The Spillover Effects of Regional Trade Agreement on Trade

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Motivation

- Rapid proliferation of regional trade agreements (RTAs) in recent decades

- Focus on the trade effects of bilateral or multilateral agreements

- There is not yet a consensus on whether RTAs are a building block or a stumbling block

- Vast literature seems to have mostly overlooked third-country effects
  - The overall direction and magnitude of the spillover effects induced by RTAs of third parties on other bilateral trade flows remains an open question

- We aim to uncover possible spatial and spillover effects of third-countries RTAs on bilateral trade flows

Contributions

- *First*, we provide measures to analyze the spillover effects of RTAs – RTA contiguity and spatially weighted RTAs

- *Second*, we use these measures to analyze the spillover effects of RTAs that are signed by neighboring or third countries

Findings

- We find strong evidence of the presence of RTA spillover effects from third countries

- Conclude that the RTAs of neighboring or third countries generate more trade flows with partners through trade creation and diversion

- Nations benefit when those countries trade with partners that have signed more RTAs
    - RTAs act as trade network neurons and extend international trade through spillover effects as well as trade creation and trade diversion

Conceptual Framework

- RTA between countries i and j (i.e., RTA_{ij}) affects the trade flows between these two countries as well as the trade between i (j) and any third country

- The reduction or elimination of tariffs by the RTA_{ij} leads to trade-creation and trade-diversion effects which spur bilateral trade among the countries forming the RTA

- Trade with non-RTA parties is most likely reduced due to the replacement of imports from RTA partners

- This trade reduction gives third parties a motivation to form more RTAs among themselves to compensate for the losses sustained with the existing partners.

- But what are the effects of the RTAs of third parties on the bilateral trade between countries i and j?

Conceptual Framework
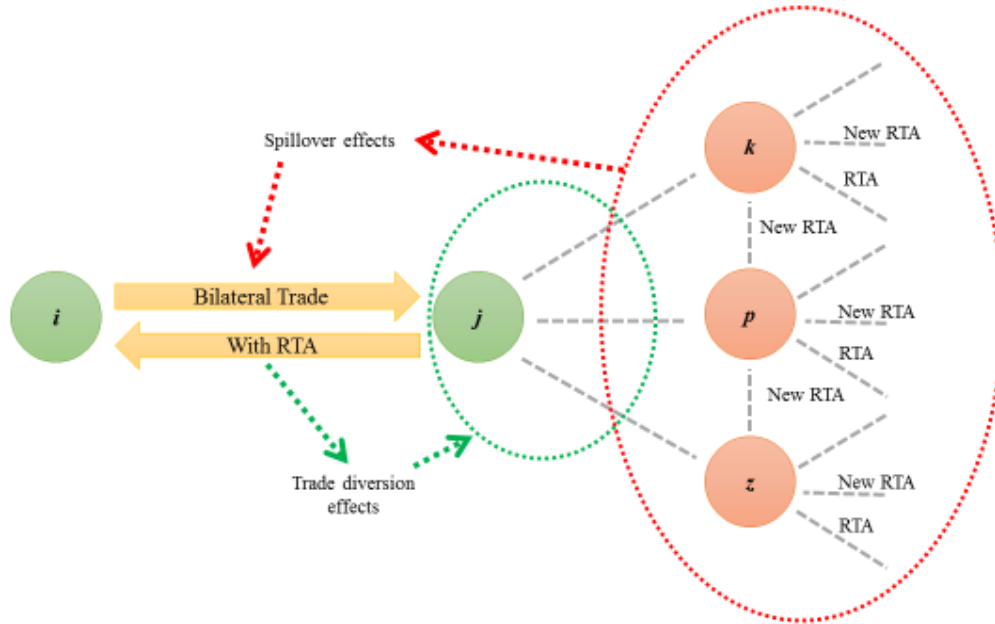
New RTAs formed by neighbors (e.g., country *p*) or third parties (e.g., country *k* or *z*) will affect the trade flows of countries *i* and *j*

Empirical Model

- The cornerstone of our empirical strategy is the gravity model
  - Similar in sprit to Anderson and Van Wincoop (2003)

- We extend the gravity model with two important additions
  1. First, we allow for spatial effects by adding a spatially-weighted vector of RTA relationships

  2. Second, a RTA-contiguous matrix constructed using the lagged dependent variable. It is used to identify the (trade) spillover effects of third countries' RTA on bilateral trade flows

$W^{RTA_{ijt-1}}$ matrix and $W^{RTA_{ijt-1}}Y_{ijt-1}$

$W^{RTA_{ijt-1}}$ matrix for a given year (t)

$$
\begin{array}{c c c c c}
 & A & B & C & D \\
A & 0 & 1 & 0 & 1 \\
B & 1 & 0 & 1 & 0 \\
C & 0 & 1 & 0 & 1 \\
D & 1 & 0 & 1 & 0
\end{array}
$$

Regressor that captures the economic spillovers of RTAs is constructed by multiplying the (lagged) matrix $W^{RTA_{ijt-1}}$ with a matrix of lagged values of the dependent variable and a vector of 1s. This gives us $W^{RTA_{ijt-1}}Y_{ijt-1}$

This matrix is normalized to have row-sums of unity

W^D matrix and $W^D RTA_{ijt}$

W^D matrix

$$
\begin{array}{c|cccc}
 & A & B & C & D \\
A & 0 & 1/dab & 1/dac & 1/dad \\
B & 1/dba & 0 & 1/dbc & 1/dbd \\
C & 1/dca & 1/dcb & 0 & 1/dcd \\
D & 1/dda & 1/ddb & 1/ddc & 0
\end{array}
$$

This matrix is normalized to have row-sums of unity

We multiply the above by the time-varying $W^{RTA_{ijt-1}}$ and with a vector of 1s to get our key spatial regressor $W^D RTA_{ijt}$

Empirical Model and Issues

Linearized version of the gravity equation

$$lnY_{ijt} = \alpha + \beta_0 RTA_{ijt} + \beta_1 ln\text{W}^\text{D}RTA_{ijt} + \beta_2 ln\text{W}^{RTA_{ijt-1}}Y_{ijt-1} + \delta_1 X_{ijt} + \delta_2 Z_{ij} + \eta_{it} + \nu_{jt} + \mu_{ijt}$$

- Issues: situation where the observed value of trade is zero

- Use Poisson pseudo-maximum likelihood (PPML) estimator

- An advantage of this PPML estimator is that, under weak assumptions, it provides consistent estimates of the original nonlinear model when the error term is heteroskedastic – Santos Silva and Tenreyro (2006).

Table 1: Variables Description and Data Source

Variables	Description and Sources	Mean (Standard deviation)
$Exports_{ijt}$	Merchandise export in 2005 constant US\$ millions (COMTRADE)	2.621 (1.215)
$Imports_{ijt}$	Merchandise import in 2005 constant US\$ millions (COMTRADE)	2.729 (1.251)
RTA_{ijt}	Matrix consisting of 0 or 1 to denote whether countries i and j are in a RTA in year t (WTO and WDI)	0.323 (0.468)
$W^D RTA_{ijt}$	Spatially weighted variable to identify the spatial spillover effects of RTA occurred by third countries.	0.010 (0.013)
$W^{RTA_{ijt-1}} Y_{ijt-1}$ ($Y_{ijt-1} = $ *Exports*)	Lagged RTA membership matrix interacted with lagged exports (WTO and WDI)	0.207 (0.558)
$W^{RTA_{ijt-1}} Y_{ijt-1}$ ($Y_{ijt-1} = $ *Imports*)	Lagged RTA membership matrix interacted with lagged imports (WTO and WDI)	0.218 (0.597)

Table 1: Variables Description and Data Source

Variables	Description and Sources	Mean (Standard deviation)
$\overline{GDP_{ijt}}$	Average GDP of countries i and j in billions US$ (WDI)	112.911 (74.096)
$diffGDP_{PCijt}$	Difference in GDP per capita between i and j, defined as $\left\| GDP_{pc_i t} - GDP_{pc_j t} \right\|$ in thousands US$ (WDI)	4.086 (0.601)
$diffGDP_{GWijt}$	Economic growth difference between countries i and j, defined as $\left\{ 1 + \frac{[\omega ln\omega + (1-\omega)\ln(1-\omega)]}{ln2} \right\}$, where $\omega = \frac{GDP_{it}}{GDP_{it} + GDP_{jt}}$ (WDI)	0.446 (0.327)
$Distance_{ij}$	Distance between i and j countries (CEPII)	43.409 (16.024)
$Border_{ij}$	1 if the two countries are contiguous or 0 otherwise (CEPII)	0.037 (0.188)
$Language_{ij}$	1 if the two countries share a common official language or 0 otherwise (CEPII)	0.070 (0.255)
$Colony_{ij}$	1 if the two countries have ever had a colonial link or 0 otherwise (CEPII)	0.026 (0.159)

Table 4: Results for Bilateral Exports (PPML)

Variables	Exports		
	(1)	(2)	(3)
RTA_{ijt}	0.6542***	0.6910***	0.6698***
$\ln(W^D RTA_{ijt})$	-5.0692***	-5.6092***	-3.9878**
$\ln(W^{RTA_{ijt-1}} Y_{ijt-1})$	0.2326***	0.2404***	0.1833***
X_{ijt}		Yes	Yes
Z_{ij}	Yes	Yes	Yes
Home country effects	Yes	Yes	
Partner country effects	Yes	Yes	
Year effects	Yes	Yes	
Home country-year effects			Yes
Partner country-year effects			Yes

Results: Exports

- The spatial spillover effects of RTA, $(W^D FTA_{ijt})$, incurred by third countries has a negative effect

- The RTA spillover effects on exports, $(W^{RTA_{ijt-1}} Y_{ijt-1})$, is significant and positive

- These results support the conclusion that both the RTA spillover effects of third countries and the spatial spillover effects of RTAs are important for the countries to export between/among the trade partners.

- The contiguous spillover effects of RTA $(W^D FTA_{ijt})$ has a negative effect on exports between the trade partners, implying that the RTA causes a trade diversion to other parties

Table 5: Results for Bilateral Imports (PPML)

Variables	Imports		
	(1)	(2)	(3)
RTA_{ijt}	0.3600***	0.3865***	0.3377***
$\ln(W^D RTA_{ijt})$	13.8456***	13.2360***	16.8080***
$\ln(W^{RTA_{ijt-1}} Y_{ijt-1})$	0.1745***	0.1813***	0.1398***
X_{ijt}		Yes	Yes
Z_{ij}	Yes	Yes	Yes
Home country effects	Yes	Yes	
Partner country effects	Yes	Yes	
Year effects	Yes	Yes	
Home country-year effects			Yes
Partner country-year effects			Yes

Results: Imports

- The results indicate that contiguous spillover effects of RTA ($\boldsymbol{W^D FTA_{ijt}}$) has a positive effect on exports between the trade partners.

- This may be because bilateral imports depends on the characteristics of the structure of trade.

- For example, imports may consist of raw materials or intermediate goods, which implies that imports are not affected by the neighbors in the framework of the bilateral RTA. All other variables have expected signs and statistically significant.

Table 4: Results for Bilateral Exports (OLS)

Variables	Log(Exports+1)		
	(4)	(5)	(6)
RTA_{ijt}	0.2251***	0.2222***	0.2181***
$\ln(W^D RTA_{ijt})$	-5.1120***	-5.2896***	-3.9978***
$\ln(W^{RTA_{ijt-1}} Y_{ijt-1})$	-0.1069***	-0.0666*	-0.0972**
$lndiffGDP_{PCijt}$		0.6088***	2.5074***
$lndiffGDP_{GWijt}$		-0.1052**	0.0280
$\overline{lnGDP_{ij}}$		0.9547***	0.7303***
$Colony_{ij}$	0.6245***	0.5677***	0.5713***
$lnDistance_{ij}$	-3.1463***	-3.1306***	-3.1286***
$Language_{ij}$	0.7228***	0.7390***	0.7321***
$Border_{ij}$	-0.0200	0.0514	0.0633
Home country effects	Yes	Yes	
Partner country effects	Yes	Yes	
Year effects	Yes	Yes	
Home country-year effects			Yes
Partner country-year effects			Yes

Table 5: Results for Bilateral Imports (OLS)

Variables	Log(Imports+1)		
	(4)	(5)	(6)
RTA_{ijt}	0.2148***	0.2151***	0.2350***
$\ln(W^D RTA_{ijt})$	3.2922***	3.2921***	7.4094***
$\ln(W^{RTA_{ijt-1}} Y_{ijt-1})$	-0.3461***	-0.3249***	-0.3889***
$lndiffGDP_{PCijt}$		0.1156	-0.3773
$lndiffGDP_{GWijt}$		-0.3379***	-0.0596
$\overline{lnGDP}_{ij}$		1.1439***	0.7150***
$Colony_{ij}$	0.5565***	0.5080***	0.5180***
$lnDistance_{ij}$	-2.6915***	-2.6742***	-2.6254***
$Language_{ij}$	0.6056***	0.6237***	0.6280***
$Border_{ij}$	0.0494	0.1122**	0.1186**
Home country effects	Yes	Yes	
Partner country effects	Yes	Yes	
Year effects	Yes	Yes	
Home country-year effects			Yes
Partner country-year effects			Yes

Conclusion

This paper makes two important contributions.

1. First, it shows the importance of empirically estimating the effects of RTA contiguity and spatially weighted RTAs of exports and imports.

2. Second, the study uses these measures to analyze the spillover effects of RTAs that are signed by neighboring or third countries using an extended gravity model.

We find strong evidence of the presence of RTA spillover effects from third countries and conclude that the RTAs of neighboring or third countries generate more trade flows with partners through trade creation and diversion

Political Implications!

Governments may benefit directly from extending trade relationships (RTAs) with other nations.

However, the trade of third country with your partner will affect your trade

On the other hand, more RTAs by third parties play a complementary role in increasing international trade

Thus, a country that trades with countries that have more RTAs is an indirect beneficiary due to RTA spillover effects

The political implications are that countries benefit economically from RTAs due to increased trade. Since an RTA induces the formation of more RTAs by other trading partners, RTAs help countries expand their trade in the global market

Thank you!