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Agri-Food Trade: Globalization, Nearshoring, and Trade Networks

Jeff Luckstead

DREXEL UNIVERSITY
Center for
Global Policy Analysis
LeBow College of Business

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Jeff Luckstead

Washington State University

jluckstead@wsu.edu

Abstract: Recent geopolitical events—including, the U.S.-China trade war, Brexit, the COVID-19 pandemic, and the Russian invasion of Ukraine—have heightened trade policy uncertainty, disrupted supply chains, and accelerated nearshoring. These shifts may have reshaped the role of globalization in agri-food trade, particularly in how distance, trade networks measured by the number of export destinations, and nearshoring influence trade flows. Using a structural gravity model, this study examines how these factors in agri-food trade have changed between 2010 and 2023. The results indicate that recent globalization trends have increased the impact of distance on primary commodity trade but reduced it for processed food trade, though these changes do not appear to be driven by any single event. Nearshoring has reduced trade in primary and minimally processed food but has not affected processed food trade. While trade networks do not influence primary commodity trade, they enhance trade in both minimally processed and processed food products. Importantly, the interaction between nearshoring and trade networks expands trade, suggesting that these factors jointly mitigate trade frictions. Finally, the findings indicate that countries with broader trade networks experience lower trade costs associated with distance.

Keywords: Agricultural Trade, Distance Puzzle, Globalization, Nearshoring, Trade Networks

JEL: Q17, F14

1. Introduction

Recent geopolitical events—the U.S.-China trade war (ongoing since 2018), Brexit, the 2020 replacement of NAFTA with USMCA, the supply chain disruptions from COVID-19, and the 2022 Russian invasion of Ukraine—have heightened uncertainty in trade policy, strained trade networks, and accelerated nearshoring. These shifts have possibly altered the trajectory of globalization in agri-food trade. This paper investigates how globalization, measured through the role of distance, nearshoring, and trade network structures have shaped agri-food trade in this evolving geopolitical landscape.

Globalization has shaped agri-food trade by reducing trade costs and enhancing market integration, supply chain structures, and trade relationships (Robinson, 2018). Understanding these dynamics requires examining the role of distance in trade costs, the impact of nearshoring on trade partners and supply chains, and the influence of trade networks on broader structural changes in trade patterns. Advances in technology and communication have significantly affected both the mechanics and costs of international trade (Baldwin, 2016; Wright, 2025). Research has shown that globalization has mitigated the trade-reducing effect of distance over time (Yotov, 2012; Yotov et al., 2016). However, the extent of this reduction in agri-food trade between 1985 and 2019 varies significantly by commodity (Luckstead, 2024). The COVID-19 pandemic may have further accelerated the trade-cost-reducing effects, as digital tools and online platforms to reach global markets become increasingly central to the global economy. Amid rapid technological advancements and shifting global trade patterns, reassessing the role of distance in agri-food trade is essential.

Although nearshoring—the relocation of cross-ocean foreign investment to more regional partner countries to reduce costs and risks—has been a longstanding strategy, it has accelerated in recent years due to heightened global market uncertainty (Capello and Dellisanti, 2024). For instance, the 2018 U.S.-China trade war, which pushed tariffs higher, the COVID-19 pandemic that caused supply chain bottlenecks (particularly at ocean ports), and the 2014 Russian annexation of Crimea and the subsequent Russian-Ukraine war have all played pivotal roles in this shift (Aguilar et al., 2024; Duran-Fernandez, 2024). In response, nearshoring has become a more prominent feature of globalization, as producers reorganize supply chains and move production more regionally to mitigate risks associated with long, complex supply chains. This trend has been further fueled by the convergence of wages in distant and nearby countries—such as the declining wage ratios between China and Mexico, and between China and Eastern Europe—eroding the wage advantage of more distant production locations (Duran-Fernandez, 2024; Aguilar et al., 2024). While primary agricultural commodities rely less on global value chains than processed food products, the impact of nearshoring on agri-food trade remains unclear, and the agricultural trade literature lacks evidence on this issue.

Accelerated nearshoring has directly impacted trade network structures, as recent geopolitical events have altered trade partner relationships. For example, Chinese retaliatory tariffs on U.S. soybeans prompted Chinese importers to seek alternative sources from countries like Brazil (Adjemian et al., 2021). These tariffs influence third-party trade networks, as the U.S.-China trade war has spillover effects on soybean production, consumption, and trade in countries such as Argentina, Paraguay, Canada, Mexico, and the EU (Sabala and Devadoss, 2019). Similar changes in trading networks of agricultural commodities followed the Russian conflicts with Ukraine (Countryman et al., 2024; Larch et al., 2024). Furthermore, from a network perspective, redundancy and supplier diversification across regions enhance resilience to external shocks and mitigate supply chain risks (Chaney, 2014; Kharrazi et al., 2017). Nearshoring strengthens these network structures by increasing resilience, reducing global trade frictions, and enhancing trade links between neighboring countries, thereby reshaping global economic networks. Given its role in reshaping supplier relationships and production locations, this study explores how nearshoring interacts with trade networks in agri-food trade.

To analyze globalization trends, we estimate a structural gravity model with a difference-in-differences (DiD) approach, treating trade before 2018 as the control period and trade from 2018 to 2023 as the treatment period. Our model incorporates controls for intra-national distance, home market effect, nearshoring, and trade networks. This framework allows us to assess whether the 2018 U.S.-China trade war, Brexit, and the restructuring of NAFTA into USMCA led to a structural shift in the role of distance in agri-food trade. Additionally, we examine how the border effect, nearshoring, and trade networks have influenced recent agri-food trade patterns. Finally, we test whether countries exporting to a larger number of destinations—i.e., those with more trade network connections—experience a weaker negative impact of distance, as predicted by Chaney (2014). We use trade and trade-cost data from the CEPII (Gaulier and Zignago, 2010) for 2010–2023, covering 171 agri-food commodities, which we aggregate into three categories: processed, minimally processed, and primary commodities.

The results indicate that recent globalization trends have increased the impact of distance on primary commodity trade but have no impact on minimally processed commodities and reduced the impact for processed food trade. However, a placebo test shows pre-trends, which does not allow us to attribute these findings specifically the events of 2018. Nearshoring has reduced trade in primary and minimally processed food but has not affected processed food trade. While trade networks do not influence primary commodity trade, they enhance trade in both minimally processed and processed food products. The interaction between nearshoring and trade networks expands trade, suggesting that these factors jointly mitigate trade frictions. Finally, we confirm the prediction by (Chaney, 2014) that, for agri-food trade, countries with broader trade networks experience lower trade costs associated with distance.

Studies that identified the distance puzzle—the counterintuitive finding that the negative impact of distance on bilateral trade flows has increased over time rather than decreased as globalization progresses—include (Coe et al., 2002; Buch et al., 2004; Brun et al., 2005; Disdier and Head, 2008). Proposed solutions to the distance puzzle include measuring international trade costs relative to intra-national costs by separating intra-national distance from international distance and accounting for the home market effect by including a border indicator variable (Yotov, 2012; Yotov et al., 2016). For instance, Yotov (2012) finds that isolating intra-national distance from international distance reduces the estimated impact of international distance on food trade by 7.9%, as would be expected as globalization progresses, resolving the distance puzzle.

A scant literature exists that examines the evolution of globalization on agricultural trade utilizing the gravity framework. Karagulle et al. (2022) examine the ad valorem equivalent trade costs of friction and policy variables over the period 2001 to 2018 on agri-food trade and find heightened agricultural trade costs during their 17-year sample. Luckstead (2024) examines globalization in agri-food trade by studying the distance puzzle by measuring international distance relative to intranational distance and home market effect via a border indicator variable. The results show that the home market effect is substantially larger in agricultural compared to processed agricultural commodities and globalization has not reduced the impact of distance on agri-food trade, although the results are heterogeneous at the commodity level.

A few studies have utilized network analysis in the context of agricultural trade. Shutters and Muneepeerakul (2012) utilize social network analysis to study agricultural trade and provide evidence on the structure of agricultural trade networks. Sartori and Schiavo (2015) apply network analysis to show that the interconnection of virtual water trade (flow of water embodied in the international trade of agricultural goods) increased over the sample, but this did not lead to greater stability. However, these studies do not apply network trade analyses within a gravity context.

This study makes four key contributions to the literature. First, while prior research (Yotov, 2012; Yotov et al., 2016) suggests that accounting for relative international distance and home market reduces the effect of international distance, the extent to which this holds for agri-food trade—particularly between 2010 and 2023—remains uncertain (Luckstead, 2024). This study extends this literature by offering new insights into the impacts of distance, domestic distance, and the home market effect on agri-food trade. It also investigates whether globalization is mitigating its impact or if nearshoring and trade networks have altered distance-related trade frictions. Second, previous studies examine globalization's impact on agri-food trade but do not fully capture its evolution amid recent geopolitical and economic disruptions or its connection to nearshoring and trade networks. This study fills that gap by analyzing how distance, nearshoring, and trade networks have shaped agri-food trade between 2010 and 2023. To our knowledge, this is the first study to assess nearshoring's impact on agri-food trade, its interaction with trade networks, and the role of trade networks in shaping trade costs. Third, the existing literature primarily relies on data up to the mid-2010s, missing the effects of recent geopolitical events. This study provides a empirical analysis using the latest trade data and a structural gravity framework, capturing the latest trends in globalization, nearshoring, and trade networks. Fourth, this study offers new insights into how trade networks influence the trade-cost effect of distance, shedding light on the mechanisms through which networks mitigate distance-related trade barriers.

2. Gravity Model

The structural gravity equation is defined as (Anderson and van Wincoop, 2003; Yotov et al., 2016)

$$T_{ijt} = \frac{Y_{it}Y_{jt}}{Y_t}\left(\frac{f_{ijt}}{\Pi_{it}P_{jt}}\right)^{1-\sigma}, \tag{1}$$

where T_{ijt} is the nominal value of agri-food exports from exporter i to importer j (inclusive of domestic sales where $i = j$) in year t, $Y_{it} = \sum_j T_{ijt}$ is the value of production in country i, $Y_{jt} = \sum_i T_{ijt}$ is the value of consumption in country j, $Y_t = \sum_i \sum_j T_{ijt}$ is the aggregate value of agri-food trade, f_{ijt} represents trade friction variable (e.g., distance, common language, colonial relationship, borders) and trade policies (e.g., WTO, FTAs), Π_{it} is the outward multilateral resistance term, P_{jt} is the inward multilateral resistance term, and $\sigma > 1$ is the trade elasticity of substitution. In this analysis, we run separate analyses for processed, minimally processed, and primary commodities to allow for comparison across these different categories of agri-food commodities.

We utilize the PPML estimator to allow zero trade flows to remain in the data, avoiding sample selection biases, and account for heteroskedasticity in the trade data (Santos Silva and Tenreyro, 2006; Yotov et al., 2016). Thus, trade frictions and policy variables are

$$\begin{aligned} f_{ijt} \;=\; & \exp(\alpha_1 \log\left(D_{ij}^{Inter}\right) + \alpha_2 \log\left(D_{ij}^{Inter} \times I_{18}\right) + \alpha_3 \log\left(D_{ii}^{Intra}\right) + \alpha_4 BE_{ij}W_{it} \\ & + \alpha_5 NS_{ij} + \alpha_6 N + \alpha_7\left(NS_{ij} \times NW_{it}\right) + \alpha_8 WTO_{ijt} \\ & + \alpha_9 FTA_{ijt} + \alpha_{10} Contig_{ij} + \alpha_{11} ComRel_{ij} + \alpha_{12} ComLang_{ij}) \end{aligned} \tag{2}$$

where αs are coefficients, D_{ij}^{Inter} is international distance (i.e., equal to zero for intra-national distance where $i = j$) and I_{18} is a year indicator variable equal to 1 for the years after 2017 and zero otherwise, D_{ii}^{Intra} is intra-national distances (i.e., equal to zero for international distance where $i \neq j$), BE_{ij} is a border indicator variable that is equal to one when sales are international and zero when sales are domestic, NS_{ij} is a nearshoring indicator variable that is equal to one if i views j as a candidate for nearshoring (discussed in more detail in the data section), ND_{it} is a network diversity index calculated as the trade-weighted average number of destinations to which exporter i sells in year t, $Contig_{ij}$ is a contiguous border indicator variable, $ComRel_{ij}$ is a common religion indicator variable, $ComLang_{ij}$ is a common language indicator variable, $WTO_{ij,t}$ is a World Trade Organization indicator variable, and $FTA_{ij,t}$ is a Free Trade Agreement indicator variable.[1]

For PPML estimation, log the right side of (1) and substitute in (2):

$$
\begin{aligned}
(3) T_{ijt} = {} & \exp(\beta_{0t} + \beta_1 \log\left(D_{ij}^{Inter}\right) + \beta_2 \log\left(D_{ij}^{Inter} \times I_{2016}\right) + \beta_3 \log\left(D_{ii}^{Intra}\right) + \beta_4 BE_{ij} \\
& + \beta_5 NS_{ij} + \beta_6 ND_{it} + \beta_7 \left(NS_{ij} \times ND_{it}\right) + \beta_8 WTO_{ijt} + \beta_9 FTA_{ijt} \\
& + \beta_{10} Contig_{ij} + \beta_{11} ComRel_{ij} + \beta_{12} ComLang_{ij} + F_{it} + F_{jt}) + \epsilon_{ijt},
\end{aligned}
$$

where β_{0t} is the intercept controlling for Y_t^k, $\beta_t = (1-\sigma)\,\alpha_t$, $\beta_1 = (1-\sigma)\,\alpha_1$,...,$\beta_{10} = (1-\sigma)\,\alpha_{10}$, $F_{it} = Y_{it} + \Pi_{it}$ and $F_{jt} = Y_{jt} + \Pi_{jt}$ are exporter-time and importer-time fixed effects controlling for outward and inward multilateral resistance terms, production, consumption, and other variables unobservable factors, and $\epsilon_{ij,t}$ is an error term. Since the research questions relate to evaluating changes in distance, we exclude country-pair fixed effects, which would be perfectly collinear with one of the primary variables of interest, distance. Note that ND_{it} and F_{it} are not perfectly collinear because ND_{it} can be zero for multiple it it observations, implying that some countries may not export to any country in various years. As a result, for those observations where $ND_{it} = 0$, the variation in the data is driven solely by the exporter-time fixed effects F_{it}, preventing perfect collinearity between the two variables.

[1] The WTO and FTAs variables account for all observed (tariffs and NTMs) and unobserved (policy and regulations synergy) impacts of these agreements.

Nearshoring involves the relocation of production or sourcing closer to key markets, which directly affects the structure of supply chain networks. In network theory, nodes represent firms or countries, and the links between them represent the flow of goods, capital, and information. Nearshoring creates new connections between nearby economies while potentially breaking existing ties with distant economies.

To analyze whether countries that export to a larger number of destinations (i.e., have more trade network connections) experience a weaker negative impact of distance, we replace $\sum_{t=2010}^{2023}\left[\beta_t \log D_{ij}^{Inter} \times I_t\right]$ with $\left[\beta_d \log D_{ij}^{Inter} + \beta_n \log D_{ij}^{Inter} \times ND_{it}\right]$.

3. Data

We collect bilateral trade flows for 192 exporters and 220 importers for 171 HS commodities from the CEPII BACI database (Gaulier and Zignago, 2010), which includes all global agri-food trade. Domestic sales are included to maintain consistency with the theoretical gravity model. For domestic sales, we utilize FAO data and subtract the value of total exports from the total value of production for each commodity and country in each year. The bilateral trade flows and domestic sales data are combined to form the dependent variable of bilateral trade. We categorize the 171 commodities into three groups processed, minimally processed, and primary commodities.[2] For nearshoring, we classify countries into nine groups: US-Canada, Mexico, Latin America & Caribbean,[3] Western

[2]Processed food includes the following HS codes 240110, 240120, and 240130. Minimally processed food includes the following HS codes 170111, 170112, 170310, 170390, 180100, 220300, 220410, 220421, 220429. Primary commodities include the following HS codes 010110, 010190, 010210, 010290, 010310, 010391, 010392, 010410, 010420, 010511, 010512, 010519, 010594, 010599, 010619, 010631, 010632, 010639, 010690, 020110, 020120, 020130, 020210, 020220, 020230, 020311, 020312, 020319, 020321, 020322, 020329, 020410, 020421, 020422, 020423, 020430, 020441, 020442, 020443, 020450, 020500, 020610, 020621, 020622, 020629, 020630, 020641, 020649, 020680, 020690, 020711, 020712, 020713, 020714, 020724, 020725, 020726, 020727, 020732, 020733, 020735, 020736, 020810, 020830, 020840, 020850, 020890, 020900, 070110, 070190, 070200, 070310, 070320, 070390, 070410, 070420, 070490, 070511, 070519, 070521, 070529, 070610, 070690, 070700, 070810, 070820, 070890, 070920, 070930, 070940, 070951, 070959, 070960, 070970, 070990, 080119, 080121, 080131, 080211, 080221, 080231, 080240, 080250, 080260, 080290, 080300, 080410, 080420, 080430, 080440, 080450, 080510, 080520, 080540, 080550, 080590, 080610, 080711, 080719, 080720, 080810, 080820, 080910, 080920, 080930, 080940, 100110, 100190, 100200, 100300, 100400, 100510, 100590, 100610, 100700, 100810, 100820, 100830, 100890, 120100, 120210, 120220, 120400, 120510, 120590, 120600, 120720, 120740, 120750, 120791, 120799, 120999, 150100, 150200, 150600, 150710, 150790, 150810, and 150910.

[3]The 3-digit ISO codes for these countries include ARG, BHS, BRB, BLZ, BOL, BRA, CHL, COL, CRI, CUB, DMA, DOM, ECU, SLV, GRD, GTM, GUY, HTI, HND, JAM, NIC, PAN, PRY, PER, KNA, LCA, VCT, SUR, TTO, URY, and VEN.

Table 1. Summary Statistics

	Mean	Standard Deviation	Minimum	Maximum
v (millions)	5.825	4,315.559	0.000	3,585,258.808
international distance (km)	6,810.254	4,491.046	1.000	19,923.000
Nearshoring	0.043	0.203	0.000	1.000
Network Diversity	1.000	9.336	0.000	196.859
Intranational Distance	0.053	0.517	0.000	7.349
Border Effect	0.011	0.104	0.000	1.000
WTO	0.771	0.420	0.000	1.000
FTA	0.227	0.419	0.000	1.000
Contiguous Border	0.034	0.181	0.000	1.000
Common Religion	0.183	0.264	0.000	0.998
Common Language	0.152	0.359	0.000	1.000
No. Obs	1,175,597			

Europe,[4] Eastern Europe,[5] Sub-Saharan Africa,[6] Middle East & North Africa,[7] South Asia,[8] East Asia & Pacific.[9] Then, we classify all countries into potential nearshoring opportunities. Specifically, we create a nearshoring indicator variable that is equal to 1 if the exporter is US or Canada and the importer is Mexico or Latin America & Caribbean, or if the exporter is Western Europe and the importer is Eastern Europe or Middle East & North Africa, or if the exporter is in the East Asia & Pacific region and the importer is in the South Asia. As mentioned in the gravity model section, the network diversity index is calculated as the trade-weighted average number of destinations where exporter i sells commodities within one of the three agri-food categories in year t. Finally, we collect other friction variables (contiguous border, common religion, and common language) from the CEPII Gravity database. Table 1 provides summary statistics of these variables.

[4]The 3-digit ISO codes for these countries include AUT, BEL, CYP, DNK, FIN, FRA, DEU, GRC, ISL, IRL, ITA, LUX, MLT, NLD, NOR, PRT, ESP, SWE, CHE, and GBR.

[5]The 3-digit ISO codes for these countries include ALB, BIH, BGR, CZE, EST, HRV, HUN, LVA, LTU, MDA, MNE, MKD, POL, ROU, RUS, SRB, SVK, SVN, and UKR.

[6]"AGO, BEN, BWA, BFA, BDI, CPV, CMR, CAF, TCD, COM, COD, COG, CIV, DJI, GNQ, ETH, GAB, GMB, GHA, GIN, KEN, LSO, LBR, MDG, MWI, MLI, MRT, MUS, MOZ, NAM, NER, NGA, RWA, STP, SEN, SLE, SOM, ZAF, SSD, SWZ, TGO, TZA, UGA, ZMB, ZWE"

[7]The 3-digit ISO codes for these countries include DZA, BHR, EGY, IRN, IRQ, ISR, JOR, KWT, LBN, LBY, MAR, OMN, PSE, QAT, SAU, SDN, SYR, TUN, TUR, ARE, and YEM.

[8]The 3-digit ISO codes for these countries include AFG, BGD, BTN, IND, LKA, MDV, NPL, and PAK.

[9]The 3-digit ISO codes for these countries include AUS, BRN, KHM, CHN, FJI, PYF, HKG, IDN, JPN, KIR, PRK, KOR, LAO, MAC, MYS, MNG, MMR, NRU, NCL, NZL, PNG, PHL, SGP, SLB, TLS, THA, TON, TUV, VUT, VNM, WSM, TKL, FSM, CXR, CCK, NFK, and PCN.

4. Results

Next, we present the econometric results of the structural gravity model for the three aggregate commodities (processed, minimally processed, and primary).

4.1. Distance, Nearshoring, and Trade Networks

This section analyzes the evolving relationship between globalization and distance, as well as the roles of nearshoring and trade networks in agri-food trade. Specifically, we examine (1) whether recent events have altered the impact of globalization on distance, (2) how nearshoring and trade networks influence trade patterns, and (3) the implications for domestic distance and border effects. Table 2 reports three gravity models for the three commodity categories. First, to provide a baseline to assess if controlling for nearshoring and network diversity impacts the evolution of globalization (measured through the distance variable) over time, Model 1 estimates equation (3) without nearshoring and network diversity. Model 2 adds nearshoring and network diversity to the analysis. Model 3 offers a placebo for whether the impact of globalization on distance experienced a shift in 2018 changing the event to 2015.

Our results provide seven main insights regarding the role of distance, nearshoring, and trade networks in agri-food trade. First, distance plays a much greater role in trade for primary commodities, with a distance elasticity of -1.282 in Model 3, compared to -0.539 and -0.453 for minimally processed and processed commodities, respectively. This pattern likely arises because primary commodities are more difficult to transport while maintaining quality and freshness, whereas processed commodities benefit from supply chain efficiencies.

Second, the distance puzzle exhibits distinct patterns across commodity types: For raw agricultural commodities, the impact of distance increased after 2018, suggesting rising trade costs have outweighed globalization-driven transport efficiencies. For minimally processed commodities, there is no evidence of a distance puzzle once nearshoring and trade networks are accounted for. For processed commodities, the distance effect declined after 2018, indicating that globalization has reduced trade costs for this commodity category. However, we cannot attribute this pattern to geopolitical events since 2018, as both

Table 2. Gravity Model Results

	Primary Commodities			Minimally Processed			Processed		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
$\log dij$	-1.26***	-1.27***	-1.28***	-0.55***	-0.54***	-0.54***	-0.61***	-0.46***	-0.45***
	(0.09)	(0.09)	(0.10)	(0.06)	(0.06)	(0.06)	(0.08)	(0.06)	(0.06)
$\log dij \times \text{Post}_{18}$	-0.09***	-0.09***		0.02***	0.01		0.02**	0.02*	
	(0.02)	(0.02)		(0.01)	(0.01)		(0.01)	(0.01)	
$\log dij \times \text{Post}_{15}$			-0.06***			0.01			0.00
			(0.01)			(0.01)			(0.01)
$\log dist_{ii}$	-0.15	-0.11	-0.11	0.26*	-0.05	-0.05	-0.20	-2.05***	-2.05***
	(0.24)	(0.22)	(0.23)	(0.13)	(0.14)	(0.14)	(0.22)	(0.26)	(0.26)
Border Effect	-0.73	-0.76	-0.79	1.36	1.45*	1.44	1.01	9.91***	9.90***
	(1.19)	(1.21)	(1.24)	(0.71)	(0.74)	(0.74)	(1.26)	(1.46)	(1.46)
Nearshoring		-0.948*	-0.979*		-2.117***	-2.117***		0.31	0.31
		(0.43)	(0.44)		(0.49)	(0.49)		(0.98)	(0.98)
Trade Network		(0.00)	(0.00)		0.015***	0.015***		0.060***	0.060***
		(0.00)	(0.00)		(0.00)	(0.00)		(0.01)	(0.01)
Nearshoring × Trade Network		0.612***	0.644***		0.294***	0.293***		0.120*	0.120*
		(0.13)	(0.13)		(0.05)	(0.05)		(0.05)	(0.05)
FTA	0.928***	0.876***	0.870***	1.107***	1.212***	1.213***	0.364*	0.35	0.35
	(0.12)	(0.14)	(0.14)	(0.12)	(0.12)	(0.12)	(0.18)	(0.20)	(0.20)
WTO	0.19	0.18	0.16	1.031***	1.325***	1.325***	1.189***	1.686***	1.690***
	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.16)	(0.19)	(0.19)
Contiguous Border	-0.12	-0.11	-0.13	0.38	0.28	0.28	0.09	(0.03)	(0.04)
	(0.28)	(0.27)	(0.28)	(0.19)	(0.20)	(0.20)	(0.23)	(0.26)	(0.26)
Common Religion	-0.01	-0.00)	0.00	0.466*	0.26	0.26	0.16	0.30	0.30
	(0.22)	(0.21)	(0.22)	(0.23)	(0.22)	(0.22)	(0.30)	(0.22)	(0.22)
Common Language	-0.957***	-0.939***	-1.005***	0.610***	0.399**	0.398**	(0.14)	(0.13)	(0.13)
	(0.26)	(0.25)	(0.27)	(0.15)	(0.15)	(0.15)	(0.18)	(0.14)	(0.14)

Notes: The number of observations is 265,111 for primary commodities, 192,739 for minimally processed commodities, and 73,460 for processed commodites. All models include importer-year and exporter-year fixed effects. Robust standard errors clustered at the country-pair level are in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

primary and minimally processed commodities fail the placebo test because the estimated coefficient for $\log dij \times \text{Post}_{15}$ is consistent with that for $\log dij \times \text{Post}_{18}$. Moreover, the parallel trends assumption is violated for all three agri-food categories (see Table 4 in the appendix).

Thus, while we cannot establish a causal relationship, our findings are nonetheless striking, as they suggest that for raw commodities, the cost-saving effects of globalization on transportation have not only failed to offset the impact of distance but have contributed to rising trade costs in recent years. This result maybe because raw commodities are less integrated in global value chains (GVCs) where the efficiency gains from globalization primarily arise. Additionally, raw commodities may be more susceptible to rising fuel costs due to their lower value per unit and increasing uncertainty stemming from climate change and trade policy disruptions. Unlike processed goods, which benefit from more flexible supply chains and diversified sourcing, raw commodities often rely on long-term contracts and bulk shipping, leading to more exposure to uncertainty.

Furthermore, no significant globalization effect emerges for minimally processed commodities. However, the cost-saving effects of advances in telecommunications, logistics, and supply chain management appear meaningful for processed foods. This likely reflects that more heavily processed food commodities are more integrated into GVCs and thus benefit more from globalization-driven efficiency gains. These results indicate that globalization has a heterogeneous impact on the role of distance in agri-food trade, depending on the level of processing.

Third, Yotov (2012) and Yotov et al. (2016) emphasize the significance of domestic distance and border effects in resolving the distance puzzle. The domestic distance effect is statistically insignificant for primary and minimally processed commodities, suggesting that the distance between major cities does not significantly impact domestic sales. This result may occur because raw commodities are often produced in bulk and concentrated in specific regions, with exports being a key outlet for sales making domestic distance less relevant. For instance, wheat production in the U.S. and Ukraine is heavily export-oriented, and in Southeast Asia, where farmers produce rice throughout the country, the distance between cities may be less relevant for domestic sales. By contrast, internal distance reduces domestic sales more substantially for processed goods, even after controlling for nearshoring and trade networks. This result likely reflects that processed goods are typically produced in more concentrated locations within a country, making transportation costs between production facilities and domestic markets more consequential.

Fourth, the estimated coefficients for the border effect are statistically insignificant for primary commodities but become marginally significant for minimally processed commodities and highly significant for processed foods. The estimated coefficient indicates a substantial home market effect for minimally processed foods,[10] with domestic sales being approximately 4.26 ($= \exp(1.45)$) times larger than international trade. In contrast, the results indicate a substantially more pronounced home market effect for processed foods, with domestic sales over 20,000 times larger than international trade. This result supports the argument that primary commodities rely on international markets, while processed foods focus more on domestic markets. Moreover, producers of processed foods likely engage in horizontal foreign direct investment (Ruppei et al., 1996), establishing production facilities in foreign regions to better cater to local tastes and preferences. Consequently, processors produce more locally to reduce trade barriers and enhance their ability to serve diverse markets effectively.

Fifth, the results of Table 5 in the Appendix show that trade networks, not nearshoring, drive these bias corrections: Including trade networks has a significant impact on domestic distance and the border effect for minimally processed and processed commodities, indicating significant downward bias in domestic distance and upward bias in the border effect if excluded, as in Model 1. These bias corrections are consistent with a priori expectations as agri-food trade and trade networks are positively correlated, and international distance and trade networks are positively correlated, whereas the border effect and trade networks are negatively correlated.

[10]The home market effect, measured by the border indicator variable, assesses domestic producers' preference for selling in their home market due to lower trade barriers, transportation costs, and regulatory hurdles.

Sixth, nearshoring reduces trade in primary and minimally processed commodities, while trade networks expand trade in minimally processed and processed commodities. Relocating production plants more regionally through nearshoring reduces trade in primary commodities and minimally processed because these commodities are the primary ingredients in processed foods, and when processed food plants are closer to the domestic market less trade is required. However, when trade networks are more pronounced, the negative effect of nearshoring is reduced, as seen by the interaction term of nearshoring and trade networks. Nearshoring does not significantly impact processed food trade because processing plants primarily serve domestic markets, while foreign affiliates handle production for regional markets (Ruppei et al., 1996). However, when trade networks are robust, the positive impact of nearshoring is amplified, as seen in the significant interaction between nearshoring and trade networks.

Seventh, trade networks do not influence primary commodity trade but have a statistically significant positive effect on minimally processed and processed commodities. This result likely occurs because primary agricultural commodities are homogeneous and are traded through large-scale bulk contracts, reducing the need for strong trade relationships. In contrast, minimally processed and, especially, processed commodities are more differentiated, often possessing region- or network-specific characteristics based on consumer preferences that make these trade relationships vital. The interaction between nearshoring and trade networks shows that when both factors are present, trade networks play a key role in mitigating the trade-reducing effects of nearshoring. This result suggests that trade networks help facilitate the continued trade of primary and minimally processed commodities despite nearshoring trends while further enhancing the trade of processed goods.

We opt not to interpret the results of FTA and WTO because the omission of country-pair fixed effect leads to omitted variable bias in this variable. The results indicate that contiguous borders or common religion do not play a statistically significant role in the trade of agri-food products, whereas common language reduces trade for primary commodities but increases trade for minimally processed goods.

Table 3. The Impacts of

	Primary Commodities	Minimally Processed	Processed
logdij	-1.25***	-0.57***	-0.36***
	(0.07)	(0.05)	(0.06)
logdij×Trade Network	0.03***	0.02***	0.02***
	(0.002)	(0.001)	(0.001)

Notes: The number of observations is 265,111 for primary commodities, 192,739 for minimally processed commodities, and 73,460 for processed commodites. All models include controls for domestic distance, border effect, nearshoring, trade network, FTA, WTO, contiguous borders, common religion, common language, common colony, and importer-year and exporter-year fixed effects. Robust standard errors clustered at the country-pair level are in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

4.2. Distance and Networks

In his paper, Chaney (2014) develops a dynamic model examining how international social networks influence importers and exporters. He concludes that firms exporting to a larger number of markets develop better logistical capabilities, distribution networks, and market knowledge, which mitigate the trade barriers imposed by distance. This, in turn, can lead to country-level trade flows consistent with a gravity model.

We empirically test whether trade networks reduce the trade-reducing effects of distance on agri-food trade. Table 3 reports the estimated coefficients for international distance and its interaction with trade networks, controlling for other trade friction variables. The coefficient estimates for distance are consistent with those in Table 2, confirming that distance hinders trade in primary commodities more than in minimally processed commodities, which in turn are more affected than processed commodities. The estimated coefficients for the interaction between international distance and trade networks are striking: countries with more extensive trade networks experience a weaker negative impact of distance on trade. The effect of trade networks in mitigating distance-related trade barriers varies by commodity: for primary, minimally processed, and processed commodities, the trade-reducing effect of distance declines by 3%, 2%, and 2%, respectively.

5. Discussion, Policy Implications, and Conclusions

Recent geopolitical and global events have increased trade policy uncertainty, disrupted trade networks, and accelerated nearshoring, potentially reshaping globalization in agri-food trade. This study examines how distance, nearshoring, and trade networks, in addition to domestic distance and the home market effect, influence agri-food trade in this evolving geopolitical landscape. Nearshoring has gained prominence as firms restructure supply chains regionally to mitigate risks from trade wars, pandemics, and geopolitical conflicts, though its impact on agri-food trade remains underexplored. Existing research highlights the persistence of the distance puzzle and the home market effect in agricultural trade but lacks a comprehensive assessment that incorporates recent disruptions, nearshoring, and trade networks. This study contributes by reassessing the role of international distance, intranational distance, and the home market effect while integrating nearshoring and trade networks into the analysis.

The results show that distance remains a significant barrier to trade, particularly for primary commodities. However, its impact on processed goods has declined, likely due to supply chain efficiencies facilitated by globalization. Trade networks reduce the trade-reducing effects of distance, especially for processed commodities, while nearshoring decreases trade in primary and minimally processed goods by relocating production closer to consumption markets. Additionally, domestic distance effects are insignificant for primary and minimally processed commodities but significantly impact processed goods. Strong border effects for processed foods indicate a pronounced home market effect, while greater trade network connections reduce the trade cost effects of distance.

These findings highlight key policy considerations regarding trade costs, market diversification, and regional integration. First, while globalization has historically reduced the impact of distance on trade, recent geopolitical disruptions—including fragmented trade networks and regionalization—may be reversing these gains, particularly for primary commodities. The results suggest that distance-related trade costs remain a persistent barrier for primary commodities, whereas globalization continues to mitigate these costs for processed food trade. Consequently, policies aimed at reducing trade costs must differentiate between primary agricultural commodities and processed food products, as their sensitivity to distance varies.

Second, while nearshoring has reduced trade in primary and minimally processed food products, it does not affect processed food trade. This suggests that nearshoring is primarily reshaping supply chains for less differentiated goods. Policymakers should carefully assess whether nearshoring incentives align with domestic production and processing capabilities to avoid unintended disruptions in specific agri-food sectors.

Third, trade networks play a crucial role in mitigating the negative effects of distance on trade. Countries that export to a greater number of destinations experience lower distance-related trade costs, particularly for processed goods. To support market diversification, policymakers should encourage exporters to expand their trade networks. Trade agreements that facilitate entry into new destinations—whether through bilateral, regional, or multilateral agreements—can help reduce geographic trade barriers.

Finally, the interaction between nearshoring and trade networks suggests that policies fostering both regional integration and global trade diversification can help mitigate trade frictions. Since nearshoring alone does not necessarily expand trade, complementary policies that enhance exporters' ability to access multiple markets can be beneficial. Strengthening regional trade agreements while maintaining broader global trade ties can improve supply chain resilience and sustain agri-food trade growth in an era of rising trade policy uncertainty.

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Table 4. Assessment of Parallel Trends

	Primary	Minimally Processed	Processed
logdij	-1.202*** (0.088)	-0.561*** (0.06)	-0.455*** (0.07)
logdii	-0.257 (0.202)	0.02 (0.15)	-2.055*** (0.26)
border	0.065 (1.066)	1.34 (0.73)	9.929*** (1.46)
fta	0.925*** (0.126)	1.168*** (0.12)	0.36 (0.20)
wto	0.280* (0.115)	1.215*** (0.12)	1.691*** (0.19)
contig	0.021 (0.24)	0.31 (0.20)	-0.04 (0.26)
comrelig	-0.038 (0.203)	0.29 (0.22)	0.30 (0.22)
comlang	-0.631** (0.206)	0.470** (0.15)	-0.13 (0.14)
nearshoring	-0.838* (0.401)	-2.126*** (0.51)	0.31 (0.98)
trade network	0.002 (0.003)	0.010*** (0.00)	0.060*** (0.01)
nearshoring x trade network	0.563*** (0.12)	0.302*** (0.05)	0.120* (0.05)
logdij x event_time = -5	-0.008 (0.007)	-0.00 (0.01)	0.00 (0.01)
logdij x event_time = -4	-0.037*** (0.007	0.01 (0.01)	0.01 (0.01)
logdij x event_time = -3	0.005 (0.006)	0.01 (0.01)	-0.025* (0.01)
logdij x event_time = -2	-0.040*** (0.006)	0.00 (0.01)	-0.01 (0.01)
logdij x event_time = 0	0.005 (0.005)	-0.00 (0.01)	-0.00 (0.02)
logdij x event_time = 1	-0.027*** (0.005	0.01 (0.01)	0.020* (0.01)
logdij x event_time = 2	-0.011* (0.006)	0.00 (0.01)	0.02 (0.01)
logdij x event_time = 3	-0.012* (0.006)	-0.00 (0.01)	0.01 (0.01)
logdij x event_time = 4	-0.095*** (0.011	-0.037*** (0.01)	0.037** (0.01)
logdij x event_time = 5	-0.294*** (0.043)	0.382*** (0.04)	0.00 (0.01)

Notes: The number of observations is 265,111 for primary commodities, 192,739 for minimally processed commodities, and 73,460 for processed commodites. All models include controls for importer-year and exporter-year fixed effects. Robust standard errors clustered at the country-pair level are in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 5. Nearshoring Vs Trade Networks

	Processed		Processed		Processed	
	Model a	Model b	Model a	Model b	Model a	Model b
logdij	-1.263***	-1.271***	-0.556***	-0.556***	-0.534***	-0.458***
	(0.09)	(0.09)	(0.064)	(0.06)	(0.06)	(0.06)
logdii	-0.16	-0.12	0.254	0.25	-0.05	-2.059***
	(0.24)	(0.22)	(0.132)	(0.13)	(0.14)	(0.26)
border	-0.71	-0.69	1.329	1.33	1.467*	9.934***
	(1.19)	(1.21)	(0.711)	(0.71)	(0.73)	(1.47)
fta	0.926***	0.902***	1.090***	1.090***	1.229***	0.36
	(0.13)	(0.14)	(0.116)	(0.12)	(0.12)	(0.20)
wto	0.20	0.17	1.037***	1.037***	1.320***	1.692***
	(0.11)	(0.12)	(0.118)	(0.12)	(0.12)	(0.19)
contig	-0.13	0.11	0.367	0.37	0.28	-0.04
	(0.28)	(0.27)	(0.195)	(0.20)	(0.20)	(0.26)
comrelig	-0.02	-0.00	0.474*	0.474*	0.26	0.29
	(0.22)	(0.22)	(0.226)	(0.23)	(0.22)	(0.22)
comlang	-0.968***	-0.930***	0.606***	0.606***	0.402**	-0.14
	(0.26)	(0.25)	(0.148)	(0.15)	(0.15)	(0.14)
logdij x post_2018	-0.089***	-0.088***	0.024***	0.024***	0.01	0.017*
	(0.02)	(0.02)	(0.006)	(0.01)	(0.01)	(0.01)
nearshoring	0.44		-1.958***	-1.958***		
	(0.46)		(0.541)	(0.54)		
trade network		-0.00			0.015***	0.060***
		(0.00)			(0.00)	(0.01)

Notes: The number of observations is 265,111 for primary commodities, 192,739 for minimally processed commodities, and 73,460 for processed commodites. All models include controls for domestic distance, border effect, nearshoring, trade network, FTA, WTO, contiguous borders, common religion, common language, common colony, and importer-year and exporter-year fixed effects. Robust standard errors clustered at the country-pair level are in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.