Time Series Properties of Japanese Semiconductor Imports and the Effects of the 1986 US-Japan Semiconductor Trade Agreement

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This paper examines the structure of Japanese import and export behavior for semiconductors by analyzing four pertinent quarterly series, namely; import prices of integrated circuits (ICs), real imports of semiconductors, and wholesale and export prices of ICs in Japan during the 1980:1-1996:3 period. Real monthly imports of integrated circuits from 1988:1 to 1996:7 are also examined. The methodology used is that of Perron (1989) wherein he tests the null and alternative hypotheses of a unit root or `trend-stationary` series, respectively, in the presence of possible slope and/or level shifts. The results indicate that real imports of semiconductors appear to have a change in slope in 1986:3, when the first Semiconductor Trade Agreement was signed. In the more limited series of monthly data for imports of integrated circuits, there appears to be an increase in its trend at the start of the second agreement in 1992. Wholesale prices, import prices and exports prices cannot reject the unit-root null and do not show signs of structural break, though this may be due to the limitations of the procedure.

1. INTRODUCTION

On September 2nd, 1986, the US and Japan signed a semiconductor trade arrangement (hereafter referred to as the STA) which in essence agreed to accomplished two goals: 1) to curtail the alleged dumping of semiconductors (in particular DRAM chips) in the US market and 2) to increase the market share of foreign-based chip manufacturers` sales[2] in the Japanese market. At that time, Japanese firms had at least two huge dumping cases pending in the US with the possibility of more US firms jumping on the anti-dumping bandwagon soon. Foreign market share in Japan at this time was around 9 percent (Baldwin, 1994) (US firms accounting for about 80%). In the STA, the Japanese government states, `The Government of Japan recognizes that the US semiconductor industry expects that the foreign market share will grow to more than 20 percent of the Japanese market by the end of 1992 and considers that this can be realized.` (Flamm 1996) The STA was renewed in August 1, 1991 and expired July 31, 1996 with similar wording, although now emphasis was put on meeting the 20% goal and the termination of the old Fair Market Value (FMV) system in favor of a new `fast-track` price reporting system (Flamm 1996).

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[2] One concern must be noted. This policy was intended to increase the market share of semiconductors of `foreign brand name`. That is to say, no matter where the chip was made or where it was shipped from, as long as it was stamped `Motorola` or `TI` for example, and was purchased in Japan, it contributed to foreign market share in Japan under the terms of the agreement. However, only two foreign semiconductor companies (Texas Instruments and Motorola) produced chips in Japan at this time and this amount was very small. Japanese production abroad was also limited (Sumita, 1995).

The method of achieving the first goal is fairly straightforward. Japanese firms were required to submit cost estimations to the Department of Commerce, and from these figures the Department would dictate the price at which Japanese firms could sell their chips. These are the so-called `FMVs`. Non-compliance would result in the re-instatement of the anti-dumping suits, many of which were dropped immediately after signing the agreement. Others were dropped shortly after compliance was ensured.

Action taken by Japanese firms and the government for compliance with the second part of the agreement is less apparent. Some authors state that heavy moral suasion by MITI encouraged reductions or delays in investment in new capacity as well as perhaps pressure on purchasers of chips in Japan to `buy foreign` (Flamm, 1996). Others (including Flamm) feel that although the STA may have had some effect on foreign market presence, other factors such as the shift in demand for those integrated circuits (ICs) for which US firms had a comparative advantage may have explained the gain in market share. The need for high quality EEPROM and MPU chips (Intel`s specialties) by Japanese firms did increase during this time (Sumita 1995). All authors seem to agree that Korean manufacturers (primarily of DRAMs) benefited greatly from the implicit price floor faced by US and Japanese producers in both the Japanese market and worldwide (Baldwin, 1994; Flamm, 1994; Sumita, 1995).

While some authors give guarded praise for the STA (Tyson,1992), many others feel the agreement was a failure and nearly cartelized the industry. Regardless of the benefits it may have afforded US chip manufacturers, in terms of increases in prices, particularly in DRAM exports, the policy was a perfect example of market distortion which injured downstream industries that use semiconductors as an input (see Baldwin 1994; Dick, 1994; Irwin, 1994, for good examples of such criticism).

While the literature on this subject is fairly large and the data compiled in some cases is impressive, there lacks a single econometric study which actually tests the hypothesis that this policy resulted in an increase above and beyond the normal rate of expansion in imports that might have occurred regardless of the policy. In addition, although it seems quite obvious to many that IC prices and in particular DRAM prices rose during this time, a careful econometric study of this has not been either[3]. Finally, although the theoretical literature on this type of Voluntary Import Expansion (VIE) makes a number of predictions as to the behavior of price and quantity in the face of such a policy, these theories have never been truly put the test either. For example, Greaney (1996) finds that VIEs should increase domestic (Japanese) prices. Krishna, Roy and Thursby (1996) also find under a more general model that both Japanese and US consumer prices should rise in all cases save one (if the STA was implemented as an *ex ante* import subsidy to US firms). This paper attempts to remedy such deficiencies by seeing if the data do, in fact, experience something extraordinary during this period.

What this paper cannot do, unfortunately, is dissect the nature of the structural breaks, whether it be in real imports or price behavior, but merely determine their existence. Ideally this would be done for each individual product series, but at this time

[3] Sato (1998), in a very different literature, finds that Japan exports prices of integrated circuits experience a structural break during the first STA. Additionally, in revising their price indices for semiconductors, the BEA conducted hedonic regressions in which STA dummy variables were found to be significant in DRAM and VRAM worldwide prices (Survey of Current Business, February, 1998).

the author does not have the detailed and historical price and quantity data for such an endeavor.

The plan of the paper is as follows. Section 2 describes the data involved. Section 3 describes the procedure for testing the null hypothesis that real imports have a unit root with a possible non-zero drift against the alternative that it is `trend-stationary` and experiences a one time change in the slope of its trend (at the time the STA policy was signed). Graphical analysis is presented to motivate the inquiry. Section 4 presents standard unit-root test results. Section 5 presents the results of the unit-root tests with structural break coefficients. Lastly, in Section 6, the findings are summarized and an interpretation of the results, as well as an assessment of the impact of the STA, is offered.

2. DATA

The data used here are taken from two sources, namely, the *Price Index Annual* published by *The Bank of Japan* (BoJ) and *The Summary Report on Trade of Japan* published by the *Japan Tariff Association* (JTA). They are all original, non-adjusted monthly, yen-denominated indices which have been aggregated to a quarterly series by a simple average as is done by the Bank of Japan in their own calculation of quarterly statistics. All of the series have been seasonally adjusted using the X-11 multiplicative filter, and (following Perron (1989)) all tests were performed on the log transformation of each series. There is considerable debate as to whether or not seasonally adjusting the series, aggregation, and log transformations are appropriate[4]. For a good discussion of the pros and cons of each, see Hatanaka (1996), Banerjee, Dolado, Galbraith, and Hendry (1993), and Ermini and Hendry (1991). Aggregation (from monthly to quarterly) and deseasonalization was done to smooth out the sometimes wide monthly fluctuations in semiconductor data. Although the various series may begin at either 1980, 1981 or 1988, they all end in the third quarter of 1996 (quarterly data) or July of 1996 (monthly data), which marks the expiration of the second STA.

2.1 *Import Prices (quarterly)*

A price index of integrated circuits from the *Bank of Japan Annual Price Index* is used. The data is monthly, but aggregated by way of a simple average (as the BOJ does) to create the quarterly series. A broader `semiconductor` price index also exists, but unfortunately, the definitions in the BoJs `semiconductor` taxonomy change over the time, therefore making it impossible to link, say, the 1990 base index to the 1985 base together in a meaningful way. For this reason only the IC import price index is used. This is actually more appropriate because only ICs, and not the broader class of semiconductors, were targeted by the STA. The JTA does have unit value price indices but they did not seem to properly reflect the real downward trend in semiconductor prices so often described and reported in other data sources (such as the BEA, BoJ, Flamm (1996), etc.). For some discussion on the drawbacks to using unit-values see Kasa (1998).

[4] Although this paper follows Perron and uses the log transformation, identical tests were done in levels for both real import series with mixed results. In the case of the quarterly data, the results in levels were more strongly in favor of a break in trend, while in the shorter monthly series results were weaker.

2.2 *Real Imports of Semiconductors (quarterly)*

Nominal imports (millions of yen) of the broad category of `Thermionic, etc. valves, tubes, semiconductor devices, I.C.s, etc.` Index number 70311 in the most recent classification of the *Summary Report* (similar to those classifications used in the HS or SITC codes) were used. As the STA policy only applied to ICs, the IC subclass is preferable. However, data for the ICs are not reported prior to 1988. For that reason, the broader 70311 category, which is consistent in description back to 1980, is used. It is important to note that of the broad category of semiconductors, imports of ICs has been steadily increasing from 74% of the value of imports in 1988 to 86% in 1998. For that reason, and the fast that IC prices tend to fall much faster than semiconductors in general, the rise in real imports of semiconductors will appear slightly more dramatic than it was in reality.

2.3 *Wholesale Prices of ICs (quarterly)*

A monthly index of wholesale prices of ICs was obtained from BoJ`s *Price Indexes Annual* and then aggregated to quarterly series from 1980:1 to 1996:3.

2.4 *Export Prices of ICs (quarterly)*

A monthly index of wholesale prices of ICs was obtained from BoJ`s *Price Indexes Annual* and then aggregated to a quarterly series. This series, however, starts in 1981:1 and continues until 1996:3. Apparently, the transition from 1975 base year and 1980 base year also involved a change in the composition of the category and as a result the data is not comparable prior to 1981.

2.5 *Real Imports of IC (monthly)*

This series uses the JTA quantities for IC imports deflated by the BoJ import price index for ICs. It spans a shorter length of time as the JTA did not report IC figures prior to 1988. The series runs from 1988:1 until 1996:7.

3. METHODOLOGY

In Perron (1989), the main concern is to determine whether or not structural breaks in a `trend-stationary` series may reverse a failure to reject the null hypothesis of a unit-root, i.e. a random walk with possible non-zero drift. It is an important paper in the trend-stationary/difference stationary debate. However, in testing for stationarity, Perron also includes a trend shift dummy variable and tests for its significance. In essence, it is a Phillips-Perron unit root test with the inclusion of dummy variables as well. While there are other methods to test for structural breaks (such as the Chow test, or other recursive residual regressions) which can be run, these test don`t properly address the unit root question. The Perron procedure also has it drawbacks, however. While a Chow test systematically, and with no *a priori* assumptions, tests for the presence of a structural break at each observation, the Perron procedure is explicitly *conditional* upon the date of the posited break. A test which could simultaneously check for the date of possible structural breaks *and* one in which the trend-stationary/difference stationary question is answered is ideal, but alas, has not yet been developed. However, for the purposes of this paper the technique is sufficient because we are interesting in testing for the *a priori* belief that a shock occurred either in 1986 or possibly in 1992.

While Perron tests for three possible kinds of breaks, a \`crash\`, a change in the growth trend, and a combination of both, the semiconductor series seem (except for export prices) to exhibit possible changes in growth trends, and so all tests will be of Perron\`s Model (A), the \`changing growth\` model. The exception is the export price series which will be modeled as a \`crash\` and growth rate change (the explicit form of this regression is explained later). It is hypothesized that the policy, although signed in September 1986, was not fully implemented until the US had made enforcement of the pact credible. This was done by refusing to lift remaining sanctions until November 1987 (see Flamm, p160-161). So, the regression will be run as a gradual trend shift also allowing for the possibility of correlation of the innovations over time. This suggests we should use Perron\`s modified equation (13) of the form,

$$(1)\, y_t = \mu + \beta t + \gamma DT_t^* + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t$$

Where μ is the intercept term, β is the linear time trend coefficient, γ is the coefficient for DT* where DT*=t-Tb if t>Tb and 0 otherwise. Tb refers to the time of the break where Tb is the number of the observation at that break. The summation term contains the relevant number of lagged difference terms. Estimation and interpretation of this equation for each of the variables in question in the ultimate goal of this paper. Significance of the γ and α terms are of particular importance. A significant γ coefficient indicates the presence of a structural break and change in trend of the variable. An α significantly close to one indicates the presence of a unit root, i.e. the series is difference-stationary rather than trend-stationary. The hypothesis is that many series may have an α close to one in a normal ADF test with an intercept and time trend, but that when a shift parameter is included and is significant, the α term may no longer be significantly close to one.

However, prior to running the above regression it is useful to graphically examine each series in order to motivate the *a priori* decision to test for a change in growth rates at the beginning of the STA. Additionally, full sample standard Perron-Phillips type unit-root test results will be shown which indicate that in the absence of accounting for the shift, all series appear to have unit roots, i.e are I(1) processes.

3.1 *Graphical Analysis (all figures are at the end of the text)*

Figure 1 shows a plot of the logarithm of import prices of ICs. The kinked, straight line is a fitted trend by OLS of the form

$$y_t = \mu + \beta t + \gamma DT^*$$

Again, DT*=0 up to and including the break at 1986:2. From 1986:3 on, DT*=t-Tb where Tb=26 in this series, i.e., the 26th observation. We observe a visable *increase* in the absolute value of the slope, indicating a possible acceleration of the price increase in ICs at this time. This runs counter to theoretical predictions of a price increase. It remains to be seen if this is significant.

Figure 2 shows a plot of the logarithm of real imports of semiconductors, and its fitted trend. There appears to be an *increase* the rate of growth of imports in Japan beginning in 1986. Recall that the choice of the break is arbitrary and was chosen to coincide with the STA. It is possible that the break occurred just before the STA, which could be the result of anti-dumping legislation, or re-structuring of the industry wholly unrelated to trade policy. However, these interpretations and their timing are far less clear, so we will stick with the STA shock assumption.

Figure 3 shows the logarithm of wholesale prices of ICs and fitted trend. There appears to be slight slowdown in the rate of decline in prices but is not large. A slowing down of price decreases is consistent with theory which predicts rising prices in the response to such a policy. Naturally, in an industry that experiences such dramatic declines in price due do learning-by-doing and other economies of scale, it would be highly unlikely that prices in real terms would actually rise. However, it must be noted that in nominal terms on a per unit basis DRAM prices did rise dramatically in the late eighties.

Figure 5 shows the log of export prices of ICs from 1981 to 1996 and its (poorly) fitted trend. It appears there is a possible plateau in the series (see Figure 6), which fits very nicely with the widely held view that the FMVs were nothing more than price supports for DRAMs. Unfortunately, this Perron technique is unable to accommodate multiple shifts as is apparent in the results presented in Section 5.

Figure 4 shows the logarithm of real monthly imports of ICs and fitted trend from 1988 until 1996. Because the series begins in 1988, it is unable to detect whether or not the first STA significantly increased imports. However, it does seem that there is an additional increase in the growth rate of imports in 1992. Here the break is assumed to occur in January of 1993, after the first deadline for the 20% market share had passed and still had not been met. Soon after the deadline was reached, the Clinton administration renewed threats for `non-compliance` with the agreement. The choice of the break reflects this `step-up` in the US trade policy.

4. PRELIMINARY UNIT ROOT TESTS

Prior to estimating equation (1), standard unit-root tests of the same form as in Perron (1989), including an intercept and time trend, were run. It is of the form,

$$(3) y_t = \mu + \beta t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t$$

which is, of course, of the same form as equation (1) but without the dummy variable. The optimal truncation lag was determined by selecting the regression in which its highest lagged difference still had a significant coefficient. This is the technique for lag selection offered in Doornik and Hendry (1994). Perron also suggests a similar criterion but with a critical value of 1.60, slightly less than the t-value of 1.70 at 30+ observations at a 5% level of significance. As one can see in Table 1, none of the series can reject the null hypothesis of a unit root (difference stationary) when the shift dummy is not included.

Table I.

Series/Period	k	μ	t-stat	β	t-stat	α	t-stat
Import Prices (IC) (1980:1-1996:3)	1	0.479	2.63	-.0030	-2.77	0.9029	-2.67
Import Real (SC) (1980:1-1996:3)	1	0.402	2.58	0.0047	2.67	0.9270	-2.51
WPI ICs (1980:1-1996:3)	2	0.491	2.28	-0.002	-2.40	0.8996	-2.31
Export Price ICs (1981:1-1996:3)	3	1.47	2.84	-0.0082	-2.86	0.7099	-2.85
Real IC Imports (1988:1-1996:7)	6	0.686	2.65	0.0031	2.40	0.8800	-2.55

-k is the number of truncation lags selected
-Real IC Imports (last row) is monthly data, all the rest are quarterly
-the Phillips-Perron critical value, based on the t-stat for a sample of 50, is -3.50 at the 5% level, so the null of a unit-root is clearly not rejected.

In addition, standard Augmented Dickey Fuller tests were performed with intercept alone and with a trend on both the levels and the first differences of each series. The null hypothesis of a unit roots could not be rejected in all variables in levels, and the null was clearly rejected (at either 5% or, more often, at the 1% level of significance) for the first differences (results not shown here). In the next section we will investigate whether or not these results are robust when a slope change and/or crash dummy is included.

5. PERRON TEST RESULTS WITH `GROWTH CHANGE` DUMMY

In this section we present the results of the estimation of equation (1) for each of the variables (except export prices) in Table II.a. and the results of a estimation for export price assuming a one-time `crash` and then a slope change in Table II.b. Under the hypothesis of a unit root process $\mu \neq 0$ (in general), β=0, γ=0, α=1. In the export price equation, θ=0, and $d \neq 0$ is also necessary. Under the alternative hypothesis of stationary fluctuations around a deterministic breaking trend: $\mu \neq 0$, $\theta \neq 0$, $\beta \neq 0$, $\gamma \neq 0$ d=0 and α<1. It is important to note that although the various break dummies and intercepts` t-statistics are distributed normally, the critical test statistic that is produced in Perron (1989) must be used for α.

5.1 *Import Prices (quarterly)*

The parameter estimates in Table II.a. are ambiguous. While the time trend and intercept are significant, the dummy variable, γ is clearly not. Also, the t statistic for α, although considerably lower than the previous 0.90, is st□ll not low enough to reject the null of a unit-root. With a λ of 0.38, the Perron critical value is -3.72 at the 5% level and -3.44 at the 10%. There is still strong evidence of a unit-root. Furthermore, the sign of the growth shift is *negative* (albeit non-significant). This runs counter to the *a prioi* belief from theory that the STA would raise prices or at least slowdown the rate of price decline.

5.2 *Wholesale Prices (quarterly)*

Again, strong evidence remains for the presence of a unit-root despite the addition of the dummy. The dummy coefficient is positive, as theory predicts, but is insignificant. The α t-statistic cannot reject the null even at 10%.

5.3 *Real Imports (quarterly)*

Here there is some evidence that the series behaves as a trend-stationary variable with an *increase* in the rate of growth of imports. μ, β, and γ are all significant at the 5% or higher level. The α t-statistic is not quite able to reject a 5% level of significance (a threshold of -3.72) but easily rejects the 10% threshold of -3.44. It must be noted that this series is the broad category of SCs but was deflated by the IC import price index, so an increasing slope bias is present.

5.4 *Real Imports (monthly)*

This is the series which spans from 1988:1 to 1996:7 and only includes IC import values deflated by the IC import price index. However, given the truncated series, the break was placed at the beginning of 1993, the start of the second STA agreement and the second big push to meet market share targets. As in section 5.3, all parameters are significant, and the unit root parameter is rejected at 10%, but not at a 5% level.

5.5 *Export Prices (quarterly)*

Export prices, and in fact prices in general, were hard to model with this particular methodology. It appears as though prices experienced a \`plateau\` effect in which the fall in prices came to a halt, remained flat, and then continued a downward trend towards the end of 1989. This plateau is most apparent in export prices (figure 6) which were arguably the most affected by the first FMV system[5]. Because the \`plateau\` effect was so dramatic in export prices, I attempted to model the shock as a \`crash\` with a growth rate change to capture the effect. This is identical to Perron\`s \`Regression (14)\` wherein the DU term takes on the value of 1 when t is greater than Tb. The D(TB) is the one-time shock component, so that at time Tb the dummy equals 1, but at all other times is zero.

[5] Memory chips (DRAM and VRAM) accounted for approximately 40% of all the value of Japanese exports in 1990, while they only accounted for about 20% of its imports. Domestic production of memory chips accounted for 32% of total chip production in 1990 (*Nihon Handoutai Nenkan* 1991).

The last term is the DT term which is zero prior to the shock and takes on the value of t at each observation where t>Tb (see Table II.b. for the explicit equation). The results are unimpressive. A fitted trend line to the regression does not really pick up this trend (see Figure 5), and the regression results are ambiguous as well. While the intercept and time trend term are significant, and *d*=0 (good signs for rejection of the null), the two other dummy variables are not. Additionally, the t-statistic for α is far below any threshold level for rejection of the unit root hypothesis.

Table II.a. `Growth Change` Regressions

$$y_t = \mu + \beta t + \gamma DT_t^* + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t$$

Tb=1986:2	T	λ	k	μ	t-stat	γ	t-stat	β	t-stat	α	t-stat
Import Prices	66	.38	8	1.55	2.16	- 0.006	-1.07	-.0049	-2.27	0.68	-2.09
Imports Real	66	.38	9	1.82	3.68	0.017	3.10	0.005	2.03	0.698	-3.67
WPI	66	.38	4	0.92	2.98	.0015	1.38	-.0046	-2.64	0.818	-3.03
Tb=1992:12											
Real Imports (monthly)	102	.59	24	3.83	3.57	0.018	3.05	.007	2.85	0.384	-3.55

λ=Tb/T and is used in selecting the critical value for α.

Table II.b. `Growth Change with one-time (reverse) Crash` (Export Prices)

$$y_t = \mu + \theta DU_t + \beta t + \gamma DT + dD(TB)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_t$$

Tb= 1986:2	T	λ	k	μ	t-stat	θ	t-stat	β	t	γ	t	d	t	α	T
Export Price	62	.34	8	2.10	3.13	-0.08	-0.92	-.017	-3.66	.006	1.45	-.028	-0.46	.61	-2.9

6. INTERPRETATION

It appears there is at least some reason to suspect the STA had an effect the real import growth rate of semiconductors and more specifically on integrated circuits. Structural dummies for an increase in slope of the Japanese imports are significant in both. Rejection of the null is difficult, however given the relatively small samples. If the STA did have an impact, it is unclear whether or not it had it`s largest impact during the first agreement or the second. More detailed historical data on ICs would most likely help in clarifying this point.

The results for the price indices are very disappointing. Virtually no support for the theory that the STA had an impact on prices is present. This could, however, be a limitation of the methodology. This functional form was not designed for multiple breaks like those seen in the export price series, and possibly the other price series as well. The regressions do not capture the break properly, and fail to reject the non-stationary hypothesis. A proper method for estimating such a break is required.

By visual inspection and by running Chow breakpoint tests (not presented here), it did appear that there was some type of radical change in the industry during this time. Certainly huge cyclical downturns such as the one that occurred in 1984 and standardization of the industry, which also occurred at this time, are other possible explanations for this seeming disruption. Finally, it is possible that demand shifts, altered the very nature of Japanese import behavior during this time, though it seems unlikely that this change would occur at such a dramatic speed. The semiconductor industry is, however, a rapidly evolving industry, and so we cannot rule this out either.

In fact, more broadly speaking, Japanese merchandise imports overall seem to have experienced an increase in their growth trend in the late eighties (see Figure 7). It has been suggested[6] that perhaps the change in the semiconductor industry is only part of a broader shift in the import patterns throughout Japan and that the timing of the STA was merely coincidence. To investigate this possibility, the identical tests were performed on total real quarterly imports calculated from the *IMF's International Financial Statistics* for the identical time period (1980:1-1996:3). Standard unit-root tests seem to support an I(1) process with trend and constant. When a structural break dummy is incorporated at the exact same period (1986:3), the t-statistic is 3.337, insufficient to reject the null. Furthermore, the dummy variable is not significant at all, with a t-stat of 0.23. Also, in a separate regression a dummy was inserted at 1993:1, the start of the second STA. Again the dummy was insignificant and this time negative. While far from conclusive, it does appear that any shock that may have occurred in the semiconductor industry was separate from changes in the general import patterns.

Clearly, better modeling of price breaks would be a welcome extension. Also, more detailed and longer price and quantity series for integrated circuits would aid in resolving this debate. Unfortunately, with the tentative results presented here it would be too strong a statement to say that the market share targets unequivocally increased imports due to the weak rejection of the unit root hypothesis. On the other hand, it is also a bit premature to say the prediction of VIE theory of higher prices is incorrect, due to the weakness of the methodology to capture the `plateau`. One other mystery would be the possible *negative* shock on import prices during this period, which cannot be explained by either conventional wisdom or theory.

Though this particular policy elapsed over two years ago, this method of managing trade may remain popular for some time, particularly in industries prone to anti-dumping suits such as semiconductors. The EC recently approved a similar `cost and price` disclosure system for Japanese producers and signed a similar agreement with Korea in March (*International Herald Tribune,* October 16, 1998). The effect of market share agreements and price floors is still an important and lively policy debate and warrants more empirically validation of its theoretical inefficiency.

All regressions were performed in Eviews 3, Quantitative Micro Software.

[6] The author would like to thank Eric Ramstetter and Ted James for offering this suggestion.

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Figure 1: Log of Import Prices

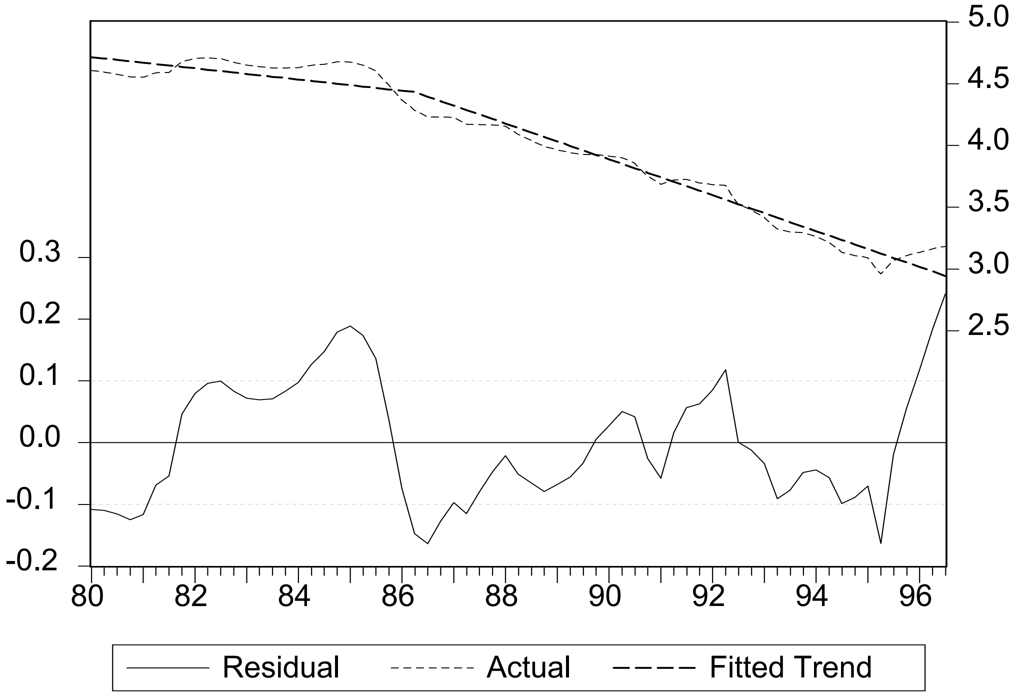

Figure 2: Log of Real Imports of SC

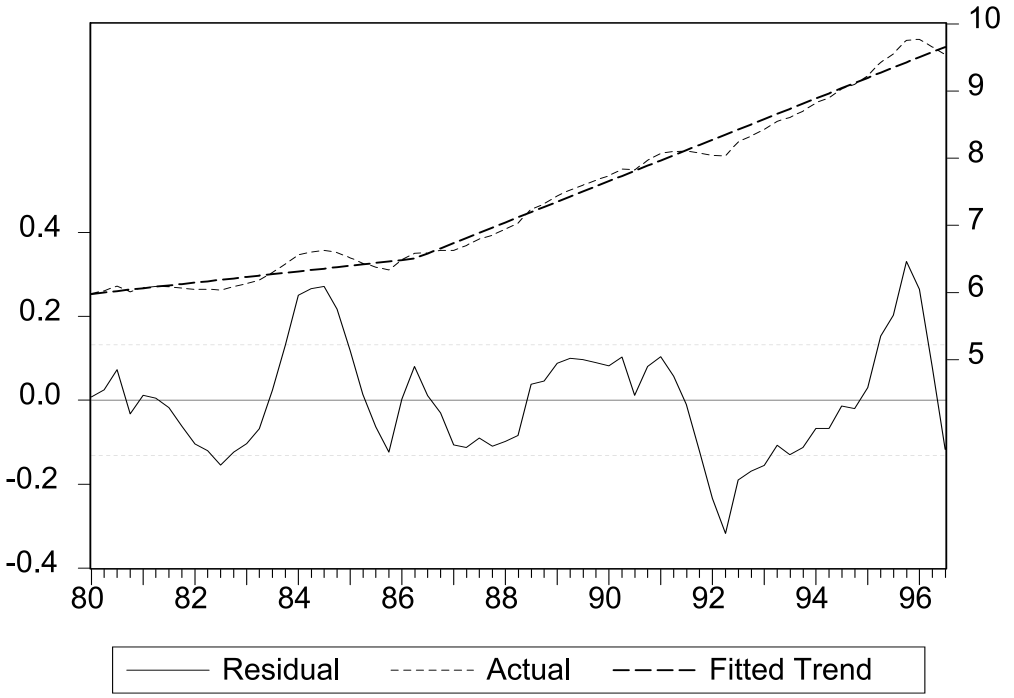

Figure 3: Log of WPI of ICs

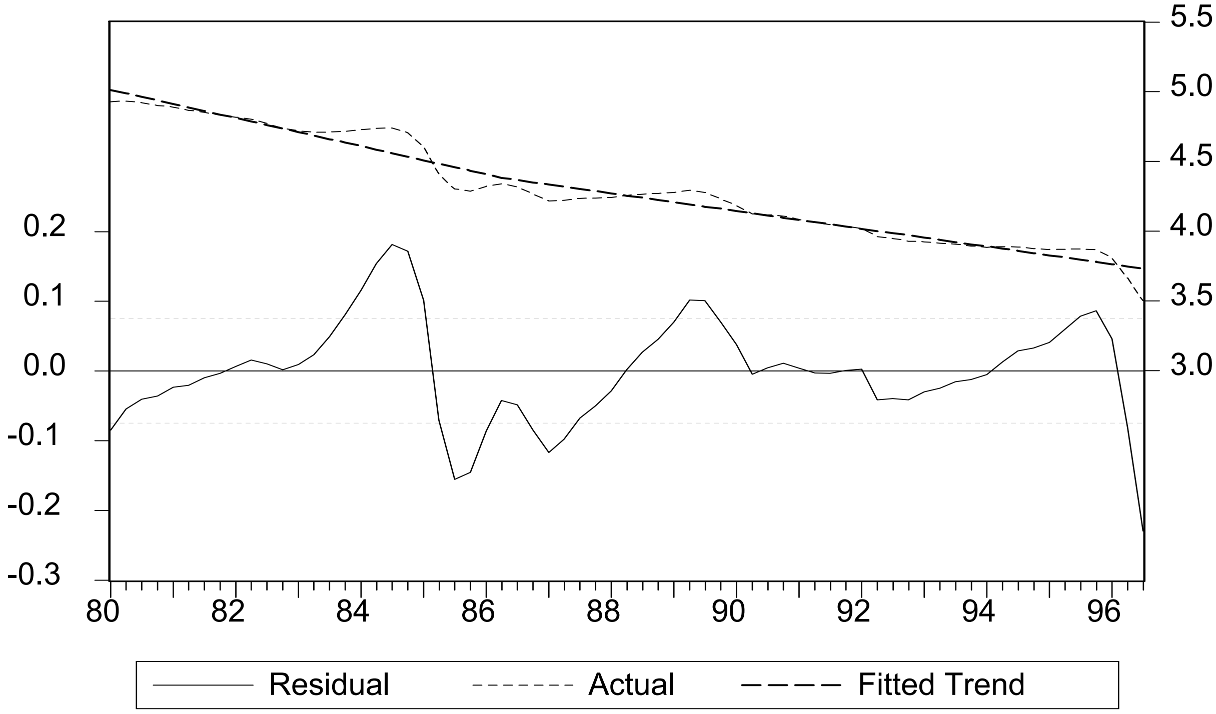

Figure 4: Log of Real Monthly Imports of ICs

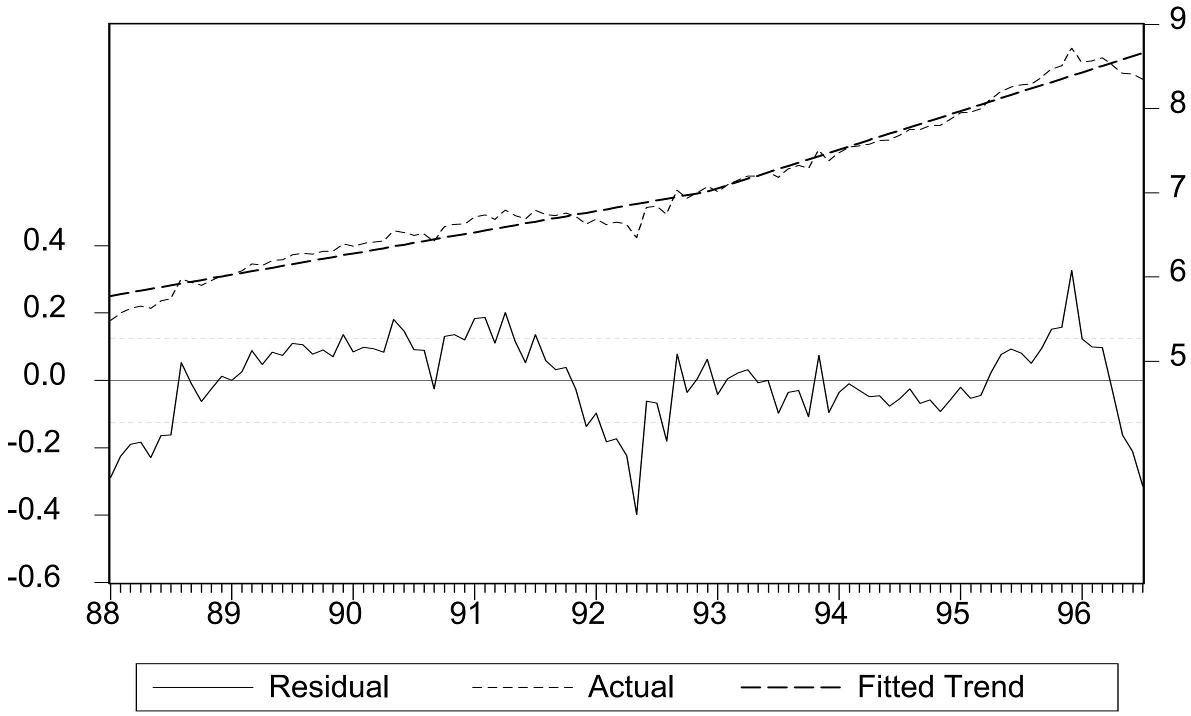

Figure 5: Log of Export Prices

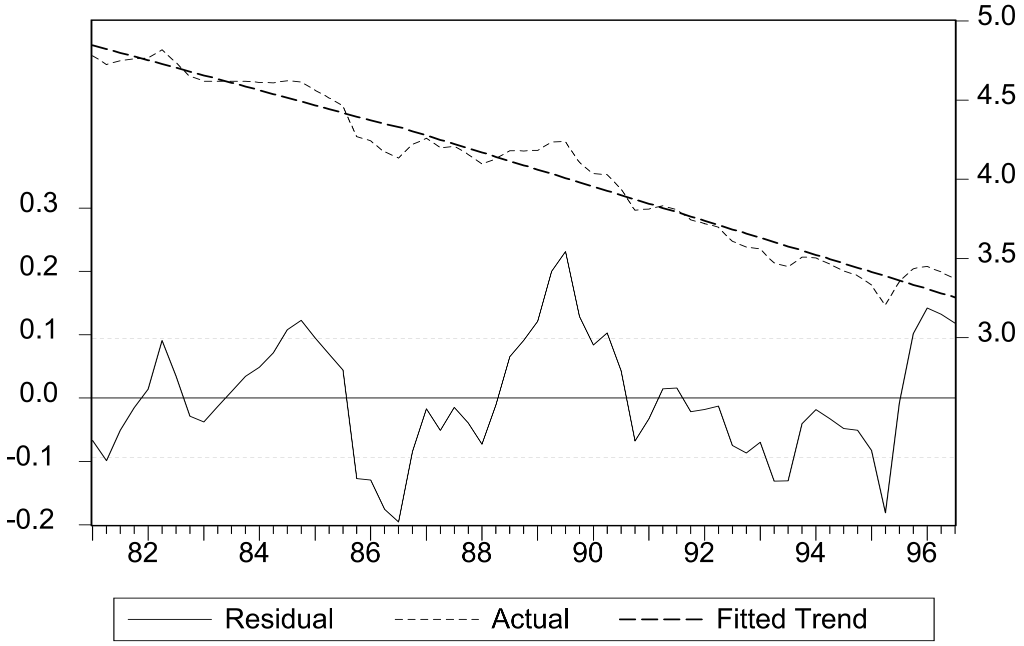

Figure 6: Log of Export Price, `Ideal` Fit

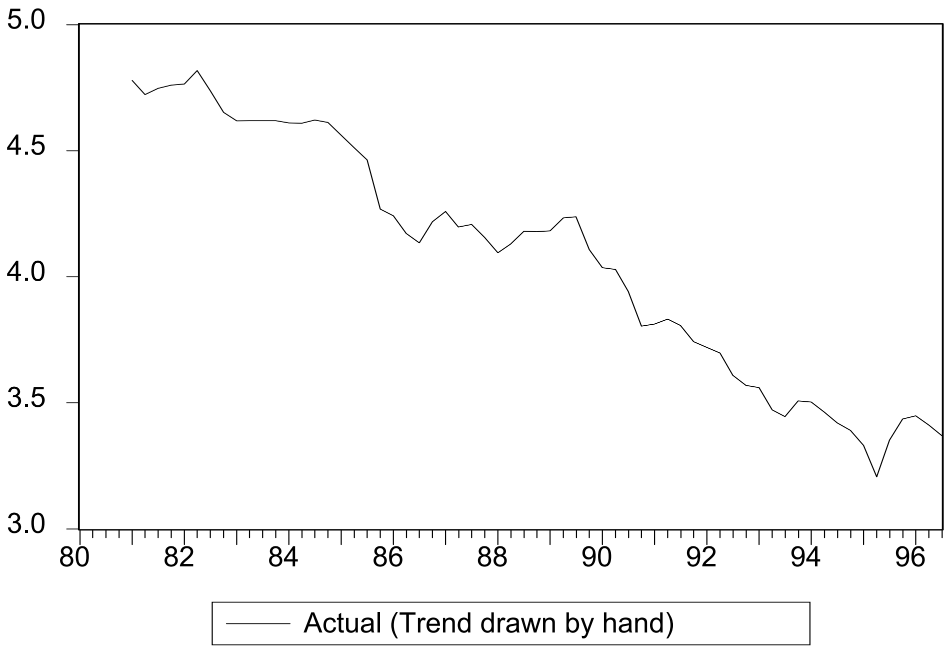

Figure 7: Log of a Real Merchandise Imports