
Do We Really Know That The WTO Increases Trade?

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ABSTRACT

This paper estimates the effect on international trade of multilateral trade agreements: the World Trade Organization (WTO), its predecessor the Generalized Agreement on Tariffs and Trade (GATT), and the Generalized System of Preferences (GSP) extended from rich countries to developing countries. I use a standard “gravity” model of bilateral trade and a large panel data set covering over fifty years and 175 countries. Despite an extensive search, I am basically unable to find positive significant effects of GATT/WTO membership on trade. The GSP does seem to have a strong effect, and is associated with an approximate doubling of trade.

I INTRODUCTION

Heresy

1.1 Economists disagree about a lot, but not everything. Almost all of us think that international trade should be free.¹ Accordingly, the multilateral organization charged with freeing trade – the World Trade Organization (WTO) – is probably the most popular international institution inside the profession, certainly compared with its obvious rivals, the IMF and the World Bank. This makes much of the furor over the WTO unfathomable to most of us. But should we – and the protestors – really care about the WTO at all? Do we really know that the WTO and its predecessor the General Agreement on Tariffs and Trade (GATT) have actually had a substantial positive effect on trade?

1.2 Maybe not. While theory, casual empiricism, and strong statements abound, there is, to my knowledge, no compelling quantitative evidence showing that the GATT/WTO has actually encouraged trade. In this paper, I provide the first comprehensive empirical study of the effect of the postwar multilateral agreements on trade. It turns out that membership in the GATT/WTO is *not* associated with increased trade, once standard factors (such as the effect of income on trade) have been taken into account. Not all multilateral trade liberalizing institutions have been ineffectual; I find that the Generalized System of Preferences (GSP) extended from the North to developing countries approximately doubles trade. Thus the data and methodology clearly *can* deliver strong results. I conclude that we currently do not have strong empirical evidence that the GATT/WTO has systematically played a strong role in encouraging trade.

¹ Kearl et. al. (1979, p. 30) show that 97% of economists surveyed in 1976 agreed (generally or with provisions) that “Tariffs and import quotas reduce general economic welfare.” Alston et. al. (1992, p. 204) show that 93% agreed with this statement in 1990.

Plain Vanilla

1.3 At the outset, let me state that I am a mainstream economist with no anti-trade or anti-WTO agenda.² To make my argument as persuasive as possible I use accepted techniques, a conventional empirical methodology, and two standard data sets. I also examine the sensitivity of my results extensively. Thus, any interest in this paper lies solely in its results; by design, there is no other innovation.

1.4 The next section of the paper provides motivation, while sections III and IV present the methodology and data set respectively. A graphical event study of accession to the GATT/WTO is presented in section V. The main results are discussed in section VI, followed by sensitivity analysis. The paper closes with a brief conclusion.

² Ask my colleagues if you don't believe me.

II A PERSON OF STRAW?

2.1 Does anyone believe that the multilateral trading system increases trade? The WTO, for one. It states that its “overriding objective is to help trade flow smoothly, freely, fairly and predictably.”³ And it believes that the system has been working. The WTO trumpeted the fiftieth anniversary of the multilateral trading system in 1998 affirming “... The achievements of the system are well worth celebrating. Since the General Agreement on Tariffs and Trade began operating from Geneva in 1948, world merchandise trade has increased 16 fold ... world trade now grows roughly three times faster than merchandise output ... this advance ranks among the great international economic achievements of the post-world war era ...”⁴ Further, “The past 50 years have seen an exceptional growth in world trade. Merchandise exports grew on average by 6% annually. Total trade in 2000 was 22-times the level of 1950. GATT and the WTO have helped to create a strong and prosperous trading system contributing to unprecedented growth.”⁵

2.2 While some (mostly non-economists) might disagree with the view that trade *should* be freed by the multilateral system, it is hard to find dissent with the view that trade *has* been liberalized by the system. For instance, the *Economist* declared in 1999 “For five decades the world’s multilateral trade-liberalising machinery ... has, in all likelihood, done more to attack global poverty and advance living standards right across the planet

³ Taken from http://www.wto.org/wto/english/thewto_e/whatis_e/inbrief_e/inbr02_e.htm

⁴ Press brief available at http://www.wto.org/wto/english/thewto_e/minist_e/min96_e/chrono.htm.

⁵ Taken from http://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr01_e.htm. Alternatively, the WTO at http://www.wto.org/english/thewto_e/whatis_e/tif_e/fact4_e.htm states “GATT was provisional with a limited field of action, but its success over 47 years in promoting and securing the liberalization of much of world trade is incontestable. Continual reductions in tariffs alone helped spur very high rates of world trade growth ...” Finally, the agreement establishing the WTO states that its objective is “... expanding the production of and trade in goods and services, ... by entering into reciprocal and mutually advantageous arrangements directed to the substantial reduction of tariffs and other barriers to trade ...”, available at http://www.wto.org/english/docs_e/legal_e/04-wto.pdf.

than any other man-made device ... such is the power of trade.”⁶ There are innumerable estimates of the effect of this or that GATT round on country x or industry y; all implicitly assume that the multilateral trading system matters.

⁶ *Economist*, December 2, 1999.

III NERDY STUFF

3.1 Quantifying the effects of the multilateral system on trade seems a worthy objective. Luckily, it is also feasible. To estimate the effect of multilateral trade agreements on international trade, I rely on the standard “gravity” model of bilateral trade, which explains (the natural logarithm of) trade with (the logs of) the distance between the countries and their joint income. I augment the basic gravity equation with a number of extra conditioning variables which affect trade, in order to account for as many extraneous factors as possible. These include: culture (e.g., whether a pair of countries share a common language), geography (e.g., whether none, one or both are landlocked), and history (e.g., whether one colonized the other). The idea is to control for as many “natural” causes of trade as possible. The search for effects of multilateral agreements is conducted in the residual.

3.2 For those unfamiliar with the gravity model, it is a completely conventional device used to estimate the effects of a variety of phenomena on international trade. Unusually for economics, it is also a successful model, in two senses. First, the estimated effects of distance and output (the traditional gravity effects) are sensible, economically and statistically significant, and reasonably consistent across studies. Second, the gravity model explains most of the variation in international trade. That is, the model seems reliable and fits the data well. A fine track for this train.⁷

3.3 The exact specification of the gravity model used is:

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

⁷ One recent empirical reference is Frankel (1997). Theoretical discussions can be found in Deardorff (1998) and Anderson and van Wincoop (2002).

where i and j denotes trading partners, t denotes time, and the variables are defined as:

- X_{ijt} denotes the average value of real bilateral trade between i and j at time t ,
- Y is real GDP,
- Pop is population,
- D is the distance between i and j ,
- $Lang$ is a binary “dummy” variable which is unity if i and j have a common language and zero otherwise,
- $Cont$ is a binary variable which is unity if i and j share a land border,
- $Landl$ is the number of landlocked countries in the country-pair (0, 1, or 2).
- $Island$ is the number of island nations in the pair (0, 1, or 2),
- $Area$ is the area of the country (in square kilometers),
- $ComCol$ is a binary variable which is unity if i and j were ever colonies after 1945 with the same colonizer,
- $CurCol$ is a binary variable which is unity if i and j are colonies at time t ,
- $Colony$ is a binary variable which is unity if i ever colonized j or *vice versa*,
- $ComNat$ is a binary variable which is unity if i and j remained part of the same nation during the sample (e.g., France and Guadeloupe, or the UK and Bermuda),
- CU is a binary variable which is unity if i and j use the same currency at time t ,
- FTA is a binary variable which is unity if i and j both belong to the same regional trade agreement,
- $\{T_t\}$ is a comprehensive set of time fixed effects,
- β and ϕ are vectors of nuisance coefficients,
- $Bothin_{ijt}$ is a binary variable which is unity if both i and j are GATT/WEO members at t ,
- $Onein_{ijt}$ is a binary variable which is unity if either i or j is a GATT/WEO member at t ,
- GSP_{ijt} is a binary variable which is unity if i was a GSP beneficiary of j or *vice versa* at t , and
- ε_{ij} represents the omitted other influences on bilateral trade, assumed to be well behaved.

3.4 The parameters of interest to me are γ_1 , γ_2 , and γ_3 . The first coefficient is the most interesting; it measures the effect on international trade if both countries are GATT/WTO members. The second coefficient measures the trade effect if one country is a member and the other is not. Of less interest to me is γ_3 , which measures the effect of the GSP on trade.

3.5 I estimate the gravity model using ordinary least squares, computing standard errors which are robust to clustering by country-pairs. I also include a comprehensive set of year-specific “fixed” effects to account for such factors as the value of the dollar, oil shocks, and so forth. Since the data set is a (country-pair x time) panel I also use “random effects” (GLS) and “fixed effects” (“within”) estimators as robustness checks.

IV **BLAH, BLAH, BLAH**

4.1 The trade data for the regressand comes from the “Direction of Trade” (DoT) CD-ROM data set developed by the International Monetary Fund (IMF). It covers bilateral merchandise trade between 178 IMF trading entities between 1948 and 1999 (with gaps); a list of the countries is included in Appendix 1. (Not all the trading entities are “countries” in the traditional sense of the word; I use the word simply for convenience.) I include all countries for which the Fund provides data, so that almost all global trade is covered.⁸ Bilateral trade on FOB exports and CIF imports is recorded in American dollars; I deflate trade by the American CPI for all urban consumers (1982-1984=100; taken from www.freelunch.com). An average value of bilateral trade between a pair of countries is created by averaging all of the (four possible) measures potentially available (exports from i to j, imports into j from i, and so forth). It is well known that trade has grown quickly since the Second World War, and that is reflected in this data set. From 1948 through the end of the sample in 1999, global trade increased on average by over eight percent annually.

4.2 Population and real GDP data (in constant American dollars) have been obtained from standard sources: the Penn World Table, the World Bank’s *World Development Indicators*, and the IMF’s *International Financial Statistics*.⁹ I exploit the CIA’s *World Factbook* for a number of country-specific variables.¹⁰ These include: latitude and longitude, land area, landlocked and island status, physically contiguous neighbors, language, colonizers, and dates of independence. I use these to create

⁸ Though I am forced to drop observations from the regression analysis if they have no usable data for e.g., output.

⁹ I use the Glick-Rose data set practice; wherever possible, I use “World Development Indicators” (taken from the World Bank’s WDI 2000 CD-ROM) data. When the data are unavailable from the World Bank, I fill in missing observations with comparables from the Penn World Table Mark 5.6, and (when all else fails), from the IMF’s “International Financial Statistics” (converting national currency GDP figures into dollars at the current dollar exchange rate). The series have been checked and corrected for errors.

¹⁰ Available at <http://www.odci.gov/cia/publications/factbook/index.html>.

great-circle distance and the other controls. I add information on whether the pair of countries was involved in a currency union, using Glick-Rose (2002).¹¹ I obtain data from the World Trade Organization to create an indicator of regional trade agreements, and include: ASEAN, EEC/EC/EU; US-Israel FTA; NAFTA; CARICOM; PATCRA; ANZCERTA; CACM, SPARTECA, and Mercosur.¹² I initially assume that all RTAs have the same effect on trade, but relax this assumption below.

The Unusual Suspects

4.3 To all this, I add the key variables of GATT/WTO membership. The website of the WTO provides dates for accession of its members to the GATT/WTO.¹³ Thirty-two trading entities were either founding members (technically “contracting parties”) of the GATT or were covered because of their relationship with a founding member (e.g., French Polynesia and Bermuda). These countries began the sample in 1948 covered by the GATT, and include many countries of interest (e.g., Belgium, Brazil, Canada, India, the Netherlands, South Africa, the United Kingdom, and the United States).

4.4 After GATT’s creation, outsiders joined over time. For instance, Italy and Sweden were among the nine countries that acceded in 1950, Germany joined in 1951 (along with Austria, Peru, and Turkey), and Japan joined in 1955. By 1960, 50 countries were covered by the GATT; by 1970 the number had risen to 90, and by 1990 to 112. As of July 2002, there were a total of 158 trading partners covered by membership in the WTO; there were also a number (29) of WTO “observers” who are required

¹¹ “Currency union” means essentially that money was interchangeable between the two countries at a 1:1 par for an extended period of time, so that there was no need to convert prices. The basic source for currency union data is the IMF’s Schedule of Par Values and issues of the IMF’s Annual Report on Exchange Rate Arrangements and Exchange Restrictions. I supplement this with information from annual copies of The Statesman’s Yearbook.

¹² Available at http://www.wto.org/english/tratop_e/region_e/region_e.htm.

¹³ Available at http://www.wto.org/english/thewto_e/gattmem_e.htm.

to begin negotiations for WTO member within five years. In addition, a number of countries (e.g., Afghanistan, Iran, Iraq, Liberia, Libya, and Syria) are neither members nor observers of the WTO.

4.5 The GATT conducted eight “rounds” of multilateral trade negotiations before it was subsumed by the World Trade Organization (WTO) in 1995: Geneva (concluded in 1947); Annecy (1949); Torquay (1951); Geneva (1956); Dillon (1961); Kennedy (1967); Tokyo (1979); and Uruguay (1994). In most of my work I maintain the hypothesis that the effect of the GATT/WTO on trade does not vary over time, but again I examine the importance of this assumption below.

4.6 The last coefficient of interest to me concerns the impact of the Generalized System of Preferences (GSP) on Trade. The UN publishes *Operation and Effects of the Generalized System of Preferences* at intervals; these booklets contain information on which countries extend trade concessions to which developing country beneficiaries under the GSP. I have obtained this pamphlet for 1974, 1979, and 1984 and use this information to construct bilateral time-varying GSP relationships.¹⁴

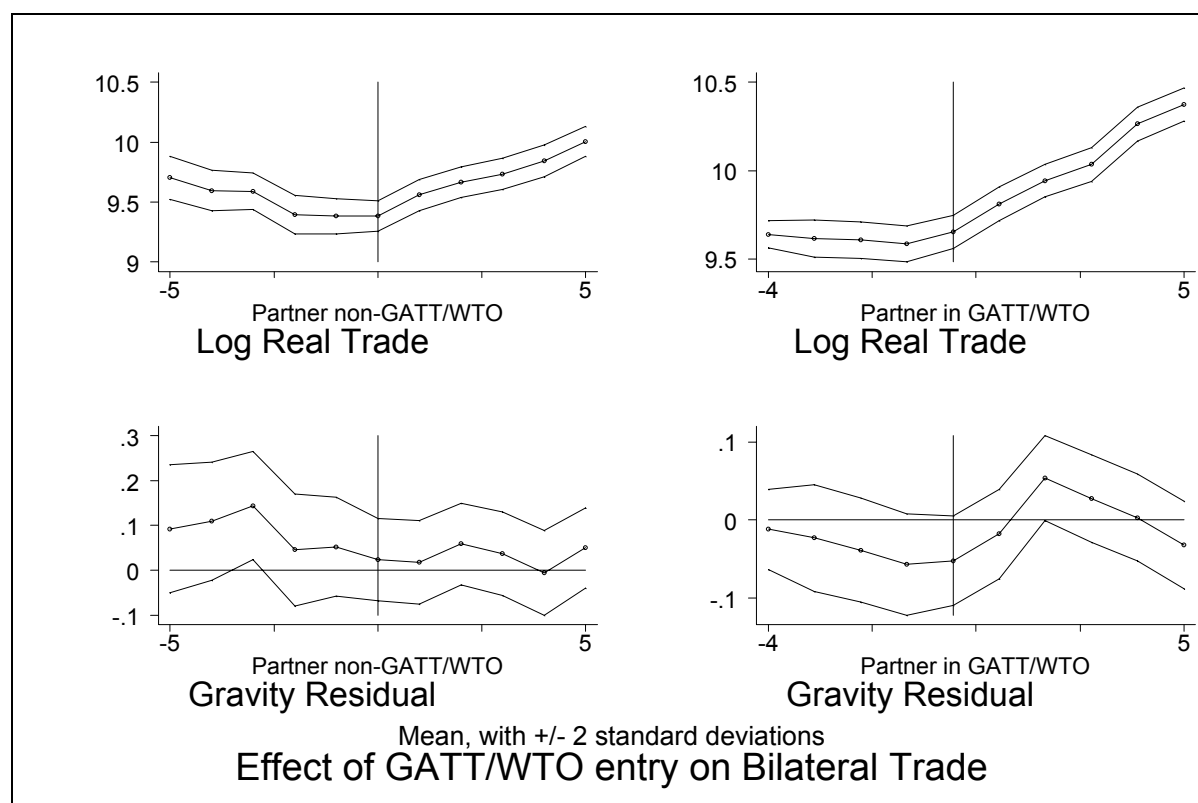
4.7 Descriptive statistics on the variables are available in Appendix 2. They show that the key GATT/WTO and GDP variables are not highly correlated with most of the gravity variables. The only exception is the GSP dummy, which is positively correlated with both real GDP variables, as one might expect (given that richer countries are those that extend the GSP concessions).

¹⁴ Most countries (e.g., those in the EEC, Austria, Finland, Japan, Norway, Sweden, and Switzerland) began to extend GSP concessions in 1971, though there were exceptions. The USSR began to extend GSP preferences in 1965; Australia in 1966; Bulgaria, Czechoslovakia, Hungary, and New Zealand in 1972; Canada in 1974; and Poland and the US in 1976. Unfortunately, I do not have information on bilateral GSP concessions on an annual basis, and Stefano Inama at UNCTAD has informed me that no such data set currently exists. I therefore construct the variable by extending 1974 GSP preferences back to the original extension of the GSP, and forward to 1976; I extend 1979 preferences to cover the period from 1977 through 1981; and the 1984 preferences are used to cover the period from 1982 through the end of the sample (adding the entrants into the EC/EU as they joined).

V A THOUSAND WORDS

5.1 A preliminary look at the data leads one to believe that entry into the GATT/WTO has a strong positive effect on trade. Figure 1 is a set of graphical “event studies” which look at bilateral trade around the dates of GATT/WTO entry. The top left-hand diagram examines the natural logarithm of real bilateral trade in the five years before, during (marked by the vertical line), and after entry; it considers trade between a new entrant and non-members. The middle line (with circles) shows the mean level of trade, while the two other lines show a confidence interval of plus and minus two standard deviations. The diagram in the top right-hand corner is the analogue showing trade between a country joining the GATT/WTO and other members. The diagram in the bottom left-hand corner is the analogue showing the gravity residual for trade between a new entrant and non-members. The diagram in the bottom right-hand corner is the analogue showing the gravity residual for trade between a country joining the GATT/WTO and other members.

Figure 1
Effect of GATT/WTO Entry on Bilateral Trade



5.2 The two graphs deliver the same message. While trade is stagnant or even falling slightly in the five years before entry into the multilateral trade system, it seems to begin rising coincident with entry and continue rising for at least five years. This increase in trade is both economically and statistically significant.

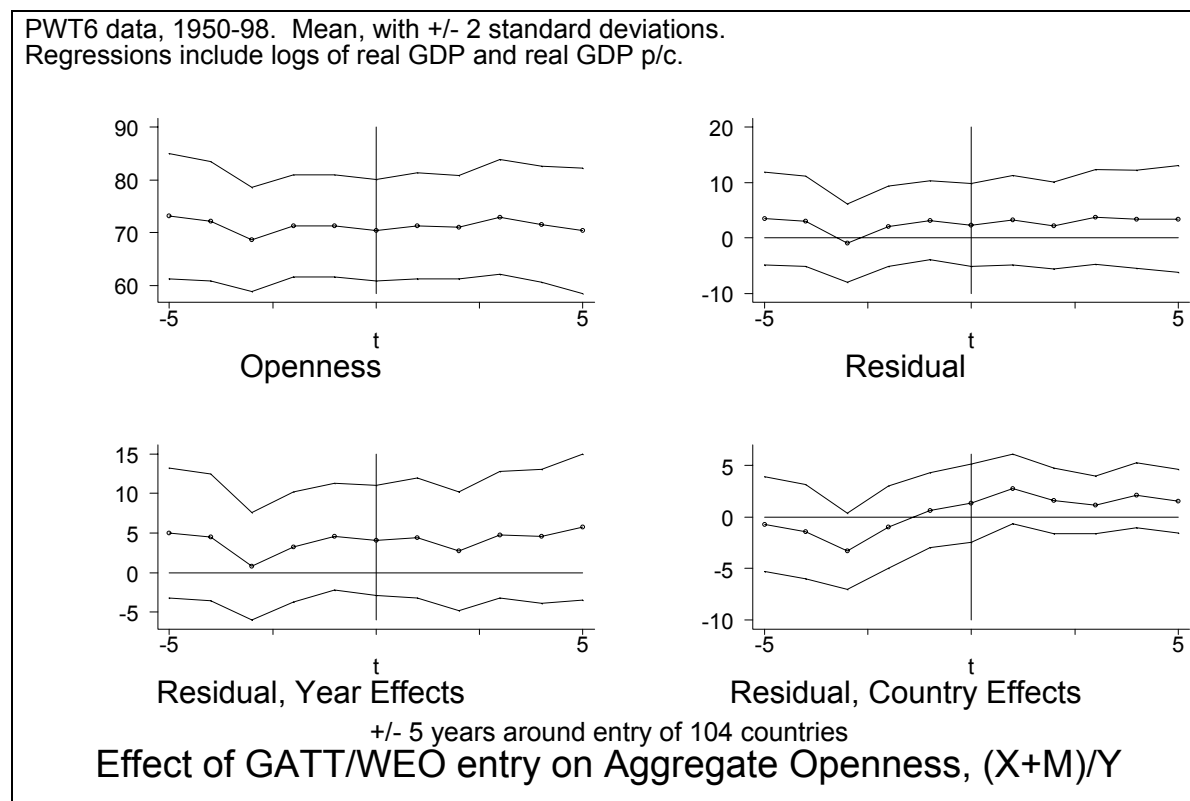
5.3 Nevertheless, it is important to note that the variable portrayed in the top pair of graphics is the unadjusted log of real trade. The graphics at the bottom of Figure 1 are analogues that plot the residual from the gravity equation of trade. That is, I regress the log of real trade on the gravity variables (with the exception of GATT/WTO and GSP membership) and plot the residuals, as before, around the time of GATT/WTO accession (more details on the regressions are provided below). The residuals are always insignificantly different from zero and do not rise significantly with entry into the GATT/WTO. That is, countries joining the GATT/WTO neither have significantly different trade from non-members, nor do they experience increases in trade, holding other factors constant.

If It's Worth Saying Once

5.4 Figure 2 is an analogous event study which examines *aggregate* openness (that is, exports plus imports divided by GDP) instead of (the log of) *bilateral* trade. I use data from the Penn World Table Mark VI, which covers the years from 1950 through 1998. During this period, 104 countries joined the GATT/WTO. Yet aggregate openness did not vary significantly from the five years preceding GATT/WTO entry through the five years after accession, as can be seen from the top left graphic in Figure 2. The other three diagrams in the figure are analogous event studies which plot the residuals once openness has been regressed on the natural logarithms of both real GDP and real GDP per capita. Since the data set is a panel with data for a number of countries and years, I show the residuals from: a) a standard regression; b) a regression which includes a comprehensive set of (49) year-specific fixed effects; and c) a regression which includes (158) country-specific fixed effects. There is little evidence

that GATT/WTO entry has a strong significant effect on the ratio of aggregate trade to GDP.

Figure 2
Effect of GATT/WTO Entry on Aggregate Openness



5.5 More evidence of the weak relationship between aggregate openness and GATT/WTO membership can be found in Figures A1 through A4. These are simple time-series plots of openness against time, for 98 countries that joined the GATT/WTO between 1950 and 1998 (the span of the PWT6 data set); entry into the GATT/WTO is marked by a vertical line.¹⁵ It is possible to find cases where entry is followed by a gradual rise in openness (e.g., Argentina and Austria). But it is also possible to find cases where entry is followed by a fall in openness (e.g., Belize and Botswana), or

¹⁵ I omit plots for six countries which lack time-series PWT6 data: Bahrain, Djibouti, Kuwait, Mongolia, Qatar, and Swaziland.

where nothing much at all happens (e.g., Denmark and the Dominican Republic).¹⁶

¹⁶ In the absence of a better model for aggregate openness, I stick to the bilateral gravity model for my regression analysis below. Still, a simple regression of aggregate openness on GATT/WTO membership delivers a negative and significant coefficient (I use robust standard errors and year effects); the point estimate remains negative but loses significance once one conditions on GDP and population.

VI TA-DA

6.1 The event studies of the previous section provide little persuasive evidence that membership in the GATT/WTO stimulates trade. But while the evidence is intriguing, it is not completely persuasive. (Perhaps a ten-year window is not enough?) In this section I use standard regression analysis to isolate the effects of the multilateral trading system on trade. It turns out that using this extra econometric firepower delivers the same (non-)result.

6.2 Table 1 contains benchmark regression results. My default specification is the augmented gravity model, estimated with ordinary least squares, year fixed effects, and robust standard errors over the full sample. This specification (labeled “Default”) appears at the extreme left of Table 1.

6.3 The good news is that the model works well. Countries that are farther apart trade less, while economically larger and richer countries trade more.¹⁷ These traditional gravity effects are not only large but economically sensible in size, highly statistically significant, and generally in line with estimates from the literature. Countries belonging to the same regional trade association trade more, as do countries sharing a money, language, or land border. Landlocked countries trade less, as do physically larger countries. A shared colonial history encourages trade. These effects are sensible and explain almost two-thirds of the variation in bilateral trade. Thus, the gravity equation seems to have done a good job in explaining most of the reasons why international trade varies across almost a quarter-million observations.

¹⁷ It is worth noting that the coefficients for GDP and GDP per capita sum to more than one, so that an increase in GDP per capita holding population constant will raise trade more than proportionately.

Table 1
Benchmark Results

	Default	No Industrial Countries	Post '70	With Country Effects
Both in GATT/WTO	-.04 (.05)	-.21 (.07)	-.08 (.07)	.15 (.05)
One in GATT/WTO	-.06 (.05)	-.21 (.06)	-.09 (.07)	.04 (.04)
GSP	.86 (.03)	.03 (.10)	.84 (.03)	.70 (.03)
Log Distance	-1.13 (.02)	-1.23 (.03)	-1.23 (.02)	-1.32 (.02)
Log product Real GDP	.92 (.01)	.96 (.02)	.95 (.01)	.16 (.05)
Log product Real GDP p/c	.32 (.01)	.20 (.02)	.32 (.02)	.55 (.05)
Regional FTA	1.03 (.11)	1.51 (.16)	.91 (.13)	.82 (.14)
Currency Union	1.13 (.12)	1.00 (.15)	1.25 (.15)	1.20 (.12)
Common Language	.32 (.04)	.10 (.06)	.36 (.04)	.27 (.04)
Land Border	.52 (.11)	.73 (.12)	.68 (.12)	.27 (.11)
Number Landlocked	-.27 (.03)	-.28 (.05)	-.31 (.03)	-1.00 (.26)
Number Islands	.06 (.04)	-.14 (.06)	.05 (.04)	-.86 (.19)
Log product Land Area	-.10 (.01)	-.17 (.01)	-.10 (.01)	.39 (.03)
Common Colonizer	.58 (.07)	.73 (.07)	.52 (.07)	.60 (.06)
Currently Colonized	1.06 (.23)		1.12 (.40)	.71 (.26)
Ever Colony	1.17 (.12)	-.43 (.57)	1.29 (.12)	1.27 (.11)
Common Country	.00 (1.09)		-.30 (1.05)	.33 (.59)
Observations	234,990	114,621	183,721	234,990
R ²	.65	.47	.65	.70
RMSE	1.98	2.36	2.10	1.82

Regressand: log real trade. OLS with year effects (intercepts not reported).
Robust standard errors (clustering by country-pairs) in parentheses.

6.4 Above and beyond these gravity effects, does membership in the GATT/WTO have any substantial effect on trade? No. The dummy variables for one or both of the countries being GATT/WTO members both have small *negative* coefficients. Neither is statistically different from zero at conventional significance levels. No reasonable person believes that membership in the GATT or WTO actually reduces trade, so I prefer to

interpret the negative coefficients as a mystery rather than an indictment. Still, by way of contrast, extension of the GSP from one country to another seems to have a large positive effect on trade. Since the regressand is the natural logarithm of real trade, the GSP is estimated to raise trade over one hundred percent (since $\exp(.86) - 1 \approx 1.36$)! That is, the data manifestly *can* yield positive effects.

6.5 The rest of Table 1 contains a set of robustness checks, presented in columns to the right of the table. The first perturbation drops all data from industrial countries.¹⁸ The second uses only data after 1970. Finally, I add country-specific fixed effects to the benchmark equation at the extreme left of the table. The key result – that membership in the GATT/WTP is associated with an economically and statistically insignificant increase in trade – seems robust. Indeed, six of the eight coefficients are actually negative (though usually insignificantly so). The *largest* coefficient in Table 1 indicates that a pair of countries both in the GATT traded only ($\exp(.15) - 1 \approx$) 16% more than a pair of countries outside the GATT.

6.6 To summarize, I have been unable to find evidence that membership in the GATT/WTO has had a strong positive effect on international trade. But since the GSP *is* associated with an approximate doubling of trade, it seems that the data (rather than the methodology) is delivering the negative message. Some aspects of the multilateral trading system seem to matter; but not the obvious ones.

¹⁸ I follow the IMF in defining countries as “industrial” if they have an IFS country code less than 200. No, the GSP coefficient is not a mistake; some (non-industrial) Eastern European countries extended GSP preference.

VII RAISING DEFLECTOR SHIELDS

7.1 Regressions can be run in a number of ways. If my results were the result of a peculiar or idiosyncratic methodology, they would be suspect. I now go to some pains to show that they are not particularly sensitive to reasonable perturbations in my methodology. Table 1 pools data across years, as I exploit both time-series and cross-sectional variation in the data set. Since the time-series effect of accession to the GATT/WTO is implicit in Figure 1, I present cross-sectional evidence in Table 2. In particular, I tabulate the estimates of $\{\gamma_1, \gamma_2, \gamma_3\}$ when the gravity equation is estimated on individual years at five-year intervals. (The gravity regressors are of course included in the regression; they are simply not tabulated to avoid clutter.) It is certainly possible to find positive significant effects of GATT/WTO membership on trade, if one looks carefully; the data from the 1950s show positive and significant effects of GATT membership. However, these coefficients shrink in the 1960s with the large expansion of the GATT and turn negative in the 1970s. The effects are also small in the 1980s and unstable in the 1990s.

Table 2
Cross-Sectional Analysis

	Both in GATT/WTO	One in GATT/WTO	GSP
1950	.59 (.12)	.21 (.09)	
1955	.64 (.11)	.30 (.09)	
1960	.40 (.10)	.07 (.07)	
1965	.23 (.07)	.13 (.07)	
1970	-.15 (.10)	-.04 (.10)	.40 (.23)
1975	-.33 (.11)	-.16 (.11)	.92 (.05)
1980	-.09 (.11)	.02 (.11)	.90 (.05)
1985	.17 (.15)	.15 (.16)	.81 (.06)
1990	.58 (.20)	.43 (.21)	.77 (.05)
1995	-.49 (.21)	-.65 (.21)	.59 (.05)

Regressand: log real trade. OLS with intercept not reported.

Robust standard errors in parentheses.

Regressors included but with unrecorded coefficients: regional FTA; currency union; log distance; log product real GDP; log product real GDP p/c; common language; land border; number landlocked; number islands; log product land area; common colonizer; currently colonized; ever colony; and common country.

7.2 A different issue is whether the effects of GATT/WTO membership have varied over time. The GATT conducted eight multilateral rounds of trade liberalization; the conclusions of the rounds seem obvious break points. Accordingly, in Table 3, I split both γ_1 and γ_2 into eight pieces. Thus the top row of coefficients shows the effect of GATT membership for 1948 (that is, prior to the conclusion of the Annecy round); the second set shows the effect from the Annecy round through the period prior to the conclusion of the Torquay round, and so forth. There is clearly (statistically and economically) significant variation in the coefficients across trade rounds. Nevertheless, it is striking that the only economically large effects are estimated for the first one or two rounds, and most of these are statistically insignificant. The fixed-effects estimation shown at the right of the table focus even more exclusively on time-series variation, since any features which are constant over time for a pair of countries (such as

language) are taken out. Yet even these within estimates are economically moderate, often insignificant and sometimes negative.

Table 3
Allowing the Effects to Vary Over GATT Rounds

	OLS, Year Effects	OLS, Year Effects	Fixed Country-Pair Effects	Fixed Country-Pair Effects
GATT Regime	Both in GATT/WTO	One in GATT/WTO	Both in GATT/WTO	One in GATT/WTO
Before Annecy Round (1949)	1.16 (.62)	.43 (.56)	.76 (.35)	.08 (.25)
Annecy to Torquay Round (1951)	.25 (.12)	.14 (.09)	.34 (.09)	.11 (.06)
Torquay to Geneva Round (1956)	.12 (.10)	.14 (.09)	.35 (.04)	.14 (.03)
Torquay to Dillon Round (1961)	-.02 (.09)	.03 (.07)	.24 (.04)	.10 (.03)
Dillon to Kennedy Round (1967)	-.14 (.07)	-.06 (.06)	.26 (.03)	.11 (.02)
Kennedy to Tokyo Round (1979)	-.14 (.07)	-.05 (.07)	.06 (.02)	.04 (.02)
Tokyo to Uruguay Round (1994)	.19 (.09)	.06 (.09)	-.07 (.02)	-.09 (.02)
After Uruguay Round	-.85 (.03)	-.80 (.12)	.18 (.02)	.14 (.03)

Regressand: log real trade.

OLS: robust standard errors (clustering by country-pairs) in parentheses.

Regressors not recorded: GSP; regional FTA; currency union; log distance; log product real GDP; log product real GDP p/c; common language; land border; number landlocked; number islands; log product land area; common colonizer; currently colonized; ever colony; and common country; intercepts.

7.3 Do the effects of the system vary systematically by region or income class? The answer is yes ... but there is still little evidence that belonging to the GATT/WTO really matters. Table 4 records the default estimates of the key parameters in the top row, and then tabulates estimates for nine different cuts of the sample. I consider five different regional groupings and four different income groupings. Thus the “South Asia” row tabulates $\{\gamma_1, \gamma_2, \gamma_3\}$ when the equation is estimated over observations which include at least one observation from a South Asian country. Analogous

estimates for four other regions and four income groupings follow.¹⁹ The results are easy to summarize. The GSP estimates remain economically and statistically significant throughout; but GATT/WTO membership seems to have a negligible (often negative) effect. The only exception is trade for South Asia, where the GATT/WTO effect is economically large but statistically marginal.

Table 4
Allowing the Effects to Vary by Region and Income Class

	Both in GATT/WTO	One in GATT/WTO	GSP
Default	-.04 (.05)	-.06 (.05)	.86 (.03)
South Asia	.93 (.40)	.67 (.39)	.86 (.11)
East Asia	.04 (.12)	-.11 (.10)	.65 (.10)
Sub-Saharan Africa	-.29 (.10)	-.28 (.09)	.98 (.06)
Middle-East or North Africa	-.16 (.12)	-.01 (.08)	1.05 (.09)
Latin America or Caribbean	.10 (.08)	.12 (.07)	.93 (.06)
High Income	-.26 (.09)	-.20 (.08)	.47 (.04)
Middle Income	-.05 (.06)	-.02 (.05)	.94 (.04)
Low Income	-.38 (.08)	-.37 (.08)	1.11 (.05)
Least Developed	-.34 (.11)	-.21 (.10)	1.11 (.07)

Regressand: log real trade. OLS with year effects (intercepts not reported).

Robust standard errors (clustering by country-pairs) in parentheses.

Regressors not recorded: regional FTA; currency union; log distance; log product real GDP; log product real GDP p/c; common language; land border; number landlocked; number islands; log product land area; common colonizer; currently colonized; ever colony; and common country.

7.4 Further sensitivity analysis is presented in Table 5, which tabulates estimates of $\{\gamma_1, \gamma_2, \gamma_3\}$ for nineteen perturbations of the benchmark methodology. The first pair of experiments splits the pooled data set by time into halves. I next split the sample by country groupings, and include only data for: a) industrial countries; b) non-Africans; and c) countries outside

¹⁹ Dummy variables for regional (e.g., South Asia) and income (e.g., Low Income) groupings were created using the lists in the World Bank's World Development Indicators CD-ROM.

Latin America and the Caribbean.²⁰ I then drop the poorest quarter of the data set (as gauged by real GDP per capita), and the smallest quarter of the data set (as gauged by total real GDP).

7.5 Having messed with the sample, I fiddle with the model. First, I add quadratic gravity terms as nuisance variables, since some authors have found these terms important. Next I drop the set of year dummies. I also record the coefficients when each of the ten regional trade agreements is allowed to have its own separate effect on trade, and separately add a lag of the dependent variable.²¹

7.6 The last set of robustness checks concern the estimation technique. First, I re-estimate everything using five-year averages in place of annual observations. I then tabulate the results of panel estimators which treat country-pairs as both random- and fixed-effects (there are two sets of estimates; one without year effects, and another with year effects). I also employ the trendy “treatment” estimator developed by Heckman and co-authors. There are two sets of maximum likelihood estimates presented. The first compares trade when both countries are GATT/WTO members to the case where neither is; the second compares trade between non-members and the case where just one of the countries is a GATT/WTO member.²² These estimates are of particular interest since small poor countries are less likely to trade and also less likely to be GATT/WTO members.²³ The treatment methodology attempts to correct for this

²⁰ Industrial countries are again defined as those with IFS country codes of less than 200; some of these countries received GSP preferences.

²¹ The lagged dependent variable is highly significant and has a coefficient of .81, so the long-run effects are around five times the tabulated coefficients. It is also worth highlighting the fact that regional trade associations seem typically to have a much larger effect than the multilateral GATT/WTO system; nine of the ten RTAs have point estimates greater than .7 (all are statistically significant), indicating that trade at least doubles with membership. Curiously, the outlier is the EEC/EC/EU, which seems a topic for future investigation.

²² Throughout, I use the full set of gravity variables as both determinants of treatment assignment and as regressors in the trade equation.

²³ Indeed, the first stage shows that countries inside the GATT/WTO have significantly higher output.

selection bias, yet it delivers even more negative results. Finally, I tabulate coefficients estimated from a robust median estimator, and a Tobit estimator.²⁴

7.7 Only one of these perturbations has any important positive effect on the key coefficients. In particular, when I restrict the sample of countries to the industrial countries only, GATT/WTO membership has a somewhat important effect on trade. My estimate indicates that a pair of industrial GATT/WTO members trades about 60% ($\approx \exp(.47) - 1$) more than an otherwise-identical pair of non-members. This result is not of overwhelming statistical significance, and even its economic importance is less than dramatic.²⁵

²⁴ I do this by replacing the smallest five percent of the sample trade observations by zero (altering the threshold from 5% has no substantive effect).

²⁵ The moderately positive evidence for industrial countries is a piece in a continuing but vague pattern. There is also weak evidence that dropping small and poor countries delivers bigger results (Table 4), and that the effects of the GATT were larger at the beginning of the sample (Tables 2 and 3) when the institution was (even) more dominated by the industrial countries. Further, founding members of the GATT have had their trade grow more than later entrants. The last column of Table 5 contains dummy variables for one or both countries being GATT founders (in practice, contracting partners in 1948 or 1949). The coefficients for both variables are positive and significant, though again not overwhelmingly so. By way of contrast, for later entrants, the maximum number of years that the parties had both been in the GATT/WTO has a slight negative effect on trade, while the minimum number of years both countries had been members has essentially no effect on trade. Perhaps the GATT was the hand servant of its (mostly rich) creators? My evidence is weak, but it seems to be an angle worth pursuing.

Table 5
Sensitivity Analysis

	Both in GATT/WTO	One in GATT/WTO	GSP
Data before 1980	.02 (.06)	.01 (.05)	.87 (.04)
Data after 1979	-.04 (.08)	-.08 (.08)	.81 (.04)
Only Industrial Countries	.47 (.22)	.19 (.22)	-.40 (.09)
No African Countries	-.06 (.07)	-.07 (.06)	.70 (.04)
No Latin or Caribbean countries	-.10 (.07)	-.16 (.06)	.63 (.04)
Without Poorest Quartile of real GDP p/c	.15 (.07)	.14 (.06)	.74 (.03)
Without Smallest Quartile of real GDP	.21 (.06)	.16 (.06)	.68 (.03)
With Quadratic Gravity terms	-.02 (.05)	-.02 (.05)	.86 (.03)
Without Year Effects	-.53 (.06)	-.33 (.05)	.47 (.03)
Dis-aggregated Regional Trade Agreements	-.03 (.05)	-.06 (.05)	.83 (.03)
With Lagged Dependent Variable	-.03 (.01)	-.01 (.01)	.10 (.01)
5-yr averages	.06 (.06)	-.07 (.05)	.87 (.03)
Random Effects (GLS) Estimator	-.07 (.02)	-.06 (.02)	.04 (.01)
Fixed Effects (Within) Estimator	.15 (.02)	.05 (.02)	.11 (.01)
Random Effects (GLS) Estimator with Years	.11 (.02)	.03 (.02)	.31 (.01)
Fixed Effects (Within) Estimator with Years	.13 (.02)	.06 (.02)	.18 (.01)
Treatment MLE: Both members vs. neither	-.20 (.07)		.73 (.04)
Treatment MLE: One member vs. neither		-.26 (.07)	1.21 (.05)
Median Regression Estimator	-.51 (.02)	-.30 (.02)	.26 (.01)
Tobit Estimator	-.63 (.02)	-.41 (.02)	.57 (.01)

Regressand: log real trade. OLS with year effects (intercepts not reported) unless noted.

Robust standard errors (clustering by country-pairs) in parentheses.

Regressors not recorded: regional FTA; currency union; log distance; log product real GDP; log product real GDP p/c; common language; land border; number landlocked; number islands; log product land area; common colonizer; currently colonized; ever colony; and common country.

Only for Geeks

7.8 A few technical issues are worth addressing. *Reverse causality* is not the problem that it ordinarily is in such exercises. Countries may join the WTO/GATT in order to increase trade, but that would tend to bias the key coefficients upwards. Similarly, there is little *measurement error* with respect to the date of a country's accession to the GATT/WTO.

7.9 *Missing data* is a potentially more serious problem. There are two distinct issues: 1) missing trade data (since trade cannot be less than zero); and 2) missing regressor data, primarily GDP. The first issue has been the subject of more research, and has already been discussed. The second issue may be more important in practice; small poor countries typically have their trade recorded but are less likely to have national accounts data. Without GDP data, these observations are dropped from the regression analysis, seriously reducing the sample size.²⁶ Econometrics has developed a number of techniques including various ways of interpolating or estimating missing data (e.g., Gouriéroux and Monfort, 1981; surveys are provided by Griliches, 1986 and Little 1992). These typically improve the efficiency of the parameters of interest, while sometimes introducing bias. Given my interest in the points estimate I do not find these estimators compelling, but it seems a reasonable topic for future research.

7.10 I conclude that both my key findings are robust. Membership in the GATT/WTO seems not to have an economically or statistically significant effect on trade, while the GSP encourages trade.

Alright Already

7.11 Is it possible to understand why economists have assumed that the GATT has been so important in encouraging trade? It is possible to

²⁶ By a factor of almost two! For instance, in Glick-Rose (2002), we have 426,792 trade observations but only 219,558 GDP observations.

shed a little light on the issue by stripping down the regression model. Table 6 contains the benchmark pooled results at the extreme left-hand side, taken directly from Table 1. I then drop the augmenting regressors in the next column (i.e., I set $\beta_4 - \beta_{14}$ to zero), leaving only a stripped-down gravity model. This barely alters the key coefficients (or the fit of the model). But if I drop the essential gravity variables – distance and output – from the model, I *can* estimate a highly significant positive effect of GATT/WTO membership on trade. In particular, the estimates show that a pair of members share 345% ($\approx \exp(1.24)$) the level of trade of a pair of non-members. The difference between this huge effect and the small (negative) effect of the benchmark result is analogous to the difference between the substantial trend visible in the top part of Figure 1 and the negligible effect in the bottom of the same graphic. *Simply taking into account standard gravity effects essentially eradicates any large effect of the GATT/WTO on bilateral trade.*

7.12 This paper reports 63 sets of estimates of the parameters of interest, including 60 estimates of γ_1 , the effect of GATT/WTO membership (by both countries) on trade. The mean estimate across these 60 γ_1 estimates is .07; the median is .03; 29 of the estimates are negative, while only 4 are greater than .69 (implying that GATT/WTO membership doubles trade). Seventy percent of the associated t-statistics are insignificant at conventional confidence levels. My interpretation: the regression analysis is saying (albeit with the whisper associated with negative results) that there is little evidence that GATT/WTO membership has a substantial positive effect on trade.²⁷

²⁷ One can also compute “meta-estimates” across the coefficient estimates. The meta fixed effect estimate of γ_1 is -.05, while the random effect meta-estimate is .03 (the latter is insignificantly different from zero). By way of contrast, the meta-fixed and random estimates for γ_3 are .36 and .69, both economically and statistically significant.

Table 6
Perturbations of the Gravity Model

Both in GATT/WTO	-.04 (.05)	.14 (.05)	1.24 (.08)		
One in GATT/WTO	-.06 (.05)	-.02 (.05)	.46 (.07)		
GSP	.86 (.03)	.74 (.03)	2.17 (.07)	.86 (.03)	.88 (.03)
Neither in GATT/WTO				.05 (.05)	
1 Founder of GATT					.22 (.04)
2 Founders of GATT					.47 (.10)
Min. Years In GATT/WTO					.001 (.001)
Max. Years In GATT/WTO					-.007 (.002)
Log Distance	-1.13 (.02)	-1.27 (.02)		-1.13 (.02)	-1.14 (.02)
Log product Real GDP	.92 (.01)	.79 (.01)		.92 (.01)	.91 (.01)
Log product Real GDP p/c	.32 (.01)	.45 (.01)		.32 (.01)	.32 (.01)
Regional FTA	1.03 (.11)			1.03 (.11)	1.01 (.12)
Currency Union	1.13 (.12)			1.13 (.12)	1.12 (.12)
Common Language	.32 (.04)			.32 (.04)	.30 (.04)
Land Border	.52 (.11)			.52 (.11)	.52 (.11)
Number Landlocked	-.27 (.03)			-.27 (.03)	-.27 (.03)
Number Islands	.06 (.04)			.06 (.04)	.02 (.04)
Log product Land Area	-.10 (.01)			-.10 (.01)	-.10 (.01)
Common Colonizer	.58 (.07)			.58 (.07)	.57 (.07)
Currently Colonized	1.06 (.23)			1.07 (.23)	.84 (.25)
Ever Colony	1.17 (.12)			1.17 (.12)	1.11 (.12)
Common Country	.00 (1.09)			.00 (1.09)	-.05 (1.11)
Observations	234,990	234,990	235,207	234,990	234,990
R²	.65	.63	.12	.65	.65
RMSE	1.98	2.04	3.13	1.98	1.98

Regressand: log real trade. OLS with year effects (intercepts not reported).
Robust standard errors (clustering by country-pairs) in parentheses.

VIII PARTING SHOTS

8.1 Perhaps the GATT has not had much of an effect on trade ... but the WTO will. Perhaps. After all, the contracting parties to the *ad hoc* and provisional GATT signed legal documents about goods trade only to the extent that they were not inconsistent with pre-existing national legislation. Members of the WTO use a more wide-reaching permanent framework to resolve disputes about trade in goods, services, and intellectual property. Time will tell.

8.2 Why has trade grown faster than income, if not because of the GATT/WTO? Who knows? But there are plenty of other candidates. Higher rates of productivity in tradables, falling transport costs, regional trade associations, converging tastes, growing international liquidity, and changing endowments are all possibilities. But that's a different topic altogether.

8.3 My quantitative examination indicates that there is little reason to believe that the GATT has had a dramatic effect on trade. Once standard gravity effects have been taken into account, bilateral trade cannot be dependably linked to membership in the WTO or its predecessor the GATT. Since the GSP and other gravity effects have economically and statistically significant influences, this negative finding does not seem to be the result of my methodology or data set, both of which are common. I conclude that it is surprisingly hard to demonstrate convincingly that the GATT and the WTO have stimulated trade. One should not conclude the GATT and WTO have not stimulated aggregate trade (although one wishes that it was easier to see this effect more clearly in the data). Rather, since conventional wisdom accords an important role to the GATT/WTO in creating trade, I prefer to view this negative result as an interesting mystery.

Appendix 1

Trading Entities in Sample

Albania	Ghana	Panama
Algeria	Greece	Papua N. Guinea
Angola	Grenada	Paraguay
Antigua and Barbuda	Guatemala	Peru
Argentina	Guinea	Philippines
Armenia	Guinea-Bissau	Poland
Australia	Guyana	Portugal
Austria	Haiti	Qatar
Azerbaijan	Honduras	Reunion
Bahamas	Hong Kong	Romania
Bahrain	Hungary	Russia
Bangladesh	Iceland	Rwanda
Barbados	India	Samoa
Belarus	Indonesia	Sao Tome & Principe
Belgium	Iran	Saudi Arabia
Belize	Iraq	Senegal
Benin	Ireland	Seychelles
Bermuda	Israel	Sierra Leone
Bhutan	Italy	Singapore
Bolivia	Jamaica	Slovak Republic
Botswana	Japan	Slovenia
Brazil	Jordan	Solomon Islands
Bulgaria	Kazakhstan	Somalia
Burkina Faso	Kenya	South Africa
Burma(Myanmar)	Kiribati	Spain
Burundi	Korea, South (R)	Sri Lanka
Cambodia	Kuwait	St. Kitts & Nevis
Cameroon	Kyrgyz Republic	St. Lucia
Canada	Lao People's Dem. Rep.	St. Vincent & Gren.
Cape Verde	Latvia	Sudan
Central African Rep.	Lebanon	Suriname
Chad	Lesotho	Swaziland
Chile	Liberia	Sweden
China	Libya	Switzerland
Colombia	Lithuania	Syria
Comoros	Luxembourg	Tajikistan
Congo, Dem. Rep. of (Zaire)	Macedonia	Tanzania
Congo, Rep. of	Madagascar	Thailand
Costa Rica	Malawi	Togo
Cote D'Ivoire (Ivory Coast)	Malaysia	Tonga
Croatia	Maldives	Trinidad & Tobago
Cyprus	Mali	Tunisia
Czech Republic	Malta	Turkey
Denmark	Mauritania	Turkmenistan
Djibouti	Mauritius	Uganda
Dominica	Mexico	Ukraine
Dominican Rep.	Moldova	United Arab Emirates
Ecuador	Mongolia	United Kingdom
Egypt	Morocco	United States
El Salvador	Mozambique	Uruguay
Equatorial Guinea	Namibia	Uzbekistan
Estonia	Nepal	Vanuatu
Ethiopia	Netherlands	Venezuela
Fiji	New Zealand	Vietnam
Finland	Nicaragua	Yemen, Republic of
France	Niger	Yugoslavia, Socialist Fed. Rep. of
Gabon	Nigeria	Zambia
Gambia	Norway	Zimbabwe
Georgia	Oman	
Germany	Pakistan	

Appendix 2 Descriptive Statistics

	Mean	Standard Deviation	Correlation with Both in GATT/WEO	Correlation with One in GATT/WEO	Correlation with GSP
Log Real Trade	10.07	3.34	.12	-.08	.24
Both in GATT/WTO	.49	.50	1.	-.84	.16
One in GATT/WTO	.42	.49	-.84	1.	-.06
GSP	.23	.42	.16	-.06	1.
Regional FTA	.01	.11	.04	-.05	-.05
Currency Union	.01	.12	.04	-.04	-.06
Log Distance	8.16	.81	.04	.02	.14
Log product Real GDP	47.88	2.68	.19	-.10	.27
Log product Real GDP p/c	16.04	1.50	.13	-.05	.35
Common Language	.22	.42	.04	-.07	-.06
Land Border	.03	.17	-.02	-.02	-.09
Number Landlocked	.25	.47	.01	-.01	.03
Number Islands	.34	.54	.04	-.01	.00
Log product Land Area	24.21	3.28	-.02	.02	.03
Common Colonizer	.10	.30	.02	-.03	-.18
Currently Colonized	.002	.04	.04	-.04	-.01
Ever Colony	.02	.14	.04	-.03	.08
Common Country	.0003	.02	.02	-.01	-.00

234,990 observations.

Figure A1
Openness and GATT/WTO Entry

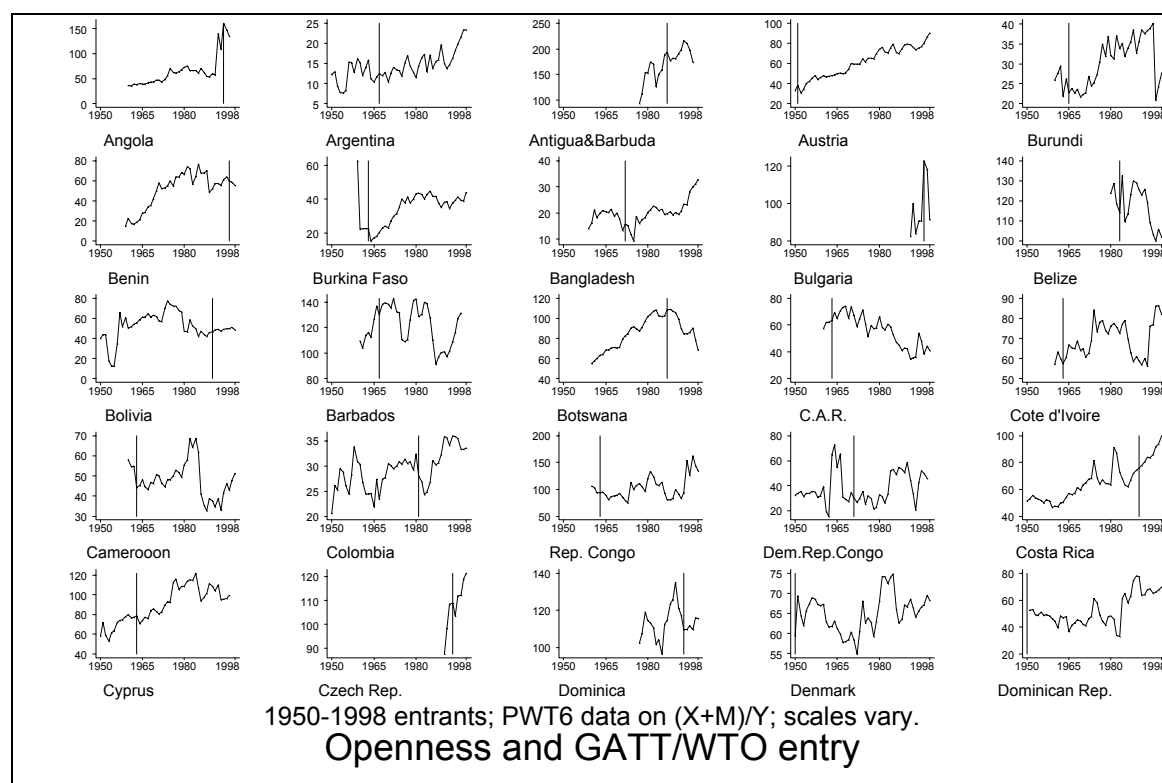


Figure A2
Openness and GATT/WTO Entry

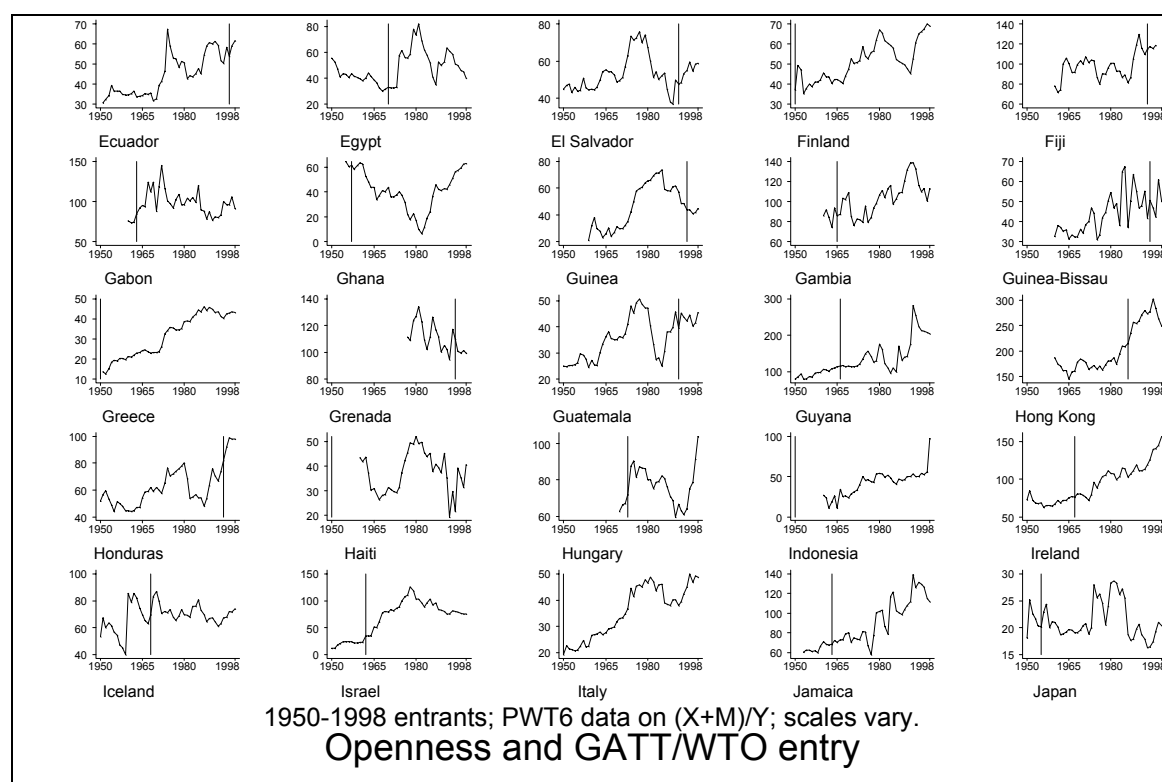


Figure A3
Openness and GATT/WTO Entry

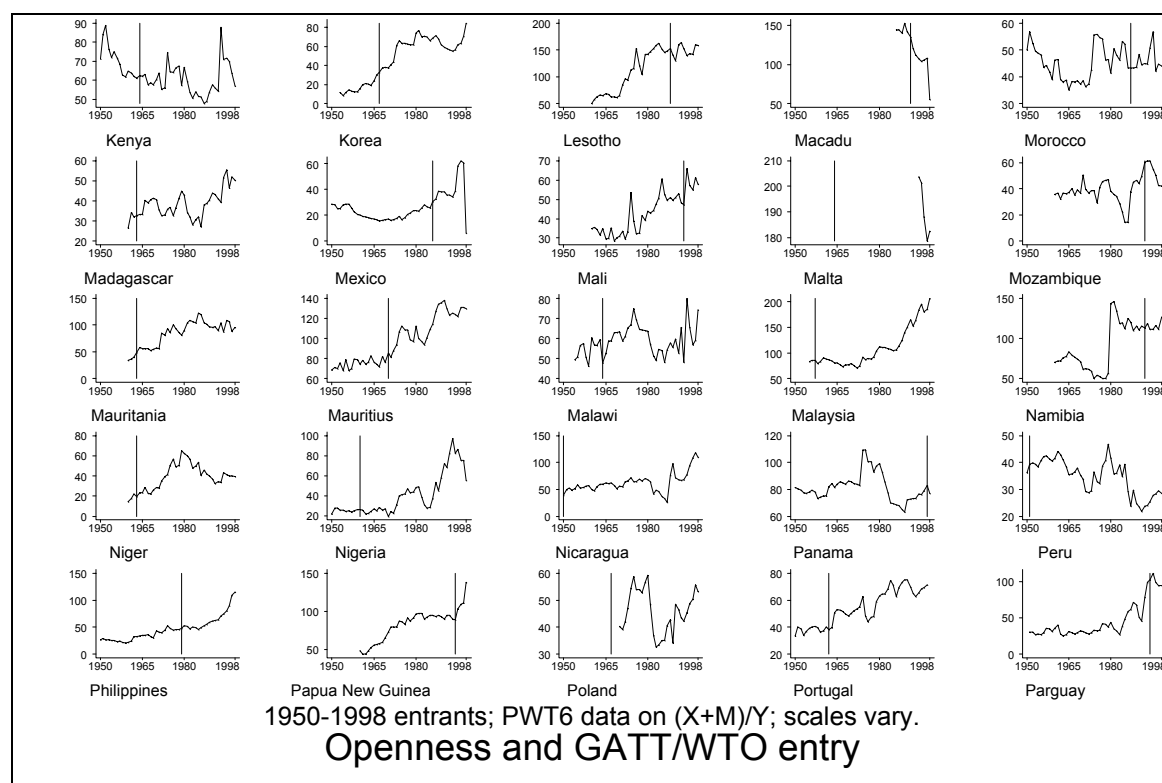
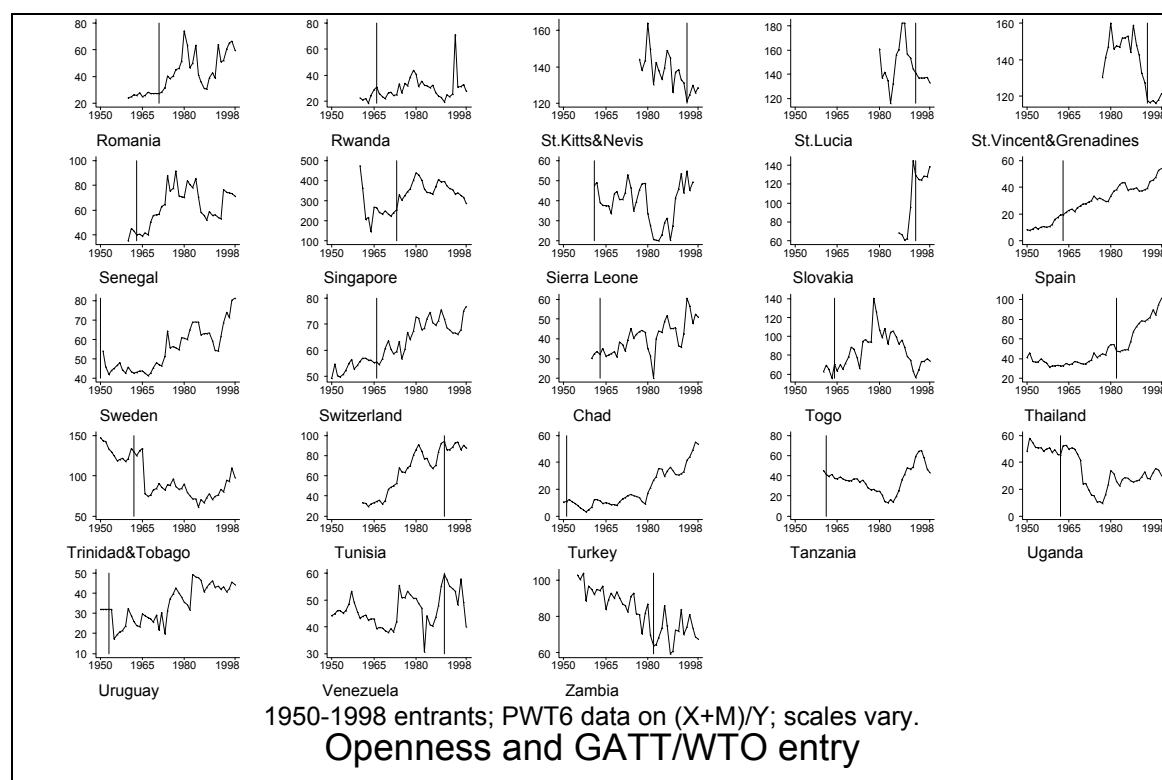


Figure A4
Openness and GATT/WTO Entry



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