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Geopolitical risk and the national logistics performance

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Abstract

Using a panel of 43 countries over the period 2007–2022, we provide evidence of the negative effects of geopolitical risk on national logistics performance. Digging deeper into the main dimensions of the national logistics performance, we find that elevated geopolitical risk deteriorates the efficiency of customs and border management clearance, the quality of trade and transport infrastructure, international shipment pricing, the competence and quality of logistics services, tracking and tracing services, and the timeliness of delivery services.

Keywords: Geopolitical risk, Geopolitical events, National logistics performance, Logistics services.

JEL classification codes: C33, F15, F51

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1. Introduction

Geopolitical risk, encompassing risks related to wars, terrorist acts, and state tensions, significantly influences the course of international relations (Caldara & Iacoviello, 2022). Over the last two decades, major geopolitical disruptions like the Iraq war, the US-North Korea tension, and the Russia-Ukraine war have not only altered global logistics and supply chain designs but also echoed significantly at national levels. However, the impact of geopolitical risk on national logistics systems remain relatively unexplored. This study aims to bridge this gap by investigating the broader patterns and implications of geopolitical risk on national logistics systems, moving beyond the limited scope of firm-specific or industry-centric analyses.

In light of the complex impact of geopolitical disruptions on national logistics systems, we focus on three principal channels most susceptible to geopolitical risk: the product flow, the financial flow, and the information flow (Nguyen & Le, 2022; Cho, 2023). Each of these channels plays a crucial role in the logistics and supply chain systems, facilitating seamless operations from suppliers to end customers (Huan et al., 2004).

First, geopolitical risk poses a significant challenge to the physical product flow within national logistics systems, necessitating a strategic redesign of infrastructure and network pertaining to procurement, manufacturing, and distribution operations across the supply chain (Moradlou et al., 2021). The inherent complexity and global interdependencies in these networks render the product flow especially vulnerable to disruptions stemming from geopolitical events. Instances such as government export restrictions, regulatory interference, and disputes between nation-states can profoundly affect the global movement of goods (Moradlou et al., 2021).

Second, while financial flows are essential for the smooth operation of logistics and supply chain activities (Huan et al., 2004), geopolitical events can disrupt the flow by creating supply and demand shocks that impede trading activities and expose logistics companies to heightened liquidity and insolvency risks (Nguyen & Le, 2022). Suppliers lack financial support struggle to ramp up production, resulting in prolonged recovery periods for supply chain operations. Besides, financial burdens cascade through the supply chain as companies delay or suspend payments to their suppliers. This could result in a spillover effect which happens when financial strain spreads and creates a vicious cycle of financial instability (Sodhi & Tang, 2021).

Third, the information flow within national logistics systems is vulnerable to disruptions caused by geopolitical risk, resulting in various logistics inefficiencies (Nguyen & Le, 2022). Such risks

often result in distorted information cascading through the network, impacting the ability of upstream companies to forecast and respond to consumer demand accurately (Moradlou et al., 2021). This misalignment can lead to situations like the panic-buying behaviour and stockpiling witnessed as well as overreactions in other operations such as inventory management and resources. The ripple effect of these disruptions extends through all parts of the supply chain, exacerbating problems like heightened demand variance, excessive inventory holding, poor customer service, misguided capacity plans, and inefficient transportation logistics (Nguyen & Le, 2022).

Our contributions to the existing literature are twofold. On the conceptual side, we provide organized views of the three mechanisms through which geopolitical risk deteriorates the national logistics systems. On the empirical side, we represent the first attempt examining the impact of geopolitical risk on national logistics performance and key dimensions of a national logistic system. Our findings are significant to policymakers to shape appropriate policies that promote resilient and sustainable logistics and supply chain practices globally.

2. Data and methods

2.1. Data and variables

We use a sample of 43 countries over the period 2007–2022 to examine the impact of geopolitical risk on national logistics performance. Country-specific geopolitical risk (*CGPR*) is measured by the share of articles published in major newspapers in the United States, United Kindom, and Canada that contain geopolitical terms and the name of the country or its capital or main city (Caldara & Iacoviello, 2022). For ease of interpretation, we standardise the CGPR index.

Data for the National Logistics Performance Index (*LPI*) and its six components (Customs, Infrastructure, International shipments, Logistics competence and equality, Timeliness, and Tracking and tracing) are collected from World Bank Logistics Performance Index (WB-LPI) surveys since 2008.[1] We use the log transformation of *LPI* and its components to lower the skewness of these variables. In addition, we also include a set of country-level control variables to account for their potential impact on the national logistics performance. We winsorise continuous variables at the 1st and 99th percentiles to lower the impact of outliers. Table A1 and A2 in the

[1] Data for LPI has been published by the World Bank based on a biennial basis since 2007. We have used repeated data for every two years since 2007.

Appendix provides the definition of all variables used and their descriptive statistics, respectively.[2] The correlations between *CGPR* and other explanatory variables (reported in Table A3) are generally low (below |0.12|) indicating that our main findings may not suffer from serious multicollinearity problems.

2.2. Research model

To control for potential endogeneity and reverse causality, we employ a traditional two-stage least squares (2SLS) approach to examine the impact of geopolitical risk on national logistics performance. Following Khraiche et al. (2023) and Adra et al. (2023), we use the religious tension index (*RT*) constructed by the International Country Risk Guide (ICRG) as an instrument for geopolitical risk. This is because religious tension leads to higher conflict between nations, which increases geopolitical risk (Sturm, 2013). Moreover, religion tension has no plausible direct influence on national logistic performance. We also employ a two-way fixed effects model to confirm the results of the 2SLS approach. Our research model can be expressed as follows:

$$LogLPI_{i,t} = \alpha + \beta CGPR_{i,t} + \beta MACRO_{i,t-1} + \gamma FREE_{i,t-1} + \theta_i + \tau_t + \varepsilon_{i,t}, \quad (1)$$

where subscripts *i* and *t* are country and year, respectively. *LogLPI* is the natural logarithm of the logistics performance index. *CGPR* denotes country-specific geopolitical risk. *MACRO* represents the set of macroeconomic control variables, *FREE* is the vector of freedom variables, θ_i and τ_t capture country fixed effects (Country FE) and year fixed effects (Year FE), respectively. $\varepsilon_{i,t}$ is the error term. Control variables enter lagged one period to alleviate simultaneous and reverse causality problems. Throughout this paper, standard errors are clustered at both country and year levels to account for potential correlation of error terms within each country and over time (Nguyen et al., 2023).

3. Empirical findings

3.1. Geopolitical risk and national logistics performance

Table 1 reports our main findings on the impact of geopolitical risk on logistics performance. Using a two-way fixed effects model, the simple regression in Column 1 shows that increased geopolitical risk deteriorates the national logistics performance. The finding remains consistent when a range of control variables is added (Column 2). Turning to our baseline model (Column

[2] The list of countries is provided in the footnote of Table A2.

3), our 2SLS estimates confirm the negative impact of geopolitical risk on the national logistics performance. The coefficient on *CGPR* does not change much, indicating that our main finding does not suffer from endogeneity problems and is not sensitive to the inclusion of control variables. Quantitatively, holding other variables at their sample means, a one-standard-deviation increase in geopolitical risk (0.44) above its mean (0.23), which is equivalent to approximately 191% increase in *CGPR*, is associated with a decline in the national logistic performance by more than 4.21%.

[INSERT TABLE 1 AROUND HERE]

3.2. Geopolitical risk and components of national logistics performance

In Table 2, we provide evidence that geopolitical risk has a negative impact on the six key components of national logistics performance. Geopolitical risk notably impairs the efficiency of customs and border management clearance (*CS*) and the quality of trade and transport infrastructure (*IS*), thus hindering the flow of products in the logistics and supply chain. This inefficiency in customs clearance and border management is largely anticipated as geopolitical risks compel governments to intensify risk assessment procedures to counter threats of terrorism. Furthermore, terrorist attacks and wars frequently target transport infrastructure (Thissen, 2004). The apprehension surrounding geopolitical events can deter investments in trade and transport infrastructure.

Regarding the ability to secure competitive pricing for international shipments (*ISS*), Column 3 indicates that *CGPR* has a negative impact on *ISS*. This finding aligns with the arguments of Thissen (2004) and Monge et al. (2023), who suggest that geopolitical risk disrupts product and financial flows. This disruption stems from the uncertainty of supply from upstream vendors, leading to increased volatility in commodity prices and fuel costs (as a hedge against potential risks) and heightened transportation expenses. For instance, global transportation costs and supply prices saw substantial increases during the Iraq War in 2003 and the Russia-Ukraine conflict in 2022 (Monge et al., 2023).

Turning to the impact of geopolitical risk on the competence and quality of logistics services (*LCQS*), tracking and tracing services (*TTS*), and the frequency of on-time delivery services (*TS*), we find that geopolitical risk undermines the quality of these services. One explanation is the increased geopolitical risk from wars, terrorism attacks, or sanctions negatively affects information sharing with partners across the supply chain. This leads to demand uncertainty in regions affected

by increased terrorism or political tensions, disrupting the flow of information from the downstream to the upstream segments of the supply chain (Nguyen & Le, 2022). Managers in such scenarios are compelled to make decisions within constrained timeframes, often based on incomplete or imperfect information, and must contend with high levels of perceived uncertainty. This situation can lead to logistics inefficiencies due to a lack of in-depth understanding of potential disruptions (Moradlou et al., 2021), ultimately impairing customer services like tracking or timeliness.

[INSERT TABLE 2 AROUND HERE]

4. Conclusions

This paper represents the first attempt to provide a comprehensive picture of the negative impact of geopolitical risk on overall national logistics performance. Delving into components of the national logistics performance, we find evidence that increased geopolitical risk deteriorates the efficiency of customs and border management clearance, the quality of trade and transport infrastructure, international shipment pricing, the competence and quality of logistics services, tracking and tracing services, and the frequency of on-time deliveries. Given that maintaining the stability of the national logistics performance is crucial for a country's sustainable development, our findings provide insightful implications for policymakers to understand the adverse impact of geopolitical risk on national logistics performance and the channels it works through.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations of interest: The authors report there are no competing interests to declare.

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Appendix

Table A1. Variable definition and source

Variable	Definition	Source
LPI	The logistics performance index is constructed based on six components using the principal component analysis method. The values of each component vary between 0 and 5 with higher values indicating better logistic performance.	WB-LPI
CS	Measures the efficiency of customs and border management clearance.	WB-LPI
IS	Measures the quality of trade and transport infrastructure.	WB-LPI
ISS	Measures the ease of arranging competitively priced shipments.	WB-LPI
LCQS	Measures the competence and quality of logistics services.	WB-LPI
TTS	Measures the ability to track and trace consignments.	WB-LPI
TS	Measures the frequency of on-time deliveries.	WB-LPI
CGPR	Country-specific geopolitical risk is measured by the share of articles published in major newspapers that contain geopolitical terms and the name of the country or its capital or main city.	Caldara & Iacoviello (2022)
GS	Government spending as percentage of GDP.	World Development Indicators (WDI)
GR	Annual GDP growth rate.	WDI
FDI	Foreign direct investment as a percentage of GDP.	WDI
UB	Urbanisation is the share of the population in urban areas to the total population.	WDI
BF	Business freedom measures the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses.	Heritage Foundation
TF	Trade freedom measures the extent of tariff and non-tariff barriers that affect imports and exports of goods and services.	Heritage Foundation
FF	Financial freedom measures the extent of government control and interference in the financial sector.	Heritage Foundation
RT	Measures the level of religiuos tension of a country. As higher values of the original religious tension index by ICRG indicate lower levels of religious tension, we follow Adra et al. (2023) to multiply the index by "-1" so that higher values of RT refer to higher levels of religious tension.	ICRG

Table A2. Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
LPI	621	3.47	0.45	2.39	4.23
CS	621	3.26	0.54	1.96	4.12
IS	621	3.41	0.59	2.02	4.44
ISS	621	3.33	0.40	2.30	4.32
LCQS	621	3.44	0.48	2.30	4.32
TSI	621	3.76	0.40	2.42	4.52
TTSI	621	3.59	0.48	2.46	4.39
CGPR	621	0.23	0.44	0.00	3.75
GS	621	17.49	4.85	7.60	26.50
GR	621	2.40	3.63	-9.90	11.00
FDI	621	4.02	8.03	-15.71	47.44
UB	621	74.02	16.26	30.60	100.00
BF	621	75.12	14.31	37.30	99.70
TF	621	80.80	8.08	44.20	90.00
FF	621	61.05	17.53	20.00	90.00
RT	621	4.73	1.26	1.00	6.00

Notes: List of countries: Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, Egypt, Finland, France, Germany, Hong Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Peru, Philippines, Poland, Portugal, Russia, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkiye, Ukraine, United Kingdom, United States, Venezuela, and Vietnam.

Table A3. Correlation matrix table

	LPI	*CGPR*	*GS*	*GG*	*FDI*	*UB*	*BF*	*TF*	*FF*
LPI	1								
CGPR	0.14	1							
GS	0.50	0.07	1						
GG	-0.18	-0.08	-0.35	1					
FDI	0.10	-0.11	-0.02	0.02	1				
UB	0.40	0.08	0.50	-0.29	0.14	1			
BF	0.67	0.12	0.45	-0.26	0.11	0.48	1		
TF	0.60	0.04	0.37	-0.25	0.15	0.39	0.47	1	
FF	0.66	0.00	0.37	-0.19	0.18	0.50	0.52	0.59	1

TABLES

Table 1. Geopolitical risk and logistic performance

	(1)	(2)	(3)
CGPR	-0.0617***	-0.0682***	-0.0421***
	(0.0201)	(0.0191)	(0.00679)
GS		0.00533***	0.00481***
		(0.00157)	(0.00147)
GR		0.000530	0.000659***
		(0.000739)	(0.000192)
FDI		0.000144	0.000290
		(0.000189)	(0.000201)
UB		0.00215**	0.00494***
		(0.000890)	(0.000736)
BF		0.000141	0.000138
		(0.000241)	(0.000242)
TF		0.00153***	0.00144***
		(0.000506)	(0.000432)
FF		0.000424*	0.000309
		(0.000254)	(0.000264)
First stage			0.162***
			(0.0552)
Observations	621	621	621
R-squared	0.601	0.605	0.198
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
UIT p-values			0.000
Kleoberg-Paap WIT			68.15
Critical values			16.38
Hansen *J*			0.000

Notes: The first stage reports the estimated coefficients on the instrumental variable (Religious tension – *RT)*. UIT is the under-identification LM test by Kleibergen and Paap, which requires a *p*-value lower than 0.05 to reject the null hypothesis at the 5% level. WIT is the Wald F-statistic of the weak identification test by Kleibergen and Paap, which must be higher than its critical value to reject the null hypothesis. OIT is the over-identification test of Hansen. Its *p*-values equal to zero because the number of instrumental variables is equal to the number of endogenous variables. Standard errors clustering at both country and year levels are in parentheses. ***, **, * indicate significant levels of 10%, 5%, and 1%, respectively.

Table 2. Geopolitical risk and components of logistic performance

	CS	***IS***	***ISS***	***LCQS***	***TTS***	***TS***
	(1)	(2)	(3)	(4)	(5)	(6)
CGPR	-0.0482***	-0.0376**	-0.0580***	-0.0462***	-0.0406***	-0.0337**
	(0.0164)	(0.0164)	(0.0186)	(0.0138)	(0.0133)	(0.0152)
GS	0.00780***	0.0696***	0.00711***	0.00768***	0.00791***	0.00769***
	(0.00209)	(0.00240)	(0.00256)	(0.00295)	(0.00257)	(0.00293)
GG	0.00137**	0.00131**	0.00244***	0.00212**	0.00217***	0.00190**
	(0.000661)	(0.000623)	(0.000882)	(0.000981)	(0.000777)	(0.000829)
FDI	0.000300	0.000211	0.000465	0.000425*	0.000412**	0.000603
	(0.000300)	(0.000171)	(0.000420)	(0.000234)	(0.000210)	(0.000387)
UB	0.00409***	0.00565***	0.00778***	0.00830***	0.00241**	0.00395***
	(0.00133)	(0.00127)	(0.00144)	(0.00118)	(0.00113)	(0.00131)
BF	0.000767*	0.000369	0.000852	0.000121	0.000759*	-0.000111
	(0.000431)	(0.000402)	(0.000522)	(0.000362)	(0.000437)	(0.000386)
TF	0.00211***	0.00253***	0.00220**	0.00259**	0.00171**	0.00129*
	(0.000774)	(0.000739)	(0.000974)	(0.00118)	(0.000808)	(0.000723)
FF	0.000283	0.000577	0.000138	0.000271	0.000900**	0.000139
	(0.000527)	(0.000373)	(0.000456)	(0.000367)	(0.000383)	(0.000505)
First stage	0.181***	0.181***	0.181***	0.181***	0.181***	0.181***
	(0.0589)	(0.0589)	(0.0589)	(0.0589)	(0.0589)	(0.0589)
Observations	621	621	621	621	621	621
R-squared	0.195	0.163	0.198	0.194	0.199	0.181
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
UIT p-values	0.000	0.000	0.000	0.000	0.000	0.000
Kleoberg-Paap WIT	41.381	41.381	41.381	41.381	41.381	41.381
Critical values	16.38	16.38	16.38	16.38	16.38	16.38
Hansen *J*	0.000	0.000	0.000	0.000	0.000	0.000

Notes: See Table 1.

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