

Geopolitical Risk and Globalization

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In this paper we examine the effect of geopolitical risks on globalization using Pseudo-Poisson Maximum Likelihood (PPML) methodology for gravity trade model. As a measure for globalization, we use bilateral foreign direct investment (FDI) data from 2001 to 2012 and bilateral trade data from 1948 to 2019. Ours is the first paper making use of the recently created geopolitical risk (GPR) dataset using text analysis to test its effect on globalization. For the univariate model, we find a significant decline in FDI by 3.6% and 0.5% in trade for 10% increase in geopolitical riskiness, but for multivariate model we only see a significant increase in trade by 0.04%. We test the robustness of our results by doing more granular analysis by using individual country GPR measures as well as using KOF Globalization Index instead of FDI and Trade flow. Here also we see a significant negative effect of geopolitical risk on globalization.

Keywords: geopolitical risk, globalization, Foreign Direct Investment (FDI), trade, Poisson pseudo-maximum likelihood (PPML)

INTRODUCTION

This paper analyzes the effect of geopolitical risk (GPR) on globalization. As a measure for globalization, we use bilateral foreign direct investment (FDI) and bilateral trade flows. To our knowledge our paper is one of the first to study the effect of geopolitical risks on globalization. We follow the trade gravity model literature and use Pseudo - Poisson Maximum Likelihood (PPML) as our choice of estimation technique. For our benchmark analysis, we test the effect of a common geopolitical risk (GPR) measure for the whole world on globalization and then for robustness check we use the historical GPR index and individual country GPR index.¹ And as a second robustness check, we replace our dependent variable - globalization indicators - with KOF Globalization Index and test the validity of our benchmark results.

Using PPML, our preferred method of estimation, for univariate analysis, we see a negative and significant decline in both FDI and trade flows with increase in geopolitical risks. With 10% increase in geopolitical risk, FDI decreases by 3.6% and trade flows by 0.5%. And the ratio of FDI relative to trade also declines by 1.3% but it is not significant. For multivariate analysis after controlling for gravity variables, we still see decline in FDI flows but it's not significant, whereas trade flows increase by 0.04% with 10% in geopolitical risk.

Even though the geopolitical risk index was only developed in 2018, this index has widely been used in different fields of study. (Aysan et al., 2019) study the effect of geopolitical risk on bitcoin returns and

volatility and conclude that bitcoin can be a hedging tool against geopolitical risks. (Balcilar et al., 2018) study the effect on BRICS nation's stock market returns and volatility and show that geopolitical tensions does not have a uniform effect on the stock market return across BRICS nations. (Antonakakis et al., 2017) similarly do a historical study, from 1899 to 2016, the effect of geopolitical risk on stock and oil returns and find that the geopolitical risk does have a negative effect on oil returns and volatility.² With regards to the effect of geopolitical risk on globalization, ours is the first study to our knowledge. To our knowledge (Gupta et al., 2019) is the only other study directly testing the effect of geopolitical risk on trade flow, who also make use of PPML along with other methods to study effect of GPR on bilateral trade and come to similar conclusion, i.e., increase in geopolitical risk negatively affect trade flows, which we show that the negative effect is more pronounced when origin country is affected by geopolitical risk, not just for current data (1985 to 2019) but also using historical data going back to 1948. There is a vast literature on the effect of conflict on trade flow and FDI. (Glick and Taylor, 2010) study the effect of war on bilateral trade, similarly (Martin et al., 2008) study the effect of military conflict on international trade and show that trade partially helps promote peace between two countries and occurrence of war is lower between countries that trade more bilaterally.³

The rest of the paper has the following sections: Section 2 covers the data source and empirical methodology used for the analysis, section 3 has the results, section 4 has robustness analysis, and section 5 has a conclusion.

DATA AND EMPIRICAL MODEL

To study the effect of geopolitical risk on globalization we make use of three different types of measures as a proxy for globalization - 1) Foreign Direct Investment (FDI), 2) Trade and 3) Ratio of foreign direct investment and trade.⁴ We make use of an unbalanced panel dataset of bilateral FDI and bilateral trade for 189 countries from 1948 to 2019. Data for bilateral foreign direct investment (FDI) is taken from United Nations Conference on Trade and Development (UNCTAD, 2020). Data for bilateral trade and other gravity variables data is taken from (Conte et al., 2021) which covers data for 252 country-pairs from 1948 to 2019. Following the trade gravity literature, we use distance between two countries, colonial relationship, common land border, common language, gross domestic product (GDP) for both origin and destination countries and gross domestic product per capita for origin and destination countries as control variables for our trade gravity model.

The data on geopolitical risk index is from (Caldara and Iacoviello, 2021)⁵ The GPR index is constructed by tallying newspaper articles on adverse geopolitical events that contain occurrence of words related to geopolitical tensions from 10 leading English language newspapers around the world.⁶ They have made two types of geopolitical risk indexes: 1) Recent geopolitical risk (GPR) index, 2) Historical geopolitical risk (GPRH) index. For GPR the data is from 1985 to 2021, for GPRH it is from 1900 to 2021. Apart from these, (Caldara and Iacoviello, 2021) have also constructed risk indexes (both recent and historical) for 39 individual countries.⁷ In our research, we do analysis using all the three types of geopolitical risk indexes. The GPR index have monthly data, which we convert to annual data by taking average for 12-month period. We do this as the data for our dependent variables bilateral FDI and bilateral trade are in annual frequency.

$$\begin{aligned} \ln(Gi_{jt}) = & \beta_0 + \beta_1 \ln(GPR_t) + \beta_2 \ln(MLRDistance_{i_{jt}}) + \beta_3 (MLRContiguity_{i_{jt}}) \\ & + \beta_4 (MLRLanguage_{i_{jt}}) + \beta_5 (MLRColony_{i_{jt}}) + \beta_6 \ln(GDP_{it}) \\ & + \beta_7 \ln(GDP_{jt}) + \beta_8 \ln(GDPPC_{it}) + \beta_9 \ln(GDPPC_{jt}) + \gamma_{ij} + \varepsilon_{ijt} \end{aligned} \quad (1)$$

Equation (1) is our OLS empirical model, which we use to analyze the effect of geopolitical risk on globalization. For our dependent variable, globalization (Gi_{jt}) we use three different variables: 1) $\ln(Trade_{i_{jt}})$ which is the natural log of bilateral trade between countries i and j in year t, 2) $\ln(FDI_{i_{jt}})$ is the natural log of bilateral foreign direct investment (FDI) of home country i in host country j in year t, and 3) $\ln(FDI/Trade_{i_{jt}})$ is the ratio of bilateral FDI and bilateral trade in natural logarithm form. Our variable of

interest is $\ln(GPR_t)$ which is the natural logarithm of geopolitical risk index in year t. In our benchmark regression, we use the current geopolitical risk (GPR) and then later on for robustness check we make use of historical geopolitical risk (GPRH) index, $\ln(GPRH_t)$ in year t, and country-wise geopolitical risk (GPRC) index, $\ln(GPRC_{it})$ of country i in year t.

All estimations are done using country-pair (γ_{ij}) fixed effects. Here, we deviate from the relevant gravity model literature by not including exporter-time and importer-time fixed effects because our variable of interest - Geopolitical Risk (GPR) index - is a time-series variable and including a time fixed effect will absorb all the information from GPR.⁸ We follow (Berden et al., 2014) and (Baier and Bergstrand, 2009) to create separate multilateral resistance terms using first-order log-linear Taylor- series approximation method, instead of using importer-time and exporter-time fixed effects. Thus, we convert DISTANCE, COMMON LANGUAGE, COMMON COLONIZER and CONTIGUITY to multi-lateral resistance (MLR) terms.⁹ $\ln(MLRDistance_{ijt})$ is the natural logarithm of distance between countries i and j, $(MLRContiguity_{ijt})$ is the binary variable taking value 1 if countries i and j share a common land border and 0 otherwise, $(MLRLanguage_{ijt})$ is a binary variable taking value 1 if countries i and j have common language and 0 otherwise, $(MLRColony_{ijt})$ is a binary variable taking value 1 if countries i and j were colony of another common country and 0 otherwise, $\ln(GDP_{it})$ is natural logarithm of GDP of country i in year t, $\ln(GDP_{jt})$ is natural logarithm of GDP of country j in year t, $\ln(GDPPC_{it})$ is natural logarithm of GDP per capita of country i in year t and $\ln(GDPPC_{jt})$ in natural logarithm of GDP per capita of country j in year t.

$$\ln(G_{ijt}) = \exp[\beta_0 + \beta_1 \ln(GPR_t) + \beta_2 \ln(MLRDistance_{ijt}) + \beta_3 (MLRContiguity_{ijt}) + \beta_4 (MLRLanguage_{ijt}) + \beta_5 (MLRColony_{ijt}) + \beta_6 \ln(GDP_{it}) + \beta_7 \ln(GDP_{jt}) + \beta_8 \ln(GDPPC_{it}) + \beta_9 \ln(GDPPC_{jt}) + \gamma_{ij}] + \varepsilon_{ijt} \quad (2)$$

(Silva and Tenreyro, 2006) show the importance of using Pseudo-Poisson Maximum Likelihood (PPML) estimation to address the biases from existence of zero observations and heteroscedasticity in OLS estimations of gravity model.¹⁰ Thus following the current growing literature in international trade and (Silva and Tenreyro, 2006), we also augment our OLS specification in equation (1) to account for heteroscedasticity and run PPML specification. Equation (2) is our PPML specification.

TABLE 1
DESCRIPTIVE STATISTICS

Variable	N	Mean	SD	Minimum	Maximum
LN(FDI)	110,680	4.11	2.80	-11.51	13.38
LN(TRADE FLOW)	656,234	9.53	3.46	-5.81	20.07
LN(FDI/TRADE FLOW)	97,215	-8.21	2.67	-21.10	9.92
LN(GPR)	1,372,469	4.58	0.27	3.93	5.17
LN(GPRH)	2,666,595	4.48	0.24	3.68	5.04
LN(GPRC)	324,911	-2.37	1.30	-5.18	1.47
LN(DISTANCE)	2,154,096	8.68	0.86	0.63	9.90
COMMON LANGUAGE	2,154,096	0.17	0.37	0.00	1.00
COMMON COLONY	2,154,096	0.11	0.31	0.00	1.00
CONTIGUITY	2,101,972	0.02	0.14	0.00	1.00
LN(GDP_O)	2,047,064	16.26	2.49	9.12	23.79
LN(GDP_D)	2,026,259	16.27	2.51	9.12	23.79
LN(GDP PER CAPITA_O)	2,034,092	0.60	1.81	-3.65	5.27
LN(GDP PER CAPITA_D)	2,013,425	0.62	1.83	-3.65	5.27

RESULTS

In this section we first present results for OLS and PPML estimations and thereafter do robustness check, where first we analyze the importer and exporter (host and home) country recent geopolitical risk measures (i.e., 1985-2019) and historical geopolitical risk measures (i.e., 1948-2019), and then change our dependent variable and use KOF Globalization Index as an alternate measure of globalization.

Table 2 has results from OLS estimation for equation 1. The results are divided into three columns each for our dependent variables. For each of type of dependent variable, we report results using country- pair fixed effects. Columns 1-3 have results using natural logarithm of FDI as dependent variable. All specifications in columns 1 to 3 suggest having a negative and significant effect of increasing geopolitical risk on FDI. The FDI elasticity to GPR is between -1.74 to -0.29, thus indicating a 10% increase in GPR reduces FDI by 17.4%. For trade flow we get the effect of GPR on trade to be negative and significant where 10% increase in GPR reduces trade by 2.2%. And for the ratio of FDI and trade, a 10% increase in GPR reduces FDI compared to trade by 3.5%.

TABLE 2
EFFECT OF GEOPOLITICAL RISK ON GLOBALIZATION: OLS ESTIMATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FDI	FDI	FDI	Trade	Trade	Trade	FDI/Trade	FDI/Trade	FDI/Trade
LN(GPR)	-1.747*** (0.021)	-0.333*** (0.043)	-0.223*** (0.079)	-0.482*** (0.007)	0.020*** (0.006)	-0.022*** (0.007)	-0.382*** (0.024)	-0.343*** (0.050)	-0.358*** (0.091)
LN(MLR CONTIGUITY)			-0.975 (1.024)			-0.451*** (0.050)			-2.939** (1.179)
LN(MLR DISTANCE)			1.247 (2.571)			0.381*** (0.115)			5.997** (2.962)
LN(MLR LANGUAGE)			-1.343 (1.547)			0.215*** (0.059)			-4.373** (1.789)
LN(MLR COLONY)			0.917*** (0.207)			0.275*** (0.027)			1.023*** (0.238)
LN(GDP_O)		1.551*** (0.077)	1.224*** (0.085)		0.667*** (0.011)	0.676*** (0.012)		0.994*** (0.106)	0.658*** (0.117)
LN(GDP_D)		1.514*** (0.077)	1.188*** (0.085)		0.450*** (0.011)	0.460*** (0.012)		1.071*** (0.106)	0.735*** (0.117)
LN(GDPPC_O)		-1.017*** (0.081)	-0.806*** (0.085)		0.127*** (0.013)	0.135*** (0.014)		-1.180*** (0.112)	-0.936*** (0.117)
LN(GDPPC_D)		-0.941*** (0.081)	-0.731*** (0.085)		0.083*** (0.013)	0.091*** (0.014)		-1.038*** (0.112)	-0.796*** (0.117)
Constant	12.205*** (0.097)	-47.870*** (2.607)	-41.618*** (11.163)	12.114*** (0.032)	-10.968*** (0.376)	-11.960*** (0.672)	-6.448*** (0.112)	-40.745*** (3.605)	-55.833*** (12.980)
N	110,384	105,772	105,773	532,398	510,924	510,924	96,927	95,098	95,098
R ²	0.664	0.669	0.669	0.828	0.880	0.880	0.556	0.559	0.559
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RMSE	1.658	1.650	1.649	1.443	1.204	1.204	1.817	1.805	1.804

The results with multilateral resistance (MLR) term are in columns 3,6 and 9. For MLR DISTANCE, as expected, a positive sign for all three measures of globalization but statistically significant for trade and FDI relative to trade. Following (Baier and Bergstrand, 2009), the interpretation of MLR DISTANCE is that as the remoteness of importer and exporter country increases from other countries, the relative cost of two trading countries decreases, thus increasing bilateral trade. Similar to MLR DISTANCE, the effect of a common land border, MLR CONTIGUITY, as per expectation has a negative sign with statistically significant for trade and ratio of FDI and trade. MLR LANGUAGE has the expected negative sign for FDI but not significant, whereas for trade it is having a positive and significant effect and FDI relative to trade

is negative and significant. And finally, MLR COLONY is theoretically consistent by having a positive and economically and statistically significant for FDI and trade flow.

For FDI, home and host country GDP increases FDI by 1.5% each. Whereas the per capita GDP is also economically and statistically significant but has a negative sign indicating higher FDI inflows for less developed countries. Similarly, trade elasticity to importer and exporter GDP is positive and significant, and unlike FDI elasticity to per capita GDP, trade elasticity to per capita GDP is positive and significant indicating higher trade as country develops. Finally, the effect of GDP and per capita GDP on FDI relative to trade is similar to its' effect on FDI.

Using equation (2) we test the effect of geopolitical risk measures using Pseudo Poisson Maximum Likelihood (PPML). Table (3) has results using PPML estimation. Here as well, we make use of multilateral resistance (MLR) terms in place of importer-time and exporter-time fixed effects along with country-pair fixed effects. The individual effect of both FDI elasticity to GPR and trade elasticity to GPR are like what we get for OLS i.e., negative and significant but has lower magnitude. But on controlling for the multilateral resistance terms, we do not see any effect of GPR on FDI, and trade elasticity of GPR is positive and significant where a 10% increase in GPR increases trade marginally by 0.04%. This positive effect on trade flows is because trade does not decrease in presence of war and peace threats as well as during military buildups and beginning and escalation of war. Also, trade can have a positive effect by promoting peace and decreasing tensions between two trading partner countries as also shown by (Martin et al., 2008).¹¹

TABLE 3
EFFECT OF GEOPOLITICAL RISK ON GLOBALIZATION: PPML ESTIMATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FDI	FDI	FDI	Trade	Trade	Trade	FDI/Trade	FDI/Trade	FDI/Trade
LN(GPR)	-0.360*** (0.004)	-0.012 (0.009)	-0.022 (0.017)	-0.047*** (0.001)	0.006*** (0.001)	0.004*** (0.001)	-0.132 (0.257)	-0.335 (0.466)	0.415 (0.609)
LN(MLR DISTANCE)			0.553 (0.553)			0.080*** (0.012)			-8.436 (18.452)
LN(MLR CONTIGUITY)			-0.466** (0.219)			-0.074*** (0.005)			6.676 (7.228)
LN(MLR LANGUAGE)			-0.320 (0.333)			0.018*** (0.006)			1.416 (11.298)
LN(MLR COLONY)			0.229*** (0.043)			0.027*** (0.002)			0.395 (1.656)
LN(GDP_O)		0.322*** (0.018)	0.283*** (0.019)		0.088*** (0.001)	0.093*** (0.001)		0.038 (0.843)	-2.845*** (0.858)
LN(GDP_D)		0.314*** (0.018)	0.275*** (0.019)		0.066*** (0.001)	0.072*** (0.001)		0.285 (0.841)	-2.605*** (0.855)
LN(GDPPC_O)		-0.176*** (0.019)	-0.146*** (0.020)		-0.011*** (0.001)	-0.010*** (0.001)		-0.295 (0.876)	2.156*** (0.818)
LN(GDPPC_D)		-0.159*** (0.019)	-0.129*** (0.020)		-0.016*** (0.001)	-0.015*** (0.001)		-0.266 (0.877)	2.194*** (0.819)
Constant	3.263*** (0.021)	-9.819*** (0.613)	-10.866*** (2.398)	2.562*** (0.003)	-0.506*** (0.041)	-0.988*** (0.070)	1.280 (1.165)	-1.761 (24.784)	125.738 (81.156)
N	104,110	99,855	99,855	531,394	516,670	509,997	405	403	385
Pseudo R ²	0.220	0.222	0.222	0.189	0.200	0.200	0.228	0.243	0.252
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The effect of importer and exporter (host and home) country GDP is similar to OLS, i.e., positive and economically and statistically significant. For the per capita GDP, the PPML results are same as OLS for FDI elasticity of per capita GDP where less developed country receives more FDI inflow. With regards to trade, PPML results are opposite to that of OLS, thus as the country develops, its' trade elasticity of per capita GDP declines, i.e., with 10% increase in per capita GDP trade declines by 0.1%. For the multilateral resistance terms, the results are in columns 3, 6 and 9. First for FDI in column 3, the sign for all four MLR terms is same as OLS but with lower magnitude. Whereas for trade flow in column 6, the sign as well as

economics and statistical significance are like OLS. Since the reason for using PPML is to include zero values as well as to address heteroscedasticity bias. On comparing the OLS and PPML results, we can say that the difference in the result is only attributed to heteroscedasticity bias in OLS results.

ROBUSTNESS CHECK

There are two ways in which we conduct the robustness check of our benchmark results: First by changing the measure of geopolitical risk, i.e., instead of using a single geopolitical risk measure for the world changing across time, now we make use of individual country geopolitical risk measures for 39 countries. For individual countries, we use both current GPR (i.e., data from 1984 to 2019) as well as historical GPR (i.e., data from 1948 to 2019) as our data for bilateral trade flow is from 1948 to 2019. And Second, we change the measure of globalization and make use of KOF Globalization index from (Gygli et al., 2019) and (Dreher, 2006).

Table (4) has the results using country current and historical GPR index. For current country GPR index, we see decline in trade for origin country by 0.05% and increase in trade for destination country by 0.03% with 10% increase in geopolitical risk. Similarly, for historical country GPR index as well we see a decline in origin country trade by 0.04% and increase in destination country trade by 0.03% with 10% increase in geopolitical risk. The effect of multilateral resistance terms (MLR) is similar to world GPR index results in table (3). For both current and historical country GPR, we get similar signs and statistical and economic significance for MLR DISTANCE, MLR CONTIGUITY and MLR LANGUAGE. Furthermore, the effect of GDP and per capita GDP is also similar for both FDI and trade flow, where developed countries have higher FDI and trade flow, but less developed countries see higher per-capita FDI and trade flow. For FDI, we do not get any statistically significant effect either for current country GPR index or historical country GPR index, but the sign of the estimates is same as previous results, i.e., FDI declines with increasing geopolitical risks.

TABLE 4
GLOBALIZATION AND GEOPOLITICAL RISK:
HISTORICAL AND RECENT COUNTRY GPR INDEX

	Country GPR (Recent)				Country GPR (Historical)			
	OLS LN(FDI)	PPML LN(FDI)	OLS LN(TRADE)	PPML LN(TRADE)	OLS LN(FDI)	PPML LN(FDI)	OLS LN(TRADE)	PPML LN(TRADE)
LN(GPRC_O)	-0.030 (0.029)	-0.002 (0.005)	-0.047*** (0.004)	-0.005*** (0.0003)				
LN(GPRC_D)	-0.023 (0.030)	-0.001 (0.005)	0.062*** (0.004)	0.003*** (0.0003)				
LN(GPRHC_O)					-0.024 (0.026)	-0.006 (0.004)	-0.030*** (0.004)	-0.004*** (0.0003)
LN(GPRHC_D)					-0.021 (0.027)	-0.004 (0.004)	0.055*** (0.004)	0.003*** (0.0003)
LN(MLR DISTANCE)	4.224 (3.553)	1.188* (0.598)	0.874*** (0.166)	0.082*** (0.013)	3.973 (3.472)	1.384* (0.574)	-0.844*** (0.129)	0.060*** (0.011)
LN(MLR CONTIGUITY)	-1.458 (1.359)	-0.570* (0.231)	-0.888*** (0.073)	-0.075*** (0.0057)	-1.367 (1.330)	-0.660** (0.220)	-0.517*** (0.055)	-0.108*** (0.0048)
LN(MLR LANGUAGE)	-3.523 (2.255)	-0.738 (0.379)	0.567*** (0.082)	0.044*** (0.007)	-3.388 (2.215)	-0.858* (0.366)	1.483*** (0.075)	0.088*** (0.006)
LN(MLR COLONY)	1.006** (0.339)	0.172** (0.057)	-0.011 (0.039)	-0.011*** (0.003)	1.009** (0.341)	0.189*** (0.059)	0.142*** (0.032)	0.018*** (0.003)
LN(GDP_O)	1.444*** (0.310)	0.425*** (0.067)	0.790*** (0.032)	0.087*** (0.003)	1.462*** (0.308)	0.423*** (0.067)	1.018*** (0.019)	0.130*** (0.002)
LN(GDP_D)	1.479*** (0.310)	0.428*** (0.068)	0.699*** (0.032)	0.081*** (0.003)	1.500*** (0.309)	0.425*** (0.067)	0.933*** (0.019)	0.124*** (0.002)
LN(GDPPC_O)	-0.999** (0.320)	-0.311*** (0.069)	0.0717* (0.035)	-0.023*** (0.003)	-1.019** (0.318)	-0.307*** (0.069)	-0.292*** (0.022)	-0.072*** (0.002)
LN(GDPPC_D)	-1.011** (0.321)	-0.313*** (0.069)	0.076* (0.035)	-0.023*** (0.003)	-1.031** (0.319)	-0.309*** (0.068)	-0.310*** (0.021)	-0.074*** (0.002)
CONSTANT	-64.34*** (18.05)	-18.98*** (3.259)	-20.41*** (1.402)	-1.045*** (0.116)	-63.89*** (17.98)	-19.80*** (3.228)	-20.44*** (0.854)	-2.387*** (0.0871)
N	27,460	26,888	78,769	78,769	27,460	26,888	102,371	102,369
R ²	0.632	0.166	0.915	0.062	0.632	0.166	0.911	0.100
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

In table (5), we have the results for the effect of geopolitical risk on globalization, but this time we make use of a different index for globalization - KOF Globalization Index. By changing the dependent variable, we still end up with same results, indicating strong robustness of our benchmark results. Here as well, with increasing geopolitical risk globalization declines for all three types of GPR indexes: For GPR it declines by 0.05%, for current country GPR it declines by 0.01% for origin and 0.01% for destination country, and for historical country GPR it declines by 0.03% for origin and 0.01% for destination country, with a 10% increase in geopolitical risk. The multilateral resistance (MLR) terms, we see all of them highly significant, but MLR DISTANCE and MLR CONTIGUITY has opposite signs compared to benchmark results. Here, we see decrease in globalization by 1.09% as the distance between countries increases, whereas when trading partners share border, MLR CONTIGUITY, globalization increases by 0.5%,

TABLE 5
GLOBALIZATION AND GEOPOLITICAL RISK: KOF GLOBALIZATION INDEX

	OLS			PPML		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: Log of KOF Globalization Index						
LN(GPR)	-0.021*** (0.001)			-0.005*** (0.0001)		
LN(GPRC_O)		-0.003*** (0.001)			-0.001*** (0.0001)	
LN(GPRC_D)		-0.004*** (0.001)			-0.001*** (0.0001)	
LN(GPRHC_O)			-0.014*** (0.001)			-0.003*** (0.0001)
LN(GPRHC_D)			-0.006*** (0.001)			-0.001*** (0.0001)
LN(MLR DISTANCE)	-0.435*** (0.007)	-0.148*** (0.022)	-0.283*** (0.017)	-0.109*** (0.002)	-0.0314*** (0.006)	-0.0637*** (0.004)
LN(MLR CONTIGUITY)	0.212*** (0.003)	-0.031*** (0.009)	0.049*** (0.007)	0.050*** (0.001)	-0.011*** (0.002)	0.007*** (0.002)
LN(MLR LANGUAGE)	0.150*** (0.003)	0.221*** (0.012)	0.247*** (0.010)	0.042*** (0.001)	0.054*** (0.003)	0.061*** (0.002)
LN(MLR COLONY)	0.077*** (0.002)	0.044*** (0.005)	0.025*** (0.004)	0.018*** (0.0005)	0.010*** (0.001)	0.006*** (0.0009)
LN(GDP_O)	0.138*** (0.001)	0.206*** (0.004)	0.166*** (0.002)	0.038*** (0.0002)	0.052*** (0.0009)	0.044*** (0.0005)
LN(GDP_D)	0.101*** (0.0007)	0.219*** (0.004)	0.173*** (0.002)	0.029*** (0.0002)	0.055*** (0.0009)	0.046*** (0.0006)
LN(GDPPC_O)	-0.036*** (0.0007)	-0.097*** (0.004)	-0.049*** (0.002)	-0.012*** (0.0002)	-0.025*** (0.001)	-0.016*** (0.0006)
LN(GDPPC_D)	-0.145*** (0.001)	-0.222*** (0.004)	-0.192*** (0.002)	-0.039*** (0.0002)	-0.055*** (0.001)	-0.050*** (0.001)
CONSTANT	2.559*** (0.041)	-2.646*** (0.180)	-0.615*** (0.100)	0.904*** (0.011)	-0.315*** (0.045)	0.110*** (0.025)
N	1,062,840	80,867	99,779	1,062,840	80,867	99,779
R ²	0.846	0.834	0.853	0.007	0.002	0.004
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes

CONCLUSION

In this paper, we test the effect of geopolitical risk on globalization. To do this analysis, we use the geopolitical risk data collected by textual analysis, which has never been used in the context of empirical trade gravity model. As we use the trade gravity model, we use the Poisson - Pseudo Maximum Likelihood (PPML) as our preferred method of estimation.

Our main results show a negative effect of geopolitical risk on FDI but a positive effect of trade, which supports the previous studies showing increase in trade during times of beginning and escalation of war as well as during military buildups, as well as indicates that investors look for relatively safer countries to for investing their wealth. Over all our results are robust to changes in globalization indicator i.e., when we use KOF Globalization index instead of bilateral FDI and trade. One way to extend this research is to follow the bilateral trade literature and test the effect of geopolitical risk on globalization after introducing firm heterogeneity into the model.

ENDNOTES

1. Apart from constructing a common GPR measure, (Caldara and Iacoviello, 2021) have also made individual country index for 39 countries.
2. For other studies on the effect of geopolitical risk see: Soltani et al. (2021) for effect on economic growth in MENA countries; for GPR effect on environment see Anser et al. (2021), Sweidan (2021), Alsagr and van Hemmen (2021), Hashmi et al. (2021), etc.
3. For similar studies see: Anderton and Carter (2001), Hegre et al. (2010), Blomberg and Hess (2006), Rohner et al. (2013), Kinne (2012), etc.
4. Similar approach was taken by (Berden et al., 2014) for their study on the effect of governance on globalization.
5. For detailed description and data see <https://www.matteoiacoviello.com/gpr.htm>.
6. The newspapers used in constructing GPR index are: Chicago Tribune, the Daily Telegraph, Financial Times, The Globe and Mail, The Guardian, the Los Angeles Times, The New York Times, USA Today, The Wall Street Journal, and The Washington Post.
7. List of countries with GPR data: Argentina, Australia, Belgium, Brazil, Canada, Switzerland, Chile, China, Colombia, Germany, Denmark, Spain, Finland, France, Great Britain, Hong Kong, Indonesia, India, Israel, Italy, Japan, South Korea, Mexico, Malaysia, Netherlands, Norway, Peru, Philippines, Portugal, Russia, Saudi Arabia, Sweden, Thailand, Turkey, Taiwan, Ukraine, United States, Venezuela and South Africa.
8. Similar approach is used by (Dissanayake et al., 2018) who study effect of geopolitical risk on corporate investments.
9. $\ln(MLRDISTANCE_{ijt}) = (\sum \theta_{jt} \ln DISTANCE_{ij}) + (\sum \theta_{it} \ln DISTANCE_{ij}) - (\sum \sum \theta_{mt} \theta_{nt} \ln DISTANCE_{mn})$
 $\ln(MLRLANG_{ijt}) = (\sum \theta_{jt} \ln LANG_{ij}) + (\sum \theta_{it} \ln LANG_{ij}) - (\sum \sum \theta_{mt} \theta_{nt} \ln LANG_{mn})$. Multi-lateral resistance terms for COLONY and CONTIGUITY can be calculated similar to MLR Language. For complete details on multi-lateral resistance terms and its' calculation see (Baier and Bergstrand, 2009).
10. For recent papers using PPML for gravity panel data estimations see (Baier et al. (2018), Baier et al. (2019), Berden et al. (2014), Larch et al. (2019)).
11. (Caldara and Iacoviello, 2021) have created Geopolitical Risk (GPR) index based on eight different categories: 1) War Threats, 2) Peace Threats, 3) Military Buildups, 4) Nuclear Threats, 5) Terror Threats, 6) Beginning of War, 7) Escalation of War and 8) Terror Acts. Here, categories 1 to 5 are used to create a first sub-index, Geopolitical Threats (GPRT), and categories 6 to 8 are used to create second sub-index, Geopolitical Acts (GPRA). We use these sub-indexes and individual categories to conduct further granular analysis. The results for this granular analysis are in Appendix tables A1 and A2. First looking at the sub-indexes, both geopolitical threats and acts we see negative and significant effect on FDI flows and KOF Globalization Index, positive and significant on trade flows, where the effect of geopolitical acts is more pronounced than geopolitical threats. For individual categories, all are highly statistically significant and have signs as expected, except terror threats and terror acts, which increases KOF Globalization Index by 0.03% and 0.05% respectively for 10% increase. Similarly, nuclear threats and terror acts are the only two categories not having a negative effect on FDI, whereas both have negative effect on trade flows.

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APPENDIX

TABLE A1
EFFECT OF GEOPOLITICAL RISK THREATS AND ACTS ON GLOBALIZATION

	GPR Threats			GPR Acts		
	FDI	Trade	KOF	FDI	Trade	KOF
LN(GPR)	-0.019* (0.011)	0.004*** (0.001)	-0.001*** (0.000)	-0.023** (0.011)	0.002** (0.001)	-0.007*** (0.000)
LN(MLR DISTANCE)	0.627 (0.507)	0.081*** (0.012)	-0.114*** (0.002)	0.503 (0.413)	0.081*** (0.012)	-0.106*** (0.002)
LN(MLR CONTIGUITY)	-0.489** (0.195)	-0.073*** (0.005)	0.053*** (0.001)	-0.441*** (0.158)	-0.077*** (0.005)	0.050*** (0.001)
LN(MLR LANGUAGE)	-0.369 (0.311)	0.014** (0.006)	0.042*** (0.001)	-0.289 (0.255)	0.021*** (0.006)	0.039*** (0.001)
LN(MLR COLONY)	0.227*** (0.038)	0.026*** (0.002)	0.016*** (0.000)	0.226*** (0.037)	0.029*** (0.002)	0.017*** (0.000)
LN(GDP_O)	0.282*** (0.020)	0.093*** (0.001)	0.037*** (0.000)	0.285*** (0.019)	0.094*** (0.001)	0.038*** (0.000)
LN(GDP_D)	0.274*** (0.020)	0.071*** (0.001)	0.028*** (0.000)	0.277*** (0.019)	0.072*** (0.001)	0.028*** (0.000)
LN(GDPPC_O)	-0.145*** (0.020)	-0.009*** (0.001)	-0.011*** (0.000)	-0.147*** (0.020)	-0.011*** (0.001)	-0.012*** (0.000)
LN(GDPPC_D)	-0.129*** (0.020)	-0.015*** (0.001)	-0.039*** (0.000)	-0.130*** (0.020)	-0.016*** (0.001)	-0.039*** (0.000)
CONSTANT	-11.170*** (2.227)	-0.984*** (0.070)	0.912*** (0.011)	-10.689*** (1.875)	-0.994*** (0.070)	0.899*** (0.010)
N	99,855	509,997	1,062,840	99,855	509,997	1,062,840
R ²	0.222	0.200	0.006	0.223	0.200	0.006
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes

TABLE A2
EFFECT OF INDIVIDUAL GEOPOLITICAL THREATS AND ACTS ON GLOBALIZATION

Geopolitical Risk - Threats	Geopolitical Risk - Acts							
Share Category	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LN(GPR)	-0.010*** (0.000)	-0.005*** (0.000)	-0.011*** (0.000)	-0.008*** (0.000)	0.003*** (0.000)	-0.008*** (0.000)	-0.009*** (0.000)	0.005*** (0.000)
LN(MLR DISTANCE)	-0.088*** (0.001)	-0.082*** (0.001)	-0.086*** (0.002)	-0.072*** (0.001)	-0.101*** (0.001)	-0.092*** (0.002)	-0.087*** (0.002)	-0.103*** (0.002)
LN(MLR CONTIGUITY)	0.057*** (0.001)	0.060*** (0.001)	0.063*** (0.001)	0.046*** (0.001)	0.072*** (0.001)	0.064*** (0.001)	0.063*** (0.001)	0.075*** (0.001)
LN(MLR LANGUAGE)	0.015*** (0.001)	0.010*** (0.001)	0.003*** (0.001)	0.0164*** (0.001)	0.008*** (0.001)	0.014*** (0.001)	0.012*** (0.001)	0.003*** (0.001)
LN(MLR COLONY)	0.010*** (0.000)	-0.002*** (0.000)	0.007*** (0.000)	0.012*** (0.000)	-0.001*** (0.000)	0.002*** (0.000)	0.004*** (0.000)	-0.004*** (0.000)
LN(GDP_O)	0.039*** (0.000)	0.039*** (0.000)	0.039*** (0.000)	0.041*** (0.000)	0.038*** (0.000)	0.039*** (0.000)	0.039*** (0.000)	0.038*** (0.000)
LN(GDP_D)	0.030*** (0.000)	0.030*** (0.000)	0.030*** (0.000)	0.032*** (0.000)	0.030*** (0.000)	0.030*** (0.000)	0.030*** (0.000)	0.029*** (0.000)
LN(GDPPC_O)	-0.011*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.010*** (0.000)
LN(GDPPC_D)	-0.042*** (0.000)	-0.042*** (0.000)	-0.042*** (0.000)	-0.042*** (0.000)	-0.042*** (0.000)	-0.042*** (0.000)	-0.042*** (0.000)	-0.041*** (0.000)
CONSTANT	0.724*** (0.007)	0.642*** (0.007)	0.709*** (0.007)	0.614*** (0.007)	0.761*** (0.007)	0.716*** (0.007)	0.728*** (0.007)	0.764*** (0.007)
N	1,340,360	1,340,360	1,340,360	1,340,360	1,340,360	1,340,360	1,340,360	1,340,360
R ²	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Country-Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes