoing ones. Based on this intuition, the GPR index is further broken down into two subindexes: Geopolitical Threats (GPT) based on the articles that contain phrases like threat and concern regarding the extent, length, and impact of geopolitical tensions and Geopolitical Acts (GPA) that captures phrases that allude to the occurrence and the unfolding of war or bad events.

In term of applied international economics study, this index offers a significant development over previous conflict measurement. Traditional conflict variables, such as war, sanctions, or alliance collapse, are only records once such events have taken place, hence making them less effective for studying the build-up of uncertainty before such events. To overcome this limitation, geopolitical risk index provides an extra dimension of uncertainty, as it shows how much media believes there is a possibility of conflicts. This difference also fills a major

gap in previous studies in which these variables of interest lacked a consistent and real-time metric of geopolitical shocks. As Caldara and Iacoviello (2022) noted that "the importance of geopolitical factors in shaping macroeconomic outcomes has not been the subject of systematic empirical analysis" mainly because there is no long-run indicator of real-time geopolitical tensions. The index developed by the them to quantify the geopolitical risk based on newspaper coverage allows researchers to combine macroeconomic and trade models with measurable values of war and crisis risk in both econometric and structural models. In their original application, they found that that abrupt rise in geopolitical risk is likely to increase stock-market volatility and causes depression in equity and oil prices, followed by the consequences of approximately 1.5 percent drop in investment in a year and labour demand decrease about 0.6 percent. The geopolitical risk index has been a popular tool in empirical literature since its inception, with applications in investment behaviour studies, trade relationships, and corporate cash-holding positions (e.g., Demir et al., 2019; Gatzert and Vogl, 2016; Gupta et al., 2019).

After the establishment of the global GPR index, Caldara, Iacoviello and their colleagues also established country specific indices to measure the degree of exposure of individual countries to geopolitical events. They constructed forty-four national GPR series of major economies, which were also defined using the same methodology as global index, but with keywords added which were related to the name of the country, capital or major cities. Nevertheless, there are only three news sources (Chicago Tribune, New York Times and Washington Post) are used to calculate the indices.

Considerations and Bias in Measuring the GPR index

Although the GPR index has many advantages, there are several major limitations associated with it. The most notable problem is that it is highly reliant on English-language news sources, as a result, the findings are likely to be heavily biased towards Western, and, specifically, North American and British, perspectives. This dependence may result in insidious geographical and media bias, whereby regions that receive a relative lack of attention by international media appear to be more stable or more prone to conflict than the reality on the ground may actually warrant. These concerns are backed by Bondarenko et al. (2024) who have depicted that the values obtained by GPR through Russian language newspapers differ significantly in values between independent and state-owned sources in comparison to those obtained using English-language reporting.

The other weakness is in the capacity of the GPR index to differentiate between actual geopolitical occurrences and its anticipation. The growth of the GPR scores is, in most instances, not related to any actual geopolitical occurrences but is an indication of the heightened anxiety of the individuals or the heightened media coverage of the future crisis. This point was at least partly considered in the first Caldara-Iacoviello model which introduced a difference between geopolitical threats and geopolitical acts. Yet, the difference is not observable in the country-specific GPR indices employed in the research. In this regard, the measure used in this study can be an accompaniment measure of the reality of the conflict events and high-perceptions of risks, hence creating confusion in the determination of the boundary between realised shocks and expected shocks.

Lastly, as any form of key word-based indexing, this method of indexing is vulnerable to the dictionary and media coverage. Even insignificant but globally infamous diplomatic evolutions would lead to high GPR scores, and tensions that are not visible even on the strategic level of action would leave very little traces in the press. Though both Caldara and Iacoviello have proved that they are strong when it comes to their wording, noise and bias are bound to take place in any news-based index where language bias may be brought about either as a result of sensationalism or governmental propaganda. This brings up a crucial issue where this index would be more likely to capture the perception or discourse of the level of geopolitical risk, as opposed to the actual level of geopolitical risk.

2.1.4 From Geopolitics to Geo-Economics

While geopolitical analysis favoured a focus on spatial and military factors related to the determinants of state power, recent scholarship argued that economic tools are becoming more important as mechanisms of strategic influence. This confluence of political power and economic power is related to the concept of geoeconomics. First articulated by Edward Luttwak (1990), geoeconomics refers to the systematic replacement of economic quantity of military tools for the achievement of national objectives. Rather than advancing power by conquering territory, at present-day states use trade policy, control of investment, and technology regulation to reconfigure the international environment in their favour.

Geoeconomics is based on the assumption that there is no longer a mutually exclusive separation between markets and security. As global value chains have become increasingly complex, economic interdependence has become a new vulnerability. According to Blackwill and Harris (2016), states have turned to supply chains, financial systems and streams of data as a source of strategic rivalry. Their discussion alters the understanding of globalization not as an objective of market integration but as a field of statecraft in which even the interdependence itself is turned into leverage. Connectivity in the economy in this view does not mean that states are going to cooperate, it only opens loopholes that can be used politically. Farrell and Newman (2019) are further extending this reasoning through the concept of weaponized interdependence, showing how network centrality can allow dominant economies to use commercial and financial choke points, such as payment systems and key supply nodes, as a tool of coercion. In terms of trade, this interpretation emphasizes that vulnerability is relative: not merely a consequence of access to the world markets, but an unequal reliance in the markets.

As dyadic geopolitical risk does not operate solely through psychological uncertainty or media sentiment, rather it is also manifested in the strategic use of economic connections as instruments of influence. When bilateral partners view each other as potential strategic competitors, even without direct conflict, trade may suffer due to governments and enterprises anticipating that their economic relations become politicized.

Table 1Table 1 Summary of studies on the relationship of conflict and uncertainty and trade flow

Author(s)	Scope of Research	Time Period	Geographic Scope	Main Variable of Interest	Method used	Findings
Impact of Trade on Conflict and Uncertainty						
Polachek (1980)	Relationship between dyadic conflict and dyadic trade patterns	1958 to 1967	30 countries	Dyadic Net Conflict	Multiple Regression (OLS) and Two-Stage Least-Squares (TSLS) for causality	The relationship found is negative where the higher the level of trade the lower the level of conflict. Two-stage least squares estimation implied a causal relationship between trade and conflict, which means that the increase in trade by twice would cause conflict to decrease by over 30.

Gasiorowski & Polachek (1982)	Investigating the causal relationship between East-West trade and conflict/interdependence in the détente era	1967 to1978 (Quarterly data)	US–Warsaw Pact dyad	Net Conflict	Granger Causality Analysis	The causal relationship is massively trade to conflict in short periods of time, thus, supporting the liberal hypothesis that trade alleviates conflict.
Reuveny & Kang (1998)	Investigate the causal direction between total bilateral trade and political conflict/cooperation	1960 to early 1990s	16 individual dyads	Bilateral Conflict/Co-operation (weighted net conflict)	Granger Causality Tests	Causality is reciprocal, and contingent on dyadic relationship, and relies on the nature of goods. The trade of such commodities like food, beverages, and machinery is also more likely to cause conflict.
Oneal and Russett (1999)	Examines the liberal hypothesis	1950–1992	Global	Militarized Interstate Dispute (MID)	General Estimating Equation (GEE)	Economic interdependence is a significant factor that reduces conflict tendencies that exist between neighbouring states and between major power groups.

Keshk, Pollins, & Reuveny (2004)	Simultaneously modeling trade and Militarized Interstate Dispute occurrence to test the liberal peace hypothesis and causality direction	Wide spatial-temporal coverage	Global	MID	Simultaneous Equations	Trade did not have a discernible impact on the likelihood of conflict
Martin, Mayer, and Thoenig (2008)	Impact of MIDs on bilateral trade barriers	1950 to 2000	Global	MID	Simultaneous Equations	Bilateral trade reduces conflict, but multilateral trade openness increases the probability of conflict
Impact of conflict and uncertainty on trade						
Pollins (1989)	The effect of changes in state-to-state diplomatic relations on bilateral trade flows	1960 to 1975.	Six importing nations and 25 exporting nations	Weighted co-operation sent	Gravity Model using cross-sectional Ordinary Least Square (OLS)	Political ties significantly and continuously affect trade flows

Barbieri & Levy (1999)	Analysis of the short-term and long-term impact of war on dyadic trade	From1870	Seven dyads (non-major powers)	War Level	Interrupted Time-Series Model	War does not have a significant impact on trading relationships in most cases and often had no permanent long-term effect
Anderton and Carter (2001)	Impact of war on trade for major power and non-major power dyads.	Ten years before, during, and after the war	14 major power dyads and 13 non-major power dyads	War Level, War Trend, and Peace Level variables	Multiple interrupted time-series method	Major power war is associated with a decline in trade.
Nitsch and Schumacher (2004)	Effect of terrorism and warfare on international trade	1960 to 1993	200 countries	Different measurements of terrorist activities	Gravity model using fixed-effects (FE), random-effects (RE), Hausman-Taylor (HT), and Poisson Pseudo-Maximum Likelihood (PPML) estimation	Terrorist actions significantly decrease the volume of trade

Author	Focus	Period	Sample	Conflict Measure	Method	Key Findings
Glick and Taylor (2010)	Examination of the indirect costs of war, focusing on the effect of belligerent conflict on international trade volume	1870 to 1997	902 pair-year observations	Binary Militarized conflict/War variable	Gravity model with Country-Pair Fixed Effects estimation	Wars have large and persistent destructive impacts on trade
Bandyopadhyay, Sandler and Younas (2018)	Effects of domestic and transnational terrorism on trade, disaggregated by product type	1995 to 2012	151 countries	Domestic terrorism and transnational terrorism from the Global Terrorism Database (GTU)	Augmented gravity model using Pooled Cross-Section and Country-Pair Fixed Effects models	Terrorism has marginal or no significant influence on the overall trade of primary products, but significantly reduce the overall trade of manufactured goods
Gupta, Gozgor, Kaya, & Demir (2019)	Effects of Geopolitical Risks (GPR) on trade flows	1985–2013	164 countries	Country-specific GPR index for 18 countries	Gravity model using FE, RE, HT, PPML estimation	Geopolitical risks negatively affect global trade flows
Li, Jian, Tian, & Zhao (2021)	How generalized political conflicts affect Chinese imports.	Not specified	China as an importer and its trading partners	Goldstein score of conflicts	Panel estimation techniques using PPML	Political conflicts reduce Chinese imports in general

Afonso, António, et al. (2024)	The effects of World Uncertainty (WUI) and GPR on export and import ratios over GDP for	1995–2023	31 European economies	GPR and World Uncertainty Index (WUI)	Panel estimation techniques using OLS and PPML	European nations predominantly respond to rising global uncertainty and GPR by concentrating their exports and imports among their top 5 trading partners

Source: Author synthesize

Based on the summary of studies provided in Table 1, the following sections will take into account the relationship between geopolitical risk, uncertainty, and conflict, and the global trends of trade. The existing literature reports a feedback relationship between uncertainty, conflict, and trade. The discussion is divided into three sections. First, the effects of uncertainty on international trade are analysed. Second, effects of wars and conflicts on international trade are directly discussed and the position of trade in fostering peacefulness. Finally, the structural gravity model of trade is presented as a perfect model of studying these complicated relations between trade and geopolitics.

2.2 Uncertainty and Trade flows

The difference between risk and true uncertainty is traced back to the idea of Frank Knight (1921), who made a fundamental separation between the two concepts. Risk is said to be those cases when probabilities are measurable, whereas true uncertainty is defined as situations which cannot be predicted and quantified. In the context international economics, uncertainty can be represented analogous to a rise in trade barriers or costs. When the probabilities are unknown, firms and states adapt and no longer act as profit optimisers which aim to maximize their profit but rather as cautious decision-makers, who seek to minimum the possible loss.

Unlike tariffs or exchange rates, variables that can be modelled and forecast, geopolitical shocks are more likely to belong to Knightian uncertainty. Their probability is not fixed and an abrupt change in policy or a regional war of a trade partner or a regime of sanctions can change the conditions of trade overnight. In such environment, uncertainty acts as implicit trade cost which prevents transactions not only in the case of formal barriers but also in the absence of such blockades.

In this section, the main theoretical and empirical ways in which uncertainty, in particular, political or geopolitical, influences international trade flows will be reviewed. The argument is developed in three perspectives, i.e. investment decisions and sunk costs by firms, financial constraints and risk-aversion, and inventory management in volatility.

2.2.1 The Real Options Theory and Sunk Costs

A major contribution in the current trade theory is that firms' decision to export is usually irreversible. Expanding into international markets can be expensive in form of fixed costs, e.g. establishing distribution channels, localizing products to suit local tastes, or complying with regulatory requirements. These sunk costs can increase the reluctance of firms to invest in foreign markets when uncertainty increases. This intuition was formalised in an option value theory by Avinash Dixit (1989), who suggest that when there is high uncertainty, firms would delay or abort irreversible investments to avoid an opportunity cost of making an expensive error. At a similar time, Baldwin (1988) introduced the concept of trade hysteresis, which was developed in Baldwin and Krugman (1989), as an extension of the option value model of Dixit to the domain of international trade. Their model demonstrates that changes in uncertainty can have significant and long-term impacts on the decision by firms to enter or leave the international market. For example, when a country that is currently at peace

is confronted with an increasing risk of war or sanctions, exporters can avoid entry even when there is a short-term profit opportunity because the threat of incurring losses in the future makes such entry suboptimal, when sunk costs are taken into account.

On the other hand, as uncertainty declines and trade barriers are eliminated or diminished, companies will be more likely to go global. The model of trade policy uncertainty by Handley and Limao (2017) demonstrates this dynamic: after the accession of China to the World Trade Organization (WTO), the decrease in uncertainty stimulated the emergence of numerous new exporters, leading to an overall increase of over 30 percent in the total trade. Their conclusions reflect the opposite reasoning of Dixit, where uncertainty is reduced, firms that were reluctant to join global markets had to get back in the market and led to high trade flows.

2.2.2 Risk Aversion and Financing Constrain, and the "Wait and See" Equilibrium.

In addition to the firm-level investment delays attributed to the real options theory, uncertainty can also initiate strong aggregate financial and behavioural responses. The first reaction is the systemic "wait and see attitude", in which companies put off exporting and foreign investments in demand of the possibility of the trade shock. This kind of uncertainty, as established by Nicholas Bloom (2009) is regarded as second-moment shock which not only paralyses investment, but also distorts the behaviour of firms in the form of pricing. With the uncertainty of possible shifts in policy, tariffs, or fluctuations in the exchange rate, companies prefer to charge more to hedge the possibility of future cost escalation or demand crashes, which further suppress demand and may trigger the economic downturn on a larger scale.

The same tightening of financial conditions adds to this climate of hesitation. Lenders, insurers and export-credit agencies, also realize that they are facing an increased risk, and respond proactively by increasing risk premiums, lending to businesses, or by completely withdrawing trade finance altogether. This directly affects the cost of trade by making freight rates, war risk insurance and insurance rates more expensive, especially when the shipment is done to the conflict zones. The 2014 crisis in Ukraine provides an example of this dynamic: the fall in exports by the Western countries to Russia was motivated not only by diminished Russian demand, but also by an all-pervasive rise in perceived country risk, which rendered transactions prohibitively expensive and complicated. This mutual reinforcement between behavioural caution and financial constraint generates a vicious circle, which imposes more macroeconomic effects of underinvestment, liquidity constraints and a slower recovery in trade way after the initial shock has passed.

2.2.3 Inventory Management

The third channel, the inventory management framework, describes the reason why the uncertainty shocks generate an over-sizable fall in international trade relative to domestically produced goods. This theory, which focuses on the inventory-adjustment behaviour of companies, was originally inspired by the work of Bloom on uncertainty and formalized to be used in the trade by Novy and Taylor (2020). In cases where future demand is uncertain, firms focus on

minimizing stock. They however reduce foreign input orders more than the domestic orders. The reason behind this bias is that international shipments have increased fixed costs, longer lead times, and greater exposure to logistical disruption (e.g. delay at the customs, transport bottlenecks). It is therefore more dangerous and irreversible to commit to a foreign order in a volatile environment.

The Great Trade Collapse of 2008-09 is an empirical vindication of this process. Novy and Taylor (2020) revealed that the world trade volumes declined almost twice in comparison to the industrial production. This imbalance arose due to the companies maximizing their own economic interests which resulted in them reducing their risky international purchase of intermediate inputs more than the domestic order. The micro level rational inventory management increased the contraction and recovery of international trade flows on the macro level. In turn, this framework points out the fact that uncertainty shocks are not only a financial phenomenon but entrenched in the structure of physical and logistical systems of world supply chains.

2.4 Summary and Implications

To conclude, uncertainty in the context of global trade act as both a behaviour and structural force. It is a by-product of partial information that are compounded by financial, logistical structures and long remains after the initial shock. There are three fundamental insights presented in the literature:

- Entry to foreign markets is an expensive choice taken by firms, which is irreversible. In cases of uncertainty, the logical decision is to "wait and see".
- Lenders and insurers react to uncertainty faster than producers, inhibits trade even with no formal barriers in place.
- Global trade is more responsive to uncertainty as compared to domestic activity due to adjustment in inventory and sourcing.

These channels suggest that uncertainty is a kind of concealed tariff of expectations that can change trade patterns not through the explicit policy and regulation but through changes in psychology and perception, and probability.

2.3 The relationship between Conflict, War and Trade flows

Having discussed uncertainty as a possible channel for geopolitical disruption, this section focuses on the direct consequences of real conflicts and wars on international trade. The relationship between conflict, war and trade flows is widely documented in both economic and political theory and is characterised by a strong, negative and persistent reciprocal interaction: conflict considerably disrupts trade flows, while, conversely, trade interdependence generally acts as a powerful deterrent to conflict.

2.3.1 The Liberal Peace hypothesis

The Liberal Peace Hypothesis is the idea that economic interdependence and democracy will lower the probability of conflict between states. The underlying rationale is that conflict will have detrimental effects on bilateral trade, and eventually, the economies of both countries. National leaders, who are assumed to be rational actors, will not engage in a war because their welfare will be significantly decreased. One of the first empirical confirmations of the premise is a model developed by Polachek (1980), in which he modelled the relationship between trade and conflict within a micro economic model. The findings showed that, on average, a doubling of trade is related to a 20 per cent drop in hostility between states. Subsequent work by Oneal and Russett (1999), supported the "commercial peace" hypothesis finding that trade intensity decreases the likelihood of militarised disputes, especially between the "politically relevant dyads."

Although the weight of evidence favours the premise of trade disruption, Barbieri and Levy (1999) offer a contrary argument from a realist perspective of economic interdependence that does not ensure peace. They assume that states are more interested in relative gains, which can lead at least one belligerent to terminate trade in an effort to prevent their adversary from using gains from trade to increase its military power. If these relative-gain concerns exist during peacetime, then they are expected to be even higher during wartime, making this led to less or no trade between hostile states.

Martin, Mayer, and Thoenig brought another nuance to the Liberal Peace Hypothesis in 2008, analysing the trade-off effect between bilateral and multilateral trade and its impact on the intensity of conflict. Their results showed that, greater bilateral trade openness decreases the probability of escalation to war, as higher bilateral dependence raises the opportunity cost of conflict between trading partners Conversely, greater multilateral openness in trade is linked with greater intensity of conflict in bilateral trade. As nations seek for a greater number of trading partners, their specific dependency on any one partner decreases, and there is less incentive for such trading partners to maintain peaceful relations. In the context of the globalization process, which is characterised by expanding both bilateral and multilateral trade, a mixed net effect emerges: globalization potential for increasing the probability of bilateral conflict by roughly 20 percent for states that are most likely to have disputes over borders or resources, at the same time reducing the probability of larger scale and global level conflict.

In conclusion, the liberal mechanism seems dependent on certain circumstances. Trade may be a way to build peace if economic relationships are sufficiently deep and exclusive that the cost of conflict is high on both sides. Conversely, in the case of diffuse and replaceable interdependence this effect weakens. The stability of trade networks is not only dependent on the volume of exchange but also on the nature of the relationship and the credibility between nations.

2.3.2 The impact of Conflict and War on Trade flows

The second premise of the liberal paradigm is based on a clear inverse logic: if economic interdependence creates peace, then war and conflict should, in turn, severely disturb trade. Conflict, whether global or localised, tends to destroy

flows of trade, drive up the transaction costs and undermine the institutional trust on which international exchange depends.

A landmark study in this area is by Glick and Taylor (2010), who applied a quantitative gravity model to data spanning 1870–1997 to estimate how wars affect international trade flows. They estimated how war affected bilateral trade between belligerents and looked at all international conflicts, including regional conflicts and World Wars. The results demonstrated that wars have significant and long-lasting detrimental effects on global trade. Trade between two adversaries at war typically falls by over 80 percent relative to its peacetime level. The estimated contemporaneous coefficient for World War I implies a decline in trade of 96 percent, and World War II implies a similarly high decline of 97 percent between adversaries, indicating trade was almost totally destroyed. Such dramatic collapse is intuitive: warfare is often the cause of embargoes, destruction or blockade of transport routes, and a general breakdown of commercial confidence. Importantly, Glick and Taylor demonstrate that the consequences of war are long-lived. Even after the hostilities have ended, trade is maintained at a much lower level than before the war for years. They found statistically significant negative effects persist for up to eight years after peace is restored and the cumulative loss in trade over a decade is nearly four times the immediate loss during the war. Recovery is particularly slow after major conflicts, where physical infrastructure, contractual networks and institutional credibility all have to be restored from virtually nothing. Furthermore, the effects of conflict can go beyond the involved countries. Large-scale conflicts frequently generate negative spillovers on neutral nations and the international trading system as a whole. Glick and Taylor argued that trade decreased during major wars even with neutral nations, primarily due to increased risks and soaring insurance premiums, trade finance and shipping expenses and also the increased international unpredictability.

In addition to interstate wars, another body of research examines lower-intensity conflicts, including civil wars, insurrections, terrorisms and their impact on trade. Martin, Mayer, and Thoenig (2008) studied the impact of civil wars on bilateral trade and found that "trade destruction due to civil wars is very large and persistent", increasing with the severity of the conflict. During a civil war, ports and roads may be destroyed, production declines, and the country's institutions and contracts are in turmoil, hence raising the cost of both exporting and importing. They documented that on average, a civil war reduces a country's trade by 20-40 percent, and more intense conflicts with longer or with higher casualties led to even larger trade collapses. In the case of terrorist attacks, Nitsch and Schumacher (2004) found evidence that a doubling in the number of terrorist incidents is associated with a decrease in bilateral trade by about 4 percent. Their results also indicated that terrorism's impact on trade was more pronounced for exports than for imports. In a later study, Bandyopadhyay et al. (2018) identified different origins of terrorism and their varying effects on trade components and found that both domestic and transnational terrorism significantly reduce the overall trade of manufactured goods, whereas terrorism has only a marginal or insignificant effect on the trade of primary products.

These empirical evidences indicate that wars, violent and political instability are not only directly destructive and severing pre-existing trade links, but also deeply corroding the institutional and psychological foundations of exchange. The durability of the post-conflict trade losses sends the crucial message

that a return to trust and to connectivity is much slower than the process of disruption itself. Peace is a relatively gradual process of increasing interdependence, while conflict is a sudden and lasting process of destroying such interdependence. Moreover, due to the spillovers over to neutral countries, globalization increases rather than provides a conducive context for containing the economic consequences of war.

2.3.3 The reciprocal relationship between trade and conflict

From the above arguments, the interaction between trade and conflict can be concluded as a strategic feedback loop. On one hand, trade may lower the likelihood of conflict. On the other hand, when tensions persist or escalate, they tend to suppress trade flows, the degree of this reduction depending on the intensity and duration of the conflict. While the reciprocal relationship between conflict and trade is widely acknowledged, identifying the direction and relative strength of these causal links remains challenging due to issues of reverse causality and omitted variable bias.

Early attempts to analyse the trade–conflict relationship simultaneously produced puzzling results that while conflict was found to reduce trade, trade did not lower the likelihood of disputes, supporting the primacy of politics view (Keshk, Pollins, and Reuveny, 2004; Gasiorowski & Polachek, 1982).

Subsequent work Hegre, Oneal, and Russett (2010) later resolved this puzzle by demonstrating that the challenge to the liberal peace derived from inadequate model specification in previous studies. They argue that both conflict and trade are heavily influenced by nations' sizes and their geographic distance, the core elements of the gravity model. Omitting these exogenous factors from the conflict equation caused trade to acts as a proxy, leading to spurious correlation. By properly modelling these factors, they re-established strong support for the liberal peace, confirming that trade promotes peace and conflict contemporaneously reduces commerce. Moreover, the simultaneous coefficient of trade in the conflict equation was found to be even larger in absolute magnitude than in simpler models, demonstrating that prior research had not overstated the benefits of economic interdependence.

However, this general pattern is not uniform across all contexts. Domestic politics and the nature of the goods traded can alter how interdependence translates into peace or rivalry. Trade in certain strategic commodities, such as minerals, fuels, and basic manufactures, may show a stronger causal relationship between conflict to trade. While causality from trade to conflict is slightly more common in goods like food and machinery (Reuveny and Kang, 1998). This pattern implies that the economic and strategy importance of traded goods can shape how interdependence turn into national political decision. While trade in non-strategic goods tends to promote cooperation and stability, essential or security-sensitive commodities are more likely to escalate geopolitical tensions.

To conclude, the trade-conflict nexus is a feedback mechanism, in which a trade tends to enhance peace and conflict always damages trade, yet these relationships are very context-specific. The liberal peace hypothesis has been confirmed by methodological developments, but the extent to which it is applicable depends on the nature of goods and the political environment. The evidence highlights that the potential of trade being used as a peace-building tool is opti-

mized when economic relations are deep, inclusive and founded on non-strategic products whereas strategic trade should be handled with diplomatic care in order to prevent an escalation. Thus, policymakers ought to focus on promoting various trade relationships and enhancing institutional trust to counter the threat of war since trade by itself is not enough without political collaboration.

2.4 Structural Gravity Framework and the Integration of Political Variables

2.4.1 The Traditional Gravity model

Over the past few decades, the gravity model of trade has become a central theoretical framework, a "workhorse" for analysing how various factors such as distance, size, or tariffs, determine trade flows. Since Jan Tinbergen's (1962) pioneering analogy between trade and Newtonian gravity, the framework has evolved from a simple empirical model to one of the most theoretically grounded one in applied trade studies.

In its simplest form, Tinbergen's formulation assumed that bilateral trade between two independent states increased in proportion to the product of the economic sizes of the two trading states and decreased in proportion to the geographic distance between them. The intuition behind it is simple: larger economies have more productive capacity and more market demand, which leads them to have higher trade flows; the higher the distance, the higher the transportation costs, informational costs and cultural costs, so the higher the cost of exchange, as far as exchange is concerned.

The specification was enriched over the years with other bilateral determinants, such as language similarity, common boundary, colonial ties and existence of trade agreement, without damaging its basic logic. Even though the conventional gravity model has been empirically effective, some theoretical limitations have weakened the robustness of this model. For a long period, it was missing a consistent general-equilibrium foundation that combined the structural determinants of trade, that is production, consumption, and demand changes, with the empirically observed relationships. Moreover, initial specifications proved unsuitable to account for the presence of zero trade flows, heteroskedasticity and the pluralistic institutional and political mechanisms whereby trade costs are operationalised.

2.4.2 From Empirical to Structural Gravity

Early applications of the so-called "naïve" gravity model were largely interpreted as estimating average partial effects, not theoretically-consistent trade shocks. Without an explicit general-equilibrium structure, the traditional approach could neither capture the propagation of political or policy shocks in one economy through international trade links nor explain how changes in national policies or institutions change a country's overall trade resistance.

In the late 20th and early 21st centuries, scholars began to recognize that conventional gravity equations often produced biased estimates as they lacked solid theoretical underpinnings. In response, the structural gravity framework became a more rigorous and consistent alternative and put the gravity model on

a micro-economic and general equilibrium theory foundation. A significant turning point in the development of the gravity model was the paper by Anderson and van Wincoop (2003) which shifted gravity analysis away from a descriptive correlation and towards a model derived from theory and based on expenditure-minimizing behaviour under the constant elasticity of substitution (CES) preferences. Apart from the traditional gravity approach, their model showed that trade between two regions is determined not only by the bilateral trade barrier between them but also on barriers relative to the average trade resistance the two regions face with all of their trading partners. This average trade barrier is referred to the concept of Multilateral Resistance (MR), represented by inward (Φ_n) and outward (Ω_i) resistance terms in the structural model. They argue that the more resistant a region is to trade with all other partners, the more it is "pushed to trade with a given bilateral partner". Omitting the MR term in earlier studies was widely referred to as the "gold medal mistake" of gravity estimation before the work of Anderson and van Wincoop.

Empirically, the modern implementation of structural gravity achieves the control of MR by using exporter- and importer-time fixed effects, which absorb shocks that are specific to countries, such as changes in productivity or macroeconomic factors or changes in institutions. This innovation helps researchers to isolate the within-pair variation in the gravity model, allowing for a more precise estimation of how their variable of interest influences bilateral trade flows. Because of this robustness, gravity modelling has been successfully extended from the modelling of trade in goods to explain a wide range of bilateral interactions, such as migration, foreign direct investment (FDI), and portfolio flows. For example, Martin, Mayer and Thoenig (2008) used this framework to study the effect of civil wars on trade. Their study allowed them to achieve two main goals: first, empirically confirming that conflict has a significant disruptive effect on trade, and second, differentiating how different types of trade interdependence can either decrease or increase the probability of conflict.

2.4.3 Integrating Political Variables in Gravity Models

Political economy variables enter gravity models typically as part of the trade cost term or as country-specific traits that affecting trade between economies. For instance, Glick and Taylor (2010) studied interstate conflict between countries i and j using a dummy variable equal to 1 when both countries were entering a war. By including both current and past war indicators in their gravity regression, they found strong and lasting negative effects of war on trade. Similarly, researchers often use dummy variables or indices to show the severity of international sanctions. Crozet and Hinz (2020) employed a gravity model that incorporated dummies for sanctioned country pairs to study the Russia-Ukraine crisis and found evidence of significant drops in trade when sanctions were imposed. Similarly, Kamwela, Binyam and van Bergeijk (2024) examined the influence of physical borders using a dummy variable labelled as Wall which is equal to 0 in the absence of a border wall or fence between countries and 1 in the event that one exists. Their results showed that the presence of a wall has a highly significant negative effect on trade flows.

However, the approach is not without limitations. Political variable such as the GPR tend to have problematic measurement error, endogeneity and little temporal variation, particularly when relying on indices or qualitative assessment.

As mentioned above, these problems are likely to cause causal inference. In order to mitigate miscalculation, the empirical analysis below will include several robustness checks and alternative specifications of geopolitical risk to make sure they reflect the accurate bilateral responses.

Chapter 3 Data and Empirical Strategy

3.1 Econometric model

Following the structural gravity framework developed by Anderson and van Wincoop (2003) and formalized for empirical use by Yotov, Piermartini and Larch (2016), this study employs an augmented structural gravity model to estimate how geopolitical risk influences bilateral trade flows:

$$T_{ij,t} = \exp\left[\alpha_{it} + \delta_{jt} + \beta_1 GPR_{ij,t} + \beta_2 Z_{ij,t}\right] + \varepsilon_{ij,t}, \quad (1)$$

$$\text{where}$$

$$T_{ij,t} = E_{ij,t} / (Y_{it} * Y_{jt}).$$

Where $E_{ij,t}$ denotes nominal exports (in USD) from country i to country j in year t. Y_{it} and Y_{jt} are real GDP of exporter and importer in year t. This normalization aimed to accounts for both partners' market size and aligns with theoretical expectations from the structural gravity model (Kamwela, Binyam, and van Bergeijk, 2024; Yotov, Piermartini and Larch, 2016). The transformation also helps address the issue that the variance of trade flows tends to increase with the GDP of trading countries, thus improving estimation efficiency.

α_{it} and δ_{jt} are exporter-year and importer-year fixed effect, respectively. $GPR_{ij,t}$ is the joint spike geopolitical risk index of country i and j in year t. $Z_{ij,t}$ is the vector of a set of time-invariant bilateral controls including distance, contiguity, common language, and colonial ties.

The empirical approach follows a structural gravity model specification. Exporter-year and importer-year fixed effects are included in order to absorb country-specific factors in each year such as changes in productivity, macroeconomic conditions or domestic policy. This approach ensures that the estimated effects of geopolitical risk are identified from time-varying variation once all standard gravity determinants are controlled for.

All estimations are conducted using the Poisson Pseudo-Maximum Likelihood (PPML) estimator, which is now considered the benchmark for gravity models. PPML provides consistent estimates in the presence of heteroskedasticity that typically biases log-linear OLS specifications and accommodates zero trade flows without data transformation. Estimating trade flows in their original level form also preserves the multiplicative structure implied by the structural gravity framework, ensuring theoretical coherence between model and estimation. Furthermore, PPML assigns observation-specific weights based on predicted trade values, reducing sensitivity to extreme outliers and allowing large and small trade pairs to contribute proportionally. To address potential serial correlation, standard errors are clustered by dyad, capturing unobserved bilateral shocks that persist over time.

This specification aligns with the goal of this research is to identify how joint geopolitical tensions, rather than a one-side isolated shocks, affect bilateral trade flow. The use of bilateral GPR interaction term help recognized the rela-

tional nature of trade that the cost of uncertainty depends not only on one country's risk but also on how both trading partners simultaneously perceive and respond to that risk.

3.2 Sample and data sources

The empirical research incorporates multiple internationally recognised datasets to explore the nexus of common geopolitical risk and bilateral trade. The main information on trade is based on the BACI International Trade Database, developed by CEPII. BACI reconciles trade statistics reported from the point of view of exporters and importers through a mirror flow methodology; thus, discrepancies are harmonized. This data set is especially suitable for conducted dyadic relationship analysis because it provides consistent bilateral flows over time, in current U.S. dollars. For the current research paper, bilateral trade flows between the forty-four countries of the period from 1991 to 2019 is extracted. The structure of this dataset is a reflection of real economic exchanges that are undertaken by businesses under different degrees of uncertainty and are therefore a concrete representation of how risk perceptions manifest into outcomes.

The main explanatory variable of GPR, comes from the index built by Caldara and Iacoviello (2018). This index measures the intensity of news reports on geopolitical tensions, wars and terrorist threats in the newspapers. A major notation is that this index does not reflect conflict, but rather the salience of potential conflict in public and policy discourse. A higher GPR value signifies that decision-makers and investors are operating in an environment overloaded with uncertainty, which may affect their trade-related decisions even in the absence of any concrete changes in their policies.

Most of control variables are extracted from CEPII's Gravity Dataset, including geographical distance, shared language, colonial ties, contiguity, and regional trade agreements. While real GDP data for all countries are obtained from the Penn World Table datatset (PWT, version 11.0).

Table 2 Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Adjusted trade flows	54,488	4.08e-06	.000016	2.66e-12	.0014558
GPR_{90}	54,868	0.164722	0.370933	0	1
Ln Distance	54,868	8.654125	0.906848	5.159055	9.893741
Ln real GDP of Exporter	54,868	13.5123	1.283722	8.805518	16.83947
Ln real GDP of Importer	54,868	13.5123	1.283722	8.805518	16.83947

Contiguity	54,868	0.041226	0.198815	0	1
Colonial relationship	54,752	0.026483	0.160568	0	1
Common language	54,868	0.086681	0.281369	0	1
RTA	54,868	0.252351	0.434366	0	1

Table 2 reports the summary statistics of all variables. The average size-adjusted bilateral trade flows are very small and go across a large number of orders of magnitude, which are heavily influenced by the economic size of countries both in the sample. The GPR_{90} dummy (an indicator that is equal to one when the annual GPR index of both country of trade is exceeds the 90th percentile) has a mean value of 0.165 meaning that only an average of 16.5% of exporter-importer-year pairs have a high-risk period. The distributions of geographic and institutional controls are as expected: the log-distance mean is associated with an average distance of 5,766 km, contiguity is 4.1 percent of pairs, common language is 8.7 percent of pairs, and membership in the RTA is true of 25.2 percent of pairs.

Table 3 Correlation matrix

	Adjusted trade flows	GPR_{90}	Ln real GDP of Exporter	Ln real GDP of Importer	Ln Distance	Contiguity	Colonial relationship	Common language	RTA
Adjusted trade flows	1								
GPR_{90}	-0.0103	1							
Ln real GDP of Exporter	-0.1329	0.0198	1						
Ln real GDP of Importer	-0.1329	0.0200	0.0173	1					
Ln Distance	-0.2629	0.0032	0.0173	0.0181	1				
Contiguity	0.2214	0.0176	0.0297	0.0296	-0.3928	1			
Colonial relationship	0.0025	0.0148	0.0580	0.0579	-0.0074	0.0326	1		
Common language	0.1855	0.0262	-0.0195	-0.0197	-0.1042	0.1711	0.3289	1	
RTA	0.1547	0.0261	-0.0049	-0.0053	-0.5735	0.1978	-0.0115	0.0622	1

Table 3 shows the correlation matrix of the key variables. The results of the correlations between the standard gravity covariates are expected: adjusted trade flows have a negative correlation with distance and a positive correlation with contiguity, common language, and RTAs. Importantly, the dyadic GPR$_{90}$ indicator has very low correlation with the adjusted trade flows as well as with all other covariates of gravity. This implies that there is no strong linear relationship between high geopolitical risk events and either size or geographic traits of a country in our sample, which eliminating preliminary fears on multicollinearity.

3.3 Constructing the main Geopolitical Risk variable

In this study, GPR data were aggregated to annual averages per month in order to match the temporal structure of trade flows. To capture bilateral exposure to geopolitical tension, this study uses a dyadic indicator that turns to 1 only when both trading partners experience an adverse GPR episode within the year. This emphasizes concurrent, tail-risk conditions rather than smoothing away crises with country averages.

Let GPR$_{i, m}$ be Caldara–Iacoviello's monthly country-specific index for country i. Country i is classified as being in adverse GPR in year t and assigned a value of 1 if at least one month in that calendar year satisfies:

$$GPR_{i, m} \geq Q_{0.90}(GPR_i),$$

where $Q_{0.90}(GPR_i)$ is the 90th percentile of country i's long-run monthly GPR. This within-country thresholding makes the definition scale-free and robust to cross-country media intensity differences. A spike is exceptional for a country and avoid merely high in absolute terms.

For each ordered pair (i,j) and year t, the bilateral GPR dummy is:

$$Dyadic\ GPR_{ij, t} = HighGPR_{i, t} \times HighGPR_{j, t}.$$

Thus, Dyadic_GPR$_{ij, t}$ = 1 only when both exporter and importer had at least one spike month during year t. This construction help isolates periods of mutual geopolitical stress, when bilateral trade faces the most severe combined obstacles. By focusing on upper-tail months, this measure effectively spikes up during world important shocks, while also identifying major interest ate tensions that, though short of declared war, substantially elevate bilateral risk. The 90th percentile cutoff is chosen to focus on meaningful but not excessively rare events. Robustness checks examine alternative thresholds including the 85th and 95th percentiles thresholds.

This percentile methodology allows for comparative analyses against different national baselines that differ in levels of heterogeneity and can identify outstanding risk periods in the context of each of their partners. The dyadic design is also consistent with the study's main premise that international trade depends

on mutual confidence; and in the face of instability perceived by both counterparts, the expected continuity of trade is muted. Utilization of the GPR index offers a number of analytical benefits: it measures risk through inputs in terms of information, as opposed to observable outcomes, provides monthly resolution, and has a high degree of reproducibility.
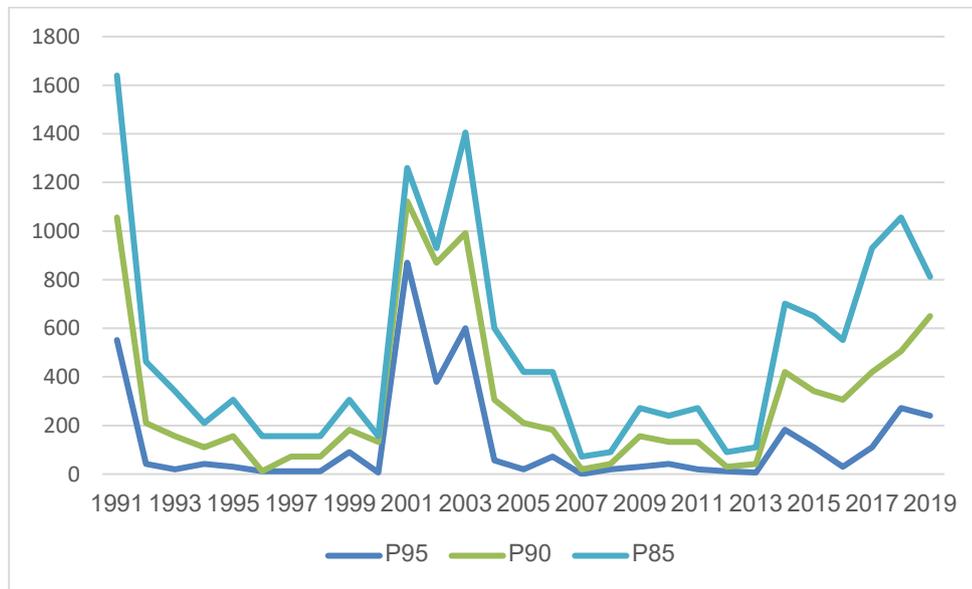

Figure 1 Frequency of GPR spikes of different GPR measurements

Source: Author's calculation

This figure shows a comparative analysis of the yearly incidence of country pair dyads experiencing joint high geopolitical risk episodes, according to three different percentile thresholds, i.e. the 85th, 90th and 95th percentile of the country specific GPR distribution. Each line plotted represents the number of dyads in which both countries involved contain GPR values that exceed the percent criterion set out for the particular calendar year. The three series follow a generally similar trajectory, but differ in both magnitude and fluctuation. The P85 series accounts for a larger number of joint risk dyads per year, which is consistent with the implications of a less stringent threshold, while the P95 series only accounts for the extreme and rare occurrences. The intermediate P90 series falls in between these two extremes, thus providing a trade-off between spatial coverage and intensity.

Across all percentile thresholds, the visualization presents the episodic nature of elevated risk, with these spikes often clustering around major global crises and periods of heightened tension. The first intensification in the dyadic GPR measurements takes place in about 1991 when the Gulf War and the corresponding geopolitical realignment happened, following the end of the Cold War. Within this period, nearly all thresholds, show significant increases in the level of high-risk dyads, indicating that increased uncertainty was both pervasive and contemporaneous across a significant number of economies. This observation is in line with the global GPR index according to Caldara and Iacoviello (2022), which is also at a peak during this period of time as the international system was adjusting to a unipolar configuration and regional conflicts escalated in the Middle East and Eastern Europe.

The second and most pronounced peak arises in the time period 2001-2003, coinciding with the 11 September 2001 attacks and subsequent security measures at the global level, in particular the military intervention in Iraq and Afghanistan led by the USA. The overlap with Caldara's global GPR index is clear – both metrics reflect an unprecedented rise in perceived geopolitical uncertainty due to the expansion of counter-terrorism policies and realignment of alliances. The dyadic approach, however, emphasises the fact that the surge was not involved by a number of important powers: the elevated risk came to be shared jointly across a number of bilateral relationships thus creating systemic exposure within the global trade network.

After 2004, all series contain a sustained decline, implying temporary stabilization of the international security environment. Nonetheless, the P85 measure identifies a number of smaller waves of increased risk. A modest rebound in around 2008 is related to the Russia - Georgia conflict and energy security concerns in Eurasia. A more obvious resurgence can be seen in 2014-2015 coinciding with Russia's annexation of Crimea, and renewed Middle Eastern conflicts linked to the rise of ISIS. These events are also coincident with a secondary peak in the Caldara GPR index, emphasizing a geopolitical risk diffusion on a global scale, rather than only locally.

Overall, temporal matching of the dyadic and global indicators of GPR confirms that both observe the same geopolitical episodes but from a different analytical perspective. While the Caldara index measures aggregate sentiment worldwide, the dyadic measures identify synchronous exposure across trading partners - exactly the type of risk most relevant, in the context of analysis of bilateral trade.

Chapter 4 Empirical Results

This section begins by estimating Equation (1) using the standard PPML approach, exporter-year and importer-year fixed effects are included to absorb time-varying multilateral resistance and country-specific shocks. The latter part of this chapter addresses several potential issues associated with this estimation and outlines a series of robustness checks designed to account for endogeneity, reverse causality, and potential biases in the construction of the GPR variable.

4.1 Standard approach

Table 4 Baseline gravity estimates with PPML

	(1)	(2)	(3)	(4)	(5)	(6)
Ln Distance	-0.785***	-0.785***	-0.824***	-0.773***	-0.828***	-0.943***
	(0.051)	(0.051)	(0.044)	(0.051)	(0.054)	(0.038)
GPR_{90}		-0.022	-0.020	-0.019	-0.014	-0.018
		(0.035)	(0.034)	(0.035)	(0.035)	(0.036)
Contiguity	0.227**	0.227**		0.261***	0.279***	0.256***
	(0.104)	(0.104)		(0.101)	(0.096)	(0.096)
Colonial relationship	0.421***	0.421***	0.418***		0.524***	0.428***
	(0.121)	(0.121)	(0.123)		(0.126)	(0.132)
Common language	0.234***	0.235***	0.280***	0.276***		
	(0.083)	(0.083)	(0.076)	(0.083)		

RTA	0.552***	0.552***	0.544***	0.533***	0.541***	
	(0.116)	(0.116)	(0.116)	(0.114)	(0.116)	
Constant	-5.552***	-5.548***	-5.209***	-5.638***	-5.162***	-3.994***
	(0.450)	(0.450)	(0.390)	(0.443)	(0.473)	(0.311)
Exporter-year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair fixed effect	No	No	No	No	No	No
Observations	54372	54372	54372	54488	54372	54372

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependent variable is adjusted-trade flows

Table 4 reports the benchmark estimates from the structural gravity equation using the PPML estimator with exporter–year and importer–year fixed effects. Column (1) reports the estimation that omits the main variable of interest of GPR, while Columns (2) – (6) introduce the GPR_{90} dummy under different specifications. Across all specifications, distance shows a consistently significant negative coefficient (from –0.78 to –0.94), confirming expected transport and information costs as dominant friction. In contrast, contiguity, shared language, colonial ties and RTA membership all exhibit significantly positive coefficients, which are also consistent with the standard gravity findings. These results imply that geographically close, culturally linked, and preferentially integrated country pairs tend to trade more intensively.

The key regression, GPR_{90} dummy has a consistently negative sign but shows no statistical significance in any specification with coefficient ranging from –0.014 to –0.022. This implies no detectable immediate decline in trade when both countries experience a high- GPR episode, but it echoes some prior work on conflict which finds immediate effects can be muted (Glick & Taylor 2010). In this case, the coefficient magnitudes are small and drop-out when fixed effects absorb MR. Thus, at first glance, bilateral geopolitical risk appears to have no simultaneous effect on trade flows.

The lack of an initial GPR impact is notable given current theoretical expectations that uncertainty or conflict should increase trade costs or reduce

demand. One possible explanation for this is that firms' export and import relationships are generally based on multi-period contracts, forward commitments, and logistical planning of several months in length. As a result, they are more likely to fulfil short-term contracts even in the presence of increased risk, delaying any meaningful changes. Moreover, the possible costs of market entry and exit, as well as supplier relocation could force firms to adopt a wait and see strategy during the year of geopolitical shocks; therefore, the contraction in trade comes only later rather than immediately (Novy & Taylor 2014).

4.2 Problems and solutions for the contemporary structural gravity model

4.2.1 Incorporating Country-Pair Fixed Effects

In practice, bilateral relations may reflect persistently correlated characteristics such as historical conflict, security alliance, or institutional familiarity, which are associated not only with trade intensity but also with long-run geopolitical tension (Hegre, Oneal, and Russett, 2010; Kamwela, Binyam, and van Bergeijk, 2024; Martin, Mayer, and Thoenig, 2008). While the baseline specification accounts for exporter-year and importer-year fixed effects, it implicitly assumes that bilateral relationships share homogeneous and time invariant characteristics. To relax this assumption, the next specification adds country-pair fixed effects to the baseline PPML gravity equation while also keeps the exporter-year and importer-year dummies. This refinement helps control for all bilateral characteristics that could otherwise bias the estimated effect of geopolitical risk on trade.

With the inclusion of pair fixed effects, the other traditional bilateral controls distance, language, contiguity, colonial ties and RTA is fully collinear with the pair dummies and, therefore, these variables are excluded from the estimation. However, the omission does not reduce explanatory power, as the pair fixed effects completely absorb the effects of all these time-invariant covariates, and of any other unobservable factors (Baier and Bergstrand 2007). This approach is widely recognized in the trade literature as the most flexible and comprehensive treatment of bilateral heterogeneity, ensuring that the estimated coefficient on GPR reflects purely temporal shocks (Yotov, Piermartini and Larch, 2016). The model specification now can be expressed as follows:

$$T_{ijt} = \exp\left[\alpha_{it} + \delta_{jt} + \mu_{ij} + \beta_1 GPR_{ij,\,t}\right] + \varepsilon_{odt}, \quad (2)$$

where μ_{ij} is the country-pair fixed effect

Column (1) of table 5 present the result which the country-pair fixed effect. With this new specification, the GPR_{90} variable continues to show a negative effect, but the effect diminishes slightly from around 0.02 in the base case to around 0.006 and is still not statistically significant. This result is thus the same in sign and significance as the standard method, which is corroborated to confirm that the null result of the baseline is not influenced by unobserved structural differences between pairs of countries. The small, negative, and insignificant coefficient remains after inclusion of pair fixed effects strengthens the inference that it is not omitted heterogeneity but the timing of the response that causes the null result.

Accordingly, the next logical step is to investigate the presence of phasing in effects by introducing lagged GPR variables. The next part discusses whether the impact of geopolitical risk phases has any lasting effects over years, with delayed but more permanent effects on trade flows.

Table 5 Examine phasing in effect and reverse causality

	(1)	(2)	(3)	(4)	(5)
	No lag	1 lag	2 lags	3 lags	3 lags and 1 forward
GPR_{90}	-0.006	-0.006	-0.006	-0.007	-0.007
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
$L1\_ GPR_{90}$		-0.018**	-0.018**	-0.018**	-0.018**
		(0.008)	(0.008)	(0.008)	(0.008)
$L2\_ GPR_{90}$			-0.019**	-0.019**	-0.019**
			(0.008)	(0.008)	(0.008)
$L3\_ GPR_{90}$				-0.024***	-0.024***
				(0.008)	(0.008)
$F1\_ GPR_{90}$					-0.010
					(0.008)
Constant	16.902***	16.905***	16.908***	16.912***	16.914***
	(0.001)	(0.003)	(0.004)	(0.004)	(0.005)

Total GPR effect	**-0.024***	**-0.043****	**-0.067****		
	(0.014)	(0.020)	(0.026)		
Exporter-year fixed effect	Yes	Yes	Yes	Yes	Yes
Country-pair fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	54488	54488	54488	54488	54488

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The dependent variable is adjusted trade flows

The total effect is calculated using post-estimation *lincom* command in Stata

To account for temporal dynamics of geopolitical shocks, the country-pair fixed-effects specification is included with lagged values of the main geopolitical risk variable, following the practice of Baier and Bergstrand (2007) and Kamwela, Binyam and van Bergeijk (2024). This approach acknowledges that trade relationships rarely react immediately to new uncertainty. Contractual agreement, shipping schedules, and supplier relationships may create inertia, allowing the full effect of risk to materialize gradually. Thus, the empirical model includes up to three yearly lags of GPR90 to the potential adjustment of bilateral trade as geopolitical tensions continue. Formally, the equation extends to:

$$T_{ijt} = \exp\left[\alpha_{it} + \delta_{jt} + \mu_{ij} + \beta_1 GPR_{ij,\,t} + \beta_2 GPR_{ij,\,t-1} + \beta_3 GPR_{ij,\,t-2} + \beta_4 GPR_{ij,\,t-3}\right] + \varepsilon_{odt},$$
$$(3)$$

The estimates reported in Columns (2) – (4) of Table 5 reveal a clear temporal pattern. The contemporaneous effect of geopolitical risk remains negative and statistically insignificant, confirming no immediately effect on trade. However, the lagged coefficients became negative and are statistically significant, with magnitude estimated to be about -0.018 to -0.024. The impact thus occurs one year after the geopolitical risk shock and persists through the second and third lags, which suggest a phasing-in effect that can last for up to three years.

The observed pattern is similar to the well-documented "phasing-in" or delayed effects observed for other forms of trade barriers. The underlying mechanism is that long term trade relationships will not be able to adjust instantaneously. Supply chains need to be reorientated, new partnerships take time to materialize and sunk cost investments gradually unwind. Heightened geopolitical tension therefore serves as a hidden shock to trade. In the short term, the effect is usually buffered by existing contracts and inventories. However, as uncertainty remains, firms may increasingly adopt a "wait and see" strategy. By the second and third years, these incremental changes are transformed into major barriers to bilateral trade. Rather than an instantaneous collapse, this delayed emphasizes the existence of fixed costs and irreversibility in the trade decisions of firms. Moreover, the lagged terms do not change the magnitude or the sign of the preceding estimates. The negative response of trade to geopolitical risk is stable and

robust, thus, confirming that the finding is not an artifact of the short run volatility.

4.2.4 Forward GPR and the trade-conflict nexus

A potential concern that still remains relates to the problem of endogeneity between trade flows and geopolitical risk. Although earlier specifications treat geopolitical risk as an external source of uncertainty, the discussed literatures have documented a highly reciprocal relationship between trade flows and conflict intensity. To assess whether reverse causality biases the results, a forward variable of GPR_{90} is introduced, which represent future geopolitical risk one year ahead. The intuition behind this is that if current trade flows systematically predict an increase in risk in the following year, then the previous estimated coefficients may be the result of feedback effects rather than causal effects.

The results in Table 5, Column (6) show that the coefficient of the forward GPR_{90} is not significant and is close to zero, while lagged coefficients from previous specifications remain negative and significant. This finding suggests that, while historical geopolitical shocks do have an influence one trade, the reverse effect whereby trade is able to mitigate geopolitical risk is not supported. Including the forward GPR term also strengthens the baseline and lagged specifications, which maintain the negative relationship between GPR and trade which is consistent with our interpretation that a rise in geopolitical risk has a causal effect on trade rather than the other way around.

4.2.5 Effect size

The estimated coefficients reported in Table 5 imply that the contemporaneous effect on bilateral geopolitical risk is statistically insignificant while the lagged effect between the first and the third year are negative and statistically significant and range from -0.018 to -0.024. Interpreting these semi-elasticities in economic terms, when both trading partners are exposed to high-risk geopolitical periodicity simultaneously (according to 90th percentile GPR threshold), the bilateral trade volumes would drop by about $[\exp(-0.018) - 1] \times 100 \approx$ -1.8 percent in the first lag, -1.9 percent in the second and 2.4 percent in the third year, thus leading to a cumulative reduction of around $[\exp(-0.067) - 1] \times 100 \approx 6.5$ 6 percent over the three year period.

This lag structure confirms a slow-moving adjustment as opposed to immediate collapse in trade. Firms do not suddenly reduce exchanges as soon as political tension arises but instead respond slowly with changes in contract renewal, insurance costs and credit conditions. The ability to persist over up to three years is consistent with the concept of trade hysteresis (Baldwin and Krugman, 1989) and the option value logic of export decisions under uncertainty (Dixit, 1989). The exporter delays 'market re-entry' until risks have abated and the importer delays diversification of its suppliers relatively slowly, as a result, a phased trade contraction would be observed.

In comparison to the results reported by Gupta et al. (2019) the present semi-elasticity is more modest. Their results show elasticities in the range of about 0.12 to 0.18, which would imply that a 1 percent rise in the GPR index leads to a 0.12 to 0.18 percent fall in total trade volume. The smaller effect sizes in this study may partly due to differences in methodology and differences in

definitions. Gupta et al. estimate a static gravity equation that logs both the dependent and independent variables, thereby emphasising cross-section elasticities of trade with respect to global GPR. In the context of this study, it uses a PPML estimator with an additional of country-pair fixed effects and defines the dependent variable as trade flow adjusted relative to both partners' GDPs. Consequently, the coefficients here represent marginal, dynamic responses to short- and medium-term changes in bilateral risk, rather than broad differences across countries with varying average exposure to geopolitical instability.

The persistence of the lag effect for up to three years therefore represents a key empirical observation of the present study: the presence of geopolitical risk behaves less as a short-lived shock than as a slowly building constraint on international exchange. Even as political tension fades, the image of fragility persists and continues to reflect on trade decisions, making geopolitical uncertainty an all-time determinant of global integration.

4.3 Robustness Check: Alternative Thresholds for Geopolitical Risk

Table 6 Alternative thresholds for GPR measurement

	(1)	(2)
GPR95	-0.014	
	(0.014)	
L1_GPR95	-0.020	
	(0.013)	
L2_GPR95	0.002	
	(0.014)	
L3_GPR95	-0.017*	
	(0.010)	

GPR85		-0.007
		(0.008)
L1_GPR85		-0.021***
		(0.007)
L2_GPR85		-0.014*
		(0.007)
L3_GPR85		-0.014*
		(0.007)
Constant	16.905***	16.915***
	(0.004)	(0.006)
Total GPR effect	**-0.048**	**-0.055****
	(0.043)	(0.024)
Exporter-year fixed effect	Yes	Yes
Country-pair fixed effect	Yes	Yes
Observations	54488	54488

To check the robustness of the main results, alternative specifications of the GPR dummy variable is re-constructed by using the 85th and 95th percentile as cut-off values instead of the baseline 90th percentile. Table 6 shows the results for these alternative specifications. This sensitivity analysis focuses on whether

the estimated sensitivity of trade to geopolitical risk depends on the operational definition of "high-risk" events.

The 85th percentile threshold incorporates a more populous collection of observations that are classified as high-risk years. Consequently, the specification covers a wider range of geopolitical events, including moderate episodes of political tension or localised crises which may or may not escalate to full scale international confrontations. Accordingly, the estimated effects are somewhat stronger in the short term under this definition, the coefficient on the term $L1\_GPR_{85}$ is equal to -0.021 and statistically significant at conventional levels, while the magnitudes in contemporaneous and higher order lags are smaller or insignificant. This pattern is similar to that of the baseline GPR_{90} results, where the impact of geopolitical shocks is greatest in the first year after the event, and gradually decreases thereafter. The greater coverage of "risk" years in the 85th percentile definition is likely to represent a less extreme but more common set of political shocks which leads to a faster and less extreme adjustment in trade flows.

In contrast, the 95th -percentile threshold isolates only the most extreme geopolitical shocks major wars, international sanctions, or severe diplomatic crises. Because such events are rarer and more severe in impact, the perceived impact is increased, but the corresponding sample size is reduced. With the stricter definition the estimated coefficients are negative over the entire series, however only with the third lag do the study find statistical significance. This delayed response suggests that severe geopolitical shocks eventually dampen trade, but adjustment takes longer rather than dramatic collapses in trade flows immediately. this may be due to more extreme crisis triggering longer term changes in strategic realignments rather than immediate collapses in trade flows.

Overall, the result of the check for robustness confirms that the main results are not due to arbitrary choice of the 90th percentile threshold. Lowering the threshold to the 85th percentile gives results consistent with the baseline effect that reinforces the phasing in effect that peaks in the first year following the shock. Raising it to the 95th percentile emphasizes more the behaviour of extreme events where the effect is to bring on materialization of the impact further in the future and to have it last much longer.

Chapter 5 Discussion and Conclusion

5.1 Results Discussion

To summarize, this study aimed at analysing the impact of geopolitical risk on bilateral trade flows, focusing especially on joint, dyadic risk exposure and temporal variation in trade reaction. The empirical findings are complex, counter to the expected short-run breakdown of trade but offering strong evidence for a strong, long-run negative impact.

The initial result presents the lack of statistically significant and contemporaneous effect of geopolitical risk and trade flows. This null result, which holds up well to inclusion of country-pair fixed effects, suggests that the mechanistic, short-run disruption generally associated with conflict is not the main channel through which measured geopolitical risk imposes its influence. Instead of triggering an immediate tear, the findings seem to be consistent with theories of trade hysteresis and sunk costs (Baldwin and Krugman, 1989; Dixit, 1989). Firm contractual obligations, deepened supply chains and irreversibility of entry in the market also seem to create a reserve that shields trade volumes from abrupt supply shock. This inertia means that the cost of suddenly leaving a market is perceived as higher than the cost of accepting short term risk, and in practise firms typically tolerate short term risk.

However, this is a transitory stability. The central contribution of this paper is the discovery of a clear phasing-in effect. As the result drawn from Table 5, geopolitical risk has a statistically and economically significant drag on trade that takes effect with a one-year lag and lasts for at least three years. This triennial period of surging geopolitical risk is associated with a cumulative trade reduction of about 6.5 percent in total. The delayed response is consistent with the "wait and see" mechanism postulated by Bloom (2009) and found in other situations. Under the threat of risk, companies wait for the existing contracts to expired, delay new investments and slowly re-engineer their supply chains to avoid high-risk partners. The logistical and inventory-adjustment behaviours described by Novy and Taylor (2020) further explain why this adjustment can be relatively drawn out rather than instantaneous. The findings also help to unravel the complex, two-way connexion between trade and conflict. The inclusion of a forward geopolitical risk variable, which turned out to be insignificant, addresses issues of reverse causality. This suggests that while declining trade does not seem to lead to a subsequent increase in geopolitical risk, increasing geopolitical risk clearly leads to a delayed trade decline. Thus, the evidence presents causal, or strong, evidence in favour of one aspect of the "primacy of politics" argument.

The results are also relevant to the current discussion about the resiliency of globalization. Although concerns about fragmentation are still exist, the quantified impact of geopolitical risk seems to be moderate rather than catastrophic. International trade does not crumble in response to rising tensions instantaneously but decreases progressively and unevenly. This nuance is significant for the policymakers as well as the scholars alike. In effect, the results imply that international trade is sticky – anchored by established networks and sunk costs - even when diplomatic relations in decline. Nevertheless, they also suggest that a long geopolitical struggle can over time produce a massive reshaping of trade flows,

as companies migrate to more secure markets and governments lock-in strategic groupings.

Given the lag in showing effects of trade due to geopolitical risk, a time space is available for effective intervention. Governments can use export-credit guarantees, risk insurance and diplomatic stabilization mechanisms in the first stage of other rising tensions to secure trade relationships before private actors withdraw. Likewise, multilateral institutions could play a role in stabilising the world by providing liquidity and coordinating the response for states facing common geopolitical shocks. It can help policymakers overcome uncertainty by thinking about the economic costs of uncertainty in a preventive rather than reactive manner.

The results of this study add to the existing literature review on the relationship of the conflict incidence and trade flows. Although past studies have largely linked trade disruption to outright hostile or economic sanctions (Martin et al., 2008; Glick and Taylor, 2010) the current paper has gone further and isolated the anticipatory stage, which involves geopolitical tensions which are currently escalating but have not yet been translated into actual restrictions. The discovery of a delayed contraction in trade is a complementary way of looking at the problem as compared with studies that use global GPR as a continuous regressor (e.g., Gupta et al., 2019) on aggregate trade. It implies that although political tensions cause short-term uncertainty, the process of actual adjustment of trade patterns is more gradual as firms adjust through revisions of financial and contractual arrangements.

5.2 Limitations and Future Research

Despite the study's contributions, it has several limitations that open ways for future studies. To begin with, the binary operation of the GPR variable might not be able to completely capture the different levels of conflict, or the level of exposure a country undergoes in the case of a geopolitical occurrence. Selecting different thresholds at 85th 90th or 95th percentile makes sense in terms of understanding only tail behaviour but it might limit the information on intensity and duration of the event.

 Second, the country-specific GPR series is totally rely on English-language sources and do not separate threats and act at the national level. This introduces measurement noise and potential geographic media biased that have been discussed in the previous section. Furthermore, while the index tries to distinguish between geopolitical threats and geopolitical acts, the country-level indices for this study fail to keep the distinction. The dyadic measure could be triggered by a period of heightened threats with no policy changes, or by actual militarized conflict. The economic and behavioural responses to these two types of shocks are likely to be different, but the empirical design is not able to separate them.

Third, the scope of the study focuses solely on total flows of bilateral trade. The effect of geopolitical risk is almost certainly more serious for strategic goods (e.g. semiconductors, rare earth minerals, defence-related items) and trade that is dependent on complex supply chain than on non-strategic or final consumer goods. A shock which causes a small dip in aggregate trade may well accompany a catastrophic breakdown of a strategic but smaller sector. Moreover, this study

does not consider services trade, which may react differently to geopolitical tensions because of lower transport costs and digital modes of delivery. Future research should take advantage of more disaggregated trade data (e.g. at the Harmonized System (HS) 6-digit level) to test whether or not strategic sectors and supply chains-intensive industries are the main drivers of the observed phasing-in effect. Additionally, expanding the dyadic GPR framework to bilateral data on services trade and FDI could be useful to understand whether the effects of geopolitical risk feature a similar response pattern.

Finaly, the model is successful in identifying the phasing in effect but does not micro-find out its precise channels. Although this study discusses possible mechanisms, e.g. contract rigidity, sunk costs, strategic adjustment of supply chains, etc., the available data do not permit to empirically decompose these factors. The cumulative impact of geopolitical risk on trade is clear but the elements of geopolitical risk are buried in the econometric "black box." A valuable extension for future research would be to investigate the role of the international financial system as a transmission channel.

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Appendix 1: List of countries in the study

Country	ISO3166 Country Code
Argentina	ARG
Australia	AUS
Belgium	BEL
Brazil	BRA
Canada	CAN
Chile	CHL
China	CHN
Colombia	COL
Denmark	DNK
Egypt	EGY
Finland	FIN
France	FRA
Germany	DEU
Hong Kong	HKG
Hungary	HUN
India	IND
Indonesia	IDN
Israel	ISR
Italy	ITA
Japan	JPN
Malaysia	MYS
Mexico	MEX
Netherlands	NLD
Norway	NOR
Peru	PER
Portugal	PRT
Philippines	PHL
Poland	POL
Russia	RUS
Saudi Arabia	SAU
South Africa	ZAF
South Korea	KOR

Spain	ESP
Sweden	SWE
Switzerland	CHE
Taiwan	TWN
Thailand	THA
Tunisia	TUN
Turkey	TUR
Ukraine	UKR
United Kingdom	GBR
United States	USA
Venezuela	VEN
Vietnam	VNM

Appendix 2: Number of joint GPR spikes per year

Year	P95	P90	P85
1991	552	1,056	1,640
1992	42	210	462
1993	20	156	342
1994	42	110	210
1995	30	156	306
1996	12	12	156
1997	12	72	156
1998	12	72	156
1999	90	182	306
2000	6	132	156
2001	870	1,122	1,260
2002	380	870	930
2003	600	992	1,406
2004	56	306	600
2005	20	210	420
2006	72	182	420
2007	0	20	72
2008	20	42	90
2009	30	156	272
2010	42	132	240
2011	20	132	272
2012	12	30	90
2013	6	42	110
2014	182	420	702
2015	110	342	650
2016	30	306	552
2017	110	420	930
2018	272	506	1,056
2019	240	650	812