TRADE LIBERALIZATION OR OIL SHOCKS: WHICH EXPLAINS STRUCTURAL BREAKS IN INTERNATIONAL TRADE RATIOS?

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Trade Liberalization or Oil Shocks: Which Explains Structural Breaks in International Trade Ratios?

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Ben-David and Papell's (1997) tests for structural breaks in international trade ratios over the post-WWII period revealed that trade ratios exhibited structural breaks in their paths and that postbreak trade averages exceeded prebreak averages. They attributed these breaks to trade liberalization policies executed during the postwar period. We reevaluate their results by comparing the postbreak trade ratios with extrapolated ratios based on the prebreak trend, and testing for structural breaks in the relative prices of imports (exports). We find that oil shocks rather than trade liberalization were the major factor behind the structural breaks in trade ratios.

Keywords: International trade, Trade Liberalization, Structural change, Oil shocks, Kennedy Round

JEL classification: C22; F1

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1. Introduction

International trade has not only grown dramatically since the Second World War, but has consistently grown more rapidly than world income. The world's share of merchandise exports in GDP increased from 5.5% in 1950 to 17.2% in 1998 (Maddison, 2001). This trend has been attributed, among other factors, to institutional harmonization and economic integration among world economies (Sachs and Warner, 1995), increases in real output and international reserves (Rose, 1991), extensive trade liberalization measures as manifested by reductions in trade barriers (Rose, 1991; Krugman, 1995; Irwin, 1996), and lower transportation costs (Krugman, 1995; Irwin, 1996). Ben-David and Papell (1997), BP hereafter, tried to determine if and when countries experienced structural breaks in the paths of their trade ratios (imports\GDP and exports\GDP ratios) by implementing sequential structural breakpoints tests. Recognizing for the possible effect of the 1973 oil shocks on imports prices, the authors conducted their analysis separately for imports and exports rather than on their sum (a common measure of trade openness) to avoid masking relevant information that could occur by lumping together the two ratios. In cases of significant structural breaks, they compared the averages of the trade ratios after the breakpoint to those before the breakpoint (hereafter referred to as BP's procedure).

Since BP observed significant breaks and increases not only in the imports ratios but also in the exports ratios, they attributed the structural breaks and the rise in trade mainly to the trade liberalization reforms launched following the implementation of the Kennedy Round in 1968.

In the present study we reevaluate these conclusions for the following reasons. First, 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 expect increases in imports of developing countries. Furthermore, 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 structural breaks in the trade ratios of developing countries that constitute the bulk of BP's sample. Second, most of trade breaks detected in BP's study had occurred during the 70's, a decade that witnessed the two major oil shocks of 1973 and 1979, and the decade in which the large tariff reductions, following the Kennedy Round, were materialized. Therefore, testing for structural breaks and comparing the prebreak\postbreak trade average is insufficient to determine which of the two factors is more likely to cause the breaks, and further analysis is needed. Finally, despite the sharp reductions in tariffs, industrialized countries had adopted non-tariff-trade-barriers to protect their affected industries (see Marvel and Ray, 1983 for the case of the US), so the overall effect of the Kennedy Round on substantially increasing trade is questionable.

We implement a battery of tests to show that oil shocks rather than trade liberalization played the major role in determining the structural breaks in trade ratios. First, like BP, we test for structural breaks in the same two trade ratios by applying Vogelsang's (1997) test. However, instead of comparing the postbreak averages of the trade ratios to the prebreak averages as BP did, we compare them to the averages of the ratios that would have prevailed if the prebreak trend was to continue after the break. Our rationale is that since trade ratios were positively trending after WWII, one would expect the average of a trade ratio after any point of time to be higher than the

average before that point, regardless of whether it is a significant breakpoint or not. Therefore, a positive change in the trade average according to BP's procedure would not necessarily be the product of trade liberalization measures. Second, we compare the averages of trade ratios over the five years following the first phase of the tariff reductions in 1968 to those over the five years before 1968. We also compare the averages over the period 1968-72 to those of 1974, the year of the first oil shock. Finally, we test for structural breaks in the relative prices of trade to examine if structural breaks in relative prices are associated with structural breaks in nominal trade ratios.

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 and compares them to those obtained using BP's procedure. Finally, Section 5 summarizes our results and offers some concluding remarks.

2. Measurement and Data Sources

We test for structural breaks in the same two measures of trade openness 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, import prices, export prices, and GDP deflators 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 59 countries; the first observation is no later than 1957, and the last observation is of 1993. Therefore our sample includes countries with no less than 37 observations. Table A in the Appendix lists the countries examined and the year of the first observation. Since we

wish to contrast our results to those of BP, we also study the same period of time, namely 1948-1993.

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 (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 exhibit unit roots, are obviously trending in most of the cases, and may be serially correlated as well.

For one break in quadratic trending data, Vogelsang's (1997) Sup Wald (or SupW_t) test involves estimating the following version of the Augmented Dickey-Fuller (ADF) regressions:

$$R_t = \mu + \beta_1 t + \beta_2 t^2 + \theta DU_t + \gamma_1 DT_t + \gamma_2 DT_t^2 + \sum_{i=1}^{k} c_i R_{t-i} + \varepsilon_t \quad (1)$$

where DU_t and DT_t are break dummy-variables that take the values

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

R_t in Equation (1) denotes either MY or XY. 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, and following BP, we call this specification model I. For the linear trending data, model II

imposes the restrictions $\beta_2 = \gamma_2 = 0$, and for non-trending data, model III, the restriction is $\beta_1 = \beta_2 = \gamma_1 = \gamma_2 = 0$.

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.

Equation (1) is estimated sequentially for each break year with 15 percent trimming, i.e., for $0.15T < T_B < 0.85T$, where T is the number of observations. For model I, SupW_t is the maximum over all possible trend breaks, of three times the standard F-test statistic for testing the null hypothesis $\theta = \gamma_1 = \gamma_2 = 0$. For model II, Sup$W_t$ is the maximum of two times the standard F for testing $\theta = \gamma_1 = 0$, and for model III, SupW_t is the maximum of the standard F-statistic for testing $\theta = 0$.

As mentioned, Vogelsang's test, which we use to determine the existence and timing of the trend breaks, 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 the Phillips-

Perron (1988) unit root test with a linear time 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 I, the model of 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 I null cannot be rejected, then model II is estimated and the results are reported if we reject the null of no-trend-break. If model II null cannot be rejected, then model III 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 where significant breaks were detected are reported in Table 1. For the MY ratio, the no-trend-break null was rejected in 48 out of the 59 countries at the 10% significance level, 38 at the 5% level, and 23 at the 1% level. For the XY ratio, the null of a no-trend-break was rejected in 41 out of the 59 countries at the 10% significance level, 33 at the 5% level, and 21 at the 1% level. Most of the breaks were detected when the quadratic-trend model was applied (in 73% of the breaks for the imports\GDP ratio, and in 88% of the breaks for the exports\GDP ratio).

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. Therefore, 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 computed the percent changes in the postbreak to prebreak trade ratios and found that about 80% of the countries that had experienced significant breaks exhibited increases in trade shares. Although BP noted the possible effect of 1973 oil shocks on these breaks, they mostly attributed them to trade liberalization reforms that countries were undertaking, especially after the Kennedy Round between 1964 and 1967.

In the following we reevaluate BP's comparative analysis of the prebreak\postbreak trade ratios using a different procedure. The raw data reveal clear upwarding trends in both of the trade ratios, 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 Germany. From Table 1, the SupW_t statistic results reveal a significant break in the case of Germany in 1985 and a statistically insignificant break in 1979 in Finland's case. In both cases, the percent changes in postbreak to prebreak trade ratios are positive (11% for Finland and 18% for Germany). As can be seen from figures 1 and 2, prior to the breakpoints there were upward sloping trends of the MY ratios and despite the downward sloping of these trends after the breaks, the percent changes in the postbreak to prebreak trade ratios averages were still largely positive. Adopting BP's interpretation one can argue that Germany but not Finland had experienced a dramatic change in its imports\GDP as a

result of trade liberalization reforms that it might have undertaken prior to the break year. However, according to our graphs, both countries had shown very similar trends in their trade shares, and no one can argue that the turn from a positive into a negative sloping trend, following the break (or the most plausible break) is a possible result of trade liberalization. Figures 3-13 depict similar findings for both trade ratios where significant breaks were detected and where the postbreak trend is negatively sloped. We now show that the likelihood of a positive change in the trade ratio of a country chosen randomly at any point of time is independent of the significance of a break in that year and of trade liberalization. To accomplish this, we calculate the probability of a positive change in the trade ratio of country *j* at period T_B, both chosen randomly, such as the following:

$$P_{jT_B} = \frac{\sum_{T_B=4}^{T-4}\sum_{j=1}^{N} I(f(t,T_B)>1)}{N(T-8)}, \text{where} \quad f(t,T_B) = \frac{\sum_{t=T_B}^{T} R_{jt}/(T-T_B+1)}{\sum_{t=1}^{T_B-1} R_{jt}/(T_B-1)}, \text{ and } I$$

represents the indicator function that takes the value 1 if its argument is true, *n* is the number of countries, and R_{jt} represents a trade ratio of country *j* at period *t*. Table 2 shows the calculated probabilities of a positive change for all the countries examined as well as for various groups of countries.

As can be seen from Table 2, there is a two-thirds chance for a country chosen randomly at any point of time to experience a positive change in either one of its trade ratios, regardless if a significant break was detected in that year or not. For OECD countries, the probability of a positive change in the exports ratio is about 90%, and in all countries with no significant break, the probability of a positive change in the imports\GDP ratio is 79%, 15% larger than that in countries with significant breaks. Finally, it is worth noting that for the US, the probability is 100%, for both MY and

XY. These results indicate that a positive percent change in a country's trade ratios is not necessarily a result of trade liberalization.

Next, we suggest a procedure for making a comparative analysis of the prebreak\postbreak changes in trade ratios 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. The rationale for doing this is simple: if we assume a trend in the trade ratios, then the prebreak\postbreak comparison of the trade ratios should be based on this assumed trend. In other words, if a breakpoint is not detected, then beyond any point of time the observed trend is the same trend obtained by extrapolating the trend up to that point of time, and the calculated averages based on these trends will be identical. A dramatic positive change at a specific date would shift the trend above the continuation of the prebreak trend at least for some time after the break. This shift is of course sufficient for the postbreak average to exceed the prebreak one.

Table 3 presents the percent changes in postbreak actual trade ratios to the extrapolated postbreak trade ratios based on the trend until the break date (labeled *AA*), and those based on BP's procedure. For the imports\GDP trade ratio, in 29 out of the 48 countries where significant breaks were detected, the average of the actual values was lower than the average that would have prevailed if the prebreak trend was to continue. For example, in Belgium, the percent change in the imports\GDP averages according to our procedure is -22% compared to 39% according to BP's procedure; in Canada it is -28% compared to 22%; in France -25% compared to 62%; in Germany -33% compared to 189%; in Italy -12% compared to 46% , and in the UK -1.6% compared to 25%. In only 10 of these 29 countries, the postbreak average was lower than the prebreak average according to BP's procedure. In another five cases,

the averages of the actual data, even though higher than the average of the extrapolated values, still fall far below those computed using BP's procedure. For example, for the US, according to BP's calculation, the percent change in the imports\GDP ratio is 143% whereas according to ours it is only 3.1%.

The results on the exports\GDP ratios show that in 28 out of the 41 countries where significant breaks were detected, the averages of the actual postbreak trade ratios were lower than the averages of the extrapolated values based on the continuation of the prebreak trend. In Belgium, the percent change according to our procedure is -26% compared to 52% according to BP's procedure; in Germany it is -27% compared to 61%, and in the UK -29% compared to 23%. In only 8 of these 28 countries, the postbreak average was lower than the prebreak average according to BP's procedure. In five other cases, the percent changes according to our calculations are positive, however, they still fall far below those found using BP's procedure. These 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 being higher than the extrapolated ratios. In the following section we evaluate the effects of the Kennedy Round and the 1973 and 1979 oil shocks to determine which of these is more likely to be the cause of the structural breaks in these trade ratios

4.1 The Kennedy Round and the Oil Shocks

The Kennedy Round of the GATT, 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). BP argue that the Kennedy Round was the major determinant of the structural breaks in international trade that occurred in the 70s. Marvel and Ray (1983) suggest, however, that political pressures appear to

have shaped the pattern of protection which emerged from the Kennedy Round so the potential impact of the tariff reductions was partially offset by the introduction of nontariff trade barriers. Furthermore, Rose (1991), who tested for the determinants of imports\GDP ratios in OECD countries, found that even though tariff reductions were significantly related to growth in trade ratios in small countries, these reductions could not explain the trade growth in large countries.

Now we implement a battery of tests to show that oil shocks rather than trade liberalization played the major role in determining the structural breaks in trade ratios. First, we evaluate the effects of the Kennedy Round on enhancing the growth in international trade by comparing the averages of trade ratios over the five years following the first phase of tariff reductions in 1968 (1968-1972) to those over the five years before 1968. The choice of 1972 was dictated by two reasons: First, 1972 is the year when reductions in the Kennedy Round were completed, and second to remove the possible effects of the first oil shock on these ratios. Table 4 depicts the annual average of MY and XY ratios over the 1963-1967 and 1968-1972 periods for four groups of countries. As results show we were not able to reject the null that the mean of MY ratios over the 1968-72 is lower than that over the 1963-7 period, even at the 10% significance level in all cases. However, in all cases we reject the null that the mean of MY ratios over the 1968-72 is higher than that of 1974 at the 1% level. We get similar results for XY, however, for the OECD countries, the mean of XY ratios over the 1968-72 period is significantly higher than that over the 1963-67. Comparing the averages in 1974 to those over 1968-72 gives us insights into the relative contributions of tariff reductions and the oil shock to the changes in trade ratios. As the t-test results show, in each of the four groups of countries, the mean of

either MY or XY ratio is significantly higher in 1974 than that over the 1968-72 period at the 1% level.

Second, we look at the timing of the breaks and their closeness to the 1973/4 and 1979/1980 oil shocks. The closer the years of trade breaks to the years of the oil shocks the higher the likelihood that the structural breaks are the results of these shocks. In our sample, between 1973 and 1981, 24 significant breaks were detected in imports ratios, which accounts for 55% of the total significant breaks. For the same period, 24 breaks were detected in export ratios, (64% of the total detected breaks). Since the effect of the oil shocks and the resulting price changes on trade ratios is country specific, we would not expect the break dates to match exactly with the dates of the oil shocks, should the latter were responsible for the breaks. Nonetheless, if we narrow the range and focus on the years 1973/4 and the 1979/80, we still find 14 breaks (32%) in import ratios and 12 breaks in export ratios (33%). These results support our hypothesis that oil shocks rather than trade liberalization measures were more likely to have caused the structural breaks.

Finally, we proceed to explicitly test for the effect of changes in relative prices of imports (exports) resulting from the oil shocks on trade breaks. To isolate the possible effect of price changes resulting from the oil shocks on the structural breaks of the trade ratios, it would be desirable to test for structural breaks in the real trade ratios or the relative prices of imports (exports). Unfortunately, the lack of data for import and export prices for the majority of countries in this study prevents us from doing that. For countries where data are available, we use the following decomposition of a nominal trade ratio to test for structural breaks in relative prices of

imports (exports).

$$\frac{\text{nominal imports (exports)}}{\text{nominal GDP}} \equiv \text{nominal trade ratio} =$$
$$= \frac{\text{real imports (exports)}}{\text{real GDP}} \cdot \frac{\text{imports (exports) price}}{\text{GDP deflator}} = \text{real trade ratio} \cdot \text{relative prices}$$

Inspecting the evolution of the relative prices of US, the main focus of BP and the country with greatest growth rate of nominal MY ratio among the OECD countries over the 1968-1972 period, clearly explain the level shift of the nominal imports ratio in 1973. The SupW_t test reveals a highly significant break in the relative prices of imports in 1973, the same year where a structural break was detected in the nominal import\GDP ratio. Not only that, but the level shift in relative prices of imports duplicates that of the nominal imports\GDP ratio (see Figures 14 and 15). Figure 16 shows that the actual postbreak trend of the real import\GDP ratio lays totally below the extrapolated postbreak trend. When we decompose the exports\GDP ratio, the break year in relative prices is 1972, the same year as the structural year in nominal exports\GDP ratio (see Figures 17 and 18). Figure 18 shows a sharp level rise in relative prices in 1972. Figures 19-22 depict the structural shifts in the relative prices of imports (exports) for countries where postbreak trade ratios had incorporated positive level shifts. As can be seen, in almost all cases the break date is identical to the break date of the nominal trade ratio. Thus, it appears that the oil shocks rather than the trade liberalization policies are responsible for the significant breaks detected in the trade ratios.

5. Concluding Remarks

In this paper we reevaluated Ben-David and Papell's claim that the structural breaks in trade shares during the post war period combined with higher postbreak trade averages compared to prebreak averages are the result of the trade liberalization that followed the Kennedy Round. We showed that a randomly chosen country has a

67% chance to increase its trade shares at any point of time, regardless if it had experienced a significant break at that point, if it had undertaken trade liberalization actions or not, and even if that country was not a GATT member by the break time. Furthermore, the averages of trade ratios of a country following a significant break to the averages that would be obtained if the trend preceding the break was to continue, reveals that actual averages are in general lower than those based on the extrapolated trends. We also found that the majority of the breaks had occurred around the time of the oil shocks of 1973/4 and 1979/80. Also, structural breaks in the nominal trade ratios trends that had incorporated a level shift, as in the case of the US, coincided with a strong level shift in the trend of the relative prices of imports (exports). In light of these findings we conclude that, contrary to BP, the oil shocks of the 70s, and the resulting drastic changes in the relative prices of imports (exports) are responsible for the structural breaks in the trends of trade ratios.

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Table 1 - Results of Sequential Trend Break Tests

$$R_t = \mu + \beta_1 t + \beta_2 t^2 + \theta DU_t + \gamma_1 DT_t + \gamma_2 DT_t^2 + \sum_{j=1}^{k} c_j R_{t-j} + \varepsilon_t$$

	Import-GDP ratios				Export-GDP ratios			
	Country	**Break Year**	**Model**	**SupW_t**	**Country**	**Break Year**	**Model**	**SupW_t**
1	Algeria	1962	I	39.1***	Australia	1971	III	19.3**
2	Australia	1971	I	31.6**	Austria	1985	I	22.14^{+++}
3	Austria	1968	I	36.0**	Belgium	1974	I	30.3*
4	Belgium	1983	I	53.3***	Brazil	1982	I	69.6***
5	Brazil	1974	I	35.7**	Cyprus	1975	I	46.9***
6	Canada	1981	I	29.8*	Ecuador	1971	II	22.94*
7	Colombia	1977	III	13.15^{+++}	El Salvador	1980	I	86.4***
8	Costa Rica	1982	II	38.5***	Finland	1981	I	50.7***
9	Denmark	1972	I	28.0*	France	1970	I	29.9*
10	Dominican R.	1984	III	19.1**	Germany	1985	I	36. 8**
11	Ecuador	1985	I	29.93*	Ghana	1971	I	44.4***
12	France	1966	I	100.8***	Guyana	1981	I	28.4*
13	Germany	1985	I	46.1***	Guatemala	1980	II	29.1**
14	Greece	1971	I	34.7**	Haiti	1979	I	55.1***
15	Guatemala	1981	I	55.5***	Honduras	1980	I	70.2***
16	Guyana	1978	I	48.9***	Iceland	1974	I	32.2**
17	Haiti	1978	III	29.5***	India	1975	I	82.9***
18	Honduras	1973	I	29.5*	Ireland	1971	I	28.7*
19	Iceland	1974	II	22.9*	Italy	1979	I	102.9***
20	India	1973	I	28. 5*	Jamaica	1979	I	29.9*
21	Ireland	1978	I	56.5***	Japan	1977	I	34.6**
22	Italy	1973	I	123.8***	Mexico	1981	I	62.6***
23	Jamaica	1975	I	22.32^{+++}	Netherlands	1981	I	75.1***
24	Japan	1985	II	23.4*	Nigeria	1979	I	24.43^{+++}
25	Korea	1968	I	29.6*	Norway	1985	I	39.9***
26	Mauritius	1972	III	12.43^{+++}	Pakistan	1971	I	57.0***
27	Morocco	1972	I	43.9***	Panama	1973	I	31.5**
28	Netherlands	1985	I	68.5***	Peru	1976	I	17.99^{++}
29	New Zealand	1973	II	33.2***	Philippines	1980	I	19.51^{++}
30	Nigeria	1979	I	23.28^{+++}	S. Africa	1971	I	30.4*
31	Norway	1977	III	20.7**	Spain	1983	I	53.3***
32	Pakistan	1977	III	21.67**	Singapore	1980	I	28.70*
33	Panama	1973	I	86.0***	Sri Lanka	1977	I	137.3***
34	Paraguay	1987	I	33.1**	Sudan	1981	I	37.4**
35	Philippines	1983	II	25.4**	Sweden	1974	I	41.5***
36	Portugal	1978	I	45.4***	Switzerland	1975	I	31.6**
37	Singapore	1979	I	38.2**	Thailand	1985	III	21.6**
38	S. Africa	1979	II	23.9**	Trinidad & Tobago	1973	I	69.1***
39	Sri Lanka	1977	I	88.9***	UK	1977	I	34.1**
40	Sudan	1985	I	31.1**	USA	1972	III	27.3***
41	Sweden	1973	I	40.1***	Venezuela	1981	I	27. 72^{+++}
42	Switzerland	1974	I	28.7*				
43	Thailand	1987	II	24.0*				
44	Trinidad & Tobago	1973	I	65.6***				
45	UK	1973	I	56.4***				
46	USA	1973	I	34.1**				
47	Venezuela	1976	I	38.3**				
48	Zambia	1971	I	37.4**				

***,**, 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. And, for model III the critical values are 22.48, 17.88, and 15.78, respectively.

$^{+++}$, $^{++}$, and $^{+}$ denote statistical significance using stationary critical values at the 1, 5, and 10% levels from Table 2 of Vogelsang (1997). For model I, these values are 19.9, 15.84, and 13.96, respectively. For model II, the critical values are 17.51, 13.29, and 11.25, respectively. And, for model III the critical values are 13.02, 9.0, and 7.32, respectively.

Table 2 - Probability that the percent change in the postbreak to prebreak trade ratio is positive for an arbitrary break year

Group of Countries	Imports\GDP ratio	Exports\GDP ratio
All Countries	67.4%	62.9%
Countries with significant breaks	63.9%	66.0%
Countries with no significant break	78.7%	58.9%
OECD	68.0%	89.3%
Non-OECD	67.1%	47.1%
Non-OECD with significant breaks	62.5%	44.4%
USA	100%	100%
UK	86.8%	100%

Table 3 - Trend Breaks and Changes in Trade

	Import-GDP ratios				Export-GDP ratios			
	Country	Break Year	%change (BP)	%change (AA)	Country	Break Year	%change (BP)	%change (AA)
1	Algeria	1962	-35.8	-34.6§	Australia	1971	-17.3	-17.3
2	Australia	1971	-17.9	-49.1	Austria	1985	29.8	1.8
3	Austria	1968	35.9	110.7	Belgium	1974	51.9	-26.2
4	Belgium	1983	39.1	-21.8	Brazil	1982	19.3	5.0
5	Brazil	1974	-15.5	-38.9	Cyprus	1975	2.4	-27.5
6	Canada	1981	21.6	-28.2	Ecuador	1971	45.6	112.1
7	Colombia	1977	14.3	14.3	El Salvador	1980	-41.5	-65.1
8	Costa Rica	1982	9.2	-25.8	Finland	1981	15.4	-32.6
9	Denmark	1972	-2.2	104.3	France	1970	60.8	-13.0
10	Dominican R.	1984	53.2	53.2	Germany	1985	23.5	-26.7
11	Ecuador	1985	23.4	37.2	Ghana	1971	-48.7	-14.0
12	France	1966	61.5	-25.2	Guyana	1981	16.2	-20.0
13	Germany	1985	18.2	-32.9	Guatemala	1980	-9.0	-37.7
14	Greece	1971	33.0	359.3	Haiti	1979	-27.0	-63.8
15	Guyana	1978	37.3	-27.3	Honduras	1980	-10.4	-49.0
16	Guatemala	1981	15.3	-31.4	Iceland	1974	7.1	5.3
17	Haiti	1978	43.3	43.3	India	1975	21.1	-31.9
18	Honduras	1973	17.9	-2.6	Ireland	1971	99.2	61.8
19	Iceland	1974	-6.1	-12.9	Italy	1979	37.8	-37.9
20	India	1973	23.8	100.6§	Jamaica	1979	12.2	-21.7
21	Ireland	1978	20.8	-33.3	Japan	1977	15.6	-28.5
22	Italy	1973	46.0	-11.8	Mexico	1981	127.8	56.8
23	Jamaica	1975	25.9	-25.6	Netherlands	1981	14.7	-20.5
24	Japan	1985	-37.6	-36.4	Nigeria	1979	38.5	-43.1
25	Korea	1968	115.9	-65.4	Norway	1985	20.9	-26.7
26	Mauritius	1972	29.6	29.6	Pakistan	1971	48.9	185.7§
27	Morocco	1972	21.5	18.5	Panama	1973	9.1	-47.8
28	Netherlands	1985	-13.2	-30.9	Peru	1976	-25.3	342.95
29	New Zealand	1973	2.5	100.7	Philippines	1980	47.4	-20.86
30	Nigeria	1979	10.1	-22.8	Singapore	1980	15.7	-51.9
31	Norway	1977	-22.5	-22.5	S. Africa	1971	-7.9	351.2
32	Pakistan	1977	58.3	58.3	Spain	1983	78.7	-22.4
33	Panama	1973	7.2	-26.7	Sri Lanka	1977	-1.8	89.2
34	Paraguay	1987	71.2	126.3	Sudan	1981	-57.6	33.5§
35	Philippines	1983	50.4	2.1	Sweden	1974	31.3	-33.9
36	Portugal	1978	50.1	-5.0	Switzerland	1975	22.8	-1.3
37	Singapore	1979	55.5	-45.7	Thailand	1985	58.0	58.0
38	S. Africa	1979	-10.3	38.4	Trinidad &Tobago	1973	-16.6	-28.3
39	Sri Lanka	1977	48.9	191.9	UK	1977	23.3	-28.6
40	Sudan	1985	-38.9	-41.8	USA	1972	69.6	69.6
41	Sweden	1973	22.7	10.2	Venezuela	1981	-16.8	-24.6
42	Switzerland	1974	10.5	-15.0				
43	Thailand	1987	75.5	44.0				
44	Trinidad & Tobago	1973	-30.9	-61.8				
45	UK	1973	24.5	-1.6				
46	USA	1973	143.0	3.1				
47	Venezuela	1976	7.0	-31.9				
48	Zambia	1971	-57.4	-56.7				

§ The prebreak trend was downward sloping so the average of the extrapolated ratios was negative, for this reason we compared the actual postbreak average to the level of the trade ratio at the eve of the break year.

Table 4- Trade Averages Before and After the First Phase of Tariff Reductions of the Kennedy Round					
Group of Countries	**Trade Ratio**	**Statistics**	**1963-7**	**1968-72**	**1974**
All countries in sample	MY	$\overline{R}$	30.71	29.36	40.82
		t-test (Pvalue)	-0.99 (0.838)		-2.27 (0.014)
	XY	$\overline{R}$	22.49	21.96	29.9
		t-test (Pvalue)	-0.91 (0. 815)		-3.02 (002)
Countries with significant breaks	MY	$\overline{R}$	22.11	22.55	29.40
		t-test (Pvalue)	0.89 (0.188)		-8.07 (0.000)
	XY	$\overline{R}$	20.35	20.06	25.9
		t-test (Pvalue)	-0.46 (0.680)		-4.42 (0.000)
OECD countries	MY	$\overline{R}$	21.18	21.68	27.9
		t-test (Pvalue)	1.08 (0.146)		-8.40 (0.000)
	XY	$\overline{R}$	17.06	18.40	22.1
		t-test (Pvalue)	3.19 (0.004)		-5.45 (0.000)
LDCs members of GATT by Kennedy Round	MY	$\overline{R}$	21.63	20.60	28.1
		t-test (Pvalue)	-0.71 (0.750)		-2.54 (0.020)
	XY	$\overline{R}$	20.41	18.80	28.1
		t-test (Pvalue)	-1.65 (0.930)		-1.89 (0.050)

$\overline{R}$ denotes the average of the relevant trade ratio over the specified period.

The figure in the first cell of t-test raw is the t-test statistics value for testing the null $H_0 : \mu_{68-72} < \mu_{63-67}$ and the figure in the second cell is the t-test statistics value for testing the null $H_0 : \mu_{68-72} > \mu_{74}$, the corresponding p-values are in parentheses.

Figure 1. Finland - Most Plausible Break Year: 1979

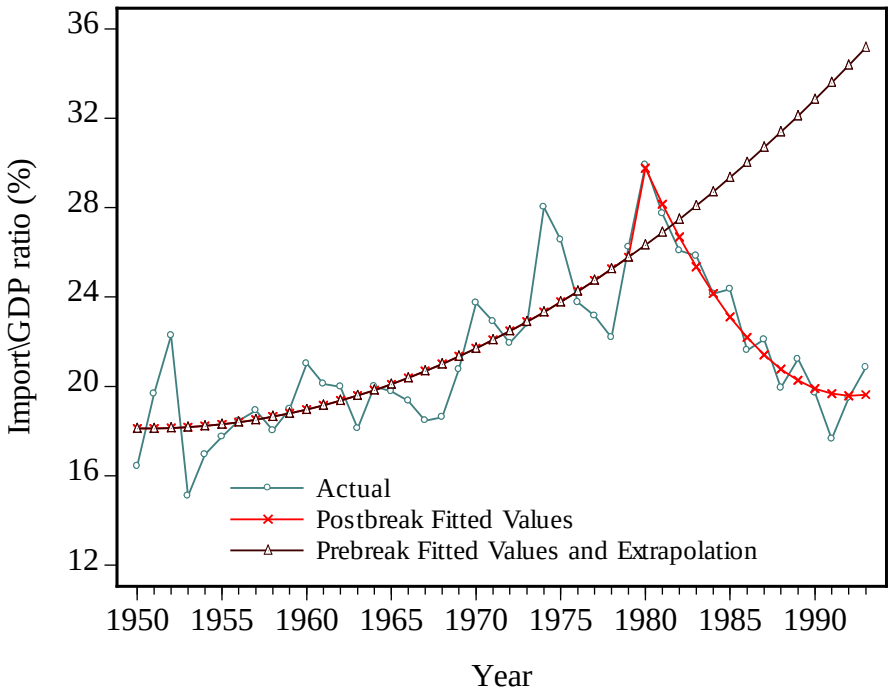


Figure 2. Germany - Break Year: 1985

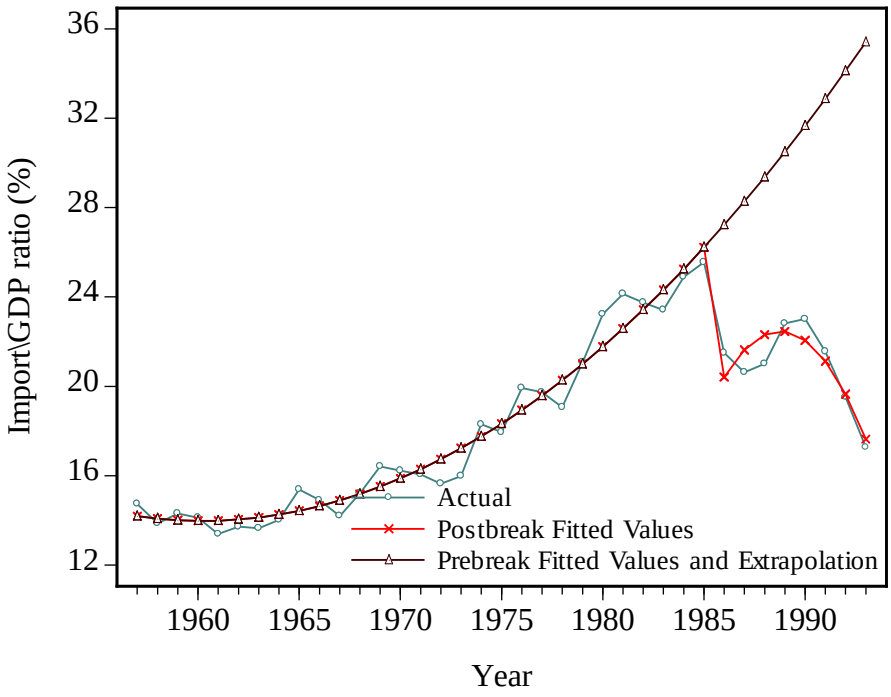


Figure 3. Belgium - Break Year: 1983

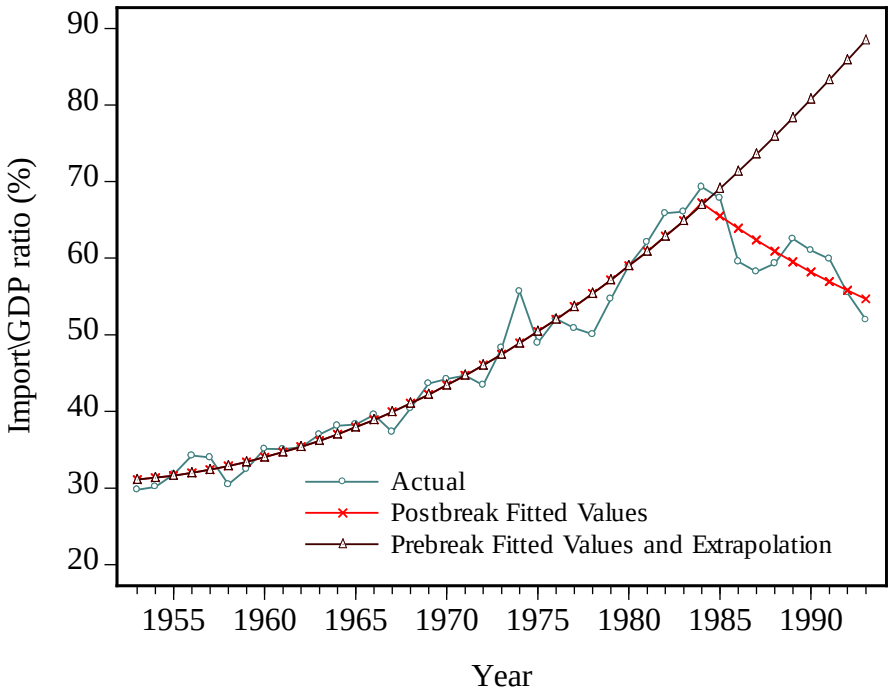


Figure 4. Switzerland - Break Year: 1974

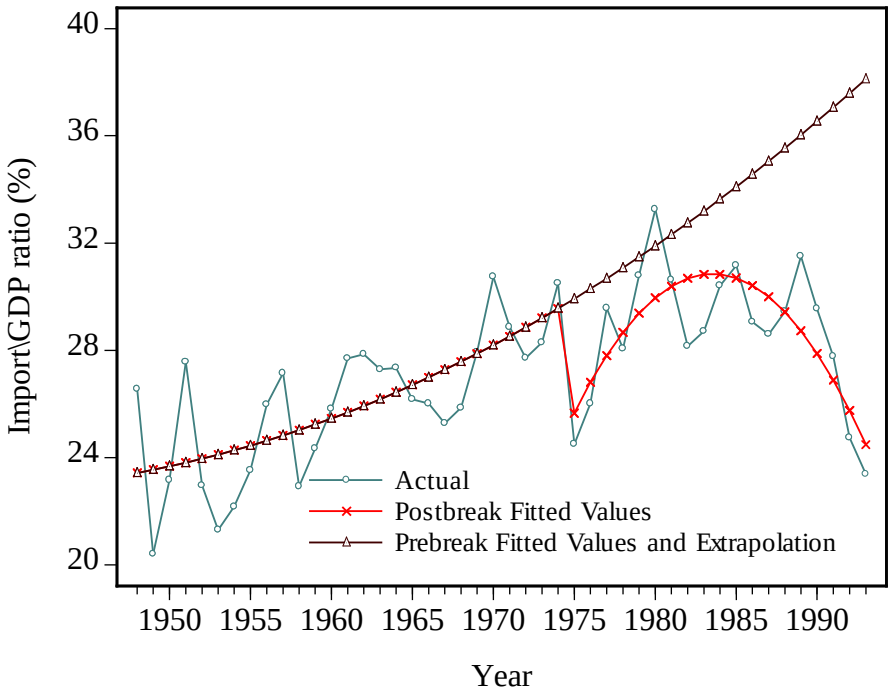


Figure 5. Ireland - Break Year: 1978

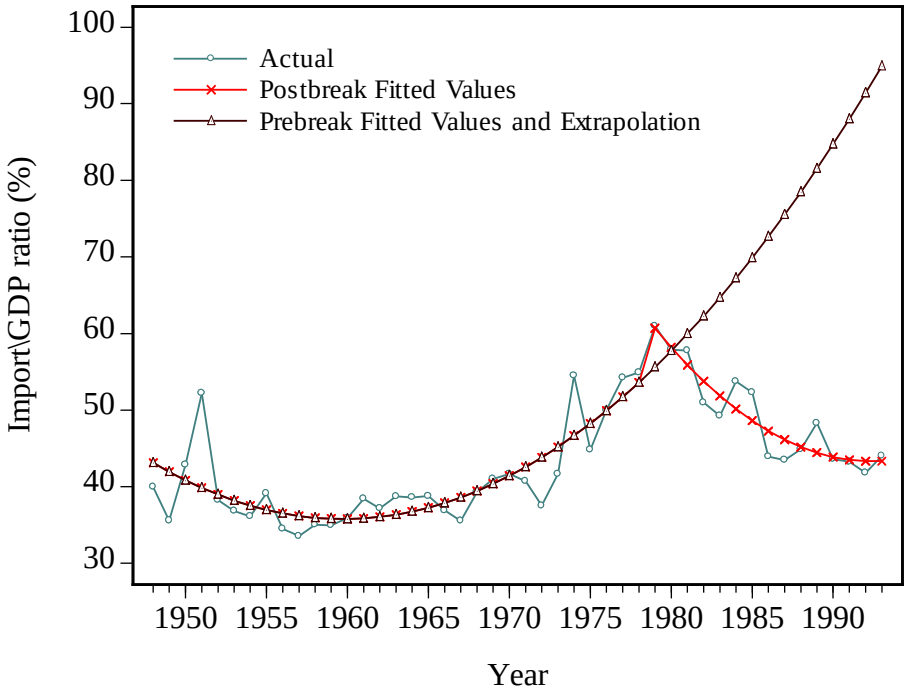


Figure 6. Panama - Break Year: 1973

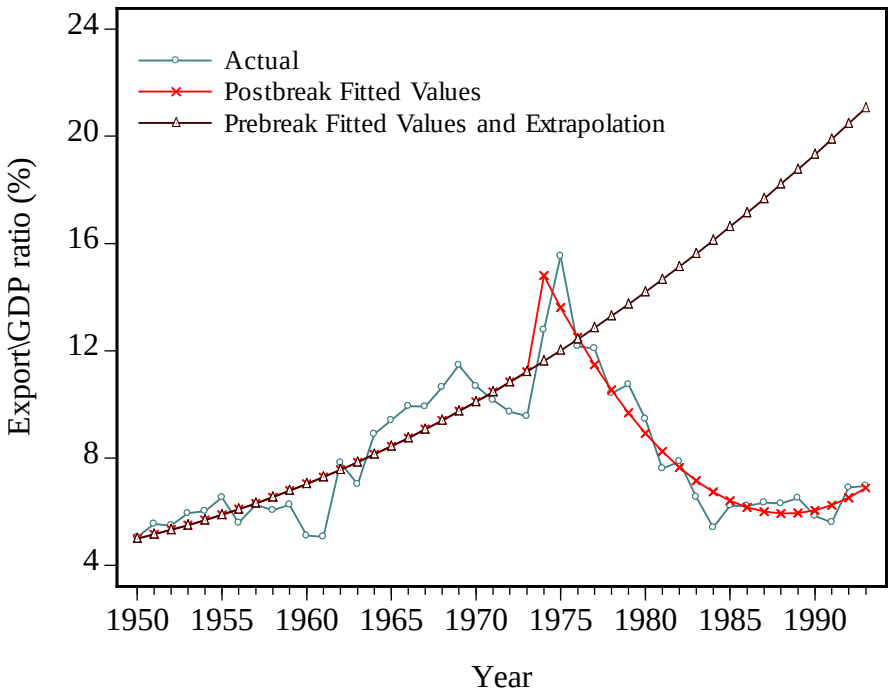


Figure 7. Belgium - Break Year: 1974

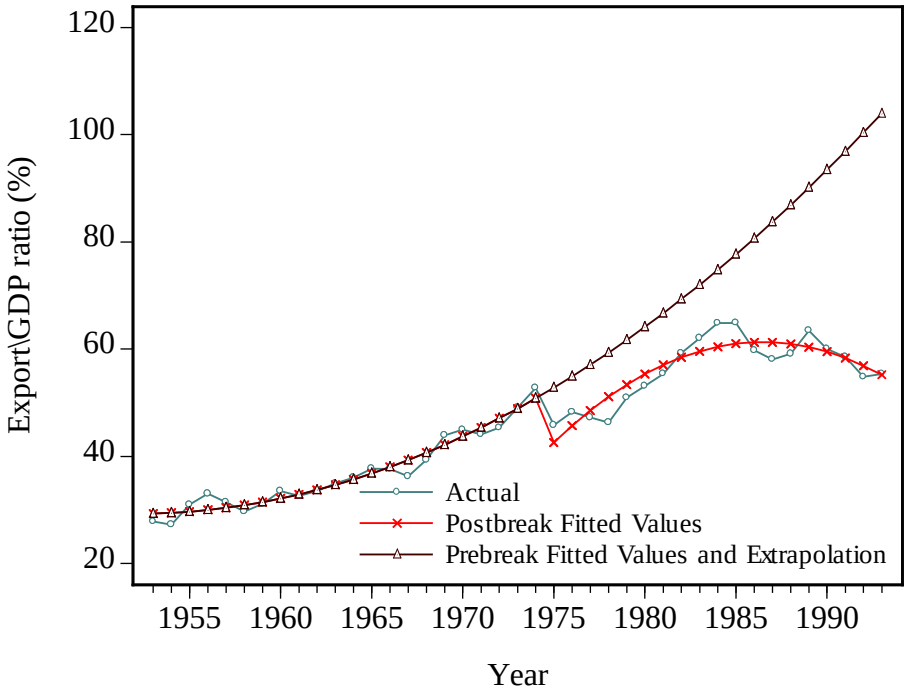


Figure 8. Germany - Break Year: 1985

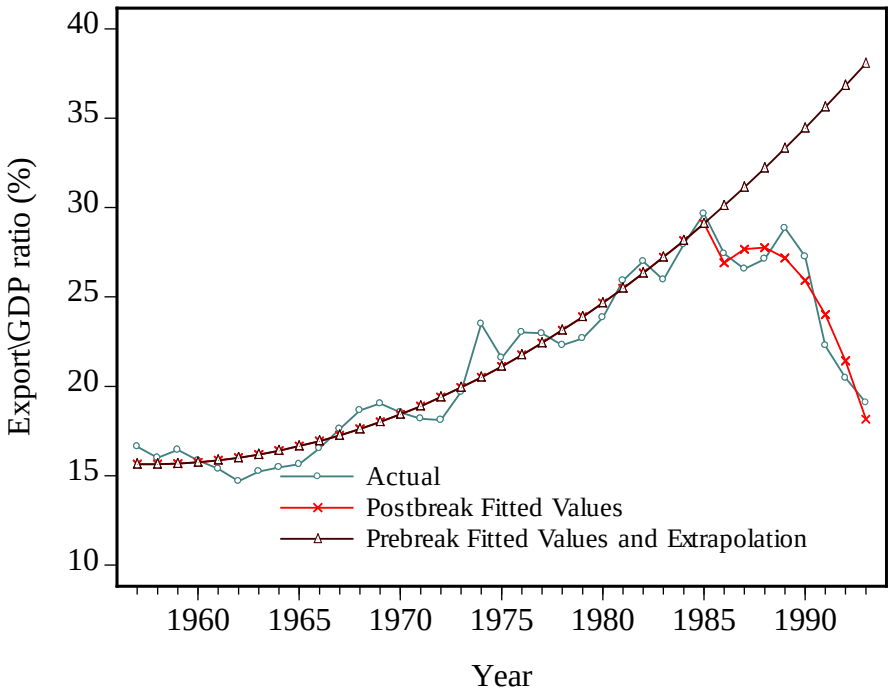


Figure 9. Finland - Break Year: 1981

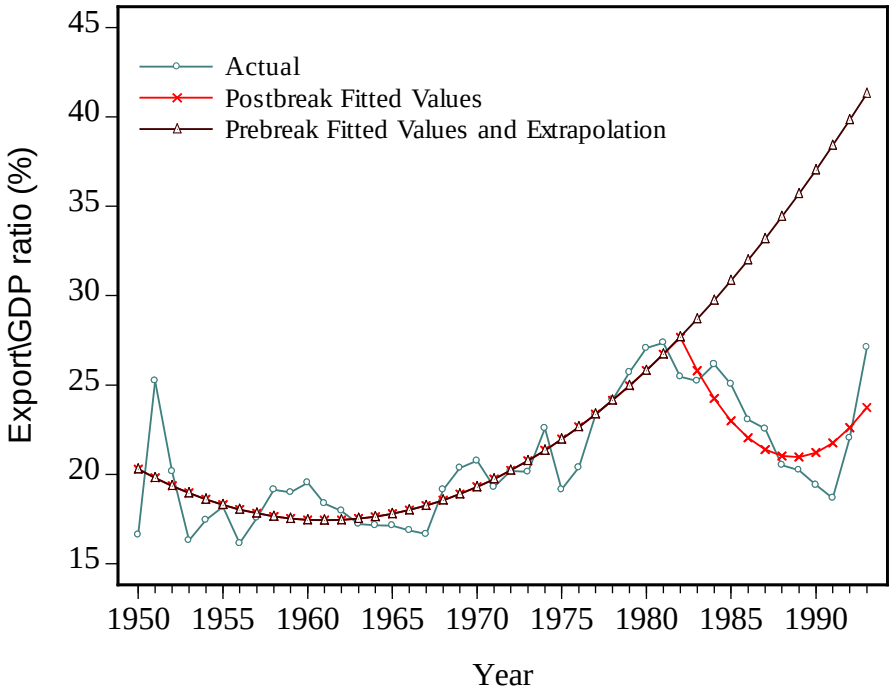


Figure 10. UK - Beak Year: 1977

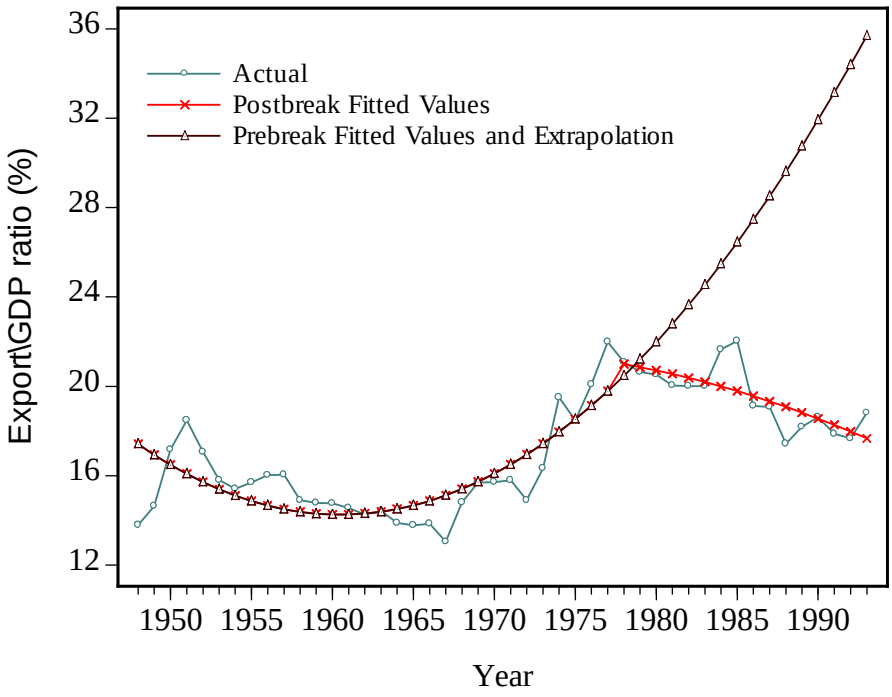


Figure 11. Italy - Break Year: 1979

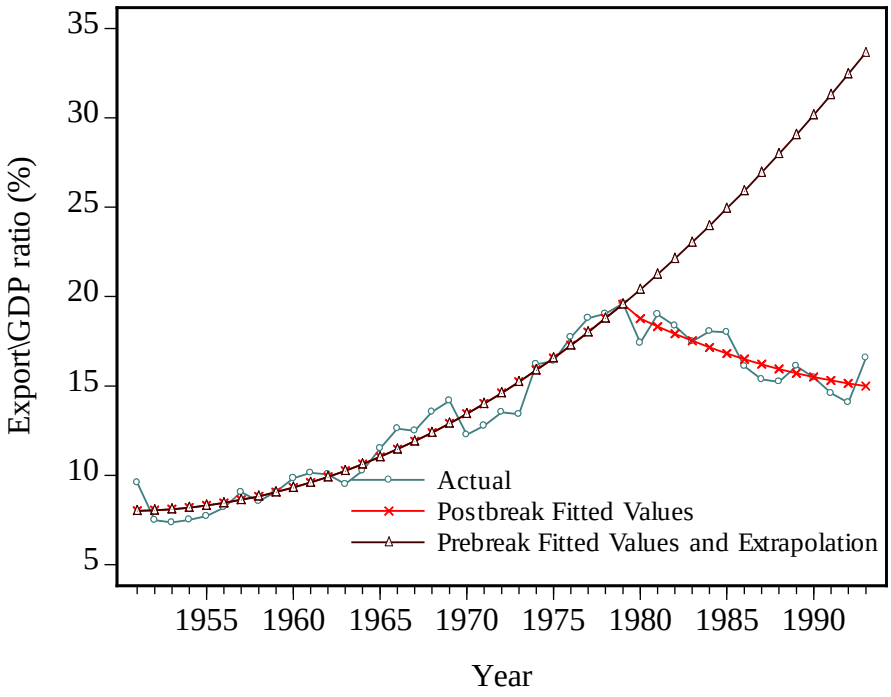


Figure 12. Japan - Break Year: 1977

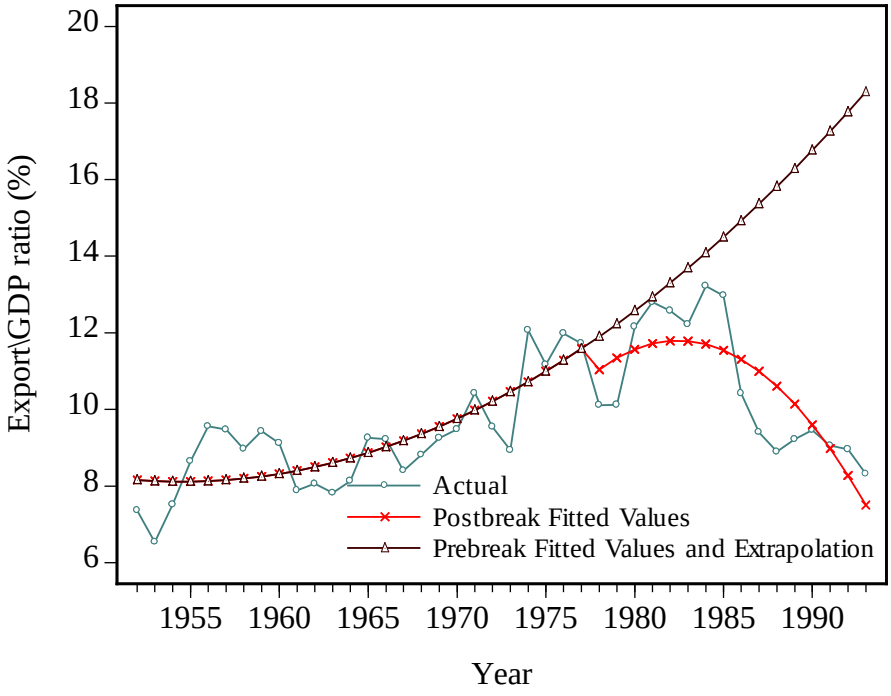


Figure 13. Netherlands - Break Year: 1981

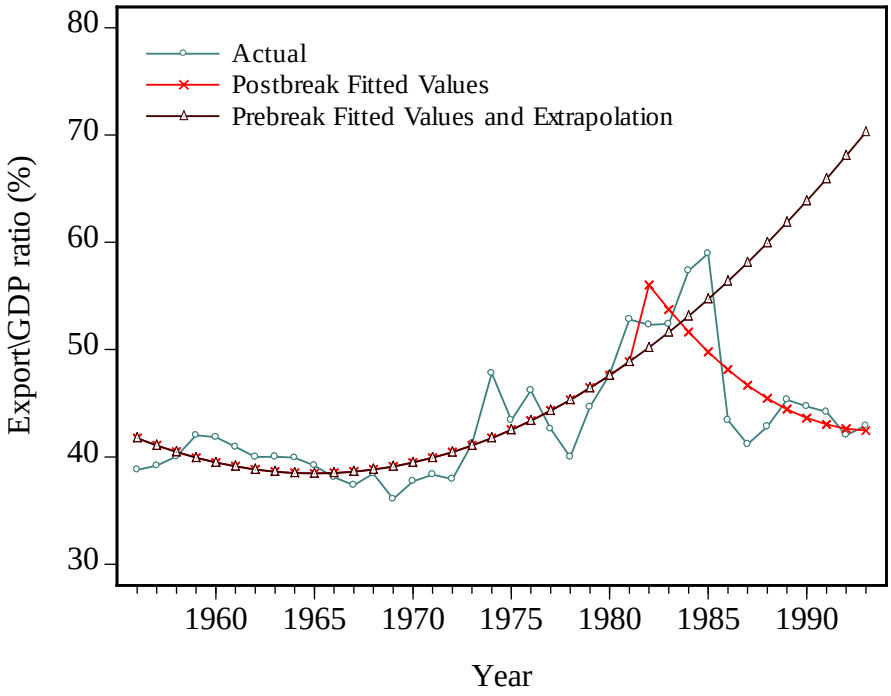


Figure 14. USA - Break Year: 1973

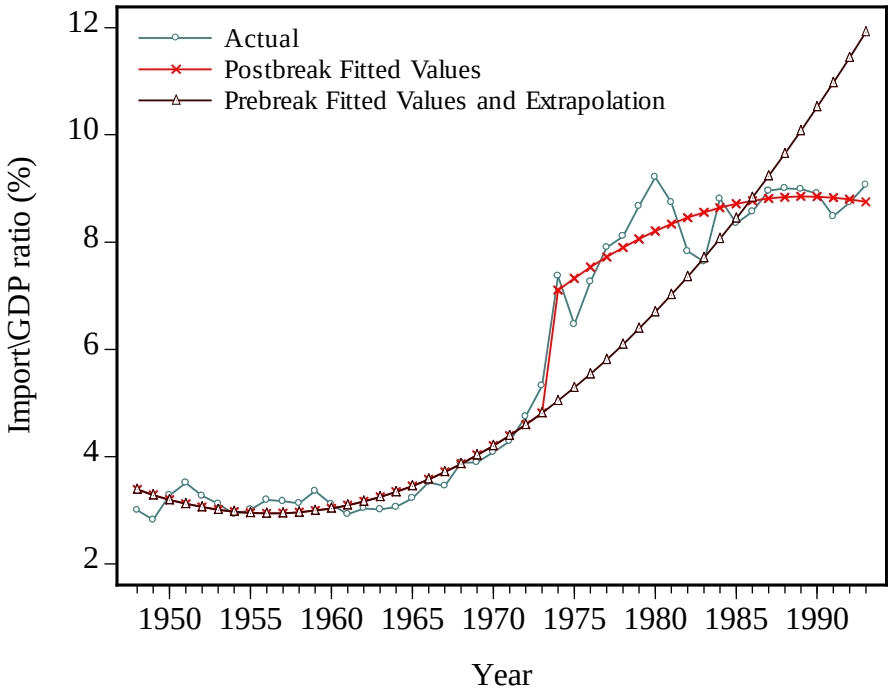


Figure 15. USA - Break Year: 1973

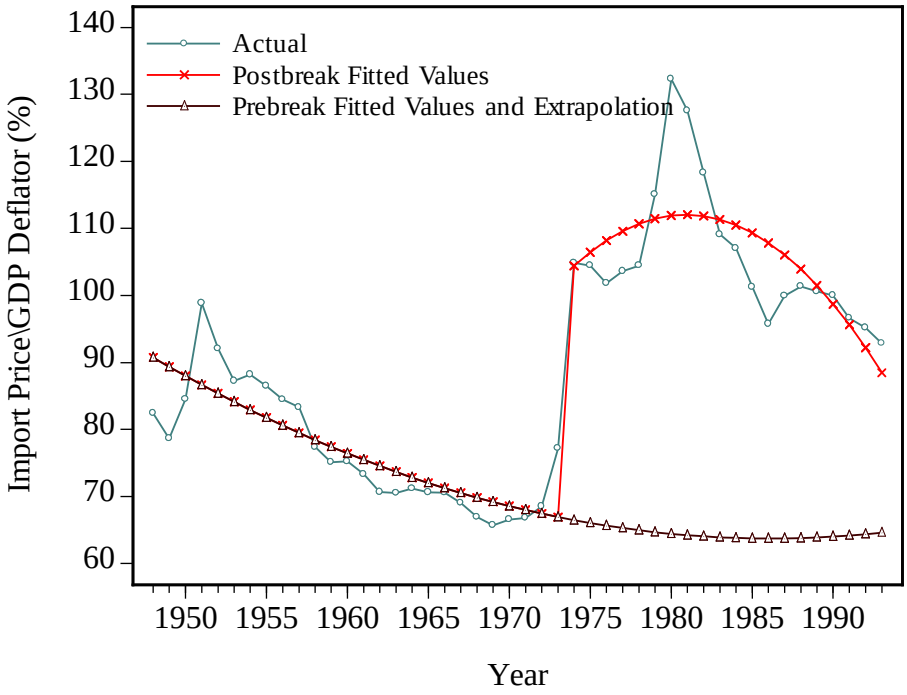


Figure 16. USA - Break Date 1976

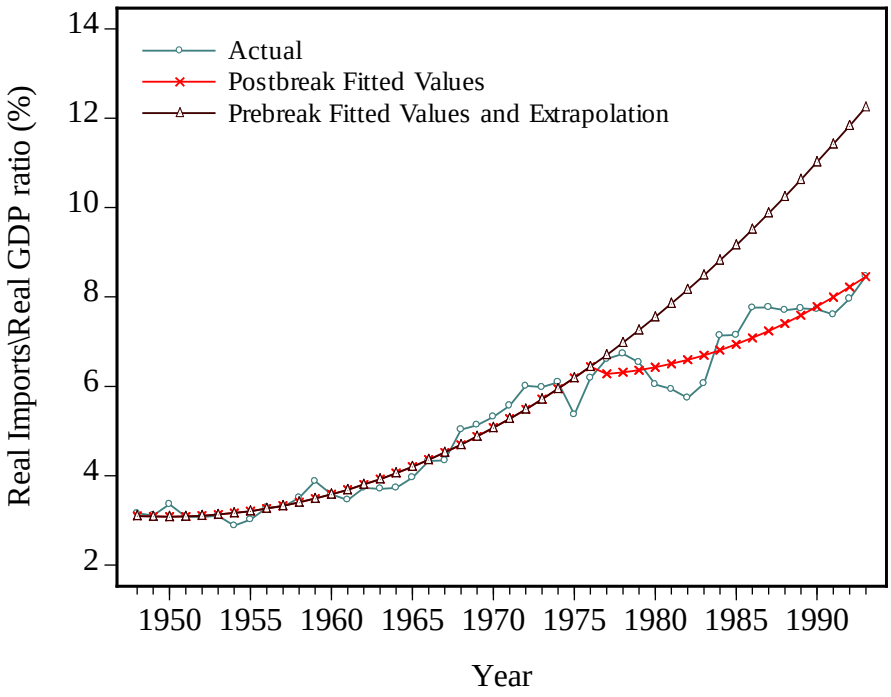


Figure 17. USA - Break Year: 1972

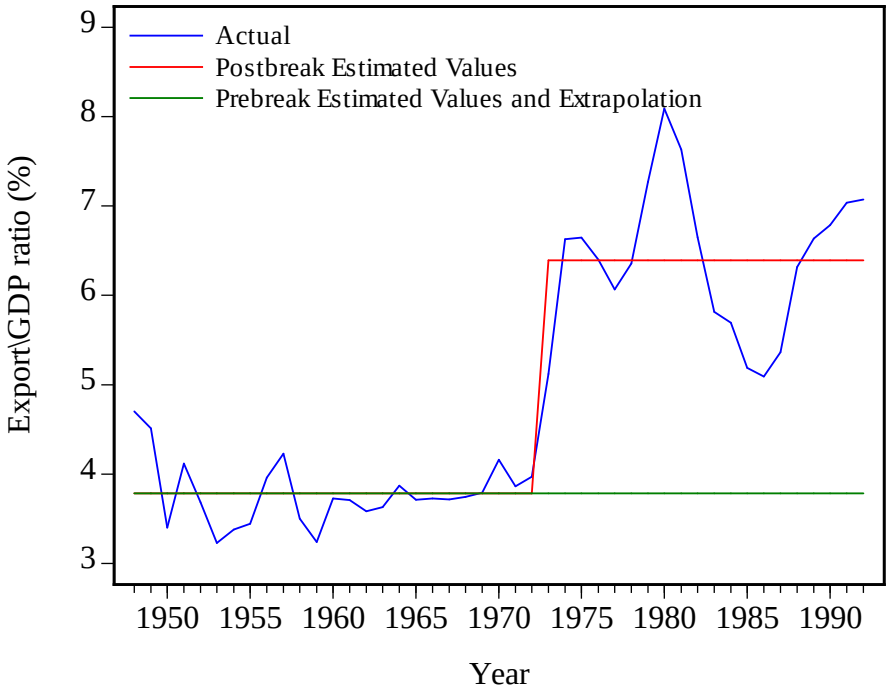


Figure 18. USA - Break Year: 1972

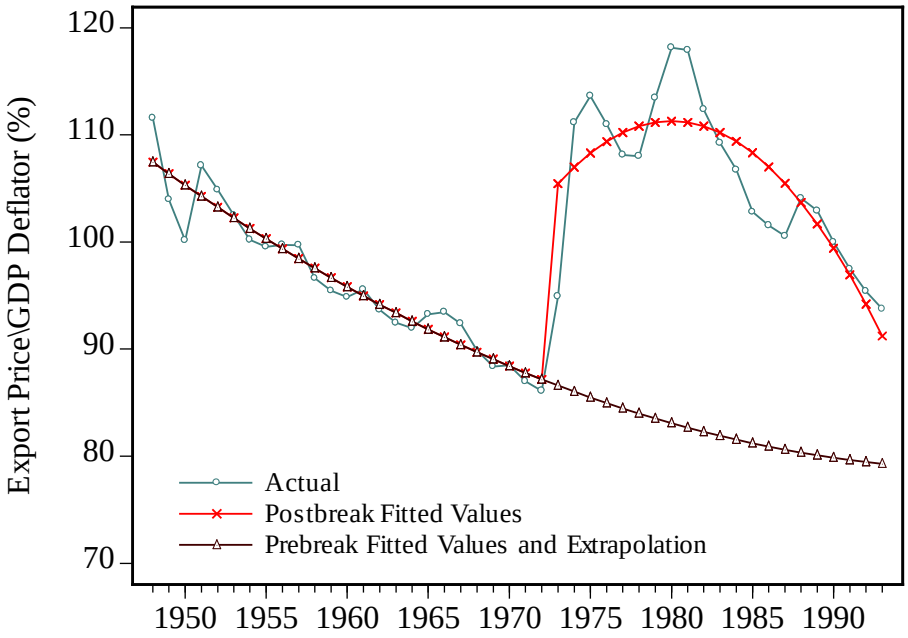


Figure 19. UK - Break Year - 1973

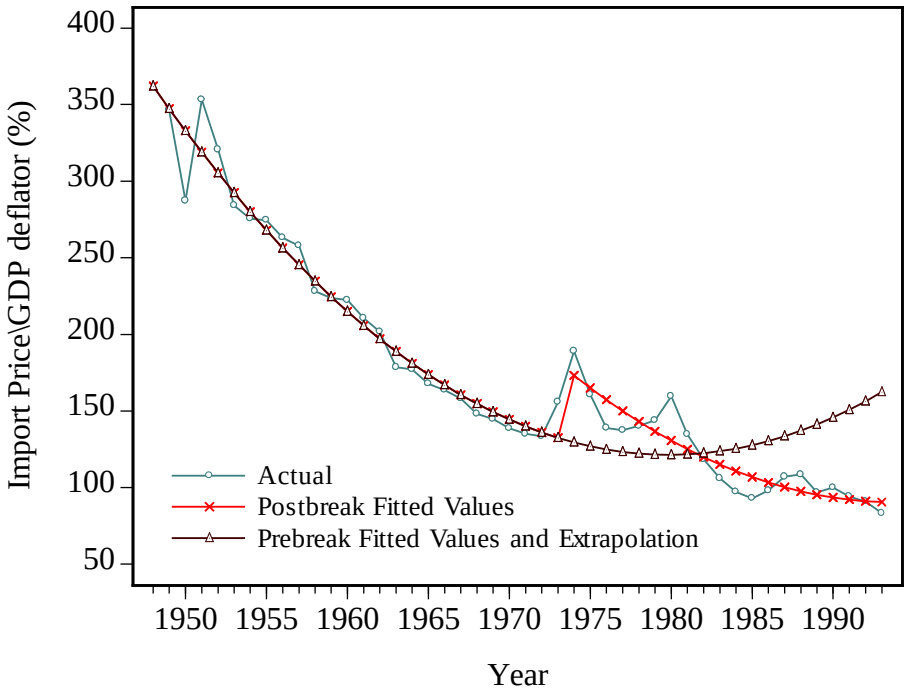


Figure 20. Italy - Break Year: 1973

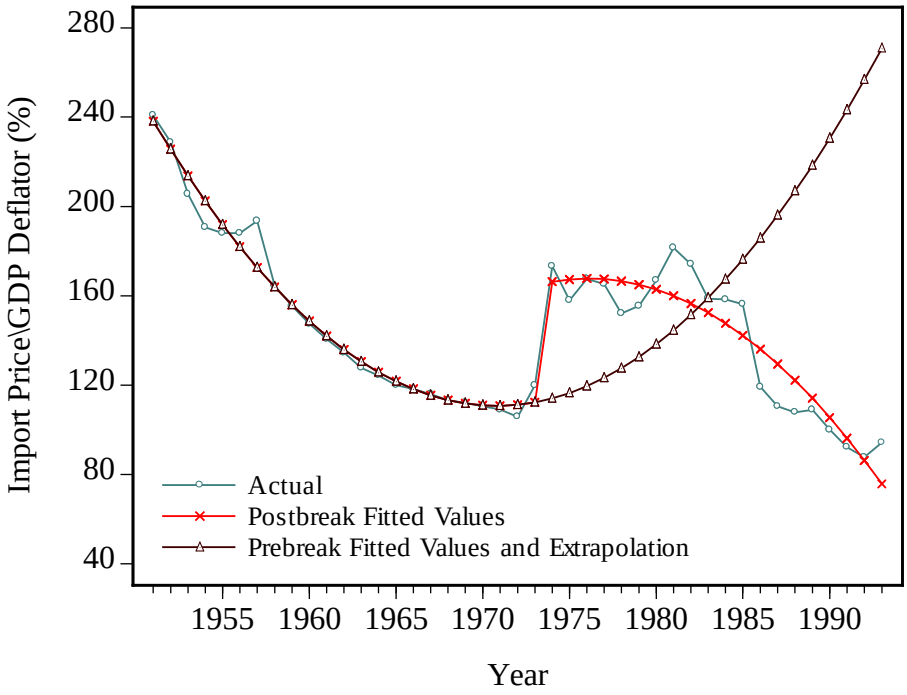


Figure 21. India - Break Year: 1974

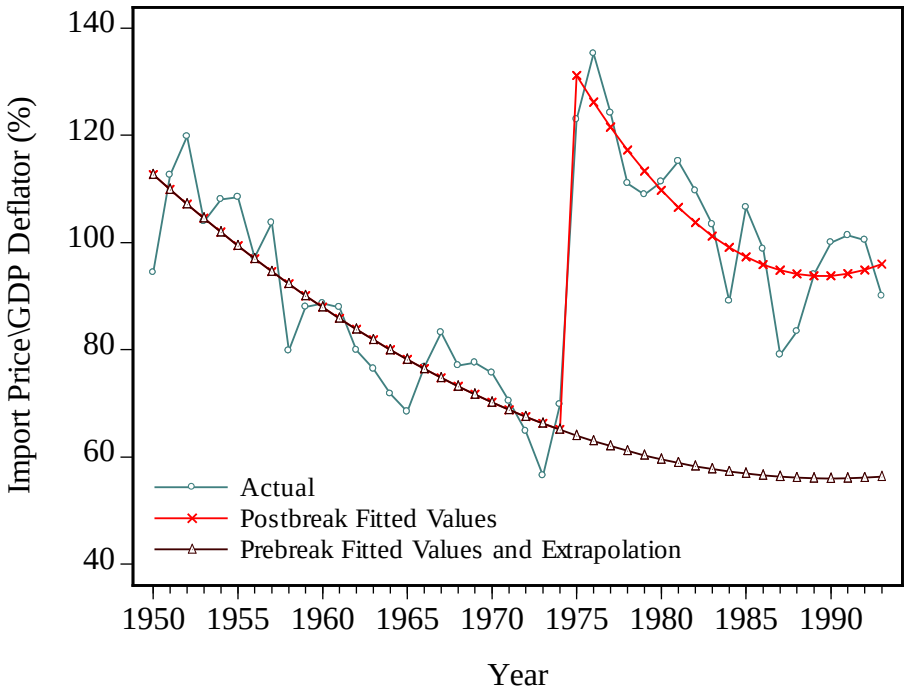


Figure 22. Ireland - Break Year: 1972

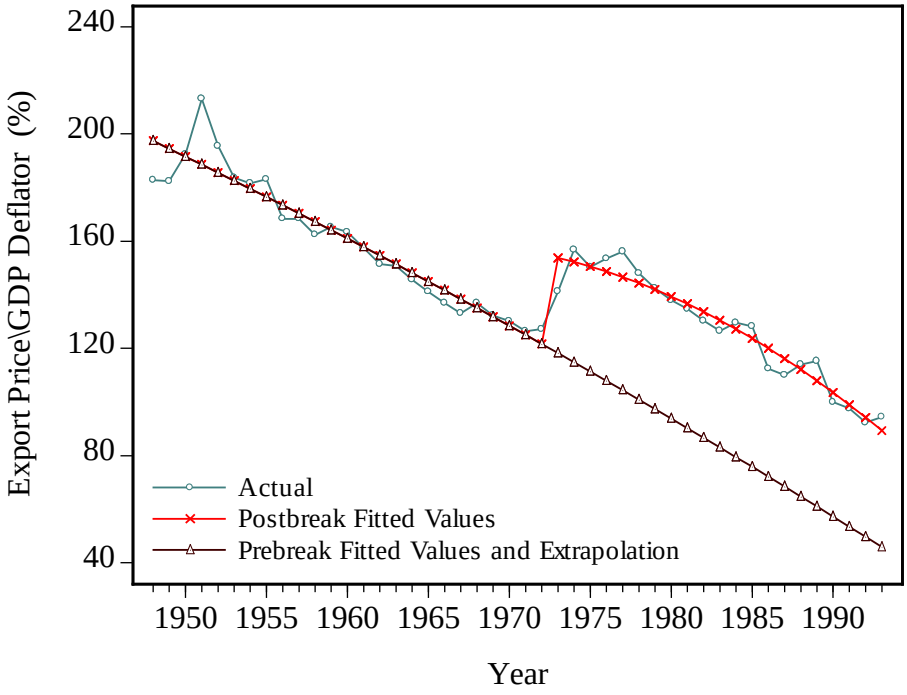
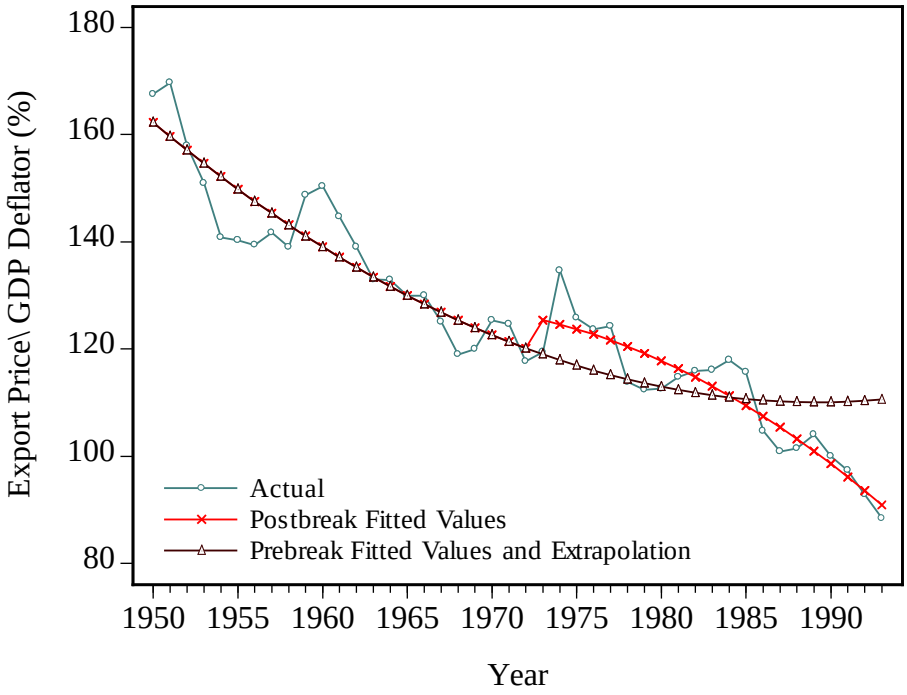


Figure 23. France - Break Year: 1972



Appendix: Table A					
No.	**Country**	**Start**	**No.**	**Country**	**Start**
1	Algeria	1950	31	Japan	1952
2	Australia	1949	32	Korea	1953
3	Austria	1948	33	Malaysia	1955
4	Barbados	1950	34	Malta	1954
5	Belgium	1953	35	Mauritius	1952
6	Brazil	1948	36	Mexico	1948
7	Canada	1948	37	Morocco	1952
8	Colombia	1950	38	Netherlands	1956
9	Costa Rica	1950	39	New Zealand	1948
10	Cyprus	1950	40	Nigeria	1950
11	Denmark	1950	41	Norway	1949
12	Dominican	1950	42	Pakistan	1953
13	Ecuador	1950	43	Panama	1950
14	Egypt	1952	44	Paraguay	1950
15	El Salvador	1951	45	Peru	1948
16	Finland	1950	46	Philippines	1948
17	France	1950	47	Portugal	1953
18	Germany	1957	48	Singapore	1957
19	Ghana	1950	49	South Africa	1950
20	Great Britain	1948	50	Spain	1954
21	Greece	1948	51	Sri Lanka	1950
22	Guatemala	1950	52	Sudan	1957
23	Guyana	1952	53	Sweden	1950
24	Haiti	1955	54	Switzerland	1948
25	Honduras	1950	55	Thailand	1950
26	Iceland	1950	56	Trinidad- Tobago	1951
27	India	1950	57	United States	1948
28	Ireland	1948	58	Venezuela	1950
29	Italia	1951	59	Zambia	1956
30	Jamaica	1950			