The Role of Multilateralism of the WTO in International Trade Stability

Online Appendix

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A Brief Description of Spatial Lag Model in General

In a spatial lag model, the observation in location i is correlated with observations in other locations j. For instance:

$$\mathbf{Y} = \mathbf{X}\beta + \rho\mathbf{W}\mathbf{Y} + \epsilon, \tag{A.1}$$

where $\mathbf{Y}$ is an $N \times 1$ vector of observations for a cross-sectional sample with N countries (or N locations); $\mathbf{X}$ is an $N \times M$ matrix of explanatory variables. The term $\mathbf{WY}$ in equation (A.1) is called the spatially lagged dependent variable (or in short a spatial lag), with $\mathbf{W}$ an $N \times N$ matrix measuring the connectivity or proximity of a specific country i to other countries j. In other words, for a country i, $\mathbf{WY}$ is a weighted average of all y_j in other countries, with $i \neq j$. Consequently, equation (A.1) suggests that the variation in each observation of y is explained by its dependence on the others. The sign and magnitude of ρ illustrate the impact of the spatial lag on the dependent variable. If ρ is positive, an increase in y in other countries j is associated with an increase in y_i. Conversely, if ρ is negative, then an increase in y in other countries j is associated with a decrease in y_i.

For panel data with N countries over T time periods, the weight matrix $\mathbf{W}$ becomes block diagonal with each block W_t being an $N \times N$ matrix for year t. Specifically,

$$W_t = \begin{bmatrix} 0 & w_t(ij) & w_t(ik) \\ w_t(ji) & 0 & w_t(jk) \\ w_t(ki) & w_t(kj) & 0 \end{bmatrix}, \tag{A.2}$$

where $t \in \{1, \ldots, T\}$. Each off-diagonal element $w_t(\cdot)$ is a weight function. The diagonal elements of W_t are set to zero so that no observation of y_t predicts itself. With T time periods, the full weight matrix of $NT \times NT$ can be expressed in equation (A.3):[1]

$$\mathbf{W} = \begin{bmatrix} W_1 & 0 & 0 & 0 \\ 0 & W_2 & 0 & 0 \\ & & \ddots & \\ 0 & 0 & & 0 \\ 0 & 0 & 0 & W_T \end{bmatrix}. \tag{A.3}$$

[1] Routinely, the weight matrix $\mathbf{W}$ is also row-standardized so that each row sums to unity.

A Discussion of Spatial Spillover Effect on Trade Volatility

This appendix further discusses the spatial lag model of trade volatility as shown in equation (7). Note that it can be written as a formal spatial lag model:

$$Y_{ij\tau} = \beta_0 + \rho_1 W_m^{\text{WTO}} Y_{ij\tau} + \rho_2 W_m^{\text{NWTO}} Y_{ij\tau} + \rho_1 W_k^{\text{WTO}} Y_{ij\tau} + \rho_1 W_k^{\text{NWTO}} Y_{ij\tau} + Z_\tau \gamma + \epsilon_{ij\tau}, \tag{A.4}$$

where $W_m^{\text{WTO}} Y_{ij\tau} = V_{im\tau}^{\text{WTO}} = \sum_{m \neq j} w_m^{\text{WTO}} \cdot Vol\left(M_{im}\right)_\tau$ in equation (3); $W_m^{\text{NWTO}} Y_{ij\tau} = V_{im\tau}^{\text{NWTO}} = \sum_{m \neq j} w_m^{\text{NWTO}} \cdot Vol\left(M_{im}\right)_\tau$ in equation (4); $W_k^{\text{WTO}} Y_{ij\tau} = V_{kj\tau}^{\text{WTO}} = \sum_{k \neq i} w_k^{\text{WTO}} \cdot Vol\left(M_{kj}\right)_\tau$ in equation (5); and $W_k^{\text{NWTO}} Y_{ij\tau} = V_{kj\tau}^{\text{NWTO}} = \sum_{k \neq i} w_k^{\text{NWTO}} \cdot Vol\left(M_{kj}\right)_\tau$ in equation (6). According to Anselin (1988), we present the spatial lag model in equation (7) in its matrix form as:

$$\begin{aligned} \mathbf{Y} &= \mathbf{Z}\gamma + \rho_1 \mathbf{W_m^{WTO}} \mathbf{Y} + \rho_2 \mathbf{W_m^{NWTO}} \mathbf{Y} + \rho_3 \mathbf{W_k^{WTO}} \mathbf{Y} + \rho_4 \mathbf{W_k^{NWTO}} \mathbf{Y} + \boldsymbol{\epsilon} & \text{(A.5)} \\ \boldsymbol{\epsilon} &\sim N\left(0, \sigma_\epsilon^2 \mathbf{I}\right), & \text{(A.6)} \end{aligned}$$

where $\mathbf{Y}$ is a matrix for the trade volatility of all country pairs *i*-*j*; Z is an matrix of control variables in all country pairs *i*-*j*; $\mathbf{I}$ is an identity matrix; and the innovation vector $\boldsymbol{\epsilon}$ is independently and identically distributed (i.i.d.) over time and across dyads. The term $\mathbf{W_s^r Y}$, for $\mathbf{s} \in \{\mathbf{m}, \mathbf{k}\}$ and $\mathbf{r} \in \{\mathbf{WTO}, \mathbf{NWTO}\}$, represents the weighted average of trade volatilities of country pairs *i*-*m* and *k*-*j*, depending on the WTO membership of country *m* and country *k*. To be more specific, $\mathbf{W_m^{WTO}}$ is a weight matrix with its elements equal to one for all WTO exporting countries *m* ($m \neq j$); $\mathbf{W_m^{NWTO}}$ is a weight matrix, where the elements are equal to one for all exporting countries *m* that are non-WTO members ($m \neq j$); $\mathbf{W_k^{WTO}}$ is a weight matrix, where the elements are equal to one for all importing countries *k* that are WTO members ($k \neq i$); and $\mathbf{W_k^{NWTO}}$ is a weight matrix, where the elements are equal to one for all WTO importing countries *k* ($k \neq i$). The spatial lag model (equations (A.5) and (A.6)) illustrates, apart from the direct effect of trade volatilities from other country pairs on country pair *i*-*j*'s trade volatility, a "feedback loop". For example, a change in country pair *i*-*j*'s trade volatility, which results from trade shocks in other dyads (*i*-*m* and/or *k*-*j*), will in turn further influence the trade volatilities of dyad *i*-*m* and/or *k*-*j*.

In a nutshell, an exogenous change in one observation can have an echoing effect through the feedback among other observations. This is referred to as the spatial multiplier effect or the long-run spatial spillover effect in the literature. The multiplier represents the extent to which the effect of an external shock on the dependent variable is magnified by spillovers in the system (Anselin 2003a). To obtain the spillover effect of an exogenous shock ($\boldsymbol{\epsilon}$) on trade volatility between countries *i* and *j*, accounting for feedback, we rewrite equation (A.5) as follows:

$$\mathbf{Y} = \Theta^{-1} \mathbf{Z}\gamma + \Theta^{-1} \boldsymbol{\epsilon}, \tag{A.7}$$

where Θ^{-1} represents the spatial multiplier with $\Theta = \mathbf{I} - \rho_1 \mathbf{W_m^{WTO}} - \rho_2 \mathbf{W_m^{NWTO}} - \rho_3 \mathbf{W_k^{WTO}} - \rho_4 \mathbf{W_k^{NWTO}}$. Equation (A.7) indicates that the trade volatility of dyad *i*-*j* depends in general upon all of the fundamentals of each and every dyad, as well as on the innovation shocks in all of the dyads (i.e., $\Theta^{-1}\boldsymbol{\epsilon}$).

In the absence of spatial correlation (i.e., $\rho_z = 0$, for all $z = \{1, 2, 3, 4\}$), there is no spatial multiplier effect and the trade volatility is simply determined by characteristics *Z* between countries *i* and *j* and the stochastic shock $\boldsymbol{\epsilon}$, that is, $\mathbf{Y} = \mathbf{Z}\gamma + \boldsymbol{\epsilon}$. In other words, without spatial spillovers, a change in external shock in country pair *i*-*j* on its *own* trade volatility would be simply the value of any change in the innovation $\boldsymbol{\epsilon}$, holding other factors constant. However, due to spatial linkages, the change in trade volatility shock of one dyad can spillover to trade volatilities of other dyads. For more detailed discussion with spatial multiplier effect, we refer interested readers to Anselin (2003b).

Country	Country	Country	Country
Afghanistan (2016)	Dominica (1993)	Laos (2013)	San Marino
Albania (2001)	Dominican Republic (1950)	Latvia (1999)	São Tomé & Príncipe
Algeria	Ecuador (1996)	Lebanon	Saudi Arabia (2005)
Angola (1994)	Egypt (1970)	Lesotho (1988)	Senegal (1964)
Antigua and Barbuda (1987)	El Salvador (1991)	Liberia (2016)	Seychelles (2015)
Argentina (1968)	Equatorial Guinea	Libya	Sierra Leone (1961)
Armenia (2003)	Eritrea	Lithuania (2001)	Singapore (1974)
Aruba	Estonia (2000)	Luxembourg (1948)	Slovak Republic (1993)
Australia (1948)	Eswatini (1995)	Macao (1991)	Slovenia (1995)
Austria (1952)	Ethiopia	Madagascar (1964)	Solomon Islands (1995)
Azerbaijan	Faroe Islands	Malawi (1965)	Somalia
Bahamas	Fiji (1994)	Malaysia (1958)	South Africa (1948)
Bahrain (1994)	Finland (1950)	Maldives (1983)	Spain (1964)
Bangladesh (1973)	France (1948)	Mali (1993)	Sri Lanka (1949)
Barbados (1967)	French Polynesia	Malta (1965)	St. Kitts and Nevis (1994)
Belarus	Gabon (1963)	Marshall Islands	St. Lucia (1993)
Belgium (1948)	Gambia (1965)	Mauritania (1964)	St. Vincent and the Grenadines (1993)
Belize (1984)	Georgia (2000)	Mauritius (1971)	Sudan
Benin (1964)	Germany (1952)	Mexico (1987)	Suriname (1978)
Bermuda	Ghana (1958)	Micronesia	Sweden (1950)
Bhutan	Greece (1950)	Moldova (2002)	Switzerland (1967)
Bolivia (1991)	Greenland	Mongolia (1997)	Syrian Arab Republic
Bosnia and Herzegovina	Grenada (1994)	Morocco (1987)	Taiwan (2002)
Botswana (1988)	Guatemala (1992)	Mozambique (1993)	Tajikistan (2013)
Brazil (1949)	Guinea (1995)	Myanmar (1995)	Tanzania (1962)
Brunei Darussalam (1994)	Guinea-Bissau (1994)	Namibia (1993)	Thailand (1983)
Bulgaria (1997)	Guyana (1967)	Nepal (2004)	Togo (1964)
Burkina Faso (1963)	Haiti (1950)	Netherlands (1948)	Tonga (2007)
Burundi (1965)	Honduras (1994)	New Caledonia	Trinidad and Tobago (1963)
Cabo Verde (2008)	Hong Kong (1986)	New Zealand (1949)	Tunisia (1991)
Cambodia (2004)	Hungary (1974)	Nicaragua (1950)	Turkey (1952)
Cameroon (1963)	Iceland (1968)	Niger (1964)	Turkmenistan
Canada (1948)	India (1949)	Nigeria (1961)	Uganda (1963)
Central African Republic (1963)	Indonesia (1950)	North Macedonia (2003)	Ukraine (2008)
Chad (1964)	Iran	Norway (1949)	United Arab Emirates (1994)
Chile (1949)	Iraq	Oman (2001)	United Kingdom (1948)
China (2002)	Ireland (1968)	Pakistan (1949)	United States of America (1948)
Colombia (1982)	Israel (1963)	Panama (1998)	Uruguay (1954)
Comoros	Italy (1950)	Papua New Guinea (1995)	Uzbekistan
Congo, Republic of (1963)	Jamaica (1964)	Paraguay (1994)	Vanuatu (2012)
Costa Rica (1991)	Japan (1956)	Peru (1952)	Venezuela (1991)
Cote D Ivoire (1964)	Jordan (2000)	Philippines (1980)	Vietnam (2007)
Croatia (2001)	Kazakhstan (2015)	Poland (1968)	Yemen (2014)
Cuba (1948)	Kenya (1964)	Portugal (1962)	Zambia (1982)
Cyprus (1964)	Kiribati	Qatar (1994)	Zimbabwe (1949)
Czech Republic (1993)	Korea, South (1967)	Russian Federation (2012)	
Denmark (1950)	Kuwait (1963)	Rwanda (1966)	
Djibouti (1995)	Kyrgyzstan (1999)	Samoa (2012)	

Notes: Year of GATT/WTO accession for countries entering before 2017 in parentheses.

Table A: **List of countries in the sample**

VARIABLES		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	$Vol(M_{ijt})_\tau$	1										
(2)	$BothWTO_\tau$	-0.0653	1									
(3)	RTA_τ	-0.1084	0.1319	1								
(4)	GSP_τ	-0.1524	0.0992	-0.0251	1							
(5)	CU_τ	-0.0375	0.0457	0.188	-0.0411	1						
(6)	$\ln(GDP_{it})_\tau$	-0.0655	0.2131	0.1014	-0.1293	-0.0503	1					
(7)	$\ln(GDP_{jt})_\tau$	-0.275	0.1914	0.0872	0.3647	-0.0642	-0.0815	1				
(8)	$\ln(GDPPC_{it})_\tau$	-0.0027	0.1914	0.198	-0.1397	-0.0164	0.5949	0.0315	1			
(9)	$\ln(GDPPC_{jt})_\tau$	-0.1085	0.1892	0.1833	0.3492	-0.0267	0.0313	0.5912	0.1672	1		
(10)	$\ln(Dist_{ij})$	0.1127	0.0748	-0.4028	0.1031	-0.2337	0.0738	0.1099	0.0406	0.0492	1	
(11)	$ComLang_{ij}$	-0.0139	-0.0044	0.0607	-0.0203	0.1683	-0.1377	-0.1535	-0.0821	-0.0974	-0.1605	1
(12)	$ComRelig_{ij}$	-0.0334	-0.0184	0.1075	-0.0118	0.0501	-0.0565	-0.0506	-0.0035	-0.0054	-0.2052	0.2428
(13)	$Colony_{ij}$	-0.0075	-0.0234	-0.0047	-0.0422	0.0127	0.1324	-0.0916	0.0587	-0.0501	0.009	0.1002
(14)	$Colonizer_{ij}$	-0.0389	-0.0263	-0.012	0.0855	0.0079	-0.1029	0.1364	-0.0492	0.0612	0.0214	0.0963
(15)	$ComColony_{ij}$	0.0431	0.0231	0.0667	-0.1175	0.1914	-0.1631	-0.181	-0.0939	-0.1201	-0.1425	0.365
(16)	$CurColony_{ij}$	-0.012	-0.0252	0.0125	-0.0088	0.0442	0.0205	-0.0431	0.011	-0.0048	0.0059	0.0491
(17)	$CurColonizer_{ij}$	-0.0152	-0.0269	0.0163	0.002	0.0405	-0.0404	0.0214	-0.0018	0.011	0.0083	0.0519
(18)	$Remote_{ijT}$	0.0346	0.2298	0.0669	0.0799	-0.0562	0.3095	0.3017	0.3465	0.3387	0.1115	-0.0686
(19)	$Landlock_{ij}$	0.0949	0.0005	0.009	-0.0237	0.0289	-0.0427	-0.0377	-0.0957	-0.0644	-0.1019	-0.0071
(20)	$Island_{ij}$	0.0585	0.0316	-0.0026	0.0163	-0.0045	-0.1237	-0.121	0.1044	0.0915	0.1338	0.1037
(21)	$\ln(Area_i)$	-0.1406	-0.0134	-0.0743	0.0955	-0.0308	-0.0902	0.4557	-0.1017	-0.2156	0.0846	-0.0568
(22)	$\ln(Area_j)$	-0.0582	0.0048	-0.0688	-0.009	-0.0262	0.4665	-0.0981	-0.2087	-0.11	0.0602	-0.0531
(23)	$Border_{ij}$	-0.065	-0.0179	0.165	-0.0576	0.1438	-0.0146	-0.0317	-0.0733	-0.0858	-0.379	0.1409

VARIABLES		(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(12)	$ComRelig_{ij}$	1										
(13)	$Colony_{ij}$	0.0067	1									
(14)	$Colonizer_{ij}$	0.0025	-0.0172	1								
(15)	$ComColony_{ij}$	-0.0118	-0.0394	-0.0447	1							
(16)	$CurColony_{ij}$	0.0082	0.1999	-0.0034	-0.0082	1						
(17)	$CurColonizer_{ij}$	0.0084	-0.0032	0.1887	-0.0087	-0.0006	1					
(18)	$Remote_{ij\tau}$	-0.1329	-0.0192	-0.0201	0.0431	-0.0225	-0.023	1				
(19)	$Landlock_{ij}$	-0.0156	-0.0019	-0.0128	0.013	-0.0129	-0.0129	0.0618	1			
(20)	$Island_{ij}$	-0.0515	0.0404	0.0516	0.112	0.0177	0.0164	0.0324	-0.2272	1		
(21)	$\ln(Area_i)$	0.0073	-0.0276	0.0822	-0.1433	-0.031	0.0037	-0.0439	0.0254	-0.3025	1	
(22)	$\ln(Area_j)$	0.0009	0.0755	-0.0468	-0.1452	0.0035	-0.0315	-0.0382	0.0528	-0.3292	0.0032	1
(23)	$Border_{ij}$	0.1615	0.0133	0.0067	0.0817	-0.0042	-0.0045	-0.0466	0.0678	-0.1054	0.0673	0.0714

Table B: **Correlation matrix among dependent and other control variables**

		(1)	(2)	(3)	(4)	(5)
(1)	$Vol(M_{ijt})_\tau$	1				
(2)	$V_{im\tau}^{WTO}$	0.1991	1			
(3)	$V_{im\tau}^{NWTO}$	0.152	0.6278	1		
(4)	$V_{kj\tau}^{WTO}$	0.4453	0.0285	0.0916	1	
(5)	$V_{kj\tau}^{NWTO}$	0.367	0.0865	0.1192	0.7862	1

Table C: **Correlation matrix among bilateral trade volatility and spatial dyadic trade volatilities**

	10-year trade volatility			15-year trade volatility		
VARIABLES	OLS	Ctry FE	Dyad FE	OLS	Ctry FE	Dyad FE
$BothWTO_{\tau}$	-0.00728***	-0.00511***	-0.00521***	-0.00584***	-0.00199*	-0.00310***
	(0.000766)	(0.000935)	(0.000939)	(0.000848)	(0.00106)	(0.00104)
RTA_{τ}	-0.0200***	-0.0120***	-0.00820***	-0.0201***	-0.0119***	-0.00761***
	(0.00126)	(0.00123)	(0.00122)	(0.00135)	(0.00133)	(0.00136)
GSP_{τ}	-0.0258***	-0.0274***	-0.0105***	-0.0303***	-0.0329***	-0.0194***
	(0.000822)	(0.000982)	(0.000866)	(0.000906)	(0.00110)	(0.00110)
CU_{τ}	-0.0184***	-0.0134***	-0.00928***	-0.0179***	-0.0143***	-0.0131***
	(0.00232)	(0.00244)	(0.00218)	(0.00248)	(0.00259)	(0.00256)
$\ln(GDP_{it})_{\tau}$	-0.197***	0.0664**	-0.108***	-0.200***	-0.00837	-0.124***
	(0.00705)	(0.0309)	(0.0288)	(0.00759)	(0.0335)	(0.0313)
$\ln(GDP_{jt})_{\tau}$	-0.488***	0.282***	0.111***	-0.505***	0.190***	0.0627
	(0.00738)	(0.0339)	(0.0342)	(0.00791)	(0.0377)	(0.0389)
$\ln(GDPPC_{it})_{\tau}$	-0.0138***	-0.0816***	-0.0387***	-0.0122***	-0.0657***	-0.0335***
	(0.00279)	(0.00907)	(0.00816)	(0.00306)	(0.00976)	(0.00896)
$\ln(GDPPC_{jt})_{\tau}$	0.0232***	-0.165***	-0.125***	0.0256***	-0.153***	-0.118***
	(0.00283)	(0.00957)	(0.00959)	(0.00306)	(0.0102)	(0.0103)
$\ln(Dist_{ij})$	0.0180***	0.0225***		0.0191***	0.0236***	
	(0.000518)	(0.000582)		(0.000555)	(0.000620)	
$ComLang_{ij}$	-0.0128***	-0.0127***		-0.0122***	-0.0125***	
	(0.00106)	(0.00112)		(0.00115)	(0.00122)	
$ComRelig_{ij}$	-0.00479***	-0.00914***		-0.00367**	-0.00907***	
	(0.00134)	(0.00153)		(0.00146)	(0.00167)	
$Colony_{ij}$	-0.0148***	-0.00554		-0.0135***	-0.00252	
	(0.00356)	(0.00365)		(0.00401)	(0.00405)	
$Colonizer_{ij}$	-0.00540**	-0.00251		-0.00751***	-0.00263	
	(0.00213)	(0.00203)		(0.00229)	(0.00214)	
$ComColony_{ij}$	-0.00892***	-0.0169***		-0.00920***	-0.0172***	
	(0.00151)	(0.00154)		(0.00161)	(0.00163)	
$CurColony_{ij}$	-0.0566***	-0.0612***	0.000312	-0.0514***	-0.0516***	0.00799
	(0.0101)	(0.0125)	(0.00957)	(0.00894)	(0.0105)	(0.00591)
$CurColonizer_{ij}$	-0.00657	-0.0212***	-0.00140	0.00112	-0.0177***	-0.000857
	(0.00661)	(0.00627)	(0.00769)	(0.00566)	(0.00524)	(0.00454)
$Remote_{ij\tau}$	-0.0130***	0.0112***	0.0108***	-0.0122***	0.00847***	0.00372**
	(0.00117)	(0.00206)	(0.00164)	(0.00122)	(0.00199)	(0.00176)
Country FE	No	Yes	No	No	Yes	No
Dyad FE	No	No	Yes	No	No	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	99016	99016	94657	81274	81274	76763
R^2	0.246	0.311	0.617	0.250	0.317	0.649

Notes: All regressions are controlled for geographical factors: $\ln(Area_i)$, $\ln(Area_j)$, $Border_{ij}$, $Landlock_{ij}$, and $Island_{ij}$. Clustered standard errors by countries i and j are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table D: **Results of WTO membership and trade volatility**

	10-year trade volatility			15-year trade volatility		
VARIABLES	OLS	Ctry FE	Dyad FE	OLS	Ctry FE	Dyad FE
$V_{im\tau}^{WTO}$	0.655***	0.314***	0.392***	0.650***	0.198***	0.428***
	(0.0271)	(0.0316)	(0.0300)	(0.0306)	(0.0381)	(0.0361)
$V_{im\tau}^{NWTO}$	0.0549***	0.0943***	0.0193	0.0644***	0.156***	0.0274*
	(0.0116)	(0.0131)	(0.0120)	(0.0137)	(0.0181)	(0.0167)
$V_{kj\tau}^{WTO}$	0.839***	0.514***	0.618***	0.854***	0.448***	0.670***
	(0.0257)	(0.0302)	(0.0325)	(0.0285)	(0.0360)	(0.0385)
$V_{kj\tau}^{NWTO}$	0.0479**	0.135***	0.0380*	0.0385*	0.173***	0.0200
	(0.0187)	(0.0210)	(0.0205)	(0.0214)	(0.0272)	(0.0269)
Country FE	No	Yes	No	No	Yes	No
Dyad FE	No	No	Yes	No	No	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	57392	57392	53166	45773	45773	40527
R^2	0.353	0.365	0.690	0.361	0.374	0.724

Notes: All regressions are controlled for other control variables presented in Table 2. Clustered standard errors by countries i and j are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table E: **Spatial regressions (10-year trade volatility and 15-year trade volatility)**

Panel A. WTO and distance weight for spatial lags

	(F.1) OLS		(F.2) Ctry FE		(F.3) Dyad FE	
$V_{im\tau}^{WTO}$	0.346***	(0.0219)	0.241***	(0.0236)	0.250***	(0.0219)
$V_{im\tau}^{NWTO}$	0.0654***	(0.00785)	0.0452***	(0.00835)	0.00308	(0.00764)
$V_{kj\tau}^{WTO}$	0.719***	(0.0228)	0.506***	(0.0272)	0.559***	(0.0276)
$V_{kj\tau}^{NWTO}$	0.0827***	(0.0130)	0.111***	(0.0130)	0.0681***	(0.0126)
Observations	101208		101208		98303	
R^2	0.273		0.302		0.587	

Panel B. WTO and trade weight for spatial lags

VARIABLES	(F.4) OLS		(F.5) Ctry FE		(F.6) Dyad FE	
$V_{im\tau}^{WTO}$	0.583***	(0.0265)	0.290***	(0.0284)	0.286***	(0.0264)
$V_{im\tau}^{NWTO}$	0.0504***	(0.00836)	0.0588***	(0.00881)	0.0231***	(0.00794)
$V_{kj\tau}^{WTO}$	0.847***	(0.0251)	0.600***	(0.0318)	0.660***	(0.0331)
$V_{kj\tau}^{NWTO}$	0.0809***	(0.0129)	0.0916***	(0.0136)	0.0434***	(0.0131)
Observations	99610		99610		96711	
R^2	0.291		0.305		0.591	

Notes: In Panel A, the weight w_m^{WTO} in equation (3) for the term $V_{im\tau}^{WTO}$ and the weight w_m^{NWTO} in equation (4) for the term $V_{im\tau}^{NWTO}$ are replaced by $w_m^{WTO}/Dist_{jm}$ and $w_m^{NWTO}/Dist_{jm}$, respectively, where $Dist_{jm}$ represents the geographical distance between j and m. We apply the same technique to generate new weight for spatial volatility terms in equations (5) and (6) as $w_k^{WTO}/Dist_{ik}$ and $w_k^{NWTO}/Dist_{ik}$, respectively, where $Dist_{ik}$ represents the geographical distance between i and k. In Panel B, the weight w_m^{WTO} in equation (3) for the term $V_{im\tau}^{WTO}$ and the weight w_m^{NWTO} in equation (4) for the term $V_{im\tau}^{NWTO}$ are replaced by $w_m^{WTO} \times trade_{jm\tau}$ and $w_m^{NWTO} \times trade_{jm\tau}$, respectively, where $trade_{jm\tau}$ represents the average trade between j and m over the five-year interval period τ. We apply the same technique to generate new weight for spatial volatility terms in equations (5) and (6) as $w_m^{WTO} \times trade_{ik\tau}$ and $w_m^{NWTO} \times trade_{ik\tau}$, respectively, where $trade_{ik\tau}$ represents the total trade between i and k over the five-year interval period τ. All regressions are controlled for other control variables, dyad and time fixed effects similar to regressions 2.1-2.3 in Table 2. Clustered standard errors by countries i and j are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table F: **Alternative weights for spatial lags, WTO sample**

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	Excluding the U.S.			Excluding China			Excluding OPEC Countries		
	(G.1)	(G.2)	(G.3)	(G.4)	(G.5)	(G.6)	(G.7)	(G.8)	(G.9)
VARIABLES	OLS	Ctry FE	Dyad FE	OLS	Ctry FE	Dyad FE	OLS	Ctry FE	Dyad FE
$V_{im\tau}^{WTO}$	0.569***	0.235***	0.277***	0.570***	0.247***	0.271***	0.554***	0.238***	0.254***
	(0.0245)	(0.0258)	(0.0240)	(0.0242)	(0.0255)	(0.0236)	(0.0249)	(0.0263)	(0.0241)
$V_{im\tau}^{NWTO}$	0.0536***	0.0659***	0.0159*	0.0550***	0.0667***	0.0151*	0.0487***	0.0617***	0.0109
	(0.00879)	(0.00911)	(0.00828)	(0.00874)	(0.00904)	(0.00819)	(0.00903)	(0.00938)	(0.00844)
$V_{kj\tau}^{WTO}$	0.815***	0.539***	0.579***	0.817***	0.540***	0.572***	0.799***	0.527***	0.562***
	(0.0241)	(0.0285)	(0.0296)	(0.0238)	(0.0282)	(0.0292)	(0.0265)	(0.0309)	(0.0319)
$V_{kj\tau}^{NWTO}$	0.0580***	0.0955***	0.0351**	0.0572***	0.0941***	0.0337**	0.0573***	0.0860***	0.0226
	(0.0145)	(0.0152)	(0.0150)	(0.0144)	(0.0150)	(0.0148)	(0.0155)	(0.0157)	(0.0154)
Observations	98707	98707	95815	100054	100054	97162	91576	91576	88939
R^2	0.289	0.302	0.586	0.291	0.305	0.588	0.295	0.309	0.594

Notes: All regressions are controlled for other control variables, dyad and time fixed effects similar to regressions 2.1-2.3 in Table 2. Clustered standard errors by countries i and j are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table G: **Excluding the U.S., China or OPEC countries**