Review of International Economics, 18(1), 193–206, 2010
DOI:10.1111/j.1467-9396.2009.00855.x

Joining the World Trade Organization: What is the Impact?

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Abstract

Research has called into question the impact of the World Trade Organization (WTO) on trade. This research, however, has been called into question on both modeling grounds for and failing to utilize comprehensive fixed effects. Others have found that when these factors are accounted for, imports rise by significant amounts. This paper seeks to reconcile these findings. I find that the WTO has a larger, though uneven, impact on exports than imports. The results indicate that the WTO frequently causes imports and exports to move in opposite directions negating any increase in overall trade. The regressions with and without fixed country effects generally demonstrate pattern consistency for generalized results that are robust to change. Owing to the finding that imports rise modestly or even fall without country effects while exports rise, the results imply that countries may not be as interested in liberalizing trade as selling to the world.

1. Introduction

Everyone seems to have a love–hate relationship with the World Trade Organization (WTO). Economists, politicians, and anti-globalization protesters all seem to find something to dislike about the WTO. To its supporters, the WTO has freed global trade by lowering tariffs and reducing nontariff barriers, ushering in unprecedented prosperity and growth. To its critics, the WTO has favored large multinationals and rich countries while ignoring the development concerns of lesser developed countries. Only recently, however, has research focused on the impact of the WTO on trade between countries (Rose, 2004a, hereafter Rose). Rose concludes, "we currently do not have strong empirical evidence that the GATT/WTO has systematically played a strong role in encouraging trade." This conclusion seems at odds with widely held beliefs.

Subramanian and Wei (2007, SW hereafter) argue that Rose is incorrect on modeling and methodological grounds. SW argue that the standard gravity model should be regressed against imports rather than the average value of real trade and should include fixed importer and exporter effects. SW conclude that, once these important changes are made, imports rise significantly in developed countries while increasing slightly in developing countries. Tomz et al. (2005, TGR hereafter) focus on WTO classifications used by Rose, specifically concerning developing countries, but this fails to address the issue of how trade flows between states and how the WTO impact

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imports and exports differently. Rose, however, in his rebuttals demonstrates not only is it not possible for both SW and TGR to be right, but that these issues have little impact on overall trade levels. This paper studies the impact of WTO membership on bilateral trade flows between states arriving at the conclusion, in support of both Rose and SW, that its impact is asymmetric across trade and country types. In short, the WTO impacts a country's imports and exports differently based upon its level of economic development.

In this paper, I argue that Rose arrives at an insignificant finding for overall trade because the WTO impacts imports and exports in offsetting ways for many states. Regressing against imports without fixed country effects, it is clear that the WTO impacts imports and exports differently. When utilizing importer and exporter effects, as specified by SW, the difference is less pronounced, but again imports and exports frequently react to WTO membership differently. High-income countries are the only income group to demonstrate a clear rise in both imports and exports across time, methodological specification, and changes to the data. Other income groups, in line with the SW findings, have either stagnant or declining levels of trade. The major finding of this paper and explanation to reconcile these conflicting findings is that the WTO impacts imports and exports differently, causing the nonfinding when regressing against overall trade. Finally, trade rises significantly between members, but fell when only one country of a trading pair is a member.[1]

2. The WTO and its Discontents

The WTO is a controversial institution. The defender and promoter of free trade, the WTO touts its own achievements in opening up markets and facilitating the unparalleled growth of economic interdependence. Until recently, however, little systematic research had studied the impact of the WTO. Research that did take place did not attempt to systematically determine the impact of the WTO on its members and their trading patterns (Rivera-Batiz and Xie, 1992; Bagwell and Staiger, 1999). Rose filled in this omission by producing a bilateral gravity trading model "searching" for WTO significance in the residual. Rose regressed average real trade against a bilateral gravity model with variables for distance, population, land area, income, and numerous dummy variables representing factors such as language and colonial history. Rose notes that his "empirical strategy is to control for as many 'natural' causes of trade as possible." After conducting a wide variety of tests, Rose concludes, "there is little reason to believe that the GATT/WTO has had a dramatic effect on trade." This conclusion seems at odds with the popular wisdom.

SW produced a paper disputing the Rose conclusions. Using a bilateral gravity trade model and the Rose data, SW make one important modeling change and one econometric change. First, SW argue that Rose fails to include importer and exporter effects, which fundamentally change the results.[2] Owing to the nature of the model and data considerations, there do seem to be significant theoretical reasons to include importer and exporter effects.[3] When comparing these two methods, clear patterns reveal themselves across methodological specification. The results that do seem most prone to significant changes between methods are those that are most fragile to alternative model specifications and most affected by data exclusions.

Second, SW argue that a gravity model is better understood if regressed against imports rather than average bilateral trade as with Rose. A gravity model is helpful in estimating the relationship for imports as well as exports due to the fact that trade between countries is measured as a trade flow with a dummy independent variable

representing WTO membership of either the importer or exporter in place of the Rose specification of members and nonmembers. The Rose method of regressing against total trade may obscure important points about the flows of trade and types of trade because, as will be demonstrated, the WTO impact varies widely. Many bilateral trading relationships are extremely unbalanced, with trade flowing primarily in one direction.[4] However, average real trade will only increase if both imports and exports increase. Separating out the trade into two relationships will illuminate these differences.

The WTO requires members to reduce import barriers but there are significant reasons to expect membership to impact exports as well. First, countries join the WTO and negotiate accession based on the knowledge of their comparative advantages and disadvantages. Countries pick winners or industries that they hope to protect but also try to gain access for their competitive and politically connected industries. If countries only relaxed import controls and did not gain greater market access, few would actively pursue membership. Countries that join actively tout the access to new markets they gain when joining the WTO. Second, countries work hard and file costly litigation to protect their rights to foreign markets. One of the major advantages of the GATT/WTO system is its dispute resolution mechanism, which permits aggrieved countries to file costly and time-consuming litigation based on substantial evidence that their products are not being accorded their rights under WTO law. Third, states that join the WTO normally have full ability to export to other members while phasing out domestic protection. This allows new members to get the benefits of free trade, while still getting used to the global trading system. Fourth, joining the WTO frequently involves a costly restructuring of domestic economies. Whether this comes through reduction in tariffs, ending of subsidies, or legal reform, joining the WTO frequently involves large and significant economic reform. This may mean a surge in imports and it may mean that competitive industries are both freed to pursue growth opportunities and obtain access to new markets. SW argue that there are no "theoretical reasons" for WTO membership to impact exports, but there are practical reasons to believe it may influence exports.

3. Questioning Country Effects

A major difference between the Rose and SW research concerns the inclusion of importer and exporter effects in the regression. Research has indicated that the gravity model may overestimate some variables when failing to control for importer and exporter effects. McCallum (1995), omitting fixed importer and exporter effects, found a 2200% increase in intra-Canadian trade due to the border with the United States. As others have demonstrated, and as these results will support, including country effects may change the results but more frequently will provide more moderate results and a better estimation of the data (Matyas, 1997, 1998; Egger, 2000, 2002; Feenstra, 2002; Anderson and van Wincoop, 2003). More important, however, is the question about which method provides a better estimation of the data in question. There are significant reasons to believe that utilizing fixed importer and exporter effects better estimates the impact of the WTO on trade. First, as Rose notes, while he attempts to control for many "natural" variables such as language, distance, and land area, he does not control for unnatural country-specific variables. It is exceedingly difficult to measure country-specific variables that impact trade, but there are undoubtedly a wide range of country-specific variables that impact trade (Pritchett, 1996; Anderson, 1998; Rodriguez and Rodrik, 1999). These unnatural influences impact trade through a variety of methods, including trade costs and political instability, that are specific to each country

(Anderson and Marcouiller, 1999; Anderson and van Wincoop, 2004). Including importer and exporter effects will help control for these unnatural variables.

Second, simply utilizing a gravity model may not correctly estimate key variables (Feenstra, 2002; Anderson and van Wincoop, 2003). Many possibilities have been proposed to correct for friction, remoteness, and policy. These effects require controls if an accurate estimation is to be arrived at. Third, due to the nature of the research, a study with 177 countries across 49 years requires time and country controls. The inclusion of fixed year effects imply that time impacts the results; similarly, fixed importer and exporter effects better estimate the data.[5]

Based upon previous work, I seek to answer three questions. First, how important is the modeling difference of regressing against imports rather than average real trade? Second, how important is the inclusion of fixed country effects to the results? Third, how does the WTO impact trade, if at all? Based upon their divergent results, the differences between Rose and SW must stem from the model, the method, or some other unaccounted issues or variables. The modeling differences do allow for some difference due to its inability to isolate certain variables and its tendency to smooth others out. The results of the different regression techniques demonstrate pattern consistency with the fixed country effects moderating the outcomes. Finally, this paper demonstrates that only studying imports in relation to the WTO, overlooks its significant impact on exports.

4. Data and Methodology

The data come from Rose downloaded via his website. Rose uses a bilateral gravity model controlling for the "natural" determinants of trade. The gravity model has been used by a wide variety of authors to study a wide variety of trade issues (Frankel and Romer, 1999; Feenstra et al., 2001; Feenstra, 2002; Glick and Rose, 2002; Anderson and van Wincoop, 2003, 2004; Rose, 2004a,b, 2005a,b; Rose and Spiegel, 2004). The STATA dataset covers 177 countries with controls for natural variables as distance between trading partners, population, per capita GDP, total GDP, and land area. It also includes a comprehensive set of dummy variables that control for such variables as common language between the trading pair, colonial history, and geographic factors such as land-locked or island countries. This research will regress against imports rather than average bilateral trade in an effort to focus on how the WTO membership impacts importing and exporting countries differently. International Monetary Fund Direction of Trade data were extracted from the online database Webstract for the years 1950 to 1999. The natural log of real imports for the importing country was arrived at by averaging the exports of country two with the imports of country one, deflating by the 1982–84 Urban Consumer CPI, and taking the natural log. Variables were added using the Rose data for import and export country WTO membership with additional dummy variables added for income and region. Regressions will be run with and without importer and exporter effects as a means of comparison to demonstrate that the fundamental conclusions will hold regardless of method. Other than the natural log of real imports and dummy variables added for importing and exporting country membership with income-level classification, all variables and methodology come from or are based on the Rose dataset. Finally, similar econometric methods are used to facilitate comparison to both the Rose and SW results, which demonstrate consistency between both papers.

The major methodological change from Rose comes in two areas. First, this study will compare the impact of including and excluding fixed country effects. Though in a later

expanded version Rose did include fixed country effects, he did not provide the level of detail that would permit reconciliation of the results. Based on the results and in line with previous findings, fixed importer and exporter effects appear to have a significant impact on the size of the coefficient and minimal impact on the pattern of results. Second, this study will regress against imports rather than average real trade. This produced two numbers: average country one imports and exports or averaged country two exports and imports, depending on the point of view.[6] The country two imports, or country one exports, were then inserted as the dependent variable and all necessary variables inverted. This change did not affect most of the bilateral variables such as distance, language, and border. This change has two major effects. First, it significantly enlarges the dataset. Rose has 234,597 observations of overall trade; this change creates a dataset with 419,910 observations.

Second, this permits an examination of the impact of the WTO on exporting country membership. Whereas with Rose, the United States and the United Kingdom had one relationship of overall trade and did not differentiate between import or export trade; now there is a two-way relation. Many trading relationships, especially ones involving lesser developed countries, have goods moving in primarily one direction but not both. It is not uncommon for the WTO to impact member trade in widely divergent ways. Furthermore, the method of examining trade flows between states, though disaggregating total trade into its component flows, studies the impact of the WTO in the same manner as Rose and SW. Finally, it is worth noting that this dataset does not exclude small observations of trade. Where real imports equaled zero, the natural log of one was used as the import value. In other words, many observations of real trade are zero or lower.[7] The method of using $\ln(trade + 1)$ has been used previously when including observations bounded by 0 (Eichengreen and Irwin, 1995). Though this may be a point of contention for some, this more accurately reflects actual trade observations, without excluding the lack of trade as a non-observation.

5. The Model

To differentiate the importance of the WTO on exports, it is necessary to control for exporting country membership. The basic model will be specified as follows:

$$\begin{aligned}\ln(M_{ijt}) = {} & \ln D_{ij} + \ln(Area_i Area_j) + \ln(Y_i Y_j) + \ln(Y_i Y_j / Pop_i Pop_j) + Lang_{ij} \\ & + Border_{ij} + Landl_{ij} + Island_{ij} + Comcol_{ij} + Curcol_{ij} + Colony_{ij} \\ & + Comctry_{ij} + Custrict_{ijt} + FTA_{ijt} + T_t + MWTO_i + XWTO_j,\end{aligned}$$

where i and j denote trading partners, t denotes times, and the variables are as follows: M_{ijt} is real imports of i from j at time t; D is the distance between i and j; Y is real GDP; *Pop* is population; *Lang* is a dummy variable which is unity if i and j have a common language; *Border* is a dummy variable which is unity if i and j share a land border; *Landl* is the number of land-locked countries in the country pair $(0, 1, 2)$; *Island* is the number of island nations in the pair $(0, 1, 2)$; *Area* is the area of the country (in square kilometers); *Comcol* is a dummy variable which is unity if i and j were ever colonies after 1945 with the same colonizer; *Curcol* is a dummy variable which is unity if i is a colony of j at time t or vice versa; *Colony* is a dummy variable which is unity if i ever colonized j or vice versa; *Comctry* is a dummy variable which is unity if i and j remained a part of the same country during the sample; *Custrict* is a dummy variable which is unity if i and j use the same currency at time t; *FTA* is a dummy variable which is unity if i and j belong to the same regional trading agreement; T is a comprehensive set of

time "fixed effects"; *MWTO* is a dummy variable which is unity if the importing country is a member of the *WTO* at time *t*; *XWTO* is a dummy variable which is unity if the exporting country is a member of the WTO at time *t*.

This model focuses thus: how did those countries trade rather than just did they trade? This study adds an additional level of detail by focusing on how trade between states changed as a result of WTO membership.

6. The Good News and the Bad News

The WTO does appear to impact trade positively. The baseline results are presented in Table 1 and the gravity variables all yield expected results. Distance is significant and negative while real GDP, currency union, and colonial variables are positive and significant. The gravity coefficients are similar to the results obtained by Rose and SW for the comparable variables and to the gravity literature in general. A few variables change sign or significance as a result of method. For instance, land area under in the absence of fixed country effects, yields a moderately negative and statistically significant coefficient.

The fixed country effects method returns an economically and statistically significant positive coefficient. Fixed country effects have the largest impact on variables with coefficients near zero or less robust results. The general model, however, returns the expected relationships.

The WTO impacts exports significantly across methodological specification, though differently across income specification and member trading pairs. In all regressions, member exports rose by economically and statistically significant amounts. Only country effects post-1970 had a smaller increase for exports than imports, with virtually no difference between the two coefficients. The difference between regression methods for importing and exporting country membership without income classification was stark. The regressions without country effects yielded an economically and statistically significant decrease in imports, while fixed importer and exporter effects yields a moderate, but statistically significant rise in imports.[8] Both regression methods yield an economically and statistically significant rise in exports.

When classified by income the findings vary more but still yield interesting and consistent findings. High-income member imports and exports increased by economically and statistically significant amounts regardless of time or method specification. Least developed members saw decreases in exports across method and time. Many of the middle- and low-income member results are insignificant or fragile to data or modeling changes. For instance, middle-income exporting members without importer and exporter effects, experienced an insignificant drop, while under fixed country effects registered a positive and statistically significant increase. Least developed countries post-1970 without country effects increased imports, while adding country effects makes imports negative. These specific results are susceptible to modeling or data changes, so it is not surprising that a method change would cause a change in the variable. The highly significant variables that are robust to changes demonstrate a high degree of consistency with or without country effects.

A major argument of this paper is that Rose obtained an insignificant finding when regressing against total trade, because imports and exports act differently under the WTO. Least developed members without country effects saw imports rise significantly and exports drop by a similar amount. Opposite signs on import and export country membership may explain why Rose found no WTO impact on total trade. The middle- and low-income results are frequently insignificant or somewhat fragile with and

Table 1. Baseline Results

	Membership		*Income*		*Post-1970*		*Post-1970*	
	W/o country	*W/ country*	*W/o country*	*W/ country*	*W/o country*	*W/ country*	*W/o country*	*W/ country*
Regional	1.319	0.602	1.29	0.635	1.26	0.372	1.25	0.416
	(0.196)	(0.227)	(0.216)	(0.225)	(0.195)	(0.232)	(0.213)	(0.228)
Currency Union	1.619	1.461	1.80	1.456	1.788	1.68	1.92	1.67
	(0.165)	(0.287)	(0.171)	(0.282)	(0.189)	(0.383)	(0.199)	(0.378)
Distance	–1.437	–1.66	–1.376	–1.668	–1.500	–1.80	–1.44	–1.803
	(0.033)	(0.038)	(0.033)	(0.038)	(0.032)	(0.036)	(0.032)	(0.036)
Real GDP	1.156	0.648	1.154	0.699	1.167	0.993	1.167	0.982
	(0.013)	(0.078)	(0.012)	(0.077)	(0.013)	(0.086)	(0.012)	(0.087)
Real Per Capita GDP	0.534	0.119*	0.138	0.02	0.513	–0.483	0.087	–0.489
	(0.02)	(0.072)	(0.022)	(0.072)	(0.019)	(0.081)	(0.024)	(0.081)
Common Language	0.472	0.65	0.596	0.648	0.515	0.66	0.630	0.659
	(0.057)	(0.063)	(0.056)	(0.063)	(0.059)	(0.063)	(0.058)	(0.063)
Border	0.698	–0.108	0.788	–0.121	0.754	–0.146	0.837	–0.154
	(0.167)	(0.235)	(0.175)	(0.234)	(0.161)	(0.216)	(0.169)	(0.216)
Landlock	–0.018		–0.188		–0.057		–0.245	
	(0.047)		(0.047)		(0.046)		(0.046)	
Island	0.029	–0.189	–0.105	0.044	0.054	–0.681	–0.088	0.718
	(0.05)	(0.291)	(0.049)	(0.271)	(0.05)	(333.2)	(0.05)	(0.268)
Land Area	–0.12	0.534	–0.117	0.488	–0.12	0.372	–0.115	0.475
	(0.01)	(0.055)	(0.01)	(0.055)	(0.01)	(0.058)	(0.01)	(0.057)
Common Colonizer	0.621	0.693	0.822	0.694	0.536	0.746	0.752	0.746
	(0.087)	(0.09)	(0.088)	(0.09)	(0.087)	(0.09)	(0.09)	(0.089)
Current Colony	1.241	1.214	1.33	1.21	1.58	0.954	1.56	1.126
	(0.326)	(0.419)	(0.308)	(0.394)	(0.537)	(0.812)	(0.469)	(0.711)
Colony Post-1945	1.776	1.55	1.77	1.561	1.98	1.65	1.99	1.66
	(0.167)	(0.176)	(0.179)	(0.174)	(0.159)	(0.167)	(0.168)	(0.163)
Common Country	–0.472	0.366	–0.492	0.67	–1.284	0.261	–1.12	0.443
	(1.17)	(1.192)	(0.941)	(1.02)	(1.02)	(1.18)	(0.739)	(0.976)
Import Country Membership	–0.25	0.18			–0.31	0.22		
	(0.04)	(0.04)			(0.04)	(0.04)		
High-Income Import Members			0.75	0.64			0.76	0.42
			(0.05)	(0.09)			(0.05)	(0.12)
Middle-Income Import Members			–0.55	0.01			–0.57	0.22
			(0.05)	(0.05)			(0.04)	(0.04)
Low-Income Import Members			–0.05	–0.12			0.10	–0.15
			(0.06)	(0.04)			(0.06)	(0.09)
Least-Developed Import Members			0.53	–0.21			0.49	–0.31
			(0.06)	(0.11)			(0.07)	(0.10)
Export Country Membership	0.89	0.38			0.86	0.21		
	(0.04)	(0.04)			(0.04)	(0.04)		
High-Income Country Members			1.36	0.55			1.72	0.04
			(0.04)	(0.08)			(0.05)	(0.10)
Middle-Income Country Members			–0.05	0.35			–0.04	0.30
			(0.04)	(0.08)			(0.04)	(0.05)
Low-Income Country Members			–0.42	–0.11			–0.49	–0.21
			(0.05)	(0.11)			(0.06)	(0.15)
Least-Income Country Members			–0.64	–0.24			–0.69	–0.21
			(0.07)	(0.15)			(0.07)	(0.18)
R-squared	0.525	0.634	0.540	0.634	0.546	0.666	0.564	0.667

Notes: Robust coefficients with standard error in parentheses.
* Indicates significant at 10% level.

without country effects. This supports the finding made by SW that membership matters to industrialized countries, but it does not speak well of the WTO's ability to stimulate trade for its lesser developed members. In line with the SW, I find that lesser developed countries have not increased trade levels as a result of joining the WTO.

7. How Does Trade Then Flow?

When grouping countries by income and WTO membership to determine how the WTO impacts trading flows between countries, the results generally reflect previous findings. High-income countries' results in Table 2 indicate positive and significant

Table 2. Trade Flow between Members

	W/o country	*Country effects*
Member Country Exports to Other Members	0.83	0.31
	(0.05)	(0.05)
Member Country Exports to Nonmembers	1.11	0.47
	(0.07)	(0.08)
Member Country Imports from Nonmembers	–0.02	0.40
	(0.07)	(0.09)
Member Country Imports from Other Members	0.28	0.13
	(0.04)	(0.04)
One Country of Trading Pair WTO Member	–0.15	–0.03
	(0.04)	(0.04)
Both Countries WTO Members	0.32	0.20
	(0.04)	(0.04)

	High-income importing member		*Middle-income importing member*		*Low-income importing member*		*Least developed importing member*	
Exporting nonmem	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*
High Income	0.64	1.01	–0.69	–0.13	–0.53	0.65	0.74	0.91
	(0.23)	(0.41)	(0.26)	(0.34)	(0.28)	(0.38)	(0.28)	(0.53)
Middle Income	1.27	0.56	–0.25	0.28	–0.88	–0.39	–0.29	–0.15
	(0.13)	(0.20)	(0.12)	(0.13)	(0.15)	(0.35)	(0.19)	(0.51)
Low Income	1.28	1.13	–0.95	0.71	–1.10	1.61	0.24	0.38
	(0.20)	(0.33)	(0.21)	(0.26)	(0.23)	(0.74)	(0.29)	(0.96)
Least Developed	1.73	0.57	–0.71	0.89	–0.96	2.00	–0.27	1.93
	(0.24)	(0.31)	(0.23)	(0.33)	(0.25)	(0.71)	(0.28)	(0.69)

	High-income importing non		*Middle-income importing non*		*Low-income importing non*		*Least developed importing non*	
Exporting mem.	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*
High Income	1.52	0.64	2.63	0.70	2.26	0.45	1.63	0.51
	(0.26)	(0.41)	(0.11)	(0.16)	(0.19)	(0.27)	(0.22)	(0.33)
Middle Income	0.78	0.17	0.86	0.50	0.48	–0.07	0.02	–0.19
	(0.25)	(0.28)	(0.11)	(0.12)	(0.18)	(0.22)	(0.21)	(0.29)
Low Income	0.34	0.80	–0.94	–0.02	–0.52	1.08	–0.34	–2.03
	(0.32)	(0.52)	(0.14)	(0.38)	(0.20)	(1.29)	(0.24)	(1.78)
Least Developed	–0.19	–0.54	–1.67	–0.83	–0.82	1.59	–0.29	–2.02
	(0.46)	(0.72)	(0.19)	(0.62)	(0.28)	(2.67)	(0.29)	(1.78)

	High-income importing member		*Middle-income importing member*		*Low-income importing member*		*Least developed importing member*	
Exporting mem.	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*	*W/o country*	*Country effects*
High Income	–0.12	0.39	–0.39	–0.13	–0.39	0.17	–0.09	–0.05
	(0.08)	(0.09)	(0.06)	(0.05)	(0.08)	(0.09)	(0.09)	(0.10)
Middle Income	0.99	0.21	–0.22	0.11	0.99	–0.08	–0.23	–0.22
	(0.10)	(0.20)	(0.09)	(0.09)	(0.11)	(0.22)	(0.13)	(0.28)
Low Income	1.83	0.71	–0.39	0.41	–0.13	0.50	0.76	0.50
	(0.14)	(0.24)	(0.13)	(0.16)	(0.14)	(0.30)	(0.16)	(0.38)
Least Developed	2.46	0.94	–0.31	0.52	0.37	–1.12	0.60	–1.28
	(0.20)	(0.41)	(0.19)	(0.27)	(0.21)	(0.49)	(0.22)	(0.52)

Note: Robust coefficients with standard error below.

coefficients for imports and exports trading with members and nonmembers alike. High-income countries have increased imports and exports significantly across all income categories, econometric method, and changes to data. Out of the 42 trade flow coefficients between high-income members and other income groups, both member and nonmember, only 10 coefficients were negative and most of those are insignificant. High-income countries have consistently and significantly higher import and export levels, with members and nonmembers alike.

Middle- and low-income countries do not seem to have benefited from the WTO the way the high-income countries did. This occurred in two ways. First, middle- and low-income members export primarily to high-income countries and almost all other export categories were negative or insignificant. Middle- and low-income countries did not, for the most part, increase trade with other middle- and low-income countries. In other words, the WTO did not create trade for middle- and low-income members, independent of high-income members. Least developed members have divergent numbers, but support the previous results that imports rise while exports decline. This result may not reveal as much about the impact of WTO membership on least developed countries as it does about the relative economic strength of lesser developed countries. Finally, this supports the findings of SW that the WTO has an asymmetric impact on countries.

Second, middle- and low-income members saw exports to high-income members rise more than imports from high-income members. This does not entirely support the SW idea that the WTO is a rich country club. This indicates that trade diversion may occur away from natural trading partners, and shift to high-income members. The WTO has allowed lesser developed members to liberalize trade at a slower rate than developed countries and the data seem to bear that out. Interestingly, high-income members do not appear to demonstrate significantly different import patterns between middle- and low-income members or nonmembers.[9] The small difference and statistically borderline results do not indicate that middle- and low-income members have economically and statistically higher export levels to high-income members than middle- and low-income nonmembers. This is all the more important as research has shown that trade composition matters to economic growth (Arora and Vamvakidis, 2005). Rich country members may tout the benefits of trade liberalization to lesser developed members, but there is little evidence to support the idea they trade more with middle- and low-income WTO members than middle- and low-income nonmembers.

The clearest trends that the data reveal about membership, is their impact on trade between members and nonmembers. Trade between members, in line with previous results, increases significantly. Interestingly, the member-to-member trading results are fragile to method change. Nine of the 16 income and method pairs have opposite signs between coefficients. For instance, high-income member trade with other high-income members has a small negative and statistically insignificant result without country effects and a moderate, though not as large as SW, but statistically significant increase with country effects. Overall, member-to-member trade demonstrates a significant increase that is robust to method and changes to the data.

The more interesting results come from trade between members and nonmembers. It is a curious result that members would have higher export levels than imports. However, when estimating bilateral pairs where one country is a member and the other is not and then disaggregating between importing and exporting states, the solution presents itself. WTO members have significantly lower import levels from nonmembers, while conversely having higher export levels to nonmembers. A clear result of these data is that members do not import from nonmembers though they export

heavily to nonmembers. The import result is even greater if only considering low- and middle-income countries. With the exception of high-income members, virtually every sign for members importing from nonmembers is negative and the coefficients that were not negative were mostly insignificant. Conversely, members increased their exports to nonmembers by an economically and statistically significant amount, though this result was less robust for least developed and low-income countries. This indicates a trade diversionary impact, potentially through a cost factor or signaling mechanism whereby members trade more with other members, export to nonmembers, but import less from those outside the club. It is worth noting that these findings are similar to more general results obtained by Rose and SW, and explain why members experience higher export levels.[10] Joining the WTO seems to boost exports to members and nonmembers alike.

8. Can the Results Take the Heat?

The overall member results are robust to the removal of high-income countries and other interesting data exclusions. Table 3 provides a list of changes made to the basic model testing model sensitivity and method specification issues on baseline results. Excluding high-income members from the general member results, with or without country effects, had little effect on the fundamental results. Exports were significantly and positively impacted by WTO membership. The only case in Table 3 where this does not hold is without country effects excluding real imports of less than $100,000 and $500,000. The results are consistent across method and data alteration methods.

The main argument of this paper, however, seems to be largely confirmed across method or income class. Though middle- and low-income members may only have a slight advantage over nonmembers exporting to high-income members, they have higher export levels to many exclusions of data and changes of method. For instance, even for trade entirely within Africa, members have higher export levels in line with the general results. This finding is robust across data exclusions and method, and is robust to many changes in the regression and method. The results, with and without country effects, yield consistent results in support of the theory that the WTO has a greater positive impact on exports than imports.

9. A Few Cautionary Notes

To temper any jubilation or despair that these results might invoke, there are a number of qualifiers that need to accompany this research. First, the impact of the WTO seems to be highly correlated with economic activity. Though industrialized countries would be the most obvious example, East Asian members also have significantly higher trade levels. Economic activity may not be the defining variable in WTO success, as it depends on domestic institutions, but it sure helps (Rodrik, 2000). Second, the WTO has not brought the expected gains to its lesser developed members. Developing members have only slightly higher export levels to high-income members than developing nonmembers.[11] If an objective of the WTO is to integrate developing countries in the global economy, it would seem that it could do a better job.

Third, countries appear to join the WTO more for the most-favored-nation status than the domestic tariff reductions. High-income members are the only income group to demonstrate economically and statistically higher import levels across time, trading partners, and method. Middle- and low-income members have mixed import records. In

Table 3. Changing the Data

	Without country effects	*Country effects*
Member Imports Excluding Industrialized Country Importers	–0.39	0.06
	(0.04)	(0.04)
Member Exports Excluding Industrialized Country Importers	1.09	0.43
	(0.05)	(0.05)
Member Imports Excluding Industrialized Country Exporters	–0.006	0.35
	(0.05)	(0.05)
Member Exports Excluding Industrialized Country Exports	0.48	0.27
	(0.05)	(0.05)
Member Imports Excluding Industrialized Countries	–0.50	0.07
	(0.05)	(0.06)
Member Exports Excluding Industrialized Countries	0.41	0.24
	(0.05)	(0.06)
Member Imports Excluding Africa, the Pacific, East Europe, and Central Asia	–0.26	0.06
	(0.06)	(0.05)
Member Exports Excluding Africa, the Pacific, East Europe, and Central Asia	0.98	0.39
	(0.06)	(0.05)
Member Imports for trade only between Latin America, the Middle East, Asia, and Africa	–0.25	0.18
	(0.04)	(0.04)
Member Exports for trade only between Latin America, the Middle East, Asia, and Africa	0.89	0.38
	(0.04)	(0.04)
Member Imports for Trade within Africa only	–0.25	0.18
	(0.04)	(0.04)
Member Exports for Trade within Africa only	0.89	0.38
	(0.04)	(0.04)
Member Imports under $100,000	–0.002	0.13
	(0.02)	(0.05)
Member Exports under $100,000	–0.07	0.39
	(0.03)	(0.05)
Member Imports under $500,000	–0.03	0.16
	(0.03)	(0.04)
Member Exports under $500,000	–0.20	0.42
	(0.04)	(0.04)
One Country of Trading Pair WTO Member under Rose data organization	0.01	–0.05
	(0.04)	(0.04)
One Country of Trading Pair WTO Member with second trading relationships (i.e. inverted data)	–0.31	–0.15
	(0.05)	(0.05)
Both Members of Trading Pair WTO Member under Rose data organization	0.21	0.15
	(0.05)	(0.05)
Both Members of Trading Pair WTO Member with second trading relationships (i.e. inverted data)	0.44	0.44
	(0.05)	(0.05)

Note: Robust coefficients with standard error below.

some instances, the results seem to imply that the WTO acts as a defense to protection more than a method to liberalize. Even when considering inter-African trade, for instance, imports dropped and exports increased. Fourth, though typically used as robustness checks, a weighted least squares model might prove more accurate than the

panel OLS by taking into account trade levels, GDP, or country data quality. It is heartening to note, however, that the weighted least squares regressions returned similar results to the baseline data.

10. Conclusion

The WTO impacts trade but countries join for what they can sell to the world, not buy from it. In other words, the WTO has a greater impact on exports than imports. There are practical reasons to believe the WTO impacts exports and the data support this argument. The asymmetric distinctions between developed and lesser developed countries hold, but more importantly, specifically when trying to reconcile the Rose and SW result, the WTO has an asymmetric impact on the type of trade. In line with the findings of Rose and SW, the WTO significantly impacts trade when both countries are WTO members but has an insignificant to slightly negative impact when only one country of a pair is a WTO member. This lends further support to the argument that the WTO has an economically and statistically significant greater impact on exports.

It is also important to note the difference with and without importer and exporter effects. First, strong robust findings held up across method. A surprising amount of the results were pattern consistent across method. Second, the results that changed from method to method were somewhat fragile. Robust results that could withstand data or modeling alterations in the original method remained consistent. Third, the results here support previous work comparing the importance of fixed country effects that failing to include them in a gravity model may overstate the impact of key variables. The two methods were presented here because they remained strikingly consistent, but also as a means of comparison. Fourth, though econometric method undoubtedly raises some discussion points and estimation questions, the major trade patterns when using similar variables hold across method. The results indicate that the WTO has a small but positive impact on trade when both members of a trading pair are members of the WTO. Joining the WTO is all about the exports.

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Notes

1. As has been pointed out, this is more of a historical empiricism than a current finding as most countries and international trade are now conducted between WTO member countries.
2. Though I may use the term "country" effects, the econometrics utilized were fixed importer and exporter effects throughout.
3. I will use the language "country effects," though this means controlling for importer and exporter effects.
4. It must be noted that though total trade will balance for a country over time or for the world in a specific year, this does not mean that specific bilateral trading pairs will not have unbalanced trade.
5. It is worth noting that in his original paper and in subsequent output provided on his website, Rose demonstrates that including fixed country effects does not change his results. My results are broadly supportive of his assertion that including fixed country effects makes minimal changes, as the results demonstrate. More important, however, is the data organization method used.
6. Though the imports of country 1 should equal the exports of country 2, this is not always the case. As I am regressing against the natural log of real imports, averaging the imports of country 1 with the exports of country 2, and vice versa, creates a smoother, but still realistic number for analysis.
7. The natural log of small numbers is negative, therefore, many observations of real imports are negative observations; 12.8% of all observations of the natural log of real imports were zero or below.

8. It is worth noting that when creating a variable for importing country membership in the Rose data and running a regression without country effects, the coefficient returned is 0.19 with a robust standard error of 0.04. High-income country members yields a coefficient of 0.67 with a robust standard error of 0.04. This is strikingly close to the results obtained here. Though not an exactly fair comparison, it is not unreasonable either. Rose divides total trade ($x_1 + x_2 + m_1 + m_2$) by 4, creating almost an import variable. In this paper, I use average real imports ($m_1 + x_2$) divided by 2.
9. The results of regressions not presented here confirm this conclusion. Lesser developed member versus lesser developed nonmember exports to developed members was economically small and of borderline significance in both methods utilized.
10. Rose covered both the impact of fixed country effects and exports briefly in Appendix 5 of the extended version of his paper available on his website. His results, though minimal in scope, are consistent with the results presented here. SW focused on the import factor but also present findings similar to these results.
11. Creating a developing member exporter dummy variable for high-income country imports yields a coefficient of 0.14 under the Rose method with a robust standard error of 0.06. The fixed-year method returns a coefficient of 0.23 and a robust standard error of 0.07. A moderate economically significant return, though borderline statistically, middle- and low-income countries do not seem to receive the unambiguous boost to trade promised by the WTO.