INTERNATIONAL MONETARY FUND

The Heterogeneous Effects of Uncertainty on Trade

Ibrahim Nana, Rasmane Ouedraogo, and Sampawende Jules Tapsoba

WP/24/139

IMF Working Papers **describe research in progress by the author(s) and are published to elicit comments and to encourage debate.**
The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

2024
JUL

WORKING PAPER

© 2024 International Monetary Fund WP/24/139

IMF Working Paper
African Department

The Heterogeneous Effects of Uncertainty on Trade

Prepared by Ibrahim Nana, Rasmane Ouedraogo, and Sampawende Jules Tapsoba*

Authorized for distribution by Axel Schimmelpfennig
July 2024

***IMF Working Papers* describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

ABSTRACT: This paper empirically investigates the relationship between uncertainty and trade. We use a gravity model for 143 countries over the 1980-2021 period to assess the impact of uncertainty on bilateral trade. We confirm that, in general, uncertainty has a negative impact on trade. The findings suggest that a one standard deviation increase in global uncertainty is associated with a decline in bilateral trade by 4.5 percent, with fuel and industrial products trade being the most impacted. This negative impact is observed for uncertainty on both sides of the border, with a higher impact of uncertainty from the importing country. The article goes deeper into the analysis and shows that deeper trade integration (horizontal integration) mitigates the negative impact of uncertainty on trade. In contrast, higher participation in global value chains (vertical integration) amplifies the negative effect of uncertainty on trade. We find that geopolitical tensions amplify the deterrent effect of uncertainty on trade. Finally, the result is heterogeneous across income levels, regions, and resource endowment: (a) uncertainty has a negative impact on bilateral trade between Emerging Markets and Developing Economies and Advanced Economies; however, (b) at the regional level, Africa and Europe's intraregional trade decrease as uncertainty surges. (c) Evidence shows that non-resources-rich countries are more at risk.

JEL Classification Numbers:	D8; F12; F13; F14; F15; F50; F62; O24
Keywords:	Trade; Uncertainty; Geopolitics; Global Value Chains; Gravity model
Author's E-Mail Address:	ibrahile@yahoo.fr; rouedraogo@imf.org; stapsoba@afreximbank.com

* The author(s) would like to thank: Jakubik, Adam; Michele Ruta; Mokhtar Benlamine; Tapsoba Rene; Roman Merga; Kpodar Kangni Roland; Schimmelpfennig Axel; Antonio David, Hans Weisfeld; and participants of the IMF's African Department seminar series for excellent comments and suggestions. All the usual caveats apply.

WORKING PAPERS

The Heterogeneous Effects of Uncertainty on Trade

Prepared by Ibrahim Nana, Rasmane Ouedraogo, and Sampawende Jules Tapsoba[1]

[1] The author(s) would like to thank: Jakubik, Adam; Michele Ruta; Mokhtar Benlamine; Tapsoba Rene; Roman Merga; Kpodar Kangni Roland; Schimmelpfennig Axel; Antonio David, Hans Weisfeld; and participants of the IMF's African Department seminar series for excellent comments and suggestions. All the usual caveats apply.

This item is classified as Confidential

Contents

Executive Summary **3**

I. Introduction **4**

II. Literature review **5**

III. Methodology and Data **7**
A. Conceptual framework of the gravity model 7
B. Data 8

IV. Results **10**
A. Baseline results 10
B. Extensions: deep dive 13
1. Sectoral trade and resource endowment 13
2. Heterogenous impact 17
3. Conditional factors 20
C. Robustness 24
1. Alternative measures of global uncertainty and additional controls 24
2. Other types of uncertainty 25
3. GMM methodology 27

V. Conclusion **28**

References **39**

Executive Summary

This paper empirically investigates the relationship between uncertainty and trade. We use a gravity model for 143 countries over the 1980-2021 period to assess the impact of uncertainty on bilateral trade. We confirm that, in general, uncertainty has a negative impact on trade. The findings suggest that a one standard deviation increase in global uncertainty is associated with a decline in bilateral trade by 4.5 percent, with fuel and industrial products trade being the most impacted. This negative impact is observed for uncertainty on both sides of the border, with a higher impact of uncertainty from the importing country. The article goes deeper into the analysis and shows that deeper trade integration (horizontal integration) mitigates the negative impact of uncertainty on trade. In contrast, higher participation in global value chains (vertical integration) amplifies the negative effect of uncertainty on trade. We find that geopolitical tensions amplify the deterrent effect of uncertainty on trade. Finally, the result is heterogeneous across income levels, regions, and resource endowment: (a) uncertainty has a negative impact on bilateral trade between Emerging Markets and Developing Economies and Advanced Economies; however, (b) at the regional level, Africa and Europe's intraregional trade decrease as uncertainty surges. (c) Evidence shows that non-resources-rich countries are more at risk.

I. Introduction

Uncertainty matters for trade. When future policies are uncertain, companies may be less inclined to invest in new production or export markets. This, in turn, reduces trade flows. Uncertainty affecting trade can be complex and multi-layered. For instance, chronic changes in government, elections, or other political events generate uncertainty about the future direction of trade policy and discourage companies from investing in trade. Similarly, frequent changes in economic conditions, such as boom-bust cycles or financial crises, create uncertainty about demand for goods and services and push firms to put off their investments in trade.

Recent events around the world are increasing global uncertainty. These events include policy measures, conflicts, geopolitical tensions, and climate shocks. Recent Red Sea Houthi Attacks that started on November 19, 2023, raised uncertainty and are expected to impact international trade as 40 percent of Asia-Europe trade channels through the region (Bonnell and McHugh, 2024). Similar conflicts occurred in the Middle East, especially in the Hormuz Strait, which channeled 21 percent of global petroleum liquid consumption, impacting energy trade and prices.[2] Besides, climate change is also increasing uncertainty. The most recent case is the Panama Canal drought, which put international trade at risk as about 5 percent of global maritime trade volumes are shipped through the Panama Canal. Events such as the recent exit of Burkina-Faso, Mali, and Niger from the Economic Community of West African States have exacerbated uncertainty in the African region. These events directly or indirectly reduce trade through their impact on uncertainty.

Uncertainty affects trade in several ways. At the firm level, when uncertainty increases, investment decisions become riskier. When companies are uncertain about the future, they are reluctant to invest in new production facilities or equipment or to expand into new markets. Uncertainty increases companies' risk aversion. When companies are risk-averse, they are less likely to trade with foreign countries to avoid losses caused by frequent changes in terms of trade induced by political upheavals. When firms are uncertain about the game's rules, they may be less inclined to invest in research and development and compete with foreign companies, which may have more market information and be more willing to take risks.

At the country level, uncertainty can affect trade through its impact on mis-forecasting, policy uncertainty, and restrictions. Indeed, both monetary and fiscal policies are likely to be affected by unexpected uncertainty, reducing their effectiveness. Debt sustainability assessments and economic policy, such as inflation targeting, are based on forecasts for the future. Thus, any change in forecasts would reduce the efficiency of these policies. In addition, high uncertainty episodes are associated with widespread trade restrictions. During uncertain periods, countries tend to implement restrictive measures on trade and capital movements. Recently, according to the World Trade Organization (WTO, 2022), trade restrictions increased significantly during the pandemic and more at the onset of the war in Ukraine. The list of import restrictions in force continues to grow, and for the first time since 2009, the number of export restrictions outpaced that of import restrictions.[3] These measures are likely to have a negative impact on international trade, especially in an interconnected World.

Against this backdrop, this paper brings a comprehensive approach to the literature on uncertainty and trade and assesses the impact of uncertainty in its various forms on trade. Theoretically, uncertainty can have negative and positive impacts and depends on multiple factors that can soften or deepen its effect. The current study questions how uncertainty can impact bilateral trade between countries depending on the source of uncertainty and several characteristics of the trading partners. To address this question and provide more detailed evidence to the existing stock of literature, we used a large sample of bilateral trade data from 143 countries, including advanced economies (AEs) and Emerging Markets and Developing Economies (EMDEs) from 1980 to 2021, to assess the relationship between uncertainty and trade. With an augmented gravity model with a strong predictive power, this study brings a comprehensive approach to the literature on uncertainty and trade.

The findings suggest that uncertainty reduces trade, with a higher demand effect: the impact of uncertainty from the importing country is higher than that of uncertainty in the exporting. We also find that the impact of uncertainty on trade is heterogeneous and nonlinear across development levels and regions. Emerging markets and developing economies (EMDEs) are more at risk. In addition, the findings suggest that uncertainty negatively and significantly impacts intraregional trade for African and European countries. Moreover, the study divides bilateral trade into commodities, mineral fuel, and manufacturing products. The

[2] U.S. Energy Information Administration

[3] WTO (2022)

results highlight that the negative impact of uncertainty is more important for mineral fuel trade and manufacturing products trade.

The paper finds that several conditional factors alter the effect of uncertainty. Such factors include the level of integration between trading partners (horizontal integration), the level of Global Value Chains (GVCs) participation of trading partners (vertical integration), the geopolitical distance between countries, and the geopolitical risk faced by countries. Horizontal trade integration contributes to attenuating the negative effect of uncertainty on trade. We find that higher levels of trade intensity between country pairs help mitigate the deterrent effect of uncertainty on trade. Vertical trade integration tends to exacerbate the negative impact of uncertainty on trade. GVC participation aggravates the negative effect of uncertainty as highly integrated countries into GVCs are more sensitive to a surge in uncertainty independently of the origin. A supplier and demand-based analysis shows that these mitigating and aggravating effects are valid when considering a hike of uncertainty in exporting and importing countries. Finally, stronger diplomatic links and lower geopolitical risks help contain the negative impact of uncertainty on trade. These findings are robust to additional measures of uncertainty, including additional control variables and the estimation strategy.

In terms of global policy implications, the issue of uncertainty is increasingly topical, as the uncertainty generated by the COVID-19 pandemic and the ongoing conflicts may remain after the said events. The main policy implications to be drawn from this article are twofold. First, despite the economic benefit of international trade, it is sensitive to high uncertainty between trading partners independently of the origin of the uncertainty. By influencing trade through supply and demand channels, high uncertainty shocks may weaken conventional economic policies and sabotage past efforts made by developing countries. In addition, adverse trade shocks might put EMDEs that rely on trade for their basic needs at risk. Besides, several studies have assessed the impact of trade on growth (e.g., Feyrer 2019; Nana et al., 2023) as well as the impact of trade on economic recovery. Thus, uncertainty shocks impacting bilateral trade can reduce growth dynamics and increase poverty. However, this paper's findings suggest that policymakers should consider a few elements when promoting trade or anticipating future uncertainty shocks. The level of integration and policymakers influencing the effect of uncertainty should differentiate between horizontal and vertical integration to implement the necessary safety nets to prevent economies from adverse shocks. Horizontal integration attenuates the negative effect of uncertainty on trade, while vertical integration aggravates this effect.

In addition, some regions are currently moving toward more regional integration. However, these efforts can be hampered by the rising geopolitical fragmentation, putting past efforts at risk. The results highlight an important channel for amplifying welfare losses due to the increased risk of geoeconomics fragmentation and associated uncertainty facing the global economy. Thus, trade policies should consider measures and protocols to prevent economic losses caused by potential uncertainty shocks. In doing so, anticipating future local uncertainty shocks from trading partners and identifying the state of geopolitical relations with the said partners remains important to determine the response. In addition, anticipating geopolitical risks in trading partners in the future in this risky context is essential to design the appropriate response to any adverse uncertainty shocks.

The rest of the paper is organized as follows: Section II summarizes the relevant literature, Section III presents the methodology, Section IV discusses the econometric results, and Section V concludes.

II. Literature review

In theory, uncertainty has both negative and positive effects on economic activity. The impact of uncertainty on trade is yet to be determined. Two strands of literature have theoretically assessed the relationship between uncertainty and trade flows, emphasizing contradictory findings of negative and positive impacts depending on the model inputs and configuration.

The first strand of the literature confirms the intuitive negative relationship between uncertainty and trade. Bernanke (1983), using the real option value theory, indicates that policy uncertainty creates a real option value of waiting. He provides evidence that uncertainty, by increasing the value of waiting for the latest information, reduces the current rate of investment. The method shows that in the presence of higher policy uncertainty, it becomes more beneficial to invest in the future, which delays the decision to invest. Wang et al. (2014), Krol (2018), and Novy and Taylor (2020) demonstrated that under high policy uncertainties, exporting firms cut investments in existing markets while delaying in new markets. Thus, uncertainty (including uncertainty about future prices and consumer demand) represents a barrier to entry and limits the extensive margins of trade. Handley (2014) and Handley and Limão (2015) developed a model in line with real options theory. They found that increasing policy uncertainty encourages firms to postpone entry to the market to

avoid paying sunk entry costs. The common point between these studies is that they highlight the negative impact of policy uncertainty on economic activity, including international trade (Scheffel, 2016).

The second strand of the literature on the impact of uncertainty provided evidence of a positive relationship between uncertainty and trade. The classical theory of Oi-Hartman-Abel (Oi, 1961; Hartman, 1972, and Abel, 1983) claims that policy uncertainty positively contributes to the trade performance of countries because risk-averse firms will take more risk and increase investment to compensate for the loss due to high uncertainty (Hartman, 1972), which in turn positively contribute to trade. Furthermore, the growth option theory proves that policy uncertainty is positively associated with investment (Bar-Ilan & Strange, 1996), positively affecting trade. More recently, Baley et al. (2020), using a simple general equilibrium trade model with information frictions, show that uncertainty can fuel more trade. In equilibrium, their model suggests that an increase in uncertainty is correlated with an increase in both the mean and variance of returns to exporting.

Empirical studies have provided robust evidence of the impact of uncertainty on trade. Consistent with theoretical predictions, certain empirical findings indirectly emphasize the trade-generating aspect of uncertainty. Freund, Mattoo, Mulabdic, and Ruta (2023) illustrate that although China's share of the United States (US) imports declined between 2017 and 2022, this decrease was compensated by imports from other economies deeply integrated into China's supply chains, experiencing import growth from China. This suggests that uncertainty from the US-China trade tensions maintained or increased trade volumes through substitution effects. Moreover, research from the BIS using firm-level network data confirms this effect, revealing that global value chains linking China to the US have extended between 2021 and 2023 (Qui et al., 2023). Additionally, Chandan Sharma and Ritesh Kumar Mishra (2023) show that tightening measures during the pandemic increased uncertainty and positively impacted India's imports in the short run. This indicates that the economy relies more on imports when pandemic-related restrictions disrupt domestic production and supply chains.

The relevant studies have used various proxies for uncertainty, including fluctuations in commodity prices, inflation expectations, interest rates, output, and exchange rates, to highlight the negative impact of uncertainty. Sharma (2000), using data from India, found that uncertainty in export prices is correlated with low export performance. Grier and Smallwood (2007) examined the relationship between uncertainty in exchange rates and incomes and exports using a GARCH model with a sample of nine developed and nine developing countries. They concluded that developing countries' trade flows are more likely to be affected by uncertainty, demonstrating a negative relationship between real exchange rate uncertainty and export growth. Taglioni and Zavacka (2013) investigated the impact of uncertainty on international trade using a VAR model over a prolonged period (1962-2008) focusing on the US. They found that macroeconomic uncertainty in the US has a strong and non-linear effect on exports. Uncertainty shocks are transmitted directly and must reach a particular level before they exert a significant aggregate impact on trade. These non-linearities suggest that uncertainty becomes particularly relevant when its levels are unusually high, and the negative effect of uncertainty shocks on trade is higher for trade relationships more intensive in durable goods. Sly (2016) estimated the impact of global uncertainty on external demand for US exports. Using quarterly data from twenty-six countries representing about 85 percent of the US exports from 2002 to 2015, Sly (2016) showed that, on average, foreign demand for US exports declines by 2.8 percent during episodes of more significant uncertainty. Raulatu et al. (2019) studied the effect of global economic policy uncertainty on Nigeria's export earnings from 1997 to 2016. Their findings revealed that global economic policy uncertainty adversely affects Nigeria's export earnings. Graziano et al. (2018) found that uncertainty from Britain's exit (Brexit) from the European Union (EU) reduces bilateral trade between the United Kingdom (UK) and the EU. The authors showed that increases in the probability of Brexit, as measured by prediction markets for the referendum outcome, reduce UK-EU exports and net export entry. The effect is most significant in products with higher potential protection in the event of a trade disagreement. More recently, Jakubik and Ruta (2023) investigated the impact of world trade uncertainty on bilateral trade using diplomatic disagreement as an interactive variable. They found that diplomatic disagreement deepens the adverse effects of world trade uncertainty on trade.

This paper contributes to this rich literature by focusing on a gravity model to provide a multidimensional assessment of the impact of country-specific episodes of uncertainty in exporting and importing countries on bilateral trade, accounting for the heterogeneities and nonlinearities in the effect. Using the new measure of uncertainty of Ahir, Bloom, and Furceri (2018) and Ahir, Bloom, and Furceri (2022), this paper explores the impact of uncertainty considering some moderating and aggravating factors, including trade integration (horizontal and vertical integration), geopolitical risk and diplomatic disagreement.

III. Methodology and Data

The current study seeks to estimate the impact of uncertainty on trade. Using a sample of 143 countries over the 1980-2021 period, the paper relies on a gravity model to assess how joint uncertainty (the sum of uncertainty from the importing and exporting countries) between country pairs and uncertainty in both the importing and exporting countries can affect bilateral trade.

A. Conceptual framework of the gravity model

Several trade studies have relied on gravity models for their empirical specifications. The basic model explains trade flows between two countries ("*i*" and "*j*") by their size or wealth (GDP) and inversely proportional to the trade frictions between them. Trade frictions consider both bilateral frictions and country-specific trade costs. Bilateral trade frictions include physical distance but also historical and cultural distance (common language, common border, and other factors affecting trade barriers). Following Anderson and Van Wincoop (2003) and Yotov et al. (2016), bilateral trade flows between the exporter i and the importer j, denoted by X_{ij}, can be expressed by:

$$X_{ij} = \frac{Y_i Y_j}{Y}\left(\frac{t_{ij}}{W_i P_j}\right)^{1-\sigma} \quad (1)$$

Where X_{ij} stands for bilateral trade value between the Exporter i and Importer j; Y_i stands for the value of nominal GDP of country i; Y_j stands for the value of nominal GDP of country j; Y is the total world production that is constant; t_{ij} represents bilateral trade costs, including for instance, distance, trade agreements, colonial and cultural ties such as sharing a common language, which dominantly affects trade between country i and j directly; W_i is outward multilateral resistance; P_j is inward multilateral resistance and σ represents the elasticity of substitution. The multilateral resistance terms W_i and P_j influence trade bilaterally and indirectly by capturing trade costs with all trading partners. Formally, the multilateral resistance terms result from the solution of the system of trade equations for all potential trade partners.[4] The linearization of equation (1) gives the following:

$$\ln(X_{ij}) = \ln(Y_{it}) + \ln(Y_{jt}) + (1-\sigma)\ln(t_{ij}) - (1-\sigma)\ln(W_i) - (1-\sigma)\ln(P_j) - \ln(Y) \quad (2)$$

With:

$$\ln(t_{ij}) = \theta_1 \ln(Dist_{ij}) + \theta_2 Lang_{ij} + \theta_3 Col_{ij} + \theta_4 Cont_{ij} + \theta_5 TA_{ij} \quad (3)$$

$$\ln(W_i) = \delta + \gamma Unc_i + \mu_i \quad (4)$$

$$\ln(P_i) = \pi + \delta Unc_j + \vartheta_j \quad (5)$$

Unc_i and Unc_j represents uncertainty. Following Matzner et al. (2023), uncertainty is integrated as a determinant of multilateral resistance terms (additional trade cost); $\ln(Dist_{ij})$ is the logarithm of the bilateral distance between trading partners i and j, $Lang_{ij}$ is a dummy variable that takes the value of one for a common official language between trading partners i and j; Col_{ij} is a dummy variable that takes the value of one if the two trading partners have had a common colonizer in the past and if they have ever been in colonial links; $Contig_{ij}$ is a dummy variable that takes the value of one if trading partners i and j share a common border and TA_{ij} is a dummy variable that takes the value of one if there is a trade agreement between trading partners *i* and *j*, including regional trade agreements and currency unions.

The empirical model is therefore defined as follows:

[4] The multilateral resistance terms W_i and P_j : $W_i^{1-\sigma} = \sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \frac{Y_j}{Y}$ *and* $P_i^{1-\sigma} = \sum_i \left(\frac{t_{ij}}{W_j}\right)^{1-\sigma} \frac{Y_i}{Y}$

$$\ln(X_{ijt}) = K + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(Dist_{ij}) + \beta_4 Lang_{ij} + \beta_5 Col_{ij} + \beta_6 Cont_{ij} + \beta_7 TA_{ij} + \beta_8 Unc_{it} + \beta_9 Unc_{jt} + \delta_i + \delta_j + \delta_{ij} + \delta_t + \varepsilon_{ij} \quad (6)$$

Or

$$\ln(X_{ijt}) = K + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(Dist_{ij}) + \beta_4 Lang_{ij} + \beta_5 Col_{ij} + \beta_6 Cont_{ij} + \beta_7 TA_{ij} + \beta_8 Unc_{ijt} + \delta_i + \delta_j + \delta_{ij} + \delta_t + \varepsilon_{ij} \quad (7)$$

With Unc_{ijt} representing joint bilateral uncertainty defined as the sum of uncertainty from both sides of the border (from the exporting and exporting countries), $\delta_i, \delta_j, \delta_{ij}$ *and* δ_t representing respectively exporter, importer, pair and time-fixed effects5; ε_{ij}The error term and K the constant (ln(Y)).

Equations (6) and (7) can be estimated using the ordinary least square (OLS) estimator. However, for the current study, the non-linear versions of equations (6) and (7) are estimated using a Poisson Pseudo-Maximum Likelihood (PPML) estimator. Using the PPML estimator is a strategic choice that responds to a frequent problem faced by gravity models. In bilateral trade data, pair countries that did not trade in each period reported zero values. So, if bilateral trade between nations is zero and if we estimate them using a conventional log-linear model, these zero observations are dropped from the sample as undefined. Consequently, the number of observations decreases, causing a loss of information and misleading results. We relied on a PPML estimator, which was estimated using the quasi-poison distribution. In addition to being a solution to the zero-trade problem, the PPML is a robust approach in the presence of heteroskedasticity (Silva & Tenreyro, 2006). This method can be applied to the levels of trade, thus estimating the non-linear form of the gravity model directly.[6] A more convenient way to interpret these results can be through the standardized coefficients obtained by standardizing the measure of uncertainty (e.g., Frankel and Rose, 1997, 1998; Calderon et al., 2007; Inklaar et al., 2008; Tapsoba, 2009). Such an approach will allow us to interpret coefficients regarding the percentage point of trade decrease following one standard deviation (SD) hike in uncertainty. The standardized measure of uncertainty is presented as follows:

$$ZUnc_{it} = \frac{Unc_{it} - \overline{Unc_t}}{\sigma};\ with\ \sigma = \sqrt{\frac{\sum_{i=1}^{N}(Unc_{it} - \overline{Unc_t})^2}{n-1}}$$

$\overline{Unc_t}$ is the mean and σ the standard deviation.

B. Data

The current study uses a gravity model for 143 countries over the 1980-2021 period to assess the impact of uncertainty on bilateral trade. Most variables used in our estimations come from the "*Centre d'Etudes Prospectives et d'Informations Internationales*" (CEPII) databases. The dependent variable, bilateral trade, comes from CEPII, the International Monetary Fund (IMF), and the United Nations Conference on Trade and Development (UNCTAD) databases. The independent variable that captures uncertainty is a text-based measure.[7] obtained from Ahir, Bloom, and Furceri (2018, 2022), which provides information for EMDEs compared to other measures of uncertainty. All control variables are obtained from the CEPII databases. Trade agreements (TAs) data are obtained from Mario Larch's Regional Trade Agreements Database (Table 1).

[5] The literature recommends the use of export-time, importer-time, and pair fixed effects. However, for the current case, the use of both export-time and importer-time would absorb the variables of interest, i.e., uncertainty.

[6] In a PPML specification, the dependent variable is trade, not the logarithm of trade. PPML estimation requires the dependent variable to have only positive values.

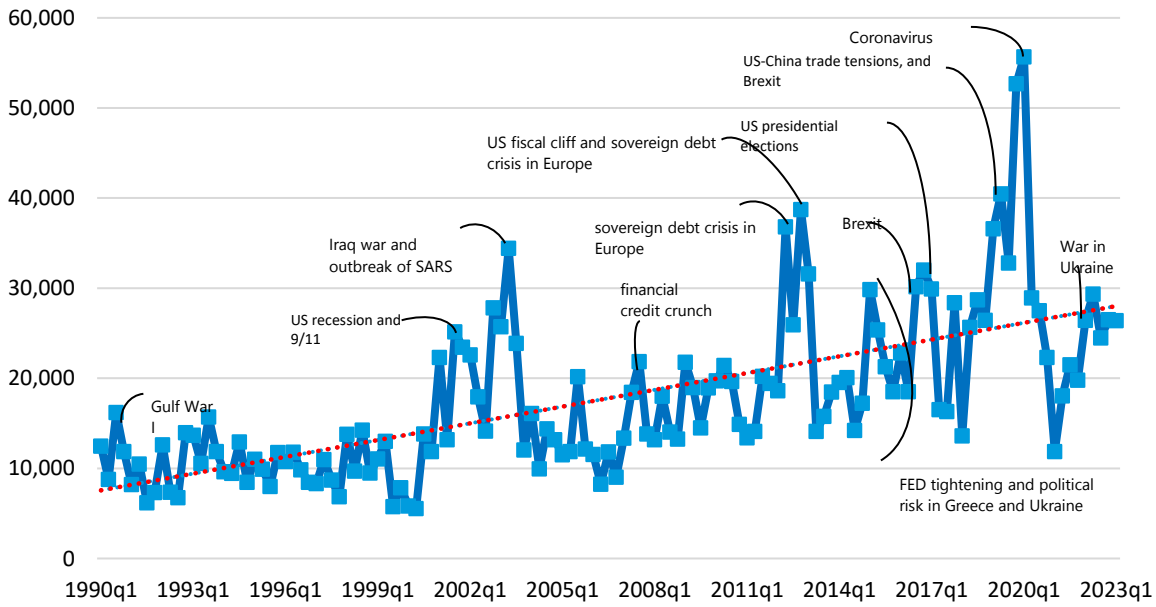
[7] One limitation is that text-based uncertainty measures may capture changes in the underlying sources of uncertainty and other factors, such as demand drops, alongside true uncertainty.

Table 1: Variables and data sources

Variable	Sources
Trade, Export, Imports series	CEPII-BACI database, IMF, UNCTAD
Geographic variables	CEPII database
Uncertainty	Ahir, Bloom and Furceri (2018, 2022)[8]
Trade agreements	Mario Larch's RTA Database[9]
Trade Intensity	Calculated using CEPII data – IMF trade data
Geopolitical Risk	Caldara and Iacoviello (2022)
Diplomatic disagreement	CEPII, Constructed by (Bailey et al., 2017)
GVCs participation	EORA-MRIO databases

Uncertainty data comes from Ahir, Bloom, and Furceri (2018). Ahir, Bloom, and Furceri (2018) constructed an uncertainty index for 143 countries from the 1950s onwards (Figure 1), using the frequency of the word "uncertainty" in the quarterly Economist Intelligence Unit (EIU) country reports. All indices have been computed by counting the frequency of the word uncertainty (or its variants) in EIU country reports. The indices are normalized by the total number of words and rescaled by multiplying by 1,000. A higher number means higher uncertainty and vice versa. The global economy has faced several episodes of global uncertainty spikes before the recent overlapping crises, namely the COVID-19 pandemic and ongoing conflicts. The most important world uncertainty spikes occurred around the September 11th attacks, the SARS outbreak, the second Gulf War, the Euro debt crisis, El Niño, Europe's border-control crisis, the United Kingdom's referendum vote in favor of Brexit, the 2016 US presidential election and recently the COVID-19 pandemic and the Russia-Ukraine conflict (Ahir et al., 2022) (Figure 1). Uncertainty has increased worldwide since the global monetary crisis. The COVID-19 crisis and the Russia-Ukraine war have exacerbated it. As discussed earlier, the impact of uncertainty is yet to be confirmed. Theoretically, uncertainty can have negative and positive impacts and depends on many factors that can soften or deepen its impact. Using this text-based measure of uncertainty, the current study provides evidence on the effects of uncertainty, highlighting supply and demand effects (domestic and foreign uncertainty), heterogeneity, and mitigating and exacerbating effects.

Figure 1. World Uncertainty Index (1990Q1 to 2023Q2)



Source: Ahir, Bloom, and Furceri (2022), "World Uncertainty Index."

[8] https://worlduncertaintyindex.com/data/

[9] Trade agreements data: https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html

Focusing on the control variables, their potential impact on trade is presented as follows. First, GDP captures the country's economic size and wealth. It gives information on the ability of the country to manufacture export-oriented products and their capacity to import. Thus, this variable should have a positive effect on bilateral exports. Second, the distance variable represents bilateral physical distance. A higher physical distance affects transportation costs, raising the unit price of the final product for sale and reducing its demand. Therefore, distance should negatively impact bilateral trade. Third, colonial and cultural links matter in explaining bilateral trade. We, therefore, expect a positive impact on some of these variables. Finally, trade agreements (regional agreements and currency unions) should help increase trade volume/ value. Thus, partner countries in the same regional trade agreement or currency union should trade more.

The study further includes interactive variables to capture nonlinearities in the impact of uncertainty on trade (see section IV-B-3). The impact of the interactive variables is to be determined. First, trade intensity is used as an interactive variable. The effect of this variable can be positive or negative. High trade intensity is expected to moderate the negative impact of uncertainty, if any, but at the same time, the higher the trade intensity between bilateral pairs, the higher the drop in bilateral trade in case of adverse shocks. GVC participation is another form of trade integration and measures how much an economy is connected to GVCs for its production and foreign trade. While this variable can attenuate the negative impact of uncertainty as trade intensity, it can also increase the negative impact of uncertainty on bilateral trade since it involves integration at several stages. Second, an elevated level of geopolitical risk, which can be considered another form of uncertainty, is expected to deepen the negative impact of uncertainty. However, the policy uncertainty generated by geopolitical risk can push risk-averse firms to take more risks and increase investment to compensate for the loss due to high uncertainty (Hartman, 1972). Thus, geopolitical risk can also reduce the negative impact of uncertainty. Finally, diplomatic disagreement is expected to deepen the negative effect of uncertainty (Jakubik & Ruta, 2023; Nana & Ouedraogo, 2023).

IV. Results

A. Baseline results

Our estimates highlight that uncertainty is negatively associated with bilateral trade. Table 2 presents the baseline results of estimating the impact of uncertainty on bilateral trade using the PPML approach. The disaggregated indexes of uncertainty in the exporter and importer countries are used in column [2], and the joint (aggregated simultaneous) indices in column [1]. The coefficients associated with aggregated and disaggregated indices are negative and strongly significant at the 1 percent level. This finding suggests that uncertainty reduces bilateral trade regardless of the origin country. As discussed in the methodology section, a more convenient way to interpret these results is using the standardized coefficients (e.g., Frankel and Rose, 1997, 1998; Calderon et al., 2007; Inklaar et al., 2008; Tapsoba, 2009). The findings suggest that an increase in global uncertainty (joint uncertainty) by one SD is correlated with a decline in bilateral trade by 3.85 percent (column [1]). This finding is slightly similar to previous findings by Jakubik and Ruta (2023), suggesting that a one SD hike in global trade policy uncertainty leads to a 3.1 percent decline in bilateral trade between geopolitical rival countries. In the current paper, a one SD increase in joint uncertainty is equivalent to joint uncertainty between Russia and Greece in 2021 or Guinea and Côte d'Ivoire in 2008.[10]

The impact of uncertainty originating from the exporting country differs from the effects of uncertainty from the importing country. Uncertainty originating from the importing country is more detrimental to bilateral trade than uncertainty from the exporting country. Table 2 shows that a one SD increase in global uncertainty in the importing country is associated with a decline in bilateral trade by 2.6 percent, against a decrease of 2.4 percent when global uncertainty in the exporting country increases by one SD (Table 2, column [2]). In the case of uncertainty in the importing country, the demand for goods will be driven by the impact of uncertainty on the country's income (capacity to import) and the type of imported products, with some consumption of goods often being irreducible. However, exports are likely to be restricted in case of uncertainty in the supplier's country (Pangestu & Trotsenburg, 2022), particularly when the uncertainty results from reduced production capacity. As a benchmark, it is important to note that a one SD increase in uncertainty is equivalent

[10] A 1 SD increase in joint uncertainty is equivalent to an increase in joint uncertainty by 0.52, which is equivalent to the level of joint uncertainty between Russia and Bangladesh in 2004; Russia and Greece in 2021, or Guinea and Côte d'Ivoire in 2008.

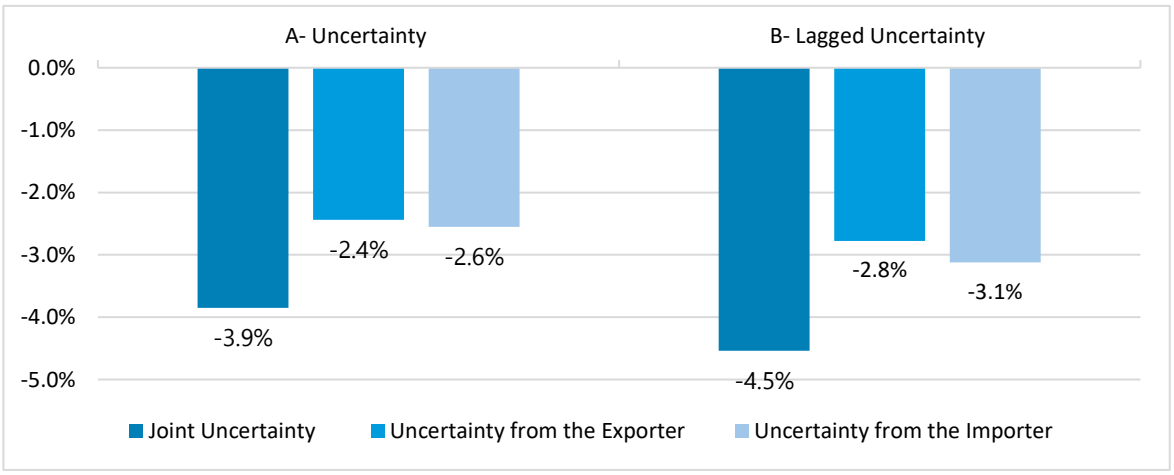
to the level of uncertainty in Madagascar in 2017.[11] However, the potential endogeneity caused by reverse causality between uncertainty and trade might affect these baseline estimates. The current study used lagged uncertainty to address potential reverse causality.

Table 2. Results – Impact of uncertainty on bilateral trade

	[1]	[2]	[3]	[4]
	Impact of Uncertainty		Impact of lagged Uncertainty	
VARIABLES	Trade	Trade	Trade	Trade
Joint Uncertainty$_t$ $(\text{Unc}_{i,t} + \text{Unc}_{j,t})$	-0.176***			
	(0.0309)			
	[-0.0385]			
Uncertainty from exporter$_t$ $(\text{Unc}_{i,t})$		-0.172***		
		(0.0457)		
		[-0.0244]		
Uncertainty from importer$_t$ $(\text{Unc}_{j,t})$		-0.180***		
		(0.0471)		
		[-0.0255]		
Joint Uncertainty$_{t-1}$$(\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1})$			-0.208***	
			(0.0293)	
			[-0.0454]	
Uncertainty from exporter$_{t-1}$ $(\text{Unc}_{i,t-1})$				-0.196***
				(0.0497)
				[-0.0278]
Uncertainty from importer$_{t-1}$ $(\text{Unc}_{j,t-1})$				-0.220***
				(0.0435)
				[-0.0312]
Observations	425,993	425,993	419,455	419,455
R2	0.9735	0.9735	0.9741	0.9741
Exporter Fixed Effects	Yes	Yes	Yes	Yes
Importer Fixed Effects	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 2. Impact of Uncertainty on Trade – Beta Coefficients



Source: Authors' calculation based on the results of the estimates

[11] A 1 SD increase in uncertainty is equivalent to a level of uncertainty of 0.29 (Uncertainty in the exporting or importing country), which is equivalent to the level of uncertainty in Madagascar in 2017.

Lagging uncertainty confirms the baseline estimation results. Uncertainty remains negatively associated with bilateral trade. To deal with the potential endogeneity of uncertainty, we lagged uncertainty to avoid reverse causation. Table 2 columns [3] and [4] present the estimates of the impact of lagged uncertainty on bilateral trade using the PPML approach. The findings confirm the baseline results and show that the coefficients associated with different uncertainty measures are negative and strongly significant at the 1 percent level. The findings confirm the results without lagged uncertainty and suggest that uncertainty reduces bilateral trade regardless of the origin country with a higher coefficient than the baseline approaches. The results highlight that lagging uncertainty to avoid reverse causation slightly deepens the negative impact of uncertainty (see Figure 2 to compare the coefficients). A one SD increase in lagged joint uncertainty is associated with a decline in bilateral trade by 4.5 percent (Table 2 column [3]). The findings confirm the difference in the impact of uncertainty in the exporting and importing countries. An increase of lagged uncertainty in the importer country by one SD is associated with a decline in bilateral trade of 3.1 percent, 0.57 percent higher than the baseline result. However, an increase of lagged uncertainty in the exporter country by one SD is associated with a decline in bilateral trade by 2.8 percent (Table 2 column [4]), confirming a higher demand effect than the supply effect.

It is important to estimate these effects separately to understand the impact of supply and demand better. We must control for fixed effects related to the exporter's and importer's countries. When estimating the impact of uncertainty from the exporting country (supply effect), we also need to control for importer-year fixed effects to account for any potential time-varying omitted variables from the importing country. We also need to control for exporter-year fixed effects when assessing the impact of uncertainty in the importing country (demand effect). This approach allows us to differentiate between supply and demand effects while minimizing bias from omitted variables. Using exporter-year and importer-year fixed effects helps address the lack of data on the covariance of bilateral shock and other time-varying trade influences. Our findings confirm a difference in the impact of lagged uncertainty in the exporting and importing countries. For example, an increase in lagged uncertainty in the importing country by one standard deviation is associated with a 3.1 percent decline in bilateral trade, compared to a 2.3 percent decrease for an increase in lagged uncertainty in the exporting country. These results highlight the greater importance of demand effects and oversupply effects.

Table 3. Results - Impact of uncertainty on bilateral trade: supply vs demand effects

	(1)	(2)
VARIABLES	Supply Effects Trade	Demand Effects Trade
Uncertainty from exporter$_{t-1}$ (Unc$_{i,t-1}$)	-0.162***	
	(0.0450)	
	[-0.0229]	
Uncertainty from importer$_{t-1}$ (Unc$_{j,t-1}$)		-0.219***
		(0.0317)
		[-0.0310]
Observations	419,455	419,454
R2	0.9807	0.9807
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Exporter-Year Fixed Effects	No	Yes
Importer-Year Fixed Effects	Yes	No
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

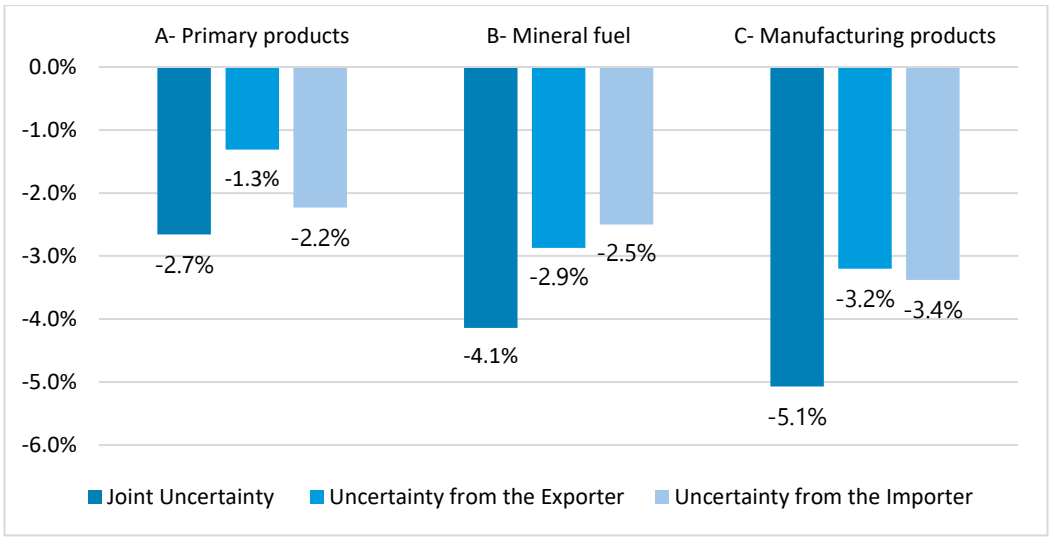
B. Extensions: deep dive

1. Sectoral trade and resource endowment

1.1. Sectoral Trade.

We find that the impact of uncertainty depends on the sectors and products traded. Manufacturing trade and mineral fuel are more sensitive to uncertainty. In this section, we investigate the effects of uncertainty on bilateral trade by type of products (sectors) following the United Nations Standard International Trade Classification system (SITC). The sectoral classification groups all products into three categories: primary products (commodities including or excluding fuel and crude oil), mineral fuel, and manufactured/ industrialized products. The results are reported in Table 4 and Figure 3. The results highlight that the coefficients associated with lagged joint and lagged uncertainty in the importing country are negative and significant at the 1 percent level. However, coefficients associated with lagged uncertainty in the exporting country are significant at 1 percent, 5 percent, or 10 percent. The results suggest that a one SD increase of lagged joint uncertainty is associated with a decline in bilateral primary products trade by 2.7 percent (Table 4, column [1]). A one SD increase of lagged uncertainty in the exporting country is associated with a decline in bilateral trade of primary products trade by 1.3 percent against a 2.2 percent decrease following a one SD hike of uncertainty in the importing country (Table 4, columns [2]).

Figure 3. Impact of Uncertainty by Products/sectors – Beta Coefficients



Source: Authors' calculation based on the results of the estimates

For trade in mineral fuel, the coefficients associated with lagged uncertainty are negative, significant at the 1 percent level (5 percent for uncertainty in the exporting country), and higher than in the case of primary products trade. We found that a one SD increase in the lagged joint uncertainty is associated with a decline in bilateral mineral fuel trade by 4.1 percent (Figure 3, Table 4, column [5]). In addition, the findings confirm uncertainty in exporting and importing countries. A one SD increase of lagged uncertainty in the exporting country is associated with a decline in bilateral mineral fuel trade by 2.9 percent vs. a 2.5 percent decline in bilateral mineral fuel trade following a one SD increase of lagged uncertainty in the importing country (Figure 3, Table 4, column [6]). These findings imply that the trade of mineral fuel tends to decline more than the trade of primary products during times of uncertainty. Besides, the findings suggest that supply effects are more important than demand when considering mineral fuel trade. This is especially true as uncertainty in oil exporting countries decreases oil supply and increases prices (World Bank 2023).

Regarding trade in manufacturing products, the coefficients associated with lagged uncertainty are negative, significant at the 1 percent level, and higher than in the cases of primary products and mineral fuel trade. The findings suggest that a one SD increase of lagged joint uncertainty is associated with a decline in bilateral trade of manufacturing products by 5.1 percent (Figure 3, Table 4, columns [7]). The findings confirmed uncertainty in the exporting and importing countries. In addition, a one SD increase of lagged uncertainty in

the exporting country is associated with a decline in bilateral trade of manufacturing products by 3.2 percent vs. a 3.4 percent decline in bilateral trade of manufacturing products following a one SD increase of lagged uncertainty in the importing country (Figure 3, Table 4, columns [8]). This finding implies that the trade of manufacturing products tends to decline more than the trade of both primary and mineral fuel products during times of uncertainty. Manufacturing products encompass luxury goods that consumers can bypass when their incomes reduce, or economic and financial uncertainties cloud the outlook.

1.2. Globally non-natural resource-rich countries hardest hit.

The results indicate that uncertainty hits non-natural resource-rich countries hardest. We investigated the impact of uncertainty, focusing on natural resource-rich countries. Table 5 presents the results of the findings when subdividing the sample between natural resource-rich countries and non-natural resource-rich countries.[12] The findings suggest that lagged uncertainty in natural resource-rich countries (lagged joint uncertainty and lagged uncertainty in exporting and importing countries) does not significantly impact their bilateral trade. However, bilateral trade between natural resource-rich countries and non-natural resource-rich countries is negatively and significantly affected by lagged uncertainty in non-resource-rich countries (whether the non-resource-rich country is an importer or an exporter) and lagged joint uncertainty. Finally, bilateral trade between non-natural resource-rich countries is negatively and significantly impacted by lagged uncertainty in non-natural resource-rich countries (lagged joint uncertainty and lagged uncertainty in the exporting or importing). While uncertainty in natural resource-rich countries is not significant in all the cases, the findings suggest that a one SD hike in lagged joint uncertainty in non-natural resource-rich countries reduces their bilateral trade by 4.4 percent (Table 5, column [7]). However, a one SD increase in lagged joint uncertainty between non-natural resource-rich exporting countries and natural resource-rich importing countries decreases bilateral trade by 3.8 percent (2.2 percent when the non-natural resource-rich country is the importing country) (Table 5, columns [3] and [5]). These findings are valid when considering uncertainty in the exporting and the importing countries.

When both importer and exporter are non-natural resource-rich countries, a one SD increase of lagged uncertainty in the exporting country decreases bilateral trade between non-natural resource-rich countries by 2.7 percent, against a 3 percent decrease in bilateral trade between non-natural resource-rich countries following a one SD increase of uncertainty in the importing country (Table 5, column [8]). Finally, when considering trade between natural resource-rich countries and non-natural resource-rich countries, the findings show that when the exporting country is not well endowed in natural resources, a one SD increase of its level of lagged uncertainty decreases bilateral trade by 5.9 percent (Table 5, column [6]), the trade reduction effect is similar when the importing country is not well endowed in natural resources. Globally, the results highlight a significant impact of uncertainty emanating from non-resource-rich countries.

[12] Dummy obtained from Sawadogo (2020) which equals one if a given country is a resource-rich country and zero otherwise.

Table 4. Results - Impact of uncertainty on sectoral trade

VARIABLES	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Primary products Trade		Primary products (no fuel) Trade		Mineral fuel Trade		Manufacturing products Trade	
Joint Uncertainty$_{t-1}$ (Unc$_{i,t-1}$ + Unc$_{j,t-1}$)	-0.122***		-0.120***		-0.190***		-0.233***	
	(0.0337)		(0.0266)		(0.0535)		(0.0343)	
	[-0.0266]		[-0.0261]		[-0.0414]		[-0.0507]	
Uncertainty from exporter$_{t-1}$(Unc$_{i,t-1}$)		-0.0922*		-0.0551		-0.203**		-0.226***
		(0.0501)		(0.0393)		(0.0831)		(0.0565)
		[-0.0131]		[-0.00781]		[-0.0287]		[-0.0320]
Uncertainty from importer$_{t-1}$ (Unc$_{j,t-1}$)		-0.157***		-0.202***		-0.176***		-0.239***
		(0.0438)		(0.0352)		(0.0622)		(0.0464)
		[-0.0223]		[-0.0286]		[-0.0250]		[-0.0338]
Observations	392,597	392,597	391,893	391,893	287,404	287,404	396,570	396,570
R2	0.9640	0.9640	0.9728	0.9728	0.9507	0.9507	0.9793	0.9793
Exporter Fixed Effects	Yes	Year	Year	Yes	Year	Year	Year	Year
Exporter Fixed Effects	Year	Yes	Yes	Year	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5. Results - the impact of uncertainty on trade - natural resource-rich countries

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Exporter ->	Resource-rich				Non-Resource-rich			
Importer ->	Resource-rich		Non-Resource-rich		Resource-rich		Non-Resource-rich	
VARIABLES	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Joint Uncertainty$_{t-1}$ (Unc$_{i,t-1}$ + Unc$_{j,t-1}$)	-0.102		-0.103*		-0.174***		-0.203***	
	(0.0677)		(0.0615)		(0.0404)		(0.0380)	
	[-0.0223]		[-0.0224]		[-0.0378]		[-0.0443]	
Uncertainty from exporter$_{t-1}$(Unc$_{i,t-1}$)		-0.123		0.119		-0.413***		-0.192***
		(0.0942)		(0.0784)		(0.0820)		(0.0629)
		[-0.0175]		[0.0169]		[-0.0585]		[-0.0272]
Uncertainty from importer$_{t-1}$ (Unc$_{j,t-1}$)		-0.0809		-0.416***		-0.00472		-0.213***
		(0.0972)		(0.0991)		(0.0683)		(0.0548)
		[-0.0115]		[-0.0589]		[-0.0007]		[-0.0302]
Observations	29,186	29,186	70,227	70,227	91,044	91,044	212,369	212,369
R2	0.9645	0.9645	0.9647	0.9647	0.9775	0.9775	0.9790	0.9790
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

2. Heterogenous impact

2.1. Development stage

The results prove that uncertainty in EMDEs has the highest impact on trade. We split the sample into two income groups, including AEs and EMDEs. For each subgroup, we estimate the effects of lagged uncertainty. The results displayed in Table 6 show that all the coefficients associated with lagged joint uncertainty are negative and strongly significant at the 1 percent level. Lagged Joint uncertainty in EMDEs trading pairs (intra-EMDEs) decreases trade by 3.3 percent, while uncertainty in AEs trading pairs (intra-AEs) decreases trade by 2.7 percent (Table 6, columns [1] and [7]). Lagged joint uncertainty also undermines trade in AEs-EMDEs trading pairs depending on which group is the exporter or importer. Joint uncertainty between exporting EMDEs and importing AEs decreases trade by 7.2 percent, while joint uncertainty between exporting AEs and importing EMDEs decreases trade by 2.4 percent (Table 6, columns [3] and [5]).

These findings are valid when considering uncertainty in the exporting and the importing countries. Most coefficients in front of uncertainty from exporting and importing countries are negative and strongly significant at the 1 percent, 5 percent, or 10 percent level, depending on the case. First, when the exporting country is an AE and the importing country an EMDE, a one SD increase of lagged uncertainty in the exporting country (AE) decreases its bilateral trade with the EMDE by 1.6 percent. In contrast, a one SD hike of lagged uncertainty in the importing country (EMDE) decreases its bilateral trade with the AE by 1.5 percent (Table 6, column [4]). This result suggests that uncertainty from importing and exporting countries adversely affects bilateral trade when the importers are from EMDEs and exporters are from AEs. Second, when the exporting country is an EMDE, and the importing country is an AE, a one SD increase of lagged uncertainty in the exporting country (EMDE) decreases its bilateral trade with the AE by 4.3 percent. In comparison, a one SD increase of lagged uncertainty in the importing country (AE) decreases its bilateral trade with the EMDE by 5.2 percent (Table 6, column [6]). These findings suggest that the impact of uncertainty is higher when the exporter is an EMDE and the importer an AE. It indicates that when the exporter is an EMDE, the effect of uncertainty from its partner, which is an AE, is higher compared to the opposite case, emphasizing the problem of production and financing of firms in EMDEs and the low demand they face in uncertain times.

Furthermore, we investigated the impact of uncertainty on intra-AEs and intra-EMDEs bilateral trade. The results confirm that uncertainty in EMDE trade has the highest impact. Uncertainty in the exporting country has a negative and significant impact at the 1 percent level on bilateral EMDEs trade, while uncertainty in the importing country is not significant. The findings suggest that a one SD increase of lagged uncertainty in the exporting country decreases intra-EMDEs bilateral trade by 4.5 percent. For intra-bilateral trade, a one SD increase of lagged uncertainty in the importing country decreases intra-AEs bilateral trade by 2.5 percent vs. a 1 percent decrease in bilateral trade following a one SD increase of lagged uncertainty in the exporting country (AE) (Table 6, columns [2] and [8]). Similar estimation using income group classification provides the same results, suggesting that uncertainty on both sides of the border impacts bilateral trade between high-income countries and medium-income countries (Table A3).

2.2. Intra versus extra-continental trade

We investigated the impact of uncertainty on intraregional trade, and the results show that intra-African and European are the hardest hit by uncertainty. The effect of uncertainty on trade may vary depending on the region. Table 7 presents the results of the intraregional assessment. The findings suggest that uncertainty from the exporting countries negatively and significantly impacts intraregional trade for African and European countries. The coefficients associated with uncertainty from exporting countries are negative and strongly significant at the 1 percent level (for Africa and Europe). A one SD increase of uncertainty in exporting countries decreases intra-African bilateral trade by 4.2 percent. However, a one SD increase of uncertainty in the exporting country decreases intra-European bilateral trade by 2.1 percent, vs. a 1.2 percent decrease in trade following a one SD increase of uncertainty in the importing country (Table 7, columns [2] and [8]). Furthermore, we investigated the impact of uncertainty on extracontinental trade. Table A4 presents the results of the effect of uncertainty on extracontinental trade. Half of the coefficients in front of lagged joint uncertainty are negative and significant at the 1 percent level. Findings suggest that, in most cases, a surge in lagged joint uncertainty decreases extra-continental bilateral trade. However, in the case of Africa, a one SD hike in lagged joint uncertainty decreases the bilateral between the exporting African countries and the rest of the world (ROW). In contrast, a hike in lagged joint uncertainty between an importing African country and the ROW does not significantly impact their bilateral trade flows. These additional findings suggest that uncertainty does not hit African countries' imports from the ROW. A result that can be symptomatic of the dependency of these countries on imports for their basic needs.

Table 6. Results - the impact of uncertainty on trade varies by development level.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Exporter ->	AE				EMDE			
Importer ->	AE		EMDE		AE		EMDE	
VARIABLES	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Joint Uncertainty$_{t-1}$ (Unc$_{i,t-1}$ + Unc$_{j,t-1}$)	-0.121***		-0.109***		-0.328***		-0.149***	
	(0.0302)		(0.0265)		(0.0477)		(0.0286)	
	[-0.0265]		[-0.0237]		[-0.0716]		[-0.0326]	
Uncertainty from exporter$_{t-1}$(Unc$_{i,t-1}$)		-0.0703*		-0.115**		-0.303***		-0.318***
		(0.0419)		(0.0459)		(0.0581)		(0.0414)
		[-0.00996]		[-0.0162]		[-0.0430]		[-0.0450]
Uncertainty from importer$_{t-1}$ (Unc$_{j,t-1}$)		-0.173***		-0.105***		-0.367***		0.0159
		(0.0415)		(0.0325)		(0.0775)		(0.0401)
		[-0.0245]		[-0.0149]		[-0.0519]		[0.00225]
Observations	32,718	32,718	113,448	113,448	79,887	79,887	193,402	193,402
R2	0.967	0.967	0.900	0.900	0.842	0.842	0.798	0.798
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Results - the impact of uncertainty on intracontinental trade

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Africa		`America		Asia		Europe		Pacific	
VARIABLES	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Joint Uncertainty$_{t-1}$ (Unc$_{i,t-1}$ + Unc$_{j,t-1}$)	-0.114		-0.0361		0.0908		-0.115***		0.354	
	(0.0750)		(0.0596)		(0.0720)		(0.0325)		(0.331)	
	[-0.0248]		[-0.00787]		[0.0198]		[-0.0251]		[0.0772]	
Uncertainty from exporter$_{t-1}$(Unc$_{i,t-1}$)		-0.295***		-0.0510		0.248**		-0.145***		0.00690
		(0.0985)		(0.0861)		(0.101)		(0.0466)		(0.227)
		[-0.0418]		[-0.0072]		[0.0351]		[-0.0206]		[0.0010]
Uncertainty from importer$_{t-1}$ (Unc$_{j,t-1}$)		0.0640		-0.0226		-0.0571		-0.0851*		0.643
		(0.111)		(0.0784)		(0.101)		(0.0451)		(0.474)
		[0.00906]		[-0.0032]		[-0.0081]		[-0.0121]		[0.0910]
Observations	28,242	28,242	16,381	16,381	33,521	33,521	32,243	32,243	198	198
R2	0.750	0.751	0.896	0.896	0.880	0.880	0.952	0.952	0.979	0.979
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

3. Conditional factors

Rising geopolitical tensions and the uneven distribution of the gains from globalization and trade integration have contributed to increasing skepticism toward multilateralism and to the growing appeal of inward-looking policies (Colantone & Stanig, 2018; Rodrik, 2018; Autor et al., 2020; Pastor & Veronesi, 2021). Supply-chain disruptions and rising geopolitical tensions caused by recent events have brought the potential benefits and costs of geoeconomic fragmentation to the center of the policy debate. In this context of increasing uncertainty, these factors are likely to influence the effects of uncertainty on trade.

The novelty of this study is integrating the empirical model of multiplicative variables to predict the non-linear relationships between uncertainty and trade. While several studies have assessed the impact of uncertainty on bilateral trade, only a few of them have examined non-linearities in the effect. The current study assesses the non-linearity of the impact of uncertainty using several multiplicative variables, including trade integration (trade intensity and GVCs participation), geopolitical risk, and geopolitical distance. To perform this study, Equation (6) is transformed as follows:

$$\ln(X_{ijt}) = K + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(Dist_{ij}) + \beta_4 Lang_{ij} + \beta_5 Col_{ij} + \beta_6 Cont_{ij} + \beta_7 TA_{ij} + \beta_8 Unc_{it} + \beta_9 Unc_{jt} + \beta_{10} M_{ijt} \times Unc_{it} + \beta_{11} M_{ijt} Unc_{jt} + \beta_{12} M_{ijt} + \delta_i + \delta_j + \delta_{ij} + \delta_t + \varepsilon_{ij} \quad (8)$$

Where M_{ijt} is the multiplicative variable representing conditional effects. It can be bilateral or unilateral country-specific mitigating / aggravating effects (M_{it} and M_{jt} in country i, country j). These interactive variables are trade integration (the level of trade intensity between country pairs, the level of GVCs participation in the importing and exporting countries), geopolitical risk in the importing and exporting countries, and bilateral geopolitical distance (diplomatic disagreement) between trading partners.

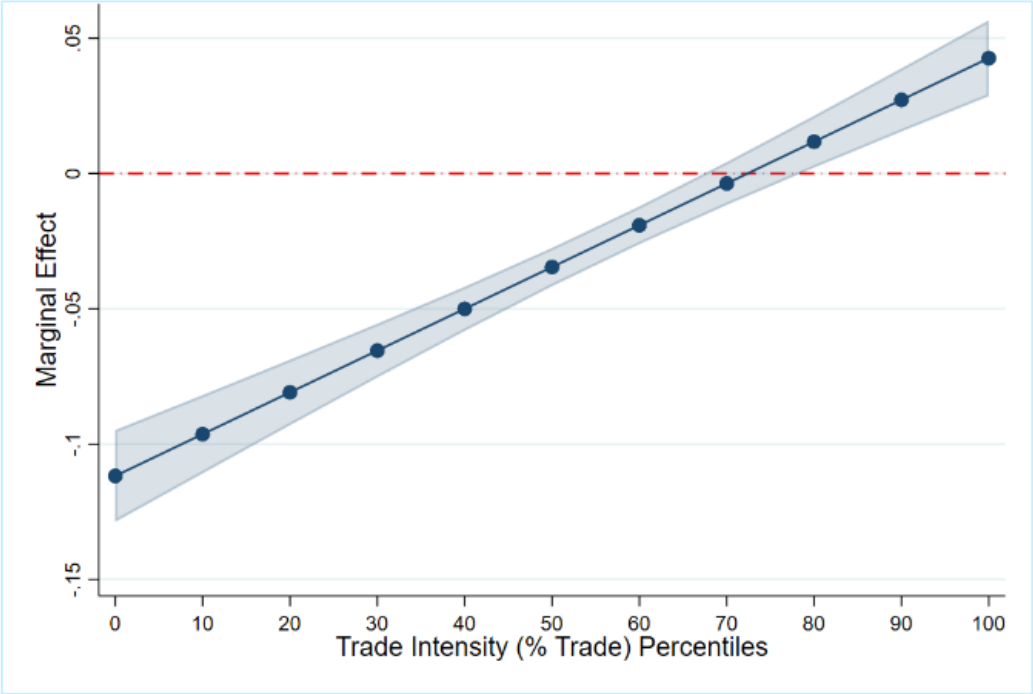
3.1. Horizontal integration

The current study assessed how horizontal trade integration influences the impact of uncertainty on trade. Horizontal trade integration is captured here by the level of trade intensity between bilateral pairs. Following Frankel and Rose (1997, 1998), Baxter and Kouparitsas (2005), and Tapsoba (2009), the degree of trade intensity between countries i and j is measured as the amount of bilateral trade divided by the sum of the total trade or the sum of the output of countries i and j. The trade intensities (TI1 and TI2) are obtained as follows:

$$TI1_{ijt} = \frac{M_{ijt} + X_{ijt}}{(M_{it} + X_{it}) + (M_{jt} + X_{jt})} \; or \; TI2_{ijt} = \frac{M_{ijt} + X_{ijt}}{(Y_{it} + Y_{jt})}$$

The negative impact of uncertainty on bilateral trade is mitigated by the level of trade intensity between trading partners. In this section, we investigate whether the impact of uncertainty on trade depends on the level of trade intensity (Equation (8)). The findings suggest that the higher the trade intensity between country pairs, the higher the marginal impact of uncertainty on bilateral trade. This finding stands for uncertainty in both the importing and the exporting countries. Figure 4 illustrates the marginal impact of uncertainty on bilateral trade depending on trade intensity. We relied on percentiles of trade intensity to better interpret the results. The findings highlight that a one SD increase in lagged joint uncertainty is associated with an approximately 7.3 percent decrease in bilateral trade between countries at the 25th percentile of trade intensity (i.e., country pairs with low trade intensity), while decreases bilateral trade by 0.37 percent between countries at the 70th percentile of trade intensity (i.e., countries that are unavoidable trading partners). The impact becomes positive at the 75th percentile of trade intensity. The findings are valid when considering uncertainty in both the exporting and the importing countries. A one SD hike in lagged uncertainty in the exporting country leads to an approximately 6.8 percent decrease in bilateral trade between countries at the 25th percentile of trade intensity. However, a one SD increase in lagged uncertainty in the exporting country leads to a 1.1 percent decrease in bilateral trade between countries at the 75th percentile of trade intensity; the impact becomes positive at the 85th percentile of trade intensity (Figure A1 Table A5). The attenuating effect of trade intensity is valid for uncertainty in the importing country. A one SD increase in lagged uncertainty in the importing country leads to a 2.8 percent decrease in bilateral trade between countries at the 25th percentile of trade intensity and a 1.5 percent increase in bilateral trade between countries at the 75th percentile of trade intensity (Figure A1 Table A5). These findings suggest that the negative impacts of uncertainty are mitigated by trade intensity between trading partners. In other words, when countries are deeply integrated, uncertainty no longer matters as they become unavoidable trade partners.

Figure 4. The Impact of Uncertainty Depends on Trade Intensity - Marginal Impact.



Note: The authors' calculations are based on the estimates' results. The figure represents the marginal impact of joint uncertainty with a 95 percent confidence interval.

3.2. Vertical integration

We investigate whether the impact of uncertainty on trade depends on the level of GVC participation. The new configuration of trade constitutes an aggravating factor in the negative impact of uncertainty. Since the nineties, countries have become interconnected via international trade and vertical specialization. This new configuration of international trade accounts now for almost half of global trade (World Bank, 2020). About 70 percent of international trade today involves GVCs. Besides, 15 percent of all firms are involved in this new trade configuration, and they capture 80 percent of total trade (World Bank 2020). These connections make international trade more vulnerable to domestic and foreign uncertainty. To check whether participation in GVCs is an aggravating factor, we include an interaction variable between the level of GVC participation and our uncertainty index, as described in equation (8).

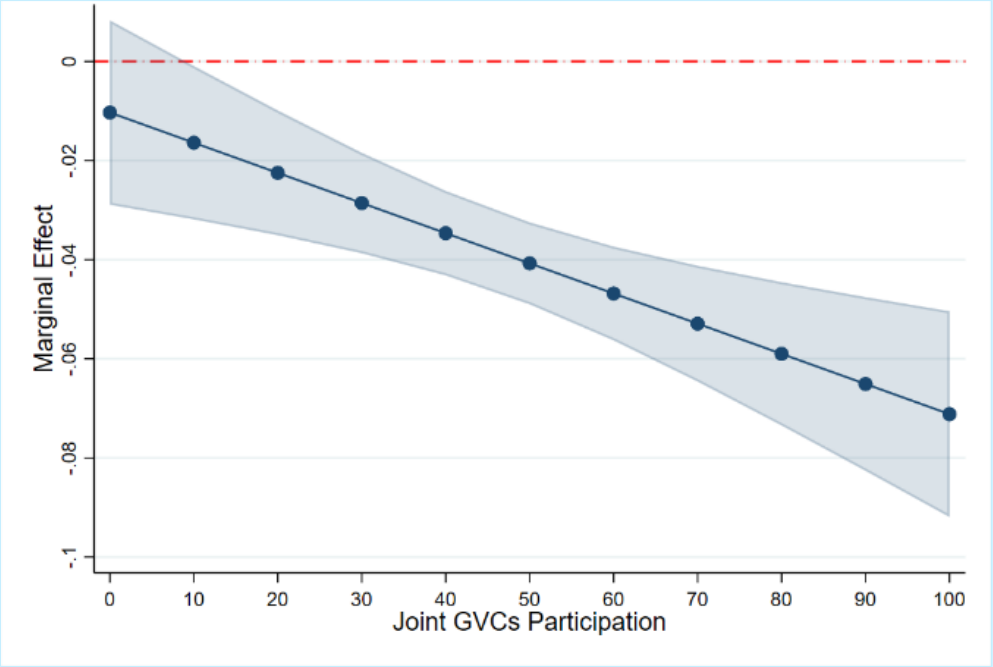
The results are reported in Table A6. Figure 5 and Figure A2 present the marginal effect of uncertainty based on the level of participation in GVCs in the exporting and importing countries and joint GVCs participation. The results highlight that uncertainty on both sides of the border (unilateral or joint uncertainty) hurts bilateral trade. However, the negative impact of uncertainty is widening and tends to become more negative with the level of GVC participation. This result is valid for both GVC's participation in the exporting and the importing countries, with a much more significant impact on GVCs' participation in the exporting country. This is true for all types of uncertainty. Findings suggest that a one SD increase in lagged joint uncertainty in less integrated countries into GVCs (25 percent of joint GVCs participation) decreases bilateral trade by 2.6 percent against a 5.6 percent decrease for a well-integrated country (i.e., 75 percent of joint GVCs participation).

These findings are valid for uncertainty and GVCs' participation in the exporting and importing countries. A one SD increase in lagged uncertainty in the exporting country leads to an approximately 2 percent decrease in bilateral trade for a level of GVCs participation of 25 percent of the exporting country. For a level of GVCs participation of the exporting country of 75 percent, a one SD increase in lagged uncertainty in the exporting country decreases bilateral trade by 6 percent. For GVCs participation in the importing country, the trade decrease is lower, and the difference between the marginal impact of uncertainty on trade for 25 percent of GVCs participation and 75 percent of GVCs participation is not more significant, suggesting a low marginal impact for uncertainty in the importing country. A one SD hike in lagged uncertainty in the importing country leads to an approximately 0.1 percent decrease in bilateral trade for a level of GVCs participation of 25 percent

of the importing country against a 2.5 percent decrease in bilateral trade for a level of GVCs participation of 75 percent of the importing country.

GVCs refer to a series of stages involved in producing a good or service, with each stage adding value and at least two stages taking place in different countries (World Bank, 2020). It refers to a configuration of coordinated activities divided among firms and has a geographical scale (Keane, 2015; Ponte & Gibbon, 2005). Given this definition, it makes sense that countries integrated deeply into GVCs are more sensitive to shocks and uncertainty. The findings suggest that the higher the countries' involvement in GVCs (especially exporting countries), the deeper the negative impact of uncertainty on bilateral trade.

Figure 5. The Impact of Uncertainty Depends on GVC participation- Marginal impact.



Note: Authors' calculations are based on the results of estimates. The figure represents the marginal impact of joint uncertainty with a 95 percent confidence interval.

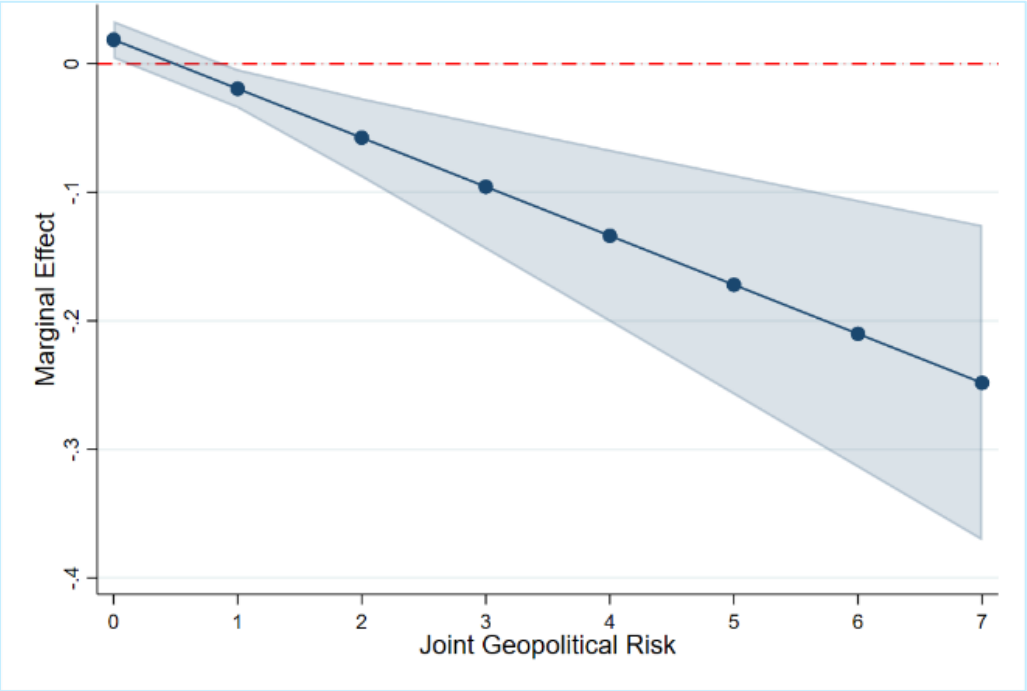
3.3. Geopolitical risk

Geopolitical risk as an aggravating effect of uncertainty. Table A7 presents the coefficient estimates for the specification in Equation (8) using geopolitical risk as an interactive variable. Figure 6 and Figure A3 report the marginal impact of uncertainty depending on the level of geopolitical risk in the exporting and importing countries and joint geopolitical risk. The results confirm that geopolitical risk level deepens uncertainty's negative impact. Joint geopolitical risk between country pairs ranges between 0 and 6.63 and between 0 and 4.35 for geopolitical risk in exporting or importing countries.

The findings suggest that a one SD hike in lagged joint uncertainty decreases bilateral trade by 1.9 percent for trading partners with low joint geopolitical risk (a level of geopolitical risk of 1). In contrast, it decreases trade by 9.6 percent for partners with high joint geopolitical risk (a level of geopolitical risk of 3). This impact is valid for geopolitical risk in the exporting and importing countries.

For instance, for a geopolitical risk of zero in the exporting country, a one SD hike in lagged uncertainty in the exporting country leads to an approximately 0.3 percent increase in bilateral trade between countries. However, for a level of geopolitical risk of one in the exporting country (i.e., countries with a high level of geopolitical risk), a one SD increase in uncertainty leads to a 6.8 percent decrease in bilateral trade between countries (a 14 percent decrease for a level of geopolitical risk of 2). This aggravating effect is valid when considering uncertainty in the importing country. The aggravating effect of geopolitical risk shows that the impact of uncertainty depends on the perception of bilateral partners of geopolitics.

Figure 6. The Impact of Uncertainty Depends on Geopolitical Risk: Marginal Impact.



Note: Authors' calculations are based on the results of estimates. The figure represents the marginal impact of joint uncertainty with a 95 percent confidence interval.

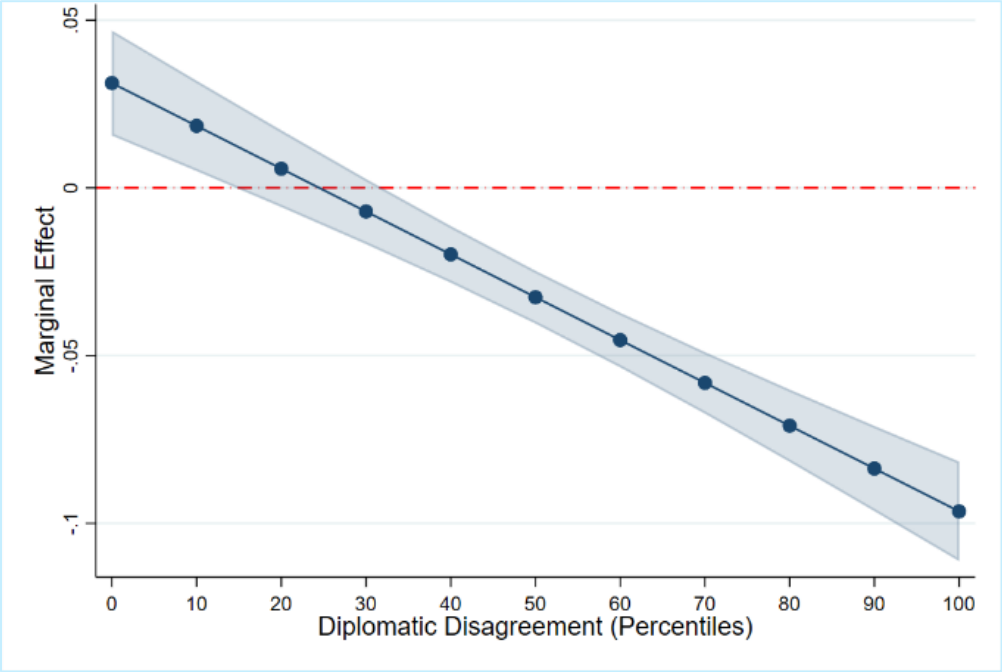
3.4. Diplomatic disagreement

Bilateral diplomatic disagreement is an aggravating effect of uncertainty. We further look at how the level of bilateral diplomatic disagreement influences the impact of uncertainty on bilateral trade following Jakubik and Ruta (2023). Table A8 presents the coefficient estimates for Equation (8) specification using bilateral geopolitical distance as an interactive variable. Figure 7 reports the marginal impact of uncertainty depending on bilateral diplomatic disagreement. Unlike Jakubik and Ruta (2023), who investigated the impact of world trade uncertainty (no country-level variation) on bilateral trade using diplomatic disagreement as an interactive variable, the current section investigates whether the impact of country-level or joint bilateral uncertainty between bilateral pairs depends on bilateral diplomatic disagreement.

The findings align with Jakubik and Ruta (2023) and suggest that diplomatic disagreement deepens the impact of uncertainty. A one SD increase in lagged joint uncertainty leads to an approximately 0.067 percent decrease in bilateral trade between countries at the 25th percentile of diplomatic disagreement (friendly countries) compared to a 6.4 percent decrease in bilateral trade between countries at the 75th percentile of diplomatic disagreement (high diplomatic rivals).

This aggravating effect is valid when considering uncertainty in the exporting and the importing countries. According to the results, a one SD hike in lagged uncertainty in the exporting country is associated with a 1 percent decrease in bilateral trade between countries at the 25th percentile of diplomatic disagreement and a 5.6 percent decrease in bilateral trade between countries at the 75th percentile. Unlike the exporting country, in the importing country, a one SD hike in lagged uncertainty is associated with an increase in bilateral trade between friendly countries by 1 percent, against a 2.8 percent decrease in bilateral trade between nonfriendly countries. Similarly, to geopolitical risk in trading partners' countries, the geopolitical distance between bilateral partners aggravates the impact of uncertainty on bilateral trade.

Figure 7. The Impact of Uncertainty Depends on Diplomatic Disagreement - Marginal Impact.



Note: Authors' calculations are based on the results of estimates. The figure represents the marginal impact of joint uncertainty with a 95 percent confidence interval.

C. Robustness

1. Alternative measures of global uncertainty and additional controls

Additional measures of uncertainty provide equivalent results. The current study relies on additional measures of uncertainty to check the robustness of our baseline estimates. We used the average uncertainty between the importer and exporter, maximal and minimal uncertainty, and the difference and the absolute difference between uncertainties on the two sides of the border. Table 8 presents the estimates' results.

The findings suggest that a one SD increase in lagged average uncertainty is associated with a decline in bilateral trade by 3.9 percent (Table 8, column [1]). For the case of maximum and minimum uncertainty, we found that a one SD increase in lagged maximal uncertainty is associated with a decline in bilateral trade by 2.9 percent (Table 8, column [2]), a lower decline in international trade compared to the decline induced by a one SD hike in lagged joint uncertainty observed in the baseline specification (4.5 percent). While lagged minimal uncertainty and lagged average uncertainty increase reduce bilateral trade by 3.4 percent (Table 8, column [3]), the difference in lagged uncertainty as well as the absolute difference in lagged uncertainty is not significant (Table 8, columns [4] and [5]).

The current study also controlled for the inclusion of additional variables, including the volatility of credit in both the exporting and importing countries, terms of trade in the exporting and importing countries, industrial value added on both sides of the border, and bilateral exchange rate. Given that uncertainty is subjective, economic agents cannot link it to probability. To control for the first-order moment of macroeconomic risks, the current study controlled for credit volatility and terms of trade. The findings confirm the baseline estimates and highlight a negative and significant impact of lagged joint uncertainty on bilateral trade. The findings suggest that a 1 SD hike in lagged joint uncertainty reduces trade by 3.1 percent (Table A9, column [1]). The findings also show that uncertainty in the exporting and importing countries negatively and significantly impacts bilateral trade. As shown in Table A9, column [2], an increase of lagged uncertainty in the importing country by one SD is associated with a decline in bilateral trade by 2.24 percent against a decrease of 1.79 percent for an increase of lagged uncertainty in the exporting country. These findings confirm the baseline results and highlight that demand effects are more important than supply effects.

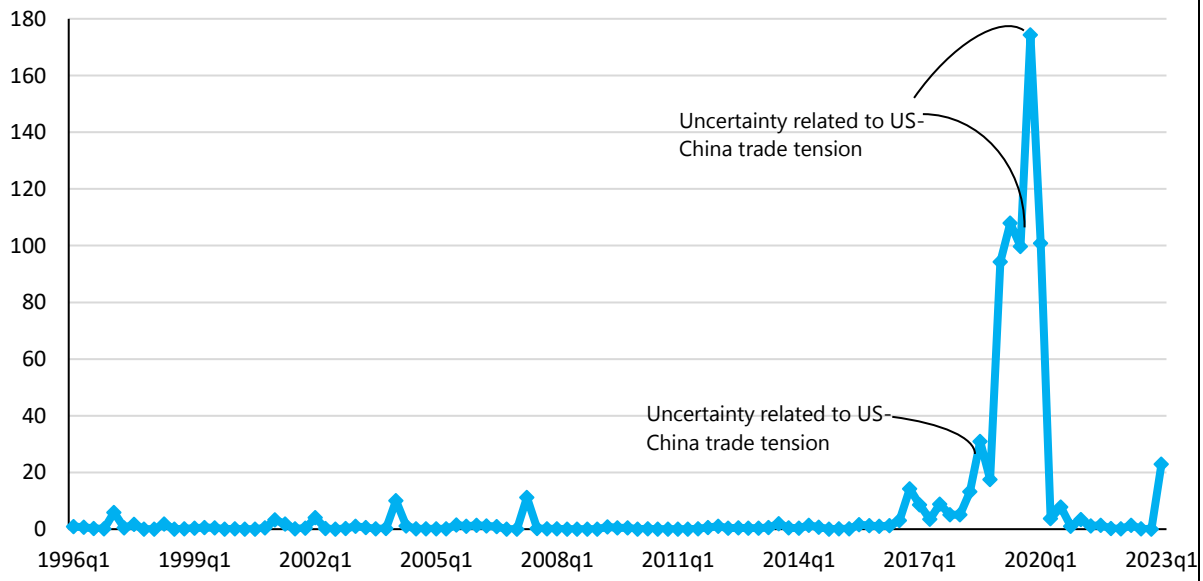
Table 8. Results - Impact of uncertainty on bilateral trade (Mean, Max, Min, and difference)

VARIABLES	[1] Trade	[2] Trade	[3] Trade	[4] Trade	[5] Trade
Mean_Uncertainty $_{t-1}$ $(\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1})/2$	-0.353***				
	(0.0619)				
	[-0.0386]				
Maximum Uncertainty $_{t-1}$ $\text{Max}\ (\text{Unc}_{i,t-1};\ \text{Unc}_{j,t-1})$		-0.180***			
		(0.0418)			
		[-0.0285]			
Minimum Uncertainty $_{t-1}$ $\text{Min}\ (\text{Unc}_{i,t-1};\ \text{Unc}_{j,t-1})$			-0.403***		
			(0.0641)		
			[-0.0343]		
Difference Uncertainty $_{t-1}$ $(\text{Unc}_{i,t-1} - \text{Unc}_{j,t-1})$				0.00728	
				(0.0341)	
				[0.00134]	
Absolute Difference Uncertainty $_{t-1}$ $\lvert\text{Unc}_{i,t-1} - \text{Unc}_{j,t-1}\rvert$					-0.0384
					(0.0418)
					[-0.00501]
Observations	426,578	426,578	426,578	425,993	425,993
R2	0.9735	0.9734	0.9735	0.9733	0.9733
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

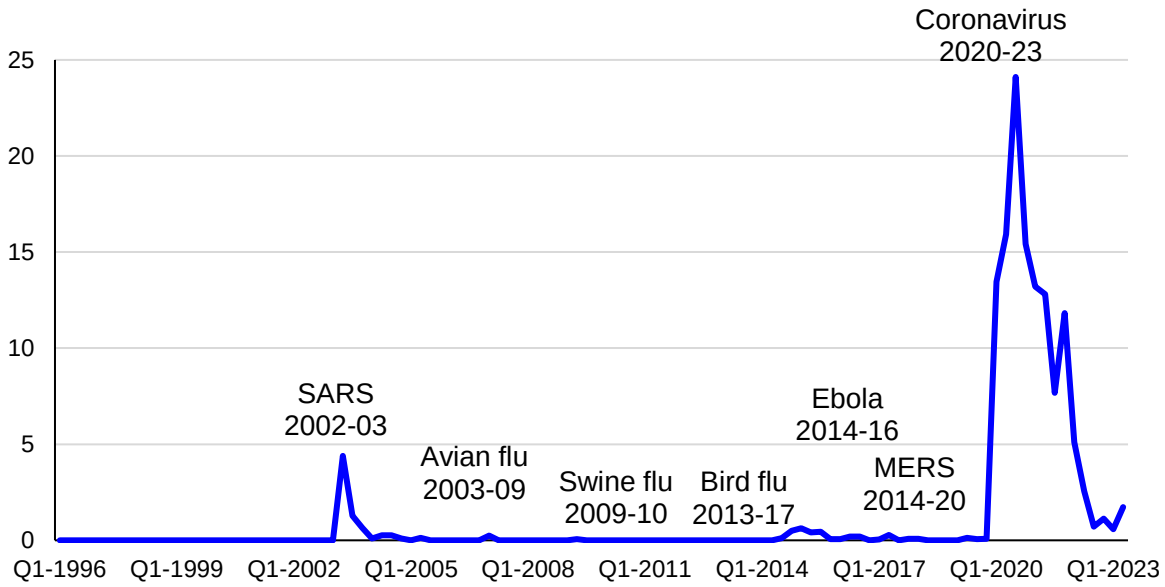
2. Other types of uncertainty

Figure 8. World trade uncertainty (1996Q1 to 2023Q2)



Source: Ahir, Bloom, and Furceri (2022), "World Trade Uncertainty Index."

Figure 9. World Pandemic uncertainty (1996Q1 to 2023Q2)



Source: Ahir, Bloom, and Furceri (2022), "World Pandemic Uncertainty Index."

Trade and pandemic uncertainty, some subcomponents of global uncertainty, negatively impact bilateral trade. In the wake of the trade tensions between the US and China and the recovery from COVID-19, which generated uncertainty around the world, it is important to assess the impact of trade and pandemic uncertainty on bilateral trade. Ahir, Bloom and Furceri (2018) calculated the World Trade Uncertainty Index by counting the number of times "uncertainty" is mentioned within proximity to a word related to trade in the EIU country reports. The index is an equally weighted average scaled by the number of words in the EIU country reports. The highest hike in trade uncertainty was registered during the US-China Trade tensions (Figure 8). The World Pandemic Uncertainty index is constructed by counting the number of times uncertainty is mentioned within proximity to a word related to pandemics in the EIU country reports. Specifically, the index is the percent of the word "uncertain" and its variants, which appear near the pandemic terms in EIU country reports, multiplied by 1,000. A higher number means higher uncertainty related to pandemics and vice versa. The highest episodes of Pandemic uncertainty include the SARS-related uncertainty between 2002 and 2003 and the uncertainty related to the COVID-19 pandemic (Figure 9).

Tables 9 and 10 present the results obtained when trade uncertainty and pandemic uncertainty are used to capture the source of uncertainty. All coefficients associated with the uncertainty indices are negative and strongly significant at the 1 percent or 5 percent level, suggesting that trade uncertainty and pandemic uncertainty are likely to reduce bilateral trade. Based on the results in Table 9 column [1], an increase of lagged joint trade uncertainty by one SD would lead to a reduction in bilateral trade ranging between 1.6 percent against an impact of lagged joint pandemic uncertainty of 4.6 percent (Table 10, column [1]). These findings are also valid when relying on lagged trade and pandemic uncertainty from the exporting and importing countries (Table 9 and Table 10, column [2]). For trade uncertainty, we found that a one SD increase in lagged trade uncertainty from the exporting country reduces bilateral trade by 1.3 percent against a decrease of 0.7 percent following a one SD hike in lagged trade uncertainty from the importing country, highlighting a higher supply effect. For pandemic uncertainty, the demand effect (2.6 percent trade decrease following a one SD hike of uncertainty from the importing country) is slightly more important than the supply effect (2.5 percent trade decrease following a one SD hike of uncertainty from the exporting country). Trade and Pandemic-related uncertainty are also detrimental to trade.

Table 9. Results - Impact of trade uncertainty on bilateral trade

VARIABLES	[1] Trade	[2] Trade
Joint Trade Uncertainty$_{t-1}$ ($\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1}$)	-0.00539***	
	(0.000929)	
	[-0.0156]	
Trade Uncertainty from exporter$_{t-1}$ ($\text{Unc}_{i,t-1}$)		-0.00723***
		(0.00145)
		[-0.0134]
Trade Uncertainty from importer$_{t-1}$ ($\text{Unc}_{j,t-1}$)		-0.00379***
		(0.00120)
		[-0.00703]
Observations	313,640	313,640
R2	0.9815	0.9815
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10. Results - Impact of pandemic uncertainty on bilateral trade

VARIABLES	[1] Trade	[2] Trade
Joint Pandemic Uncertainty$_{t-1}$($\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1}$)	-0.00502***	
	(0.00162)	
	[-0.0456]	
Pandemic Uncertainty from exporter$_{t-1}$ ($\text{Unc}_{i,t-1}$)		-0.00492**
		(0.00206)
		[-0.0251]
Pandemic Uncertainty from importer$_{t-1}$ ($\text{Unc}_{j,t-1}$)		-0.00510**
		(0.00251)
		[-0.0261]
Observations	313,640	313,640
R2	0.9815	0.9815
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

3. GMM methodology

A GMM approach to control endogeneity confirms baseline results. To check the robustness, the current study followed a system-GMM approach (Blundell and Bond 1998). We acknowledge that the GMM approach has some limitations as it can be subject to weak instruments. Table 11 shows that the impact of uncertainty using a GMM approach and the measures of uncertainty in both exporting and importing countries, as well

as joint uncertainty, is negative and significant at the 1 percent level. The current GMM model uses a period lag of uncertainty and the second-period lag of bilateral trade as instruments for both uncertainty and lagged bilateral trade. The equation is therefore identified, and the findings suggest that a one SD increase in joint uncertainty reduces bilateral trade by 2.3 (Table 11, column [1]). These findings confirm uncertainty in exporting and importing countries. A one SD increase in uncertainty in the exporting country is associated with a decline in bilateral trade of 2.1 percent. However, a one SD increase in uncertainty in the importing country is associated with a decline in bilateral trade of 1 percent (Table 11, column [2]). The system GMM results (Table 11, columns [3] and [4]) yield higher coefficients, in line with the baseline results.

Table 11: Results - Impact of uncertainty on bilateral trade (GMM approach)

	[1]	[2]	[3]	[4]
	IV/GMM estimation		System GMM estimation	
VARIABLES	Log of Trade	Log of Trade	Log of Trade	Log of Trade
Joint Uncertainty$_t$ (Unc$_{i,t}$ + Unc$_{j,t}$)	-0.104***		-0.211***	
	(0.0230)		(0.0753)	
	[-0.0227]		[-0.0477]	
Uncertainty from exporter$_t$ (Unc$_{i,t}$)		-0.145***		-0.194*
		(0.0330)		(0.108)
		[-0.0205]		[-0.0293]
Uncertainty from importer$_t$ (Unc$_{j,t}$)		-0.0644**		-0.213**
		(0.0324)		(0.104)
		[-0.00912]		[-0.0312]
Log of Trade$_{t-1}$	0.772***	0.772***	0.577***	0.577***
	(0.00515)	(0.00515)	(0.0144)	(0.0144)
Observations	354,443	354,443	60,664	60,664
Number of pairs	15,354	15,354	16,498	16,498
Inst Count < Groups	Yes	Yes	Yes	Yes
Over identification / Hansen	*id*	*id*	135.9	139.5
AR1 p-value	-	-	0.000	0.000
AR2 p-value	-	-	0.167	0.167
Exporter Fixed Effects	Yes	Yes	Yes	Yes
Importer Fixed Effects	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	No	No
Time Fixed Effects	Yes	Yes	Yes	Yes

Note: gravity model's basic control variables are included. "id" means Exactly identified. Beta coefficients between brackets. The second-order lagged logarithm of trade is used as an instrument for the lagged dependent variable. The lag of uncertainty is used as an instrument for uncertainty. For the System GMM estimation, the period goes from 1980 to 2021, and we constructed six periods, each variable for a given period representing the average on seven consecutive years. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

V. Conclusion

In the wake of the recovery from COVID-19, the Russia-Ukraine war, and conflicts in the Middle East that generated uncertainty around the world, this paper has investigated the impact of past episodes of uncertainty on bilateral trade. The paper concludes with the following results using an augmented gravity model with 143 countries from 1980 to 2021. Uncertainty negatively impacts bilateral trade between countries. The findings suggest that this negative impact of uncertainty channels through both supply and demand effects as uncertainty in the exporting country and uncertainty in the importing country negatively affect bilateral trade, with a higher impact of uncertainty from the importing country. The study finds differences in the amplitude of the impact depending on the type of traded goods. The findings suggest that manufacturing and mineral fuel product trade are more at risk.

The findings suggest the existence of heterogeneity in the impact of uncertainty on bilateral trade. A heterogeneous regional analysis of the impact of uncertainty suggests that EMDEs and non-natural resource-rich countries are more at risk. This intuitive finding for EMDEs suggests they are more likely to be impacted by uncertainty in their trade relations with both AEs and EMDEs. EMDEs' policy maker, therefore, needs to consider uncertainty as a key element in their strategy. The findings suggest that non-natural resources are

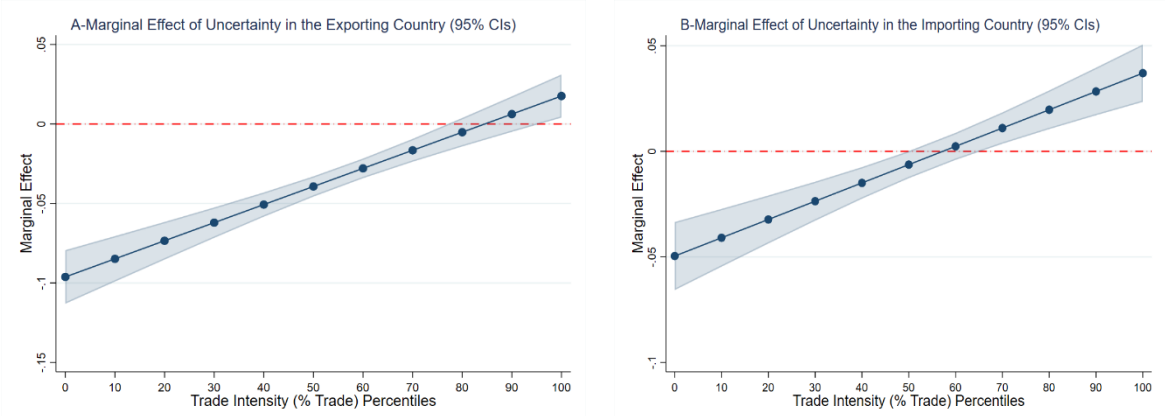
more at risk, but natural resource countries face adverse effects from uncertainty. Intra-African and intra-European trade were found to be vulnerable to uncertainty shocks.

One of the significant contributions of the current study is the introduction of non-linearities in the effect of uncertainty on trade. Further investigations provide additional results on the non-linear impact of uncertainty. While the negative impact of uncertainty is confirmed, it is moderated by the level of trade intensity between trading partners and aggravated by geopolitical risk, geopolitical distance, and the level of GVCs participation. These non-linearities highlight important takeaways for the current economic and geopolitical context, showing essential elements that can deepen the negative impact of uncertainty and hamper countries' short and medium-term strategies. Policymakers should, therefore, consider these mitigating and aggravating effects in their strategies for more efficiency.

Regarding global policy implications, uncertainty is increasingly topical, given the uncertainty and downturn generated by events such as the COVID-19 pandemic, the invasion of Ukraine by Russia, and the current conflicts in the Middle East. Uncertainty may remain after these events and harm economic recovery, especially for developing countries. The results depicted in this study suggest that despite the economic benefit of international trade, it is sensitive to high uncertainty in the exporting or the importing country. In international relationships, uncertainty matters and is even detrimental as bilateral countries well integrated into GVCs can quickly become vulnerable to uncertainty. We currently face positive regional dynamics in promoting international trade, such as in the African Continental Free Trade Area. However, these dynamics are coupled with negative dynamics created by the rising geopolitical fragmentation in Africa (e.g., the creation of the AES), putting current positive dynamics and past efforts at risk. One positive outcome from these findings is that trading more with a partner can help counter the negative impact of uncertainty as the two trading partners are unavoidable trade partners. Thus, policymakers, by promoting openness and trade integration, should, at the same time, promote measures and protocols to prevent economic losses caused by potential uncertainty shocks.

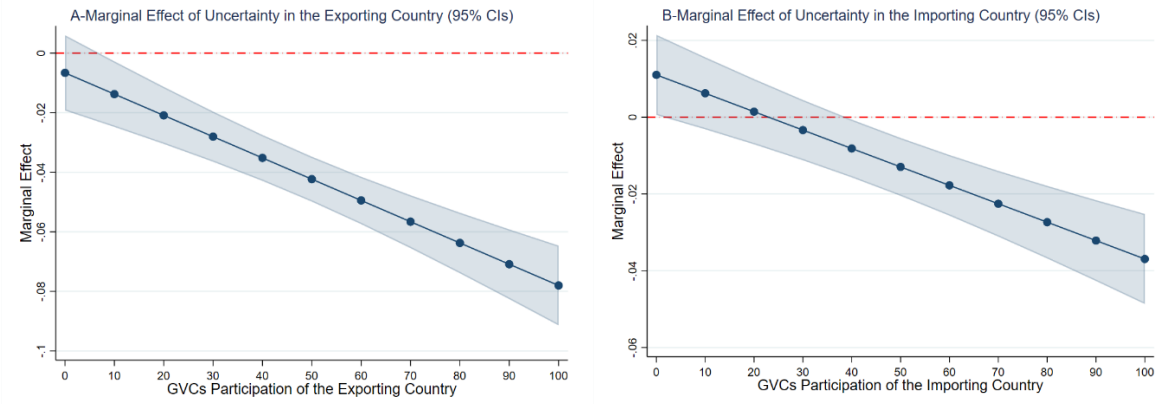
Appendix – Charts and result tables

Figure A1. The Impact of Uncertainty Depends on Trade Intensity: Marginal Impact.



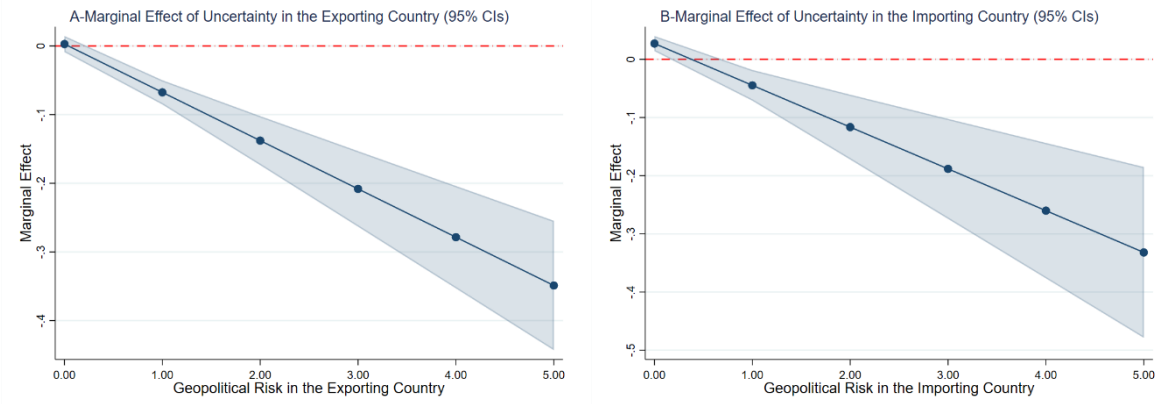
Note: Authors' calculations are based on the results of estimates.

Figure A2. The Impact of Uncertainty Depends on GVCs participation: Marginal impact.



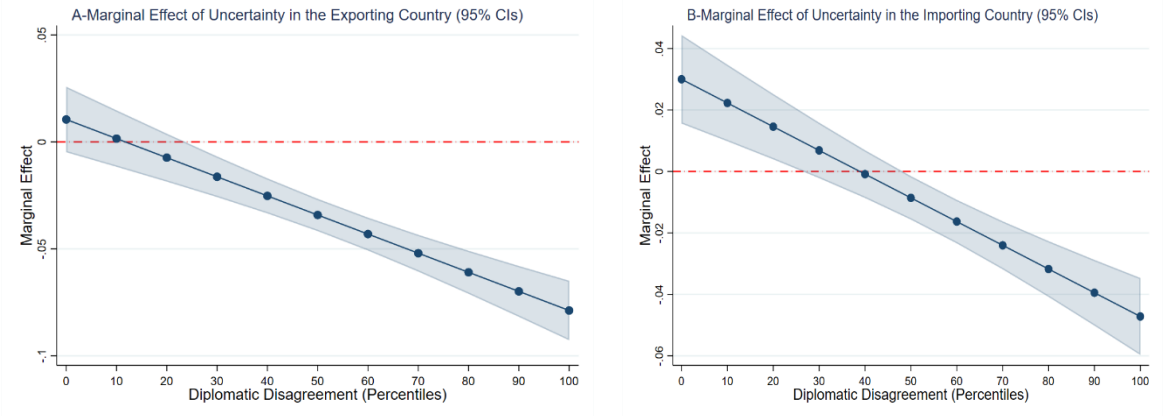
Note: Authors' calculations are based on the results of estimates.

Figure A3. The Impact of Uncertainty Depends on Geopolitical Risk: Marginal Impact.



Note: Authors' calculations are based on the results of estimates.

Figure A4. The Impact of Uncertainty Depends on geopolitical distance: Marginal impact.



Note: Authors' calculations are based on the results of estimates.

Table A1. Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Log (Trade)	433,797	8.81	3.76	-6.91	19.99
Distance (Km)	759,214	7304	4240	8	19,94
Log (GDP)	778,540	17.27	2.165	11.61	23.86
Log (GDP per capita)	778,540	0.94	1.66	-2.73	4.61
Global Uncertainty	791,280	0.15	0.142	0	1.34
Trade Uncertainty	513,240	0.44	1.86	0	36.40
Pandemic Uncertainty	513,240	1.21	5.11	0	74.60
Geopolitical Risk	217,560	0.21	0.41	0.004	4.35
Geopolitical distance	685,496	0.98	0.792	0	5.26
Trade Intensity (percent Trade)	465,111	0.002	0.006	0	0.51
Trade Intensity (percent GDP)	457,291	0.001	0.004	0	0.25
GVCs (US$ billion)	627,200	44.9	122.7	8. e-6	1466.7

Source: Authors' estimates from CEPII, EORA-MRIO Ahir, Bloom, and Furceri (2018).

Table A2. Global Uncertainty and bilateral trade – baseline results with all controls

	[1]	[2]	[3]	[4]
	Ordinary Least Squares (OLS)		Poisson Pseudo Maximum Likelihood (PPML)	
VARIABLES	Log of Trade	Log of Trade	Trade	Trade
Joint Uncertainty$_t$ ($\text{Unc}_{i,t} + \text{Unc}_{j,t}$)	-0.129***		-0.176***	
	(0.0182)		(0.0309)	
Uncertainty from exporter$_t$ ($\text{Unc}_{i,t}$)		-0.193***		-0.172***
		(0.0260)		(0.0457)
Uncertainty from importer$_t$ ($\text{Unc}_{j,t}$)		-0.0662***		-0.180***
		(0.0257)		(0.0471)
Distance	-0.806***	-0.807***	-0.0003**	-0.0003**
	(0.251)	(0.250)	(0.0001)	(0.0001)
GDP per capita Exporter$_t$	-0.143***	-0.141**	-0.007***	-0.007***
	(0.0549)	(0.0550)	(0.002)	(0.002)
GDP per capita Importer$_t$	-0.133***	-0.135***	-0.010***	-0.010***
	(0.0442)	(0.0442)	(0.002)	(0.002)
GDP Exporter$_t$	0.974***	0.970***	0***	0***
	(0.0538)	(0.0538)	(0)	(0)
GDP Importer$_t$	0.792***	0.795***	0**	0**
	(0.0437)	(0.0438)	(0)	(0)
Colonial relationship ever	0.363***	0.363***	0.150*	0.150*
	(0.0820)	(0.0960)	(0.0798)	(0.0788)
Regional Trade Agreement	0.242***	0.242***	0.296***	0.296***
	(0.0219)	(0.0219)	(0.0461)	(0.0461)
Observations	425,993	425,993	425,993	425,993
R2	0.865	0.865	0.974	0.974
Exporter Fixed Effects	Yes	Yes	Year	Year
Exporter Fixed Effects	Year	Year	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes

Note: Control variables are not in logarithm for the case of PPML estimations. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A3. Results - the impact of uncertainty on trade varies by income group.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Exporter ->	HICs			MICs			LICs		
Importer ->	HICs	MICs	LICs	HICs	MICs	LICs	HICs	MICs	LICs
VARIABLES	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Joint Uncertainty$_{t-1}$	-0.0836**	0.0270	-0.360***	-0.197	-0.167	-0.263*	-0.585***	-0.124	-0.620***
$(\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1})$	(0.0338)	(0.0581)	(0.0495)	(0.124)	(0.196)	(0.155)	(0.0828)	(0.127)	(0.110)
	[-0.0182]	[0.00588]	[-0.0785]	[-0.0430]	[-0.0365]	[-0.0574]	[-0.128]	[-0.0271]	[-0.135]
Uncertainty from exporter$_{t-1}$	-0.0857*	-0.0490	-0.194**	0.0194	-0.573**	-0.611***	-0.622***	-0.131	-0.873***
$\text{Unc}_{i,t-1}$	(0.0467)	(0.0938)	(0.0783)	(0.142)	(0.273)	(0.226)	(0.111)	(0.179)	(0.168)
	[-0.0121]	[-0.00694]	[-0.0275]	[0.00274]	[-0.0812]	[-0.0866]	[-0.0881]	[-0.0185]	[-0.124]
Uncertainty from importer$_{t-1}$	-0.0815*	0.0783	-0.464***	-0.462**	0.155	0.00713	-0.524***	-0.118	-0.364**
$\text{Unc}_{j,t-1}$	(0.0466)	(0.0728)	(0.0652)	(0.210)	(0.233)	(0.202)	(0.124)	(0.176)	(0.141)
	[-0.0115]	[0.0111]	[-0.0657]	[-0.0654]	[0.0220]	[0.00101]	[-0.0742]	[-0.0167]	[-0.0516]
Observations	58,144	33,037	42,632	14,616	6,001	7,808	32,391	12,824	16,896
R2	0.930	0.788	0.866	0.699	0.699	0.698	0.816	0.745	0.769
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Please note that the variable joint uncertainty is not included in the same equation as uncertainty in exporting and importing countries. Joint uncertainty is included in equation (7), while disaggregated uncertainty is considered in equation (6).

Table A4. Results - the impact of uncertainty on intracontinental trade

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Exporter ->	Africa	ROW	America	ROW	Asia	ROW	Europe	ROW	Pacific	ROW
Importer ->	ROW	Africa	ROW	America	ROW	Asia	ROW	Europe	ROW	Pacific
VARIABLES	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade	Trade
Joint Uncertainty$_{t-1}$	-0.327***	0.00103	-0.246***	-0.224***	-0.0472	-0.278***	-0.0934***	-0.378***	-0.101	-0.179
$(\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1})$	(0.0621)	(0.0405)	(0.0522)	(0.0481)	(0.0433)	(0.0456)	(0.0286)	(0.0484)	(0.111)	(0.151)
	[-0.0714]	[0.0002]	[-0.0537]	[-0.0489]	[-0.0103]	[-0.0607]	[-0.0204]	[-0.0825]	[-0.0220]	[-0.0390]
Uncertainty from exporter$_{t-1}$	-0.333***	-0.0504	-0.229***	-0.476***	-0.126*	-0.327***	-0.126***	-0.421***	-0.495**	-0.256
$\text{Unc}_{i,t-1}$	(0.0828)	(0.0598)	(0.0673)	(0.0805)	(0.0688)	(0.0626)	(0.0411)	(0.0640)	(0.220)	(0.174)
	[-0.0472]	[-0.00714]	[-0.0324]	[-0.0674]	[-0.0179]	[-0.0463]	[-0.0178]	[-0.0597]	[-0.0701]	[-0.0362]
Uncertainty from importer$_{t-1}$	-0.320***	0.0407	-0.267***	-0.0366	0.00566	-0.211***	-0.0705*	-0.318***	-0.0113	0.150
$\text{Unc}_{j,t-1}$	(0.0978)	(0.0530)	(0.0794)	(0.0567)	(0.0539)	(0.0644)	(0.0385)	(0.0695)	(0.132)	(0.216)
	[-0.0453]	[0.0058]	[-0.0379]	[-0.0052]	[0.0008]	[-0.0299]	[-0.010]	[-0.0450]	[-0.0016]	[0.0212]
Observations	55,681	88,574	57,498	51,380	81,147	82,876	103,981	75,025	10,526	9,072
R2	0.745	0.819	0.836	0.864	0.863	0.847	0.888	0.850	0.876	0.876
Exporter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Importer Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. ROW represents the Rest of the World. Please note that the variable joint uncertainty is not included in the same equation as uncertainty in exporting and importing countries. Joint uncertainty is included in equation (7), while disaggregated uncertainty is considered in equation (6).

Table A5. Trade intensity is a mitigator of the negative Impact of Global Uncertainty.

VARIABLES	[1] Trade	[2] Trade
Joint Uncertainty$_{t-1}$	-0.513***	
	(0.0396)	
	[-0.112]	
Joint Uncertainty$_{t-1}$*Trade Intensity	0.00708***	
	(0.000648)	
	[0.00154]	
Uncertainty from exporter$_{t-1}$		-0.679***
		(0.0607)
		[-0.0962]
Uncertainty from importer$_{t-1}$		-0.350***
		(0.0581)
		[-0.0496]
Uncertainty from exporter$_{t-1}$*Trade Intensity		0.00803***
		(0.00100)
		[0.00114]
Uncertainty from importer$_{t-1}$* Trade Intensity		0.00612***
		(0.000969)
		[0.000866]
Observations	387,621	387,621
R2	0.843	0.843
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A6. GVC participation aggravates the negative Impact of Global Uncertainty

VARIABLES	[1] Trade	[2] Trade
Joint Uncertainty$_{t-1}$	-0.0473	
	(0.0435)	
	[-0.0103]	
Joint Uncertainty$_{t-1}$*Joint GVCs	-0.00279***	
	(0.000838)	
	[-0.000609]	
Uncertainty from exporter$_{t-1}$		-0.0467
		(0.0456)
		[-0.00662]
Uncertainty from importer$_{t-1}$		0.0778**
		(0.0376)
		[0.0110]
Uncertainty from exporter$_{t-1}$ * Exporter GVCs		-0.00504***
		(0.000766)
		[-0.000714]
Uncertainty from importer$_{t-1}$ *Importer GVCs		-0.00339***
		(0.000588)
		[-0.000480]
Observations	367,496	367,496
R2	0.751	0.752
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A7. Geopolitical risk aggravates the negative Impact of Global Uncertainty.

VARIABLES	[1] Trade	[2] Trade
Joint Uncertainty$_{t-1}$	0.0856**	
	(0.0343)	
	[0.0187]	
Joint Uncertainty$_{t-1}$* Joint Geopolitical Risk	-0.175***	
	(0.0438)	
	[-0.0381]	
Uncertainty from exporter$_{t-1}$		0.0197
		(0.0422)
		[0.00279]
Uncertainty from importer$_{t-1}$		0.192***
		(0.0466)
		[0.0272]
Uncertainty from exporter$_{t-1}$*Exporter Geopolitical Risk		-0.496***
		(0.0714)
		[-0.0703]
Uncertainty from importer$_{t-1}$*Importer Geopolitical Risk		-0.507***
		(0.110)
		[-0.0718]
Observations	57,773	57,773
R2	0.832	0.832
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A8. Diplomatic disagreement aggravates the negative Impact of Global Uncertainty

VARIABLES	[1] Trade	[2] Trade
$\text{Joint Uncertainty}_{t-1}$	0.143***	
	(0.0366)	
	[0.0313]	
$\text{Joint Uncertainty}_{t-1}$*Diplomatic Disagreement	-0.00586***	
	(0.000612)	
	[-0.00128]	
$\text{Uncertainty from exporter}_{t-1}$		0.0740
		(0.0552)
		[0.0105]
$\text{Uncertainty from importer}_{t-1}$		0.212***
		(0.0520)
		[0.0300]
$\text{Uncertainty from exporter}_{t-1}$ *Diplomatic Disagreement		-0.00630***
		(0.000903)
		[-0.000893]
$\text{Uncertainty from importer}_{t-1}$ * Diplomatic Disagreement		-0.00545***
		(0.000829)
		[-0.000772]
Observations	393,024	393,024
R2	0.866	0.866
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A9. Results - Impact of uncertainty on bilateral trade – additional controls

VARIABLES	[1] Trade	[2] Trade
Joint Uncertainty$_{t-1}$ $(\text{Unc}_{i,t-1} + \text{Unc}_{j,t-1})$	-0.143***	
	(0.0274)	
	[-0.0311]	
Uncertainty from exporter$_{t-1}$ $(\text{Unc}_{i,t-1})$		-0.126***
		(0.0450)
		[-0.0179]
Uncertainty from importer$_{t-1}$ $(\text{Unc}_{j,t-1})$		-0.158***
		(0.0361)
		[-0.0224]
Additional controls		
Credit volatility	Yes	Yes
Terms of Trade	Yes	Yes
Industrial Value Added	Yes	Yes
Exchange Rate	Yes	Yes
Observations	232,561	232,561
R2	0.9859	0.9859
Exporter Fixed Effects	Yes	Yes
Importer Fixed Effects	Yes	Yes
Pair Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes

Note: The gravity model's basic control variables are included. We also controlled domestic credit to private sectors provided by banks volatility, terms of trade, industrial value added, and exchange rate. Beta coefficients between brackets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

References

Abel, A. B. (1983). Optimal investment under uncertainty. American Economic Review, 73(1), 228–233. https://www.jstor.org/stable/1803942

Ahir, H., Bloom, N., & Furceri, D. (2018). The World Uncertainty Index (SSRN Scholarly Paper ID 3275033). Social Science Research Network. https://doi.org/10.2139/ssrn.3275033

Ahir, H., Bloom, N., & Furceri, D. (2022). The World Uncertainty Index (Working Paper No. 29763; Working Paper Series). National Bureau of Economic Research. https://doi.org/10.3386/w29763

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. American Economic Review, 93(1), 170–192. https://www.aeaweb.org/articles?id=10.1257/000282803321455214

Autor, D., Dorn, D., Hanson, G., & Majlesi, K. (2020). Importing political polarization? The electoral consequences of rising trade exposure. *American Economic Review*, *110*(10), 3139-3183. https://www.aeaweb.org/articles?id=10.1257/aer.20170011

Bailey, M. A., Strezhnev, A., & Voeten, E. (2017). Estimating dynamic state preferences from United Nations voting data. Journal of Conflict Resolution, 61(2), 430-456. https://doi.org/10.1177/0022002715595700

Baley, I., Veldkamp, L., & Waugh, M. (2020). Can global uncertainty promote international trade?. Journal of International Economics, 126, 103347. https://doi.org/10.1016/j.jinteco.2020.103347

Bar-Ilan, A., & Strange, W.C. (1996). Investment lags. The American Economic Review, 86(3), 610–622.

Baxter, M., & Kouparitsas, M. A. (2005). Determinants of business cycle comovement: a robust analysis. Journal of Monetary Economics, 52(1), 113–157. https://doi.org/10.1016/j.jmoneco.2004.08.002

Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment. The quarterly journal of economics, 98(1), 85-106. https://doi.org/10.2307/1885568

Blundell, R., & Bond, S. 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87: 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Bonnell, C., & McHugh, D. (2024). "How attacks on ships in the Red Sea by Yemen's Houthi rebels are crimping global trade" Yahoo News January 12, 2024. https://news.yahoo.com/houthi-attacks-ships-red-sea-093757343.html

Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk. American Economic Review, 112(4), 1194-1225. https://www.aeaweb.org/articles?id=10.1257/aer.20191823

Calderon, C., Chong, A., & Stein, E. (2007). Trade intensity and business cycle synchronization: Are developing countries any different?. Journal of International Economics, 71(1), 2-21. https://doi.org/10.1016/j.jinteco.2006.06.001

Colantone, I., & Stanig, P. (2018). The trade origins of economic nationalism: Import competition and voting behavior in Western Europe. *American Journal of Political Science*, *62*(4), 936-953. https://doi.org/10.1111/ajps.12358

Constantinescu, C., Mattoo, A., & Ruta, M. (2020). Policy uncertainty, trade, and global value chains: some facts, many questions. Review of Industrial Organization, pp. 57, 285–308. https://link.springer.com/article/10.1007/s11151-020-09772-0

Feyrer, J. (2019). Trade and income—exploiting time series in geography. American Economic Journal: Applied Economics, 11(4), 1–35. https://www.aeaweb.org/articles?id=10.1257/app.20170616

Frankel, J. A., & Rose, A. K. (1997). Is EMU more justifiable ex post than ex ante?. European Economic Review, 41(3-5), 753-760. https://doi.org/10.1016/S0014-2921(97)00034-2

Frankel, J. A., & Rose, A. K. (1998). The endogeneity of the optimum currency area criteria. The Economic Journal, 108(449), 1009-1025. https://doi.org/10.1111/1468-0297.00327

Freund, C., Mattoo, A., Mulabdic, A., & Ruta, M. (2023). US-China decoupling: Rhetoric and reality. VoxEU Column, 31.

Graziano, A., Handley, K., and Limão, N. (2018). Brexit Uncertainty and Trade Disintegration (Working Paper No. 25334; Working Paper Series). National Bureau of Economic Research. https://doi.org/10.3386/w25334

Grier, K. B., & Smallwood, A. D. (2007). Uncertainty and Export Performance: Evidence from 18 Countries. Journal of Money, Credit and Banking, 39(4), 965–979. https://doi.org/10.1111/j.1538-4616.2007.00053.x

Handley, K. (2014). Exporting under trade policy uncertainty: Theory and evidence. Journal of International Economics, 94(1), 50–66. https://doi.org/10.1016/j.jinteco.2014.05.005

Handley, K., and Limão, N. (2015). Trade and investment under policy uncertainty: Theory and firm evidence. American Economic Journal: Economic Policy, 7(4), 189–222. https://doi.org/10.1257/pol.20140068

Hartman, R. (1972). The effects of price and cost uncertainty on investment. Journal of Economic Theory, 5(2), 258–266. https://doi.org/10.1016/0022-0531(72)90105-6

Inklaar, R., Jong-A-Pin, R., and De Haan, J. (2008). Trade and business cycle synchronization in OECD countries—A re-examination. European Economic Review, 52(4), 646-666. https://doi.org/10.1016/j.euroecorev.2007.05.003

Jakubik, A., and Ruta, M. (2023). Trading with Friends in Uncertain Times (No. 2023/124). International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2023/06/16/Trading-with-Friends-in-Uncertain-Times-534717

Keane, J. (2015). Firms and value chains in Southern Africa. World Bank Working Paper. Washington, DC: World Bank. Available at: http://documents.worldbank.org/curated/en/2016/02/25858463/firms-value-chainssouthern-africa

Krol, R. (2018). Does uncertainty over economic policy harm trade, foreign investment, and prosperity? Mercatus Center at George Mason University. https://doi.org/10.2139/ssrn.3169563

Matzner, A., Meyer, B., & Oberhofer, H. (2023). Trade in Times of Uncertainty (2023). CESifo Working Paper No. 10284, Available at SSRN: https://ssrn.com/abstract=4368213

Nana, I., & Ouedraogo, I. (2023). Friendship is as Important as Neighborhood: The impact of Geopolitical Distance on Bilateral Trade.. 2023. Working Paper - CERDI ⟨hal-04266229⟩ https://hal.science/hal-04266229/document

Nana, I., Motelle, S. I., & Starnes, S. K. (2023). The Trade-Growth Nexus: Evidence of Causality from Innovative Instruments for Trade. Policy Research working paper; no. WPS 10645 Washington, D.C.: World Bank
Group http://documents.worldbank.org/curated/en/099550412132341350/IDU0a68116e90579804937091a70918736db8633

Novy, D., & Taylor, A. M. (2020). Trade and uncertainty. Review of Economics and Statistics, 102(4), 749-765. https://doi.org/10.1162/rest_a_00885

Oi, W. Y. (1961). The Desirability of Price Instability Under Perfect Competition. Econometrica, 29(1), 58–64. https://doi.org/10.2307/1907687

Pangestu, M.E. & Trotsenburg, A.V. (2022). Trade restrictions are inflaming the world food crisis in a decade. World Bank. https://blogs.worldbank.org/voices/trade-restrictions-are-inflaming-worst-food-crisis-decade (Accessed on December 10, 2023) https://blogs.worldbank.org/voices/trade-restrictions-are-inflaming-worst-food-crisis-decade

Pástor, Ľ., & Veronesi, P. (2021). Inequality aversion, populism, and the backlash against globalization. *The Journal of Finance*, *76*(6), 2857-2906. https://doi.org/10.1111/jofi.13081

Ponte, S., & Gibbon, P. (2005). Quality standards, conventions, and the governance of global value chains. Economy and society, 34(1), 1–31. https://doi.org/10.1080/0308514042000329315

Qiu, H., Shin, H. S., & Zhang, L. S. Y. (2023). Mapping the realignment of global value chains (No. 78). Bank for International Settlements.

Raulatu, B. L., Ugbem, O. V., Augustine, U., & Paul, F. M. (2019). Uncertainties in Global Economic Policy and Nigeria's Export Earnings. International Journal of Business, Economics and Management, 6(1), 23–38. https://doi.org/10.18488/journal.62.2019.61.23.38

Rodrik, D. (2018). Populism and the economics of globalization. *Journal of International Business Policy*, pp. *1*, 12–33. https://link.springer.com/article/10.1057/s42214-018-0001-4

Sawadogo, P. N. (2020). Can fiscal rules improve financial market access for developing countries? *Journal of Macroeconomics*, *65*, 103214.

Scheffel, E. M. (2016). Accounting for the political uncertainty factor. Journal of Applied Econometrics, 31(6), 1048-1064. https://doi.org/10.1002/jae.2455

Sharma, K. (2000). Export Growth in India: Has FDI played a role? Yale - Economic Growth Center. Working Paper No. 1858-2016-152730. https://econpapers.repec.org/paper/fthyalegr/816.htm

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. The Review of Economics and Statistics, 88(4), 641–658. https://doi.org/10.1162/rest.88.4.641

Sly, N. (2016). Global uncertainty and U.S. exports. Economic Review (Kansas City), 101(2), 5–25. https://ideas.repec.org/a/fip/fedker/00039.html

Taglioni, D., & Zavacka, V. (2013). Innocent Bystanders: How Foreign Uncertainty Shocks Harm Exporters (SSRN Scholarly Paper ID 2240185). Social Science Research Network. https://doi.org/10.2139/ssrn.2240185

Tapsoba, S. J. A. (2009). Trade intensity and business cycle synchronicity in Africa. Journal of African Economies, 18(2), 287-318. https://academic.oup.com/jae/article/18/2/287/729797

Wang, Y., Chen, C. R., & Huang, Y. S. (2014). Economic policy uncertainty and corporate investment: Evidence from China. Pacific-Basin Finance Journal, 26(2014), 227–243. https://doi.org/10.1016/j.pacfin.2013.12.008

World Bank. (2020). World Development Report 2020: Trading for Development in the Age of Global Value Chains. World Bank. https://doi.org/10.1596/978-1-4648-1457-0

World Bank (2023). Conflict in the Middle East Could Bring 'Dual Shock' to Global Commodity Markets. Press Release October 30, 2023. NO: 2024/025/DEC

WTO (2022). "Overview Of Developments In The International Trading Environment. Annual Report By The Director-General." Trade Policy Review Body; WT/TPR/OV/25 (22-8661) https://www.wto.org/english/news_e/news22_e/tmwto_06dec22_e.htm

Yotov, Y. V., Piermartini, R., & Larch, M. (2016). An advanced guide to trade policy analysis: The structural gravity model. WTO iLibrary. https://www.wto.org/english/res_e/booksp_e/advancedwtounctad2016_e.pdf

PUBLICATIONS