TIME SERIES ANALYSIS OF

U.S.-EAST ASIA COMMODITY TRADE, 1962-1992[+]

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Abstract

We examine the composition of bilateral trade between the United States and each of eight Asian Pacific economies from 1962 to 1992. Two complementary time series analyses of individual commodities at the SITC four-digit level indicate that significant change occurred in trade composition during this period. For the eight bilateral trade relationships, commodities representing from fifty to seventy percent of 1992 dollar trade volume have shown statistically significant change in the magnitude and, in some cases, in the direction of net trade balance, over the thirty-year period. Results support the conclusion that changes in trade patterns in both low-tech industries, such as textiles and clothing, and more high-tech industries, such as electronic parts and electronic goods were important in these so-called Asian tigers as their economies advanced.

Keywords: international trade flows, time series, ADF, KPSS, trends, economic development

JEL Codes: F02, F14, F17, O14

1. Introduction

Trade between the United States and the East Asian region has enabled the phenomenal growth of a number of the area's economies over the past several decades. Japan was the first of the Asian tigers to take advantage of trade with the US to expand and advance its economy. Taiwan, South Korea, Hong Kong and Singapore followed. Until the financial crisis of 1997-98, Indonesia, Malaysia and Thailand were emerging as the latest Asian tigers, and only the first of these three remains slow to recover from that crisis.

Many empirical studies have examined the mechanisms and sources of the Asian tigers' economic growth (e.g., Bradford and Branson, 1987; Park and Park, 1992; World Bank, 1993). These studies suggest the importance of changing comparative advantage in the composition of US-East Asia trade. However, Gagnon and Rose (1995), in an innovative analysis of changes in international trade patterns, for a number of developing and advanced economies, found considerable persistence in the direction of net trade. Interestingly, one possible exception to this finding of persistence was South Korea, one of the Asian tigers. Gagnon and Rose's results might be taken to imply that mechanisms such as the product cycle, which assumes relatively rapid changes in the location of production and hence in trade patterns, have limited overall significance for economic development. Given the dynamic nature of East Asia's economies, Gagnon and Rose's analysis suggested that a closer look at changes in patterns of international trade was warranted.

Carolan, Singh and Talati (1998) adapted and extended the analysis of Gagnon-Rose to examine the question of dynamics in the composition of international trade flows. They focused

on bilateral flows between the United States and eight East Asian economies, rather than multilateral trade for a mixed sample of countries, which Gagnon and Rose had considered. Using statistical tests and a somewhat heuristic classification of time series of trade balances for individual commodities at the 4-digit Standard International Trade Classification (SITC) level, Carolan *et al*. found strong evidence of changing trade composition between the US and the eight East Asian economies. Furthermore, this changing trade composition was consistent with changing comparative advantage and, in particular, shifts toward being net exporters of goods that were more intensive in using technology or human capital, and away from goods that were more intensive in using natural resources or unskilled labor.

In the present paper, we provide a formal time series analysis of US-East Asia trade balances, using the same data set as Carolan *et al*. While the period covered is only till 1992, the analysis in this paper facilitates comparison with the earlier analysis of Carolan *et al.*, and permits using a data set that was already purged of errors and missing observations. Specifically, we test all the 4-digit SITC commodities' trade balance time series for the presence of a unit root or for trend stationarity, in order to determine whether bilateral trade composition has been persistent or has undergone significant change. Findings of either a unit root or a significant deterministic trend can be taken as evidence for change. On the other hand, a time series that is stationary and has no deterministic trend represents a commodity for which the importance in trade has not changed.

Note that the approach in the current paper does not require the classification according to factor intensity that was used in Carolan *et al*., nor does it focus only on changes in the sign of the trade balance. Hence, the analysis here is more general as well as being more formal, and, we

would suggest, it provides a useful general tool for examining the behavior of trade over sufficiently long periods of time.

The paper is organized as follows. In section 2 we describe the data and methodology. The data is standard international trade data that has been extensively checked and validated. The methodology is also well known, but has not been previously applied to microeconomic data such as we consider here: this in itself represents an innovation of our analysis, aside from the specific results. We present results in section 3. Briefly, our results show that there has been substantial change in trade composition within our sample, and the changes identified fit well with expected patterns and processes of economic development that incorporate international trade in an important manner. Section 4 concludes the paper with a summary of our contribution.

2. Data and Basic Methodology

The data consist of comprehensive annual, bilateral trade flows disaggregated to the four-digit Standard Industrial Trade Classification (SITC) level. The years cover 1962 through 1992, with two exceptions, where the data begin in a later year.[1] Examples of goods at this level are "trucks and buses" (7322), "television receivers" (7241), "plastic polymers" (5812), and "porcelain or china household ware" (6664). Although we will use the terms "commodity" and "good," the four-digit level is commonly considered the industry level, not the individual product level. Nominal dollar values of exports and imports are available for each year and each

[1] The exceptions are Malaysia (1964) and Singapore (1966). In general we shall ignore these two exceptions and refer to 1962 as the beginning year.

of several hundred categories of goods at this level of disaggregation.[2] However, those commodities whose time series were incomplete were ineligible for analysis.

Our approach to preparing the data for the time series tests follows from Gagnon and Rose (1995). For a more detailed explanation than presented here, see Carolan, Singh and Talati (1998). The normalized trade balance for commodity group *i* at time *t* is defined by

$$NB_{it} \equiv \left(\frac{X_{it}}{\sum_i X_{it}} - \frac{M_{it}}{\sum_i M_{it}} \right) * 100,$$

where X_{it} denotes the value of exports of subgroup *i* at time *t,* and M_{it} denotes imports. This normalization removes the impact of macroeconomic imbalances on trade patterns, since the sum of NB_{it} for any year is always zero. Consider, for example, that a macroeconomic effect such as a 1 percent growth in exports spread uniformly across all subgroups will not affect any individual NB_{it}.

A similar normalization is used for commodity trade shares. *NV* measures the relative importance of a commodity in terms of its share of trade for a given year, as follows:

$$NV_{it} \equiv \frac{1}{2} * \left(\frac{X_{it}}{\sum_i X_{it}} + \frac{M_{it}}{\sum_i M_{it}} \right) * 100 \ .$$

NV_{it} measures the importance of trade in commodity *i* at time *t*. The sum for any time period for all commodities is 100, and thus NV_{it} conveys a percentage measure. We use the normalized trade volume to indicate the relative importance of a particular commodity in overall trade between the US and an East Asian trade partner.

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[2] As noted in Carolan, Singh and Talati (1998) the trade data do not account for re-exporting. We believe this activity to be an insignificant part of trade for all the countries with the exception of Hong Kong and, possibly, Singapore. Hong Kong serves as an entrepot for China's trade, and Singapore serves as a middleman for Malaysia

To the *NB* statistic, we apply two time series analyses of the data, the augmented Dickey-Fuller (ADF) unit root test and a test of trend stationarity from Kwiatkowski, Phillips, Schmidt and Shin (1992). We refer to the latter test as KPSS, and we follow the example of Cheung and Chinn (1996) in applying the two tests.[3] Typically in time series analysis, it is critical to distinguish between a series as being difference stationary or trend stationary. A unit root series means that the variance is not finite, and the economic variable may wander far from its level at one point in time in an unpredictable manner. A trend stationary series, on the other hand, does indeed wander from its level at one point in time but in a predictable pattern once the trend has been determined. For our purposes both types of time series would imply a lack of persistence in trade composition, which is to say, significant change in what the US trades with each of the eight Asian economies. A unit root series for commodity trade balances would indicate that trade composition undergoes unpredictable yet significant changes in the magnitude of *NB* or even in the direction of trade. A trend stationary trade balance for a 4-digit level commodity describes a clear pattern in changing trade composition, an increasing or decreasing trade surplus or deficit, and possibly also a change in the direction of trade.

In addition to allowing us to examine different forms of lack of persistence in trade composition, there are also several purely statistical advantages to using both the ADF and KPSS tests. The ADF and similar unit root tests have the unit root as the null hypothesis, but lack power against trend stationary alternatives, so may give spurious unit root results. On the other hand, the KPSS test uses trend stationarity as the null hypothesis against the alternative of a unit root, so any lack of power will work in the opposite direction. Hence, as argued by Cheung and

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and the region in general, though likely on a smaller scale than does Hong Kong. The role of Hong Kong has continued to evolve in the last decade, especially after being reintegrated with China.

[3] See also Cheung and Chinn (1997) for further discussion and analysis. We are grateful to Yin-Wong Cheung for providing us with his estimation programs, which we have used here.

Chinn (1996, 1997), the two tests can be viewed as complementary rather than competing.[4] Since, in this paper, we are interested in identifying change per se, and not the issue of stationarity versus non-stationarity, employing both tests is particularly appropriate. Note that for our purposes, a finding of trend stationarity requires further decomposition into cases where the trend is significantly different from zero or not. Only the former cases indicate changing trade composition.

3. Results

Table 1 presents ADF, KPSS and trend estimation results for all commodities with complete time series for the 1962-1992 period. Results appear in terms of 1992 normalized trade volume (*NV*) and number of commodities. We use *NV* to indicate the relative importance of each commodity in overall trade since the sum of *NV*s equals 100. ADF and KPSS tests that resulted in failure to reject the respective null hypothesis of unit root or trend stationarity are marked as "Fails." Tests that resulted in rejection of the null are marked "Rejects." Both conclusions are at the five-percent level of significance. For cases when the null of trend stationarity for the KPSS test was not rejected, estimates of the trend are given. In line with the ADF and KPSS five-percent significance levels, zero-trend estimates, as opposed to a positive or negative trend, are those for which the t-statistic did not exceed 1.96. The "Totals" row gives the share of trade volume and the count of commodities that offer complete time series for testing. For example, Hong Kong has 85.85% of trade volume (345 commodities) available for time series testing, while Indonesia has the lowest portion at 75.34% (335 commodities).

For the ADF test, the finite sample critical value is from Cheung and Lai (1995), -3.4013

[4] Again, see Cheung and Chinn (1996, 1997) for a more detailed discussion.

at the 5% level of significance.[5] Using either the AIC or BIC criterion[6] for choosing the number of lags to account for any serial correlation does not alter the results significantly. The ADF test fails to reject the null for a majority of commodities and trade share. This is true for all eight economies and indicates that most individual commodity trade balances do not persist in both magnitude and trade direction, and yet do not follow any finite pattern.

The KPSS test finite sample critical value is from Kwiatkowski *et al*. (1992), 0.14073 at the 5% level of significance. Like the ADF test, the KPSS test fails to reject its null hypothesis in a majority of cases for all eight economies. That is, the KPSS test finds trend stationarity in most of the normalized commodity trade balance data. Again, as with the ADF test results, there is a lack of persistence in *NB*, but KPSS indicates the change contains a trend.

The unit root and trend considerations amount to eight possible categories for the normalized trade balance (*NB*) of each individual 4-digit level commodity as shown in Table 1. Interpreting Table 1, categories 2-4 and 6-7 indicate significant change in a commodity's *NB*, either in sign or in magnitude with an upward or downward direction, excluding category 4 in regards to trend. A positive trend means either a declining net US trade deficit or an increasing net US trade surplus. A negative trend means either an increasing net US trade deficit or a declining net US trade surplus. Categories 1 and 5 mean no significant direction for *NB* was detected, despite the KPSS result of trend stationarity. Category 8 presents an odd case in which the commodity's *NB* apparently does not contain a unit root and yet is not trend stationary. Finally, we note, given that ADF and KPSS are complementary tests of time series behavior, the

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[5] Finite sample critical values are required to avoid biases. These are developed and reported in Cheung and Lai (1995), and also used in Cheung and Chinn (1996, 1997).

[6] AIC is the Akaike information criterion, $AIC(p) = n*\log \sigma_p^2 + 2p$, where p is the number of parameters and n is the sample size. BIC is the Schwartz Bayesian information criterion, $BIC(p) = n*\log (\sigma_p^2) + p*\log(n)$.

failure to reject either null hypothesis in categories 1-3 reveals the low power of both tests in these instances.

[Table 1 about here]

The results of the testing and classification according to these eight categories are reported in Table 2. Adjacent columns report the percentage share of trade volume in that category, and the corresponding number of commodities. Table 2 does indeed show that for all eight economies most commodities and the greatest share of normalized dollar trade volume falls into categories 1-3, which means that time series analysis fails to reject both the null hypothesis of unit root and the null hypothesis of trend stationarity. While category 1, which means no significant trend was found, often contains the greatest number of commodities for each economy, it does not have a correspondingly high share of *NV*. Category 3, on the other hand, which means a significant negative trend (moving towards or into a US net trade deficit), contains the single greatest share of *NV* for six of the eight economies, Hong Kong, Japan, Korea, Singapore, Taiwan and Thailand. In a comparison of positive trend (categories 2 and 6) and negative trend (categories 3 and 7), all economies except Malaysia show greater *NV* with a negative trend than with a positive trend. A relatively small share of trade volume falls into category 8, the odd case, with minor exceptions noted for Japan and Taiwan.

[Table 2 about here]

Categories 1-7 suggest that most commodities' normalized trade balances undergo significant change over the thirty-one year period. Only categories 4-7 distinguish between a unit

root process or trend stationarity, and, unfortunately, our results do not provide such a clear distinction. Categories 4-7 do not contain as much trade volume or number of commodities as do categories 1-3. However, we are most interested in categories 2, 3, 4, 6 and 7. According to both ADF and KPSS results, these five categories indicate significant change in a commodity's *NB*, although not necessarily a change in sign, that is, net surplus to net deficit or the reverse. Time series graphs for commodities that fall into these five categories are presented in Figure 1 for Japan. Japan and Taiwan are the only economies containing results that covered all of categories 2, 3, 4, 6 and 7, as can be seen in Table 4. We discuss Table 4 after a brief discussion of Table 3. As it happens, Figure 1 shows that these five commodities for Japan undergo a reversal in the net direction of trade.

[Figure 1 about here]

[Table 3 about here]

For those *NB* commodities that fall into categories 2, 3, 4, 6 and 7, Table 3 aggregates their 1992 *NV* according to one-digit level SITC sector, of which there are ten, numbered 0-9. The cumulative *NV* columns show that a large portion of trade has undergone change for all eight economies. Indonesia has the smallest portion of changing *NB* commodities at 49.37 *NV*, nearly half of normalized trade volume, while Hong Kong has the largest portion at 70.75 *NV*. SITC sectors 7 and 8 contain most of the *NV* for changing *NB* commodities. Sector 7 is comprised of machinery, electronic equipment, and transportation vehicles; sector 8 includes mostly consumer manufactures. Except for Hong Kong and Indonesia, sector 7 has been the dominant area of *NB* change as measured by dollar trade share. For Hong Kong and Indonesia sector 8 dominates the other nine. Indonesia shows change for sector 2, which is raw materials

from agriculture, forestry, and the textile and metal industries. Japan also shows change for sector 0, which is mostly raw and processed foods, excluding beverages. In general though, and in terms of *NV*, little change occurs for sectors 0-6, and sector 9.

[Table 4 about here]

Table 4 presents, for each of the eight economies and again according to 1992 *NV*, a list of the top ten commodities, in terms of trade volume, that undergo significant change in magnitude of *NB*. As indicated above, most of these commodities are from SITC sectors 7 and 8, with the case of Indonesia being a minor exception. Consider first commodities that the eight economies have in common. "textile clothes not knit" (8411) appears for all economies except Japan and Korea. This commodity shows a positive trend for Taiwan, but the *NB* remains negative throughout the 1962-1992 period, as it does for Hong Kong, Malaysia, Singapore, and Thailand (not shown[7]). Indonesia's *NB* for textile clothes has some years of positive balance, but it ends the period negative. "clothing, accessories knit" (8414) appears as an important commodity for Hong Kong, Indonesia, Malaysia, and Thailand, and it ends the time period with a negative balance for all these economies. "footwear" (8510) stands out as an important changing *NB* commodity for Korea and Indonesia. For both economies it has a negative trend, having started with a positive *NB* for Indonesia but maintaining a negative *NB* for Korea.

Common sector 7 commodities present several interesting cases. "transistors, valves, etc" (7293) appears for Hong Kong, Japan, Malaysia, Singapore, Taiwan, and Thailand, with all of them experiencing positive trends except of Japan, which appears to contain a unit root process

[7] Throughout, the positive or negative sign for *NB*s are discussed but not shown.

only. However, despite the common positive trends, the sign of the *NB*s varies among the six economies. For Hong Kong and Malaysia the *NB* maintains a positive sign. For Singapore and Taiwan the *NB* begins positive, goes negative for a few years, but ends the period positive again. For Thailand the *NB* fluctuates between positive and negative, but runs positive for most of the final twelve years. Japan's is the only economy for which "transistors, valves, etc" ends the time period with a negative *NB*. "statistical machines" (7143) is another common commodity. It appears in Table 4 for Hong Kong, Japan, Korea, Singapore, and Thailand. The trend is positive for Hong Kong and negative for Japan, Singapore, and Thailand, while for Korea it is unit root only. Finally, "telecomm equipment nes" (7249) appears for Hong Kong, Indonesia, Japan, Korea, Malaysia, Singapore, and Taiwan. For all but Indonesia the trend is negative in sign.

Malaysia and Singapore share some results that nevertheless separate them from the other six economies. For Malaysia, one commodity already mentioned, "transistors, valves, etc," (7293) represents 30.51 *NV* in 1992, and the *NB* has a positive trend and is positive in sign for all but one year, 1982. For Singapore, three sector 7 goods make up an even larger share of its trade with the US, "statistical machines" (7143) at 21.49 *NV*, "office machines nes" (7149) at 6.96, and "transistors, valves, etc" (7293) at 13.14 *NV*. Combined, these three commodities amount to 41.59 *NV* for Singapore's trade with the US in 1992. The two machines commodities have a negative trend and end the period with a negative sign, while the transistors have a positive trend. However, the transistors' *NB* is positive for the first three years, goes negative for twenty years and then returns to positive for the last seven years. Malaysia and Singapore, close neighbors economically as well as geographically, share the importing of "transistors, valves, etc," from the US as an important commodity.

Finally consider what distinguishes several of the other six economies in Table 4. For Hong Kong, "textile clothes not knit" (8411) represents 12.24 *NV*, almost double the *NV* for Indonesia, the next highest figure, and the trend for Hong Kong is negative. This large share may reflect Hong Kong's role as a re-exporter for China. Both Korea's and Taiwan's lists contain "pass motor veh exc buses' (7321), but with different trends. Passenger vehicles' *NB* trend is negative for Korea, beginning the time period positive and ending negative, while the *NB* trend is positive for Taiwan, running positive throughout the thirty-one year period. No surprises there for these two countries. However, Japan's list contains motor vehicle parts, including piston engines, but not motor vehicles. Japan's is the only economy that does not have any textile or clothing commodities in the top ten. Only two of the ten commodities in Japan's list have a positive trend, "special transactions" (9310) and "fish fresh, chilled, frozen" (0311). These results for Japan are generally consistent with the view of this country as the leader of the East Asian economies, particularly in trade with the world's advanced economies.

4. Concluding Remarks

This paper has examined the dynamic composition of US-East Asian trade for the period extending from 1962 to 1992. We have innovated by applying formal statistical tests for the existence of trend stationarity and unit root processes to detailed time series of disaggregated bilateral international trade flows. The question motivating the analysis has been a simple one: has trade between the United States and eight Asian economies been persistent in composition or has it shown significant change? Unlike previous studies (Gagnon and Rose, 1995; Carolan *et al*., 1998), we have not restricted change in trade composition to reversals in direction of trade, net surplus to net deficit or the reverse. We have also considered trend increases or decreases in a

given positive or negative net trade balance. To answer the question, we have applied ADF and KPSS tests to four-digit SITC trade data between the US and eight East Asian economies, or over 2000 time series. Although both time series tests exhibit weak power, the results clearly show changing trade patterns for these eight US trade partners. Evidence presented here supports the previous results of Carolan *et al*., which found significant changes in the composition of trade between the United States and East Asia.

Measured by 1992 *NV*, a large portion of trade has undergone change for all eight economies, not change of the product cycle type or even necessarily changes of trade direction but significant changes in magnitude of normalized trade balance. Most changing *NB* occurs in sectors 7 and 8. Some of the more important commodities in these two sectors that are common across several of the economies include “textile clothes not knit” (8411), “clothing, accessories knit” (8414), “footwear” (8510), “transistors, valves, etc” (7293), “statistical machines” (7143), and “telecomm equipment nes” (7249). It is perhaps no surprise to state that textiles, clothing or shoes and electronic intermediate and final goods play important roles in the changing composition of trade between the US and East Asia. But we provide new evidence in support of this statement. In general for these eight Asian economies, textiles, clothing and shoes represent the low-tech element in trade and electronic goods represent a more high-tech element in trade. For Japan, we find evidence in trade data supporting its role as the economic leader of the East Asian economies during the period analyzed.

One important contribution of our paper is methodological. We have applied time series tests that have previously been applied to macroeconomic data to make a detailed and extensive analysis of over 2,000 time series of normalized international trade balances. In doing so, we have indicated an approach that can be useful in other contexts, to examine the kind of questions

posed by Gagnon and Rose, in using disaggregated trade data to empirically test implications of product cycle or other theories of dynamic trade patterns. Until recently, such tests were not possible, because time series of trade data were not long enough, and statistical tests of time series properties relied on critical values from asymptotic theory. Both the empirical and theoretical constraints have been relaxed, and we suggest our approach as a fruitful one for a better general understanding of changes in trade patterns over time.

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Table 1: ADF, KPSS and KPSS Trend Estimation Categories

Category	ADF H_0: Unit Root	KPSS H_0: Trend Stationarity	Trend Estimation
1	Fail to reject	Fail to reject	Zero
2	Fail to reject	Fail to reject	Positive
3	Fail to reject	Fail to reject	Negative
4	Fail to reject	Reject	Not applicable
5	Reject	Fail to reject	Zero
6	Reject	Fail to reject	Positive
7	Reject	Fail to reject	Negative
8	Reject	Reject	Not applicable

Table 2: ADF, KPSS and KPSS Trend Estimation Results

	Hong Kong		Indonesia		Japan		Korea	
Category	**1992 NV**	**Count**	**1992 NV**	**Count**	**1992 NV**	**Count**	**1992 NV**	**Count**
1	9.73	117	17.91	152	7.86	57	25.52	119
2	22.36	89	16.72	49	16.22	118	12.71	75
3	38.16	81	13.17	69	24.44	81	26.19	80
4	2.83	19	10.15	17	10.37	59	7.86	28
5	2.02	8	2.24	15	0.10	3	3.53	15
6	5.61	11	0.30	3	2.57	10	1.55	11
7	1.79	4	9.02	18	7.39	4	3.20	7
8	3.35	16	5.83	12	15.36	13	2.08	9
Totals	85.85	345	75.34	335	84.31	345	82.65	344

	Malaysia		Singapore		Taiwan		Thailand	
Category	**1992 NV**	**Count**	**1992 NV**	**Count**	**1992 NV**	**Count**	**1992 NV**	**Count**
1	11.49	135	13.77	162	11.66	111	15.67	114
2	33.72	35	26.26	61	16.28	86	13.65	46
3	23.09	113	33.87	83	24.59	79	27.05	113
4	0.97	16	0.01	1	6.00	31	3.02	16
5	1.66	11	0.99	8	0.34	9	0.93	12
6	1.29	7	0.31	9	5.90	6	1.18	8
7	10.19	13	8.77	12	3.85	6	9.43	13
8	0.30	6	1.27	4	12.69	17	4.46	13
Totals	82.71	336	85.26	340	81.32	345	75.39	335

Table 3: *NB* Change Commodities (Categories 2, 3, 4, 6, 7) 1992 *NV*, Grouped by SITC Sector

	Hong Kong		Indonesia		Japan		Korea	
SITC Sector	**NV**	**Cum. NV**	**NV**	**Cum. NV**	**NV**	**Cum. NV**	**NV**	**Cum. NV**
0	2.51	2.51	3.69	3.69	8.72	8.72	2.76	2.76
1	2.39	4.90	0.00	3.70	0.69	9.41	0.44	3.19
2	2.15	7.05	9.18	12.87	2.74	12.14	4.90	8.09
3	0.09	7.14	0.72	13.59	0.48	12.63	0.70	8.79
4	0.00	7.14	0.36	13.96	0.02	12.65	0.06	8.85
5	1.22	8.36	0.73	14.68	1.45	14.11	0.91	9.75
6	4.74	13.10	6.67	21.36	3.28	17.39	4.22	13.97
7	20.27	33.37	7.94	29.30	32.82	50.21	21.29	35.26
8	33.84	67.22	20.07	49.37	8.71	58.91	14.30	49.57
9	3.54	70.75	0.00	49.37	2.08	61.00	1.94	51.51

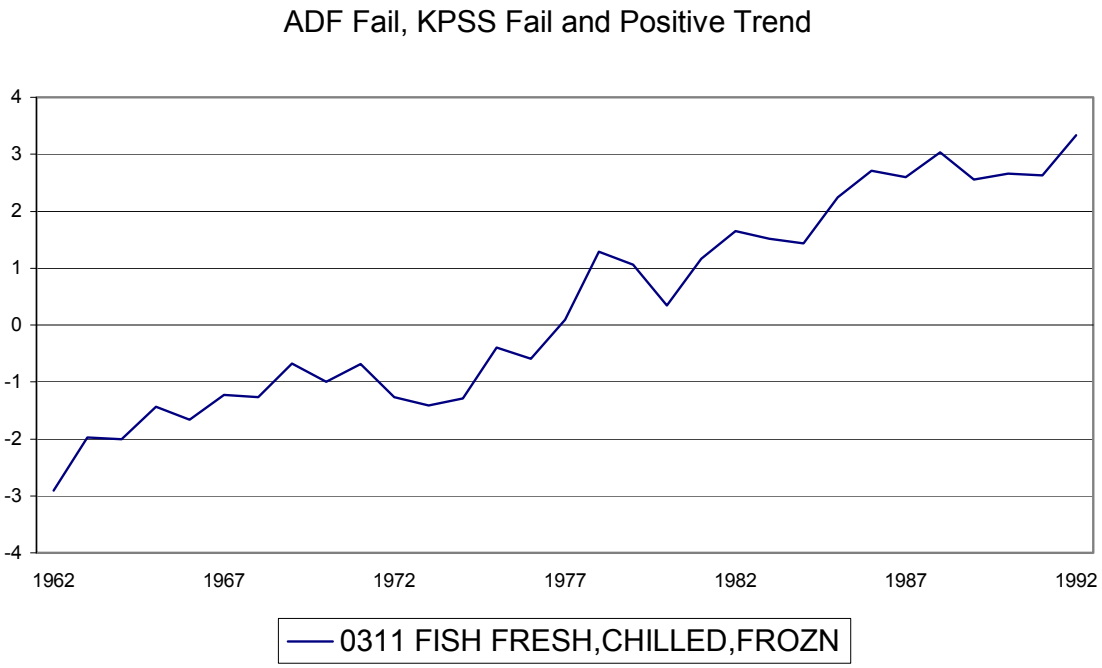
	Malaysia		Singapore		Taiwan		Thailand	
SITC Sector	**NV**	**Cum. NV**	**NV**	**Cum. NV**	**NV**	**Cum. NV**	**NV**	**Cum. NV**
0	1.24	1.24	0.72	0.72	3.84	3.84	5.11	5.11
1	0.49	1.72	0.13	0.85	0.46	4.30	1.08	6.19
2	1.67	3.39	0.28	1.12	1.79	6.09	2.88	9.07
3	0.10	3.50	0.01	1.13	0.60	6.69	0.51	9.58
4	0.03	3.53	0.01	1.14	0.01	6.70	0.00	9.58
5	0.65	4.18	0.64	1.78	0.48	7.18	0.96	10.54
6	2.21	6.39	1.52	3.30	4.58	11.76	2.89	13.43
7	49.01	55.40	54.95	58.24	29.39	41.15	22.87	36.30
8	12.02	67.42	7.63	65.87	12.88	54.04	15.87	52.17
9	1.83	69.25	3.35	69.22	2.59	56.63	2.16	54.33

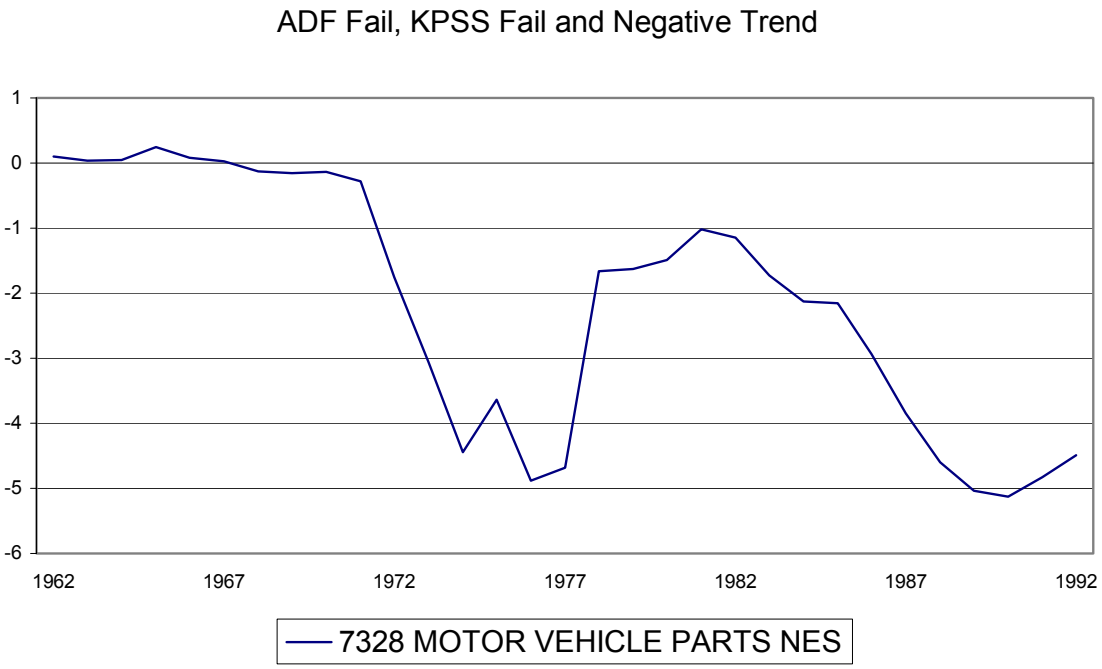
Table 4: Top Ten Change Commodities, by 1992 *NV*

		ADF/KPSS Results (Fail or Reject) & Trend Estimation				
Economy and COMMODITY	**1992NV**	**F/F and + Trend**	**F/F and - Trend**	**F/R**	**R/F and + Trend**	**R/F and - Trend**
Hong Kong						
8411 TEXTILE CLOTHES NOT KNIT	12.24		X			
8414 CLOTHING,ACCESSORYS KNIT	9.69		X			
7293 TRANSISTORS,VALVES,ETC	6.48	X				
7143 STATISTICAL MACHINES	3.66				X	
9310 SPECIAL TRANSACTIONS	3.53	X				
7249 TELECOMM EQUIPMENT NES	2.52		X			
8641 WATCHES,MOVEMENTS,CASES	2.36		X			
1222 CIGARETTES	1.97	X				
8971 REAL JEWELRY,GOLD,SILVER	1.56		X			
8930 ARTICLES OF PLASTIC NES	1.17				X	
Indonesia						
8510 FOOTWEAR	7.13		X			
8411 TEXTILE CLOTHES NOT KNIT	6.22			X		
2311 NATURAL RUBBER,GUMS	5.32	X				
6312 PLYWOOD	4.12					X
7249 TELECOMM EQUIPMENT NES	2.73	X				
8414 CLOTHING,ACCESSORYS KNIT	2.59			X		
7349 AIRCRAFT PARTS,ETC	1.87	X				
2517 SULPHATE WOOD PULP	1.46	X				
0313 SHELL FISH FRESH,FROZEN	1.27		X			
8210 FURNITURE	1.20		X			
Japan						
7143 STATISTICAL MACHINES	6.40					X
7293 TRANSISTORS,VALVES,ETC	3.60			X		
7328 MOTOR VEHICLE PARTS NES	3.46		X			
7249 TELECOMM EQUIPMENT NES	3.30		X			
7149 OFFICE MACHINES NES	3.07		X			
9310 SPECIAL TRANSACTIONS	1.76				X	
0311 FISH FRESH,CHILLED,FROZN	1.75	X				
7115 PISTON ENGINES NON-AIR	1.67		X			
0440 MAIZE UNMILLED	1.62			X		
8616 PHOTOGRAPHIC EQUIP NES	1.41		X			
Korea						
8510 FOOTWEAR	4.50		X			
7143 STATISTICAL MACHINES	3.91			X		
7249 TELECOMM EQUIPMENT NES	2.92		X			
7321 PASS MOTOR VEH EXC BUSES	2.39		X			
8413 LEATHER CLOTHES,ACCESRYS	2.12		X			
8911 SND RECRDRS,PHONOGR,PRTS	2.11		X			
2111 BOVINE,EQUINE HIDES	1.90	X				
7242 RADIO BROADCAST RECEIVRS	1.43		X			
9310 SPECIAL TRANSACTIONS	1.37	X				
7349 AIRCRAFT PARTS,ETC	1.30	X				

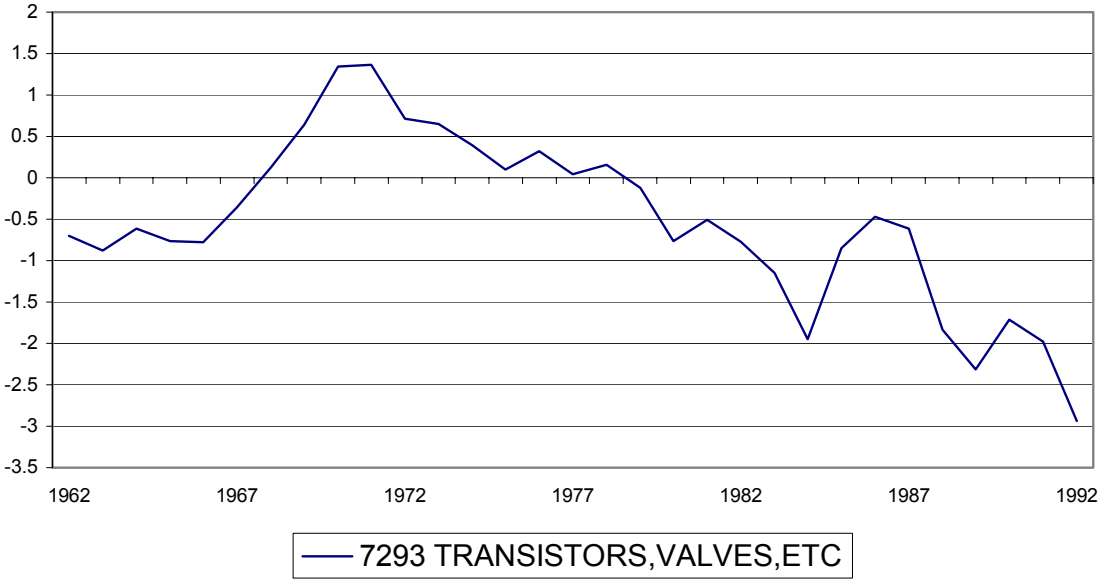
Malaysia							
7293 TRANSISTORS,VALVES,ETC	30.51	X					
7249 TELECOMM EQUIPMENT NES	5.19		X				
7242 RADIO BROADCAST RECEIVRS	5.16						X
8911 SND RECRDRS,PHONOGR,PRTS	4.09						X
8411 TEXTILE CLOTHES NOT KNIT	2.36		X				
9310 SPECIAL TRANSACTIONS	1.76		X				
8414 CLOTHING,ACCESSORYS KNIT	1.33		X				
8942 TOYS,INDOOR GAMES	1.27		X				
7241 TELEVISION RECEIVERS	1.18		X				
7299 OTH ELECTRICAL MACHINERY	1.16		X				
Singapore							
7143 STATISTICAL MACHINES	21.49		X				
7293 TRANSISTORS,VALVES,ETC	13.14	X					
7149 OFFICE MACHINES NES	6.96						X
8912 SOUND RECRDNG TAPE,DISCS	3.40	X					
9310 SPECIAL TRANSACTIONS	3.28	X					
7249 TELECOMM EQUIPMENT NES	3.25		X				
7349 AIRCRAFT PARTS,ETC	1.92	X					
8411 TEXTILE CLOTHES NOT KNIT	1.20	X					
7192 PUMPS,CENTRIFUGES	1.07		X				
7114 AIRCRAFT ENGINES INC JET	0.86	X					
Taiwan							
7293 TRANSISTORS,VALVES,ETC	6.01	X					
7321 PASS MOTOR VEH EXC BUSES	4.99				X		
7149 OFFICE MACHINES NES	3.45						X
7249 TELECOMM EQUIPMENT NES	3.22		X				
8210 FURNITURE	2.67		X				
8942 TOYS,INDOOR GAMES	2.36		X				
8411 TEXTILE CLOTHES NOT KNIT	2.28	X					
0440 MAIZE UNMILLED	2.09	X					
9310 SPECIAL TRANSACTIONS	1.81			X			
7250 DOMESTIC ELECTRIC EQUIP	1.27		X				
Thailand							
7293 TRANSISTORS,VALVES,ETC	6.93	X					
7143 STATISTICAL MACHINES	5.41		X				
0320 FISH ETC TINNED,PREPARED	2.69		X				
8971 REAL JEWELRY,GOLD,SILVER	2.44						X
8414 CLOTHING,ACCESSORYS KNIT	2.44		X				
8411 TEXTILE CLOTHES NOT KNIT	2.31		X				
8911 SND RECRDRS,PHONOGR,PRTS	2.14						X
7349 AIRCRAFT PARTS,ETC	1.81	X					
9310 SPECIAL TRANSACTIONS	1.62	X					
7241 TELEVISION RECEIVERS	1.55						X

Figure 1: *NB* Time Series Graphs for Japan
(Each of the Five *NB* Change Categories from Table 3)

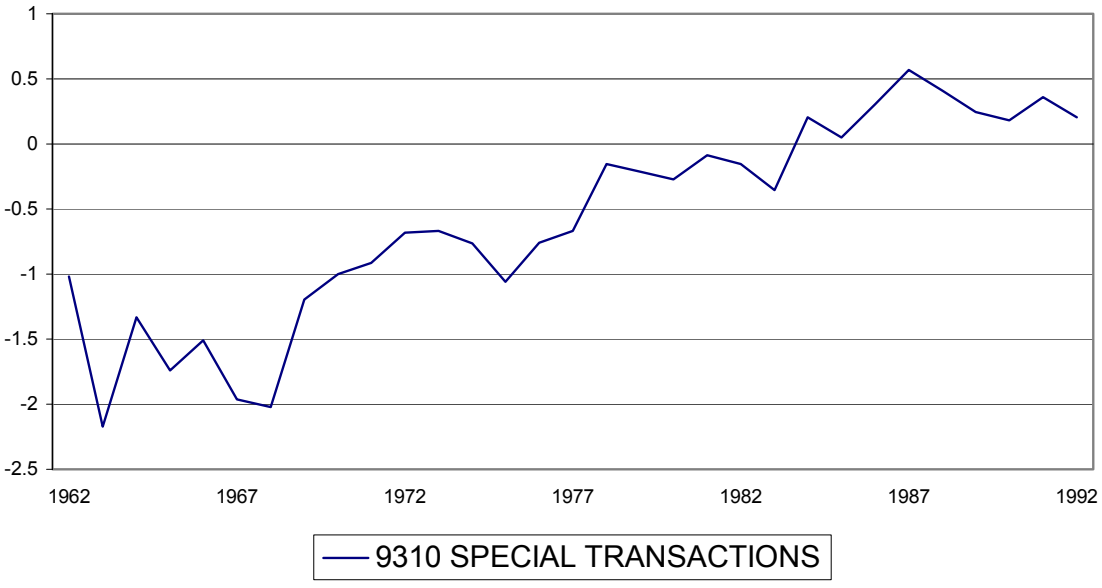




ADF Fail and KPSS Reject



ADF Reject, KPSS Fail and Positive Trend



ADF Reject, KPSS Fail and Negative Trend