THE IMPACT OF GATT ON INTERNATIONAL TRADE: EVIDENCE FROM STRUCTURAL BREAK ANALYSIS

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Abstract
In this study we test for structural changes in international trade patterns of 77 countries over the post-WWII period, to examine if they experienced a substantial increase in their trade ratios following major GATT rounds such as the Kennedy Round, or after joining GATT. Our results show that trade ratios of most of these countries exhibited structural breaks in their time paths, however, most of the postbreak paths were below the extrapolated prebreak paths. Furthermore, while the significant break years coincided closely with major regional and international events such as the oil shocks of the 70s and the East-Asian financial crisis in 1997, they occurred far before or after the time of a country's accession to GATT or the time of the major GATT rounds.
Keywords: International Trade, Trade Liberalization, Structural Change, Oil Shocks, Kennedy Round, East Asia, Financial Crisis.
JEL classification: C22; F1

1. Introduction

International trade has not only grown dramatically since the Second World War, but has consistently grown more rapidly than world income. More specifically, the world's share of merchandise exports in GDP has increased from 5.5% in 1950 to 17.2% in 1998 (Maddison, 2001). This trend has been attributed, among other factors, to extensive trade liberalization measures as manifested by reductions in trade barriers that were facilitated by the General Agreement on Tariffs and Trade (GATT) (Krugman, 1995; Irwin, 1995).[1]

In light of the postwar GATT process of trade liberalization, Ben-David and Papell (1997) (BP hereafter) used endogenous structural break tests to determine if and when countries experienced structural changes in the paths of their trade ratios. In cases of significant structural breaks, they compared the postbreak to prebreak averages of the trade ratios (hereafter referred to as BP's procedure). Since BP found significant breaks and increases in the trade ratios, they attributed these breaks mainly to the trade liberalization reforms launched following the implementation of the Kennedy Round of GATT. However, the ability of GATT to increase international trade has been challenged in a recent series of papers (see Rose (2004a, b)). Using gravity models and large panel data sets, Rose concluded that GATT\WTO did not increase trade among member countries, nor did it even produce more open trade policies among member countries. A number of studies have questioned the findings of Rose based on both theoretical and

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[1] Other factors that were found to explain the increase in international trade over the post WWII period include institutional harmonization and economic integration among world economies (Sachs and Warner, 1995); increases in real output and international reserves (Rose, 1991); lower transportation costs (Krugman, 1995).

empirical grounds. Taking account of several liberalization asymmetries between developing and developed countries, and between developing countries that joined the GATT before and after the Uruguay Round, in addition to refining Rose's empirical methodology, Subramanian and Wei (2007) found that membership had a strong, however, uneven impact on international trade. Tomz et al. (2005) argue that Rose (2004a) mistakenly classified countries as outsiders and thus systematically underestimate the effect of membership on trade. When correcting for country classification they found that GATT substantially increased trade among its members. The debate regarding the impact of GATT on increasing international trade is not settled yet, and in this paper we try to contribute to this controversy by using time series analysis of international trade patterns.

We examine the impact of GATT on increasing international trade, using endogenous structural breakpoint tests. First, we reevaluate BP's findings by applying a different methodology to compare the prebreak and postbreak trade ratios, to correctly identify positive changes that can potentially be a result of trade liberalization reforms. Second, we test if a positive structural break in a country's trade ratio can be attributed to the country's accession to GATT or to major GATT rounds by comparing the break date to the accession or major rounds dates. Our departure point is that if GATT was influential in increasing international trade then we could expect to find positive structural breaks in a country's trade ratios close to either the date of joining GATT or to the dates of the major GATT rounds.

The paper proceeds as follows: Section 2 describes the trade measures used in the paper as well as the data sources. Section 3 lays out the econometric methodology for performing the sequential trend break tests. Section 4 presents the empirical findings. Finally, Section 5 summarizes our results and draws conclusions.

2. Measurement and Data Sources

We test for structural breaks using the same two measures of trade openness that were used in BP's study: the share of nominal merchandise imports in nominal GDP (MY ratio) and the share of nominal merchandise exports in nominal GDP (XY ratio). Data for merchandise imports and exports (in current $US) were obtained from the IMF *International Financial Statistics* (*IFS*) 2005 CD. To calculate the trade ratios, GDP data were converted from *IFS* data in local currencies to $US using mid-year official exchange rates. Our sample covers 77 countries over the period 1948-2004; the first observation is no later than 1968, and the last observation is no earlier than 1989, with a minimum of 36 annual observations. We also make the same structural break analysis over the shorter sample period 1948 to 1993, as in BP's study, to test for the sensitivity of the results to the time span.

3. Trend Break Tests

Earlier works on structural changes in a univariate time series were done under restrictive assumptions such as independent and identically distributed data, non-trending data, and/or stationary data. In this paper, we apply Vogelsang's (1997) test for detecting shifts in the trend function of a dynamic time series which successfully relaxes the aforementioned assumptions. The test allows for both serial correlation and trending data, and is valid whether or not the series is stationary. These features are important because the trade ratios are likely to exhibit unit roots, are obviously trending in most of the cases,

and may be serially correlated. For one break in quadratic trending, linear trending, or non-trending data, Vogelsang's (1997) Sup Wald (or SupW_t) test involves estimating equation (1), equation (2), or equation (3), respectively.

$$R_t = m + b_1 t + b_2 t^2 + q\,DU_t + g_1 DT_t + g_2 DT_t^2 + \sum_{i=1}^{k} c_i R_{t-i} + e_t \quad (1)$$

$$R_t = m + b_1 t + q\,DU_t + g_1 DT_t + \sum_{i=1}^{k} c_i R_{t-i} + e_t \quad (2)$$

$$R_t = m + q\,DU_t + \sum_{i=1}^{k} c_i R_{t-i} + e_t \quad (3)$$

where R_t denotes either MY or XY and DU_t and DT_t are break dummy-variables that take the values:

$$DU_t = \begin{cases} 1 \; if \; t > T_B \\ 0 \; otherwise \end{cases} \quad \text{and} \quad DT_t = \begin{cases} t - T_B \; if \; t > T_B \\ 0 \; otherwise \end{cases}$$

The period in which the change in the parameters of the trend function occurs will be referred to as the time of the break, or T_B.

The exact specification of the test depends on the trending that characterizes the data. Equation (1) allows for both a linear and a quadratic trend in data, Equation (2) allows for a linear trend in data, and Equation (3) allows for no trend in data.

For each T_B, the value of k (the number of lags in the right-hand side of equation (1)) has to be chosen. There exists considerable evidence that data-dependent methods for selecting the lag length of k are superior to making an *a priori* choice of k. We adopt an approach suggested by Perron and Vogelsang (1992) to determine the optimal lag length. We start with an upper bound of k=8, where if c_8 is significant, k will take the value 8; otherwise we choose $k=7$ and check again if c_7 is significant. We continue thusly until the last lag becomes significant; otherwise $k=0$ will be chosen.

Equations (1)-(3) are estimated sequentially for each possible break year with 15 percent trimming, i.e., for $0.15T < T_B < 0.85T$, where T is the number of observations. For model (1), SupW_t is the maximum over all possible trend breaks, of three times the standard F-test statistic for testing the null hypothesis $q = g_1 = g_2 = 0$. For model (2), SupW_t is the maximum of two times the standard F for testing $q = g_1 = 0$, and for model (3), SupW_t is the maximum of the standard F-statistic for testing $q = 0$.

As mentioned, Vogelsang's test is valid whether or not a unit root is present in a series. The critical values, however, depend on whether the series is stationary or contains a unit root. If the calculated values of the SupW_t statistic are larger than the critical values under the unit root case calculated in Vogelsang (1997), we reject the null hypothesis of a no-trend break regardless of whether or not the data have a unit root. If these values are smaller than the critical values of SupW_t with a unit root, but larger than those in the stationary case, we have to test for unit roots. If these tests reject the null of a unit root then one can conclude that a breakpoint exists. We apply then the Phillips-Perron (1988)

unit root test with a linear time trend that allows for possible structural break in the trend to test for unit roots in the trade ratios series.

The structural change literature provides little guidance regarding the choice of the trend to include in the estimated model. If the data have a linear or a quadratic trend, then estimating a model which does not contain the appropriate trend may fail to capture a significant break. On the other hand, the power to reject a no-trend-break null when there is a break is reduced when estimating a model which includes a trend that is not contained in the data because the critical values increase with the inclusion of more trends. Here we use the following algorithm proposed by BP for model selection. First, model (1), the model of the quadratic trend, is estimated. If we reject the null of no-trend-break (at a 10 percent level or lower), then we report the SupW_t test results. If the model (1) null cannot be rejected, then model (2) is estimated and the results are reported if we reject the null of no-trend-break. If model (2) null cannot be rejected, then model (3) is estimated and, like before, the results are reported if the null is rejected.

4. Empirical findings

The results of the Vogelsang SupW_t test are reported in Table 1. For the MY ratios, the no-trend-break null was rejected in 41 out of the 77 countries at the 10% significance level, 34 at the 5% level, and 23 at the 1% level.[2] Among the OECD countries, the share of significant breaks (at the 10% level) was higher than that in the developing countries; 64% of the OECD countries experienced structural breaks in their MY ratios compared to less than 50% in developing countries. For the XY ratios, the null of a no-trend-break was rejected in 48 out of the 77 countries at the 10% significance level, 34 at the 5% level, and 23 at the 1% level. The shares of significant breakpoints in the XY of both OECD and developing countries were very similar: 62% of developing countries experienced structural breaks in their XY ratios compared to 64% in OECD countries.

The breakpoint test only reveals if the time series has experienced a structural break during the period tested, but provides no information about the nature of the change. As such, a comparative analysis of the trade behavior before and after the break cannot be made. To deal with this problem, BP compared the postbreak averages of trade ratios (either MY or XY) to the prebreak averages for countries where significant breaks were detected. They found that about 80% of the countries that had experienced significant breaks had exhibited increases in the averages of trade ratios. Although BP were aware of the possible effect of the 1973 oil shocks on these breaks, they mostly attributed them to trade liberalization reforms, especially those after the Kennedy Round.

The patterns of both the MY and XY ratios reveal clear upwarding trends, and therefore, when calculating the percent change in the postbreak to prebreak trade ratio, as BP did, it is most likely to be positive, regardless if there is a significant break or not. To illustrate this, we consider the cases of Finland and Ireland. From Table 1, the SupW_t statistic results reveal a significant break in the MY ratio of Ireland in 1978 and a marginally significant break in 1979 in Finland's MY ratio. In both cases, the percent changes in postbreak to prebreak trade ratios are positive (15% for Finland and 21% for Ireland). As can be seen from Figures 1 and 2, prior to the breakpoints there were upward

[2] Since the results of the Phillips-Perron unit root tests show less than 5% incidence of unit roots in the trade ratios, we adopt the critical values for nonstationary data from Vogelsang (1997).

sloping trends of the MY ratios and despite the downward sloping of these trends after the break years, the percent changes in the postbreak to prebreak trade ratio averages were still largely positive. Adopting BP's interpretation of higher postbreak relative to prebreak trade averages, one can argue that Ireland, and Finland to some extent, had experienced a dramatic change in its trade ratio as a result of trade liberalization reforms that it presumably had undertaken prior to the break year. However, as evident from the graphs, both countries had shown negative sloping trends in their MY ratios, and therefore, it is obvious that the turn from a positive into a negative sloping trend, following the break cannot be a result of trade liberalization policies. Similar downward postbreaks can be found in the MY trends of Belgium, Brazil, Cyprus, Denmark, Haiti, Italy, Japan, Luxemburg, Netherlands, Portugal , and Syria, among others; and in the XY trends of Algeria, Belgium, Botswana, Cyprus, El Salvador, Gabon, Haiti, Japan, Netherlands, New Zealand, Norway, Panama, and Trinidad and Tobago.

In the following we reevaluate BP's comparative analysis of the prebreak\postbreak trade ratios using a different procedure that involves comparing the average of the observed postbreak trade ratios to the average that would have prevailed if the prebreak trend was to continue (hereafter referred to as AA's procedure). The rationale for doing this is simple. If we assume the existence of a trend in the trade ratios, then, in the absence of a significant break beyond any point of time the observed values of the series will be the same as the extrapolated values. However, if a structural break exists then the continuation of the trend after that point will differ from the actual values. To learn how substantial that structural change is, one needs to compare the extrapolated and the actual postbreak parts of the trend. A dramatic positive change at a specific date would shift the trend above the continuation of its prebreak part. This shift is, of course, sufficient for the postbreak average to exceed the prebreak one.

Table 1 (columns 5 and 9) compares the percent changes in postbreak actual trade ratios to the extrapolated postbreak trade ratios based on the trend that prevailed until the break date (labeled AA), and those based on BP's procedure (columns 6 and 10). For the MY ratio, only for two out of the 14 OECD countries and for 12 out of the 27 developing countries was the average of the actual values higher than the average that would have prevailed if the prebreak trend was to continue. Using BP's procedure, in seven out of the 14 OECD, and in 16 out of the 27 developing countries, the postbreak averages were higher than the prebreak averages of the MY ratios. In the case of the XY ratio, only in five out of the 14 OECD countries and in 18 out of the 34 developing countries where significant breaks were detected, was the average of the actual values higher than the average that would have prevailed if the prebreak trend was to continue. Using BP's procedure, in ten out of the14 OECD, and in 20 out of the 34 developing countries, the postbreak averages are higher than the prebreak averages of the XY ratios. As expected, the results based on BP's procedure show a higher rate of positive structural breaks than the results based on AA's procedure, especially for the MY ratios.

The above results are not in line with what one would expect for countries undergoing a process of trade liberalization. Engaging in trade liberalization reforms would entail the actual postbreak ratios to be higher than the extrapolated ratios. Even adopting BP's procedure, in only about 50% of the countries, the postbreak average of the MY ratios was higher than the prebreak average in both OECD and developing countries, a figure that is far below that in BP's 1997 study, where in more than 80% of countries with significant structural breaks, was the postbreak trade average higher than the

prebreak average. This discrepancy can be attributed to sample differences both in terms of the number of countries covered and time span.

In the following we test for the sensitivity of the break dates to the difference in the time spans. Panel A of Table 2 shows the break years of the trade ratios based on the shorter sample period 1948-1993, as in BP's study, and also on the extended sample period 1948-2004. Since for some countries there are not enough observations to test for structural breaks in trade ratios when using the 1948-1993 sample period, the comparison between break dates from the two sample periods is restricted to countries where the 1948-1993 sample period allows for structural break testing, and where significant breaks were detected using both time spans.

Panel B of Table 2 compares the break dates based on the two sample periods. For developing countries 44.4% of the break years in the MY ratios coincide, and in 70.3% of the cases, the breaks based on one sample period took place in a distance of less than four years from those based on the other sample period. Similar results are obtained for the XY ratios; about half of the breaks coincided, and about 65% of the breaks based one sample period took place in a distance of less than four years from those based on the other. For OECD countries, only 25% of the significant breakpoints in both MY and XY ratios coincide, and less than 40% of breaks based on the extended sample period took place in a window of four years around the break year based on the shorter sample period. Two important observations are worth mentioning. First, most of the countries where the break dates from the two sample periods coincided experienced structural breaks very close to the time of one of the two oil shocks of the 70s. From Table 2 we can see that more than 50% of the breaks in the MY ratios and 55% of the breaks in the XY ratios of developing countries based on either one of the sample periods occurred in a window of two years about the time of the oil shocks of 1973/4 and 1979/80. The corresponding figures are even higher for OECD countries. Second, among the developing countries where the break dates diverge, are the East-Asian countries that suffered most from the 1997 financial crisis. Indonesia, South Korea, Malaysia, and Thailand experienced significant structural breaks in their XY ratios in 1997, the same year of the financial crisis. Examining exports and GDP separately, it appears that the hard slump in the national output of Indonesia, Korea and Thailand, was the reason behind the negative structural change in the XY ratios of these countries. Naturally, these breaks would not have been detected using the shorter time span of 1948-1993.

Next, we study if the positive structural breaks, that can potentially be a result of trade liberalization reforms, in the extended sample period can be attributed to the tariff reductions following the Kennedy Round. If these reductions had a substantial impact on increasing trade ratios then we can expect that positive breaks would occur following the Kennedy Round, especially in the case of the OECD countries for which the tariff reductions mostly pertain. Figure 3 presents a scatter diagram of the positive break years of the countries where the postbreak trade average is higher than the prebreak average. As can be seen, the break years are widely scattered around 1972, the year when tariff reductions were completed. The break years of the MY ratios of the OECD countries are distributed in a range of one to 25 years after 1972 with an average of 11 years. In the case of the developing countries, these breaks are distributed in a range of up to 25 years after 1972 with an average of 11 years, with only one break occurring ten years before 1972. Similar results are obtained for the XY ratios. Figure 4 shows a scatter diagram of the positive breaks, according to the AA procedure, and again we can see that the breaks

are widely scattered around 1972. The above results further undermine BP's conclusion that trade liberalization policies following the Kennedy Round were the major determinants of the breakpoints in the trade ratios, and suggest that major international events, such as the oil shocks of the 70s and the financial crisis in East-Asia, might be responsible for the structural breaks in trade ratios. In the following we explain why the observed structural breaks are not likely to result from tariff reductions instituted by Kennedy Round.

The Kennedy Round, which lasted from 1963 to 1967, yielded agreements that significantly reduced tariff levels of developed countries on industrial products by a third on average (Preeg, 1970). However, the potential impact of the tariff reductions was partially offset by the introduction of nontariff trade barriers arising from political pressure of major industries which were affected by the tariff reductions (see Marvel and Ray (1983) for the case of the US). In addition, the significant achievement of the Kennedy Round was a substantial reduction of tariffs on manufactured products, especially in technologically-advanced industries, by developed countries. Thus, while we may expect large increases in the multilateral trade of these countries, we would not necessarily expect increases in imports of developing countries. Finally, the exports of the developing countries consisted mainly of raw materials and primary goods that were subjected to low or no tariffs by developed countries, and of processed agricultural products and textile, which received only modest tariff reductions in the Kennedy Round (Preeg, 1970). Therefore, we would not expect positive structural breaks in the trade ratios of developing countries that constitute the bulk of BP's sample.

Our next consideration is to study if GATT membership contributed to increasing international trade. We do this by utilizing the break dates we found in the previous section and comparing them to the country's accession date to GATT. We pay special attention for countries that joined GATT after the Uruguay Round, when the impact of GATT on the trade of developing countries became substantial (Subramanian and Wei, 2007).[3]

Figure 5 presents a scatter diagram of the deviations of break years in the trade ratios of developing countries from the corresponding accession year to GATT. As can be seen, only a few breaks occurred in a window of ten years around the time of joining GATT. Figure 6 illustrates the sampling distribution of the these deviations. We can see that a small fraction of the countries with significant breaks in either MY or XY experienced a structural break around the accession to GATT. Less than 17% of the countries experienced significant structural breaks in their MY ratios, and less than 20% experienced significant structural breaks in their XY ratios, in a window of ten years about their accession to GATT. Focusing only on countries that experienced positive structural breaks, only two of the 11 significant structural breaks took place in a window of ten years about the time of the accession to GATT. These results suggest that developing countries did not experience any substantial increase in their trade ratios about the time of their accession to GATT, and the small number of countries that did experience did so either long before or after the accession year. This makes it difficult to

[3] We focus here on developing countries since most of developed countries were among the founders of GATT in 1948 or joined GATT soon after that date. Since our data begins after 1948, there is no way to test if membership of these countries in GATT resulted in structural breaks in their trade ratios.

relate the structural breaks to GATT membership. When we focus on developing countries that joined GATT after the Uruguay Round in 1986, once again the results do not support any significant impact of membership in GATT. Among the twelve countries that joined GATT after the Uruguay Round none experienced significant positive structural breaks, in either of their trade ratios. When using the BP procedure, three countries are seen to have experienced positive structural breaks in their MY ratio, and six in their XY ratios, however, in both cases the breaks occurred long before the Uruguay Round.

5. Concluding Remarks

In this paper we addressed the question of whether the Kennedy Round or GATT membership increased international trade by using sequential structural break tests in international trade ratios over the period 1948-2004. We found that most countries experienced structural breaks in their trade patterns, however, in most cases the postbreak average of the extrapolated prebreak ratios was higher than that of the actual ratios. For a large number of countries, the postbreak trends of the trade ratios were found to be downward sloping, even though the postbreak average of the trade ratios was higher than the prebreak average. In addition, the break years of the small fraction of countries that had experienced positive structural breaks in their trade ratios scatter widely around 1972, the year when tariff reductions instituted by the Kennedy Round were completed, and around the accession years to GATT. These results indicate that the detected structural breaks cannot be attributed to trade liberalization that countries might have adopted following the Kennedy Round, as BP argue, or to GATT membership. On the other hand, the significant break years coincided closely with major regional and international events such as the oil shocks of the 70s, and the East-Asian financial crisis in 1997, which suggest that these events might be responsible for a considerable part of the observed structural breaks.

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Table 1. Sequential trend break tests (1948-2004)

		Import-GDP ratios				Export-GDP ratios			
	Country	Break Year	$SupF_t$	Average percentage change AA[a]	Average percentage change BP[b]	Break Year	$SupF_t$	Average percentage change AA	Average percentage change BP
Developing Countries									
1	Algeria	1962[I]	36.0**	-47.2[§]	-36.1	1980[I]	17.1		
2	Argentina	1993[III]	19.0**	-81.0	-81.0	1998[I]	41.2***	77.4	121.6
3	Barbados	1991[I]	14.1			1985[I]	11.8		
4	Botswana	1993[I]	50.0***	82.0	-55.9	1988[I]	72.1***	-75.9	-22.6
5	Burundi	1986[I]	53.8***	135.3[§]	119.8	1977[I]	46.4***	-85.8	-14.6
6	Brazil	1974[I]	38.7***	-48.1	-7.5	1982[I]	42.6***	-13.6	20.6
7	Cameron	1980[I]	41.7***	-58.7	-34.0	1992[I]	22.0		
8	Chile	1973[II]	27.0**	551.8	78.9	1987[I]	20.3		
9	Colombia	1992[I]	10.8			1971[II]	24.5*	105.4	14.8
10	Costa Rica	1981[I]	48.7***	-32.0	27.3	1980[I]	18.0		
11	Cote D´ivoire	1993[I]	17.6			1983[I]	27. 9*	68.8	13.4
12	Cyprus	1975[II]	26.1**	17.3	4.3	1975[I]	53.9***	-55.3	-17.0
13	Dominican R.	1984[III]	27.3***	-72.7	-72.7	1975[I]	11.0		
14	Ecuador	1981[I]	24.3			1973[I]	23.5		
15	Egypt	1973[I]	29.2*	94.5[§]	33.8	1988[I]	13.60		
16	El Salvador	1972[I]	20.3			1979[I]	34.6**	-76.4	-46.8
17	Ethiopia	1990[I]	54.4***	9.5	57.1	1993[I]	32.3**	239.1[§]	5.2
18	Gabon	1976[I]	24.0			1985[I]	29.5*	-34.4	-6.5
19	Ghana	1973[I]	22.0			1971[I]	44.4***	-14.0	-48. 7
20	Guyana	1987[I]	13.3			1986[III]	19.5**	48.2	48.2
21	Haiti	1984[I]	95.6***	-60.4	32.0	1979[I]	46.7***	-75.6	-31.3
22	Honduras	1973[I]	27.3			1980[I]	11.8		
23	India	1973[I]	14.9			1975[I]	14.0		
24	Indonesia	1997[I]	37.9**	8.0	53.7	1997[I]	45.6***	126.4	65.4
25	Iran	1992[I]	179.0***	242.1[§]	3.5	1992[I]	39.3***	556.0[§]	16.3
26	Jamaica	1975[I]	32.2**	-37.8	28.0	1976[I]	23.9		
27	Jordan	1982[I]	16.6			1988[I]	17.6		
28	Kenya	1992[I]	22.9			1984[III]	18.7**	-21.8	-21.8
29	Korea	1985[I]	39.4***	-37.5	23.8	1997[I]	29.8*	27.6	96.7
30	Libya	1972[I]	52.4***	-87.7	-11.7	1973[I]	37.5**	-133.3	-22.0

31	Madagascar	1972[I]	45.7***	-95.6	-41.1	1971[I]	50.6***	-98.1	-33.3
32	Malawi	1983[I]	21.7			1993[I]	29.9*	75.0	21.2
33	Malaysia	1988[III]	28.0***	96.9	96.9	1997[I]	36.6**	3.3	94.5
34	Malta	1989[I]	15.3			1980[I]	13.8		
35	Mauritius	1981[I]	18.3			1975[I]	20.7		
36	Mexico	1962[I]	39.3***	-83.4	73.8	1994[I]	28.5*	10.8	220.0
37	Morocco	1985[I]	20.9			1973[I]	10.1		
38	Niger	1985[I]	13.0			1980[I]	15.8		
39	Nigeria	1980[I]	17.3			1989[I]	19.9		
40	Oman	1989[I]	16.9			1981[I]	32.3*	35.7[§]	10.7
41	Pakistan	1977[III]	22.2**	-77.8	-77.8	1983[I]	17.0		
42	Panama	1973[I]	23.2			1973[I]	45.9***	-58.7	3.3
43	Paraguay	1988[I]	37.4**	317.5	120.1	1983[I]	38.8***	1324.0	32.0
44	Peru	1973[I]	12.2			1976[I]	23.3		
45	Philippines	1983[I]	24.0			1995[I]	47.0***	86.6	217.4
46	S. Arabia	1981[I]	32.0*	-67.7	31.1	1973[I]	52.6***	-119.6	-20.1
47	Singapore	1985[I]	18.5			1978[I]	30.3*	-62.3	23.3
48	S. Africa	1979[I]	20.5			1976[I]	19.6		
49	Sri Lanka	1977[I]	97.9***	238.9	53.5	1977[I]	30.6*	88.6	7.8
50	Sudan	1989[I]	31.8*	54.0	-6.6	1973[I]	31.3**	5.5[§]	-54.0
51	Syria	1977[I]	120.7***	-87.3	-28.6	1997[I]	30.2*	280.4	51. 6
52	Thailand	1994[I]	16.3			1997[I]	37.8**	23.8	173.0
53	Trinidad and Tobago	1976[I]	21.6			1973[I]	95.6***	-37.4	-18.2
54	Venezuela	1978[I]	21.4			1973[I]	14.3		
55	Zambia	1971[I]	39.5***	-68.1	-58.8	1985[II]	25.2**	30.5[§]	-45.5
Developed Countries									
1	Australia	1992[III]	23.7***	-76.3	-76.3	1968[I]	103.8***	-72.1	-16. 6
2	Austria	1982[I]	21.3			1992[I]	35.2**	19.2	56.1
3	Belgium	1983[I]	37.2**	-28.1	36.4	1988[I]	26.6		
4	Canada	1988[I]	21.7			1988[I]	45.0***	-11.0	57.8
5	Denmark	1986[I]	30.5*	-19. 7	-8.1	1985[I]	33.3*	-18.4	21.5
6	Finland	1979[I]	28.1*	-31.8	15.0	1991[I]	17.2		
7	France	1980[I]	18.5			1981I	16.1		
8	Germany	1984[I]	27.3			1990[I]	48.7***	-28.4	18.4
9	Greece	1973[I]	18.4			1968[I]	28.2*	30.4[§]	57.3
10	Iceland	1992[I]	28.3*	19.5	-7.7	1965[I]	17.3		
11	Ireland	1978[I]	58.7***	-39.9	21.0	1989[I]	18.8		
12	Italy	1981[I]	31.6**	-52.8	22.3	1992[I]	19.0		
13	Japan	1981[I]	36.6**	-60.6	-24.9	1985[I]	50.1***	-42.8	-3.0
14	Luxembourg	1985[I]	85.4***	-27.7	-17.4	1992[I]	32.33*	13.1	-39.5
15	Netherlands	1985[I]	30.3*	-37.8	-7.4	1981[I]	50.7***	-43.0	10.1
16	New Zealand	1985[I]	26.1			1985[I]	41.8***	-39. 8	-2.2
17	Norway	1982[I]	40.6***	16.6	-26.6	1985[I]	42.3***	-32.8	32.9
18	Portugal	1983[I]	45.2***	-46.5	31.0	1982[I]	26.9***	55.9	55.9
19	Sweden	1983[I]	18.8			1983[I]	30.8*	-24.1	43.1
20	Switzerland	1989[I]	33.6**	-12.4	0.6	1975[I]	26.9		
21	UK	1973[I]	55. 8***	-17.9	23.5	1972[I]	24.2		
22	USA	1973[I]	27.1			1972[III]	21.2**	79.1	79.1

I,II, and III, denote the model type.[a] AA procedure compares the postbreak actual trade ratios average to that of the extrapolated postbreak trade ratios based on the trend that prevailed until the break date. [b] BP procedure compares the postbreak actual trade ratios average to that of the prebreak actual trade ratios. ***,**, and * denote statistical significance using unit root critical values at the 1, 5, and 10% levels from Table 2 of Vogelsang (1997). For model I, these values are 38.35, 31.29, and 27.99, respectively. For model II, the critical values are 30.36, 25.10, and 22.29, respectively. For model III the critical values are 22.48, 17.88, and 15.78, respectively. § The prebreak trend was downward sloping so the average of the postbreak extrapolated ratios was negative. For this reason the AA index compares the actual postbreak average to the level of the trade ratio at the eve of the break year, rather than to the average of the extrapolated postbreak ratios.

Table 2. Sequential trend break tests 1948-2004 and 1948-1993

		Import-GDP ratios		Export-GDP ratios	
	Country	Break Year (1948-1993)	Break Year (1948-2004)	Break Year (1948-1993)	Break Year (1948-2004)
	Panel A Developing Countries				
1	Algeria	1962	1962		
2	Brazil	1974	1974	1982	1982
3	Colombia	1977	1992		
4	Costa Rica	1982	1981		
5	Cyprus			1975	1975
6	Dominican R.	1984	1984		
7	Ecuador	1985	1981	1971	1973
8	El Salvador			1980	1979
9	Ghana			1971	1971
10	Guatemala	1981	1981	1980	1980
11	Guyana	1978	1987	1981	1986
12	Haiti	1978	1984	1979	1979
13	India	1973	1973	1975	1975
14	Jamaica	1975	1975	1979	1976
15	Korea	1968	1985		
16	Mauritius	1972	1981		
17	Mexico			1981	1994
18	Morocco	1972	1985		
19	Nigeria	1979	1980	1979	1989
20	Pakistan	1977	1977	1971	1983
21	Panama	1973	1973	1973	1973
22	Paraguay	1987	1988		
23	Peru			1976	1976
24	Philippines	1983	1983	1980	1995
25	Singapore	1979	1985	1980	1978
26	S. Africa	1979	1979	1971	1976
27	Sri Lanka	1977	1977	1977	1977
28	Sudan	1985	1989	1973	1973
29	Thailand	1987	1994	1985	1997
30	Trinidad and Tobago	1973	1976	1973	1973
31	Venezuela	1976	1978	1981	1973
32	Zambia	1971	1971		

Panel A Developed Countries					
1	Australia	1971	1992	1971	1968
2	Austria	1968	1982	1985	1992
3	Belgium	1983	1983	1974	1988
4	Canada	1981	1988		
5	Denmark	1972	1986		
6	Finland			1981	1991
7	France	1966	1980	1970	1981
8	Germany	1985	1984	1985	1990
9	Greece	1971	1973		
10	Iceland	1974	1992	1974	1965
11	Ireland	1978	1978	1971	1989
12	Italy	1973	1981	1979	1992
13	Japan	1985	1981	1977	1985
14	Netherlands	1985	1985	1981	1981
15	New Zealand	1973	1985		
16	Norway	1977	1982	1985	1985
17	Portugal	1978	1983		
18	Sweden	1973	1983	1974	1983
19	Switzerland	1974	1989	1975	1975
20	UK	1973	1973	1977	1972
21	USA	1973	1973	1972	1972
Panel B		**Developed Countries**		**Developing Countries**	
		MY	**XY**	**MY**	**XY**
A1		25%	25%	44.4%	47.8%
A2		40%	31.3%	70.4%	65.2%

Key: **A1**: % of countries where break years based on the 1948-2004 sample period coincide with break years based on the 1948-1993 sample period. **A2**: % of countries where break years based on 1948-2004 sample period fall in a four year window around break years based on 1948-1993 sample period.

Figure 1 – Finland – Break Year: 1979

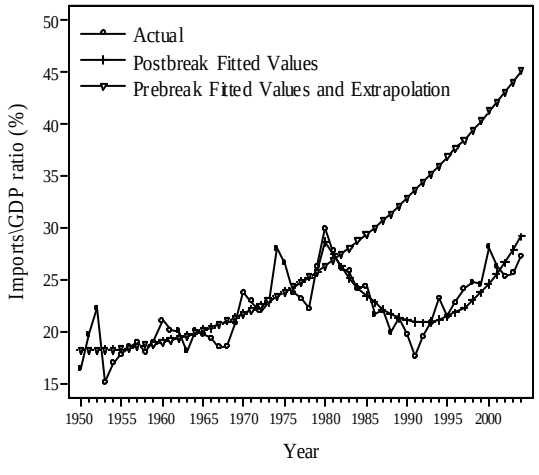

Figure 2 – Ireland, Break Year: 1978

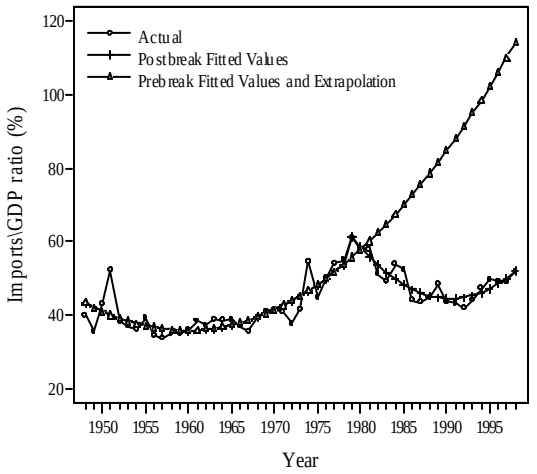

Figure 3 – Scatter Diagram of Positive Breakpoints (According to BP) Around 1972

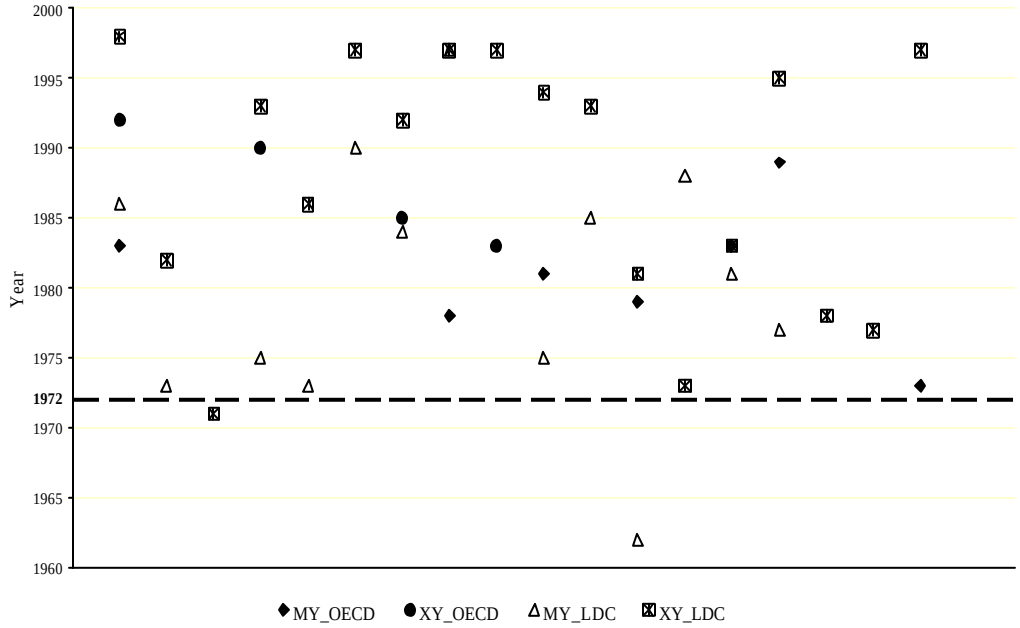

Figure 4 – Scatter Diagram of Positive Breakpoints (According to AA) Around 1972

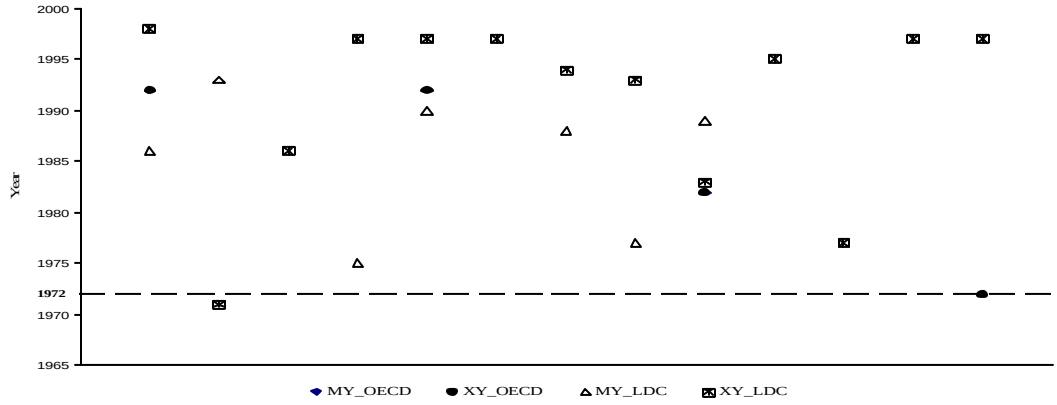

Figure 5 – Scatter Diagram of Break Years Around the Accession to GATT

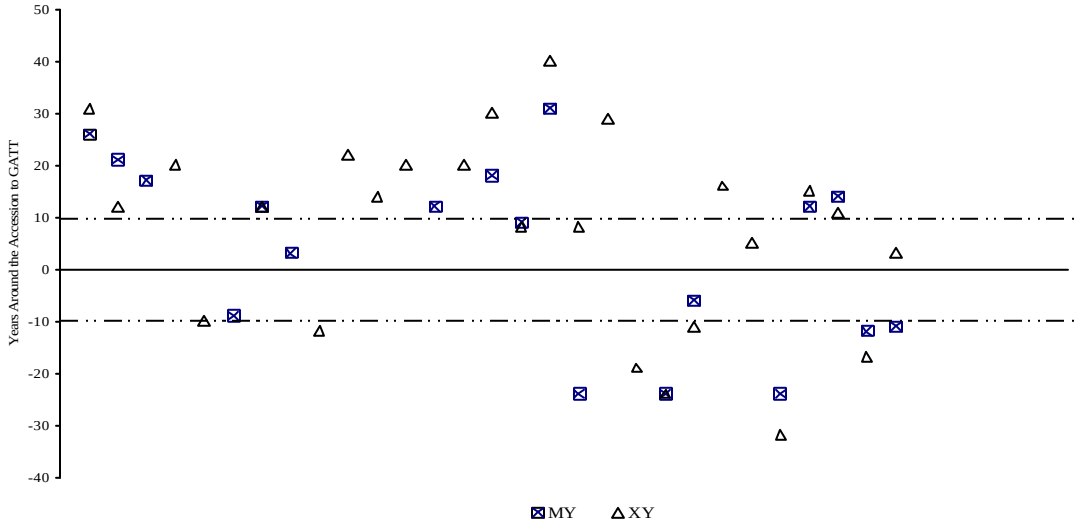

Figure 6 – Distribution of Break Dates Around the Accession to GATT