



Ninth ARTNeT Capacity Building Workshop for Trade Research "Trade Flows and Trade Policy Analysis"

June 2013

Bangkok, Thailand

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Application of the gravity model: Trade effects of the WTO

- Since 1950, the expansion of world trade has been unprecedented in world history

Annual growth	1870-1913	1950-2005
Exports	3.4%	6.2%
GDP	2.1%	3.8%
Ratio	1870 1913	1950 2005
Trade/GDP	4.6% 7.9%	5.5% 19.4%

The role of the WTO

- 3 reasons for the expansion of world trade
 1. Technological changes (lower transport and communication costs)
 2. Changes in economic organization (vertical specialization and offshoring)
 3. Changes in trade policies
- ...But trade liberalization can take place unilaterally, bilaterally, regionally and multilaterally
- What has been the role of the multilateral liberalization fostered by the GATT/WTO?

WTO membership and trade: [Rose \(2004\)](#)

- Rose (2004) used an augmented gravity model to estimate the impact of WTO accession on bilateral trade
- The study covers 178 countries in the period 1948-1999
- The dependent variable is average bilateral exports and imports in real US \$ (deflated by the US GDP deflator)
- The estimated gravity model takes the form:

$$\begin{aligned} \ln(X_{ijt}) = & \beta_0 + \beta_1 \ln D_{ij} + \beta_2 \ln(Y_i Y_j)_t + \beta_3 \ln(Y_i Y_j / \text{Pop}_i \text{Pop}_j)_t \\ & + \beta_4 \text{Lang}_{ij} + \beta_5 \text{Cont}_{ij} + \beta_6 \text{Land}_{ij} + \beta_7 \text{Island}_{ij} + \beta_8 \ln(\text{Area}_i \text{Area}_j) \\ & + \beta_9 \text{ComCol}_{ij} + \beta_{10} \text{CurCol}_{ijt} + \beta_{11} \text{Colony}_{ij} + \beta_{12} \text{ComNat}_{ij} \\ & + \beta_{13} \text{CU}_{ijt} + \beta_{14} \text{FTA}_{ijt}, \\ & + \gamma_1 \text{Bothin}_{ijt} + \gamma_2 \text{Onein}_{ijt} + \gamma_3 \text{GSP}_{ijt} \\ & + \sum_t \phi_t T_t + \varepsilon_{ijt} \end{aligned}$$

WTO membership and trade: Rose (2004)

- Bothin = 1 if both countries are WTO members 0 otherwise
 - Intended to capture trade creation
- Onein = 1 if only one of the two countries in the pair is a WTO member
 - Intended to capture trade diversion
- GSP = 1 if either country was beneficiary of GSP from partner
- Baseline estimation: OLS with year effects, robust standard errors (Table 1)
- Parameters of Interest: γ_1 , γ_2 , and γ_3

Discussion of Rose (2004) and subsequent literature

- Rose argues that there is no strong evidence that GATT/WTO membership increases a country's trade
- Baseline estimation: $\gamma_1 = -0.04$ is not significant
- Little evidence of trade diversion
- The GSP has a positive and significant effect on trade
- Robust to a number of sensitivity test:
 - Running cross-sectional analysis every 5 years from 1950-95
 - Allowing the effect to change across rounds (Annecy, Torquay, Geneva, Dillon, Kennedy, Tokyo, Uruguay)
 - Allowing the effect to change by region (South Asia, East Asia, Middle East and North Africa, Sub-Saharan Africa, Latin America and the Caribbean), and income class (high, middle low income countries)

Problems with Rose results

1. Between 1950 and 1994, 63 developing countries joined the GATT, BUT they did not have commitments to liberalize their trade regimes
 2. A transition period for tariff reduction is generally allowed for
 3. In many circumstances, countries benefited already from MFN treatment or preferential tariffs before the accession to GATT/WTO
 4. In other cases, acceding countries removed important barriers to trade incompatible with WTO prior to accession
 5. Many developing countries are exporters of fuels and minerals, and have a comparative advantage in agriculture. Fuels and minerals always faced low tariffs in developed countries, while Agriculture still remains a highly protected sector
- Points 1 to 5 imply that impact of membership should be higher in developed countries

Problems with Rose results (ct'd)

- Issues neglected in Rose's paper
 - a. Failure to distinguish country and sector asymmetries in terms of de facto liberalization (excessive pooling)
 - b. The omission of zero trade observations (censoring or selection bias)
- When these issues are taken into account GATT/WTO membership has a positive impact on trade

a. Excessive pooling

Across countries

- Developing countries that were not required to liberalize should not be included ([Subramanian and Wei, 2007](#))
 - $\gamma_1 = 0.52$ and significant for industrial countries
 - Also positive and significant for the “new” WTO developing countries
- Developing countries that were informal WTO members should also be included ([Tomz et al. 2007](#))
 - $\gamma_1 = 0.17$ and significant

a. Excessive pooling (ct'd)

Across industries

- Agriculture, textile, clothing and footwear have not be included in GATT liberalization efforts, therefore should no be included (Subramanian and Wei, 2006)
 - Subramanian and Wei estimate a system of 5 equations (through the method SURE) for 5 sectors: unprotected manufacturing, clothing, footwear, agriculture, highly protected manufacturing (in the latter 4 sector US and EU have tariffs higher than 10% both in 1990 and 2001 on a 4-digit bases)
 - They find that the coefficient for WTO for the unprotected manufacturing is positive and highly significant
 - $\gamma_1 = 0.62$ (even larger than in the aggregate estimates)

a. Excessive pooling (ct'd)

Country-specific fixed effects

- Rose himself finds a positive and significant effect that GATT/WTO increases trade by 15% (last column of Table 1)
 - $\gamma_1 = 0.15$ (Rose)
 - $\gamma_1 = 0.54$ (Tomz et al.)

Country-pair fixed effects

- Country-pair fixed effect allow to take into account all bilateral explanatory variables that do not change over time (missing/unobservable variables)
 - $\gamma_1 = 0.13$ (Rose) – first column of Table 6
 - $\gamma_1 = 0.48$ (Tomz et al.)
- Note: again when estimating a gravity equation with theoretical foundations the estimated effect of WTO membership is positive and significant

b. Omission of zero trade flows

- GATT/WTO membership may affect the probability that two countries trade (the extensive margin of trade)
- Neglecting zero trade observation may bias the results
- Zero trade may be due to
 1. Censoring
 - Factors external to the firm/trader (e.g. trading requires a certain level of infrastructure, but the government does not provide this unless the expected size of trade is above a threshold level)
 - The estimation method is the Tobit estimation
 - [Felbermayr and Koler \(2006\)](#): $\gamma_1 = 0.5$
 2. Self selection
 - Firms decide whether to enter an export market or not. The selection depends on their underlying productivity because only firms above a certain threshold level will be able to remain profitable after paying the fixed cost of entry
 - [HMR \(2008\)](#): $\gamma_1 = 0.3$
 - [Liu, 2009](#): $\gamma_1 = 1.45$

Exercise

1. Begin with estimating Rose's benchmark equation and reproduce the results in the first column of Table 1
2. What is (are) Rose's mistake(s) in the estimation of the first column of Table 1?
3. Assess the robustness of the results on the coefficients for both countries member of WTO running the regressions for
 - Importer country and exporter country fixed effects
 - Country-pair fixed effects

[Stata do file](#)

[Results](#)