An Analysis of the Determinants of Thailand's Exports and Imports wtih Major Trading Partners

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AN ANALYSIS OF THE DETERMINANTS OF THAILAND'S EXPORTS AND IMPORTS WITH MAJOR TRADING PARTNERS

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ABSTRACT

This study investigates the impact of real exchange rates and related variables on Thailand's exports and imports with its three major trading partners. The stationarity test results show that all time series variables in the models are non-stationary and integrated of order one. However, the cointegration tests indicate these series are not cointegrated. Therefore, Stock and Watson's dynamic ordinary least squares method are employed. The results show that real income and bilateral real exchange rates are crucial determinants of export and import between Thailand and its three major trading partners as predicted by a relatively vast literature in international trade.

INTRODUCTION

A switch from the import-substitution policy to export-oriented policy in the late 1970s substantially expanded the export of manufactured goods. The full-scale implementation of export promotion began in the early 1980s. By the end of 1980s, Thailand achieved a high rate of economic growth as a result of an economic boom in foreign direct investment from overseas and its expanded export of manufactured goods [17]. A substantial reduction in import tariffs enhanced the imports of important raw materials, semi-finished products, and capital goods especially machinery that could not be produced in the domestic factories. At the same time, stronger measures to liberalize trade and promote investment were implemented. This resulted in growth and development in the late 1980s. However, Thailand has been dependent on imports of cheaper capital goods from Japan since then.

Major trading partners with a high percentage of imports and exports are the United States, Japan, Singapore, and some EU nations such as the United Kingdom. Data obtained from the Bank of Thailand's Quarterly Bulletin [2] indicated that Thailand's exports to the three major trading partners (USA, Japan, and Singapore) accounted for 47.22 percent of total exports in 1990, increased slightly to 48.65 percent in 1995, then dropped to 44.36 percent in 1999. Imports from the three major trading partners accounted for 49.07 percent in 1990, declined to 48.44 percent and 43.04 percent in 1995 and 1999, respectively. Other trading partners spread thinly over the other 50 plus percent. While the United States is the largest market for Thai exported goods, Japan is the largest source of imported goods, especially machinery and equipment.

The continuous appreciation of the real exchange rate of Thai currency (baht) in the economic boom that continued until the mid 1990s caused a slowdown in Thai exports. The real appreciation was due to the steady rise in the domestic price level relative to the price levels of major trading partners. The country consequently lost its competitiveness in the international markets as export growth dropped sharply in 1995, just two years prior to the financial crisis. Also noteworthy is the time period of the relocation of capital to Thailand. Bangkok International Banking Facility was established in 1993 to settle international transactions and liberalize foreign exchange rate under the fixed exchange rate system. This liberalization induced a massive inflow of foreign capital particularly from Japan. These Japanese manufacturers relocated their labor-intensive operations to Thailand and its neighboring countries in order to maintain a competitive edge in the global economy. Despite this foreign investment, the trade deficits with Japan did not sufficiently improve Thailand's overall trade flows. In addition, the high domestic interest rates also induced an influx of foreign capital. Large capital inflows caused the domestic currency to appreciate and, in turn, led to a current account deficit.

The realization of economic vulnerability in 1996 by foreign investors coupled with the persistent current account deficit caused a large dumping of baht on world currency markets. The baht depreciated dramatically to less than half of its previous value. Even though the Bank of Thailand had attempted to defend the baht from speculative attacks, there appeared to be chronic and massive capital outflow that caused foreign reserves to sharply decline. In the second quarter of 1997, the baht was allowed to float due to a depletion of foreign currency reserves. After three decades of steady growth, Thailand plunged into an economic crisis when its financial sector nearly collapsed.

In theory, a currency devaluation (equivalent to a depreciation under the flexible exchange rate regime) can improve trade flows if the relative prices among the country and its trading partners and other factors are unchanged. Whether devaluation will improve the trade flows remains unclear as shown by many empirical studies. Some international economists contend that the effect of devaluation is to reduce the real value of cash balances and/or the relative prices, and thus improve trade flows. However, some researchers find that devaluation improves trade flows while others reach contradictory conclusions [see 12, p. 600; 10, p. 143; 15, p. 290 and 16, p. 301]. In other words, changes in the real exchange rate do affect the trade flows in some countries but not all because the changes in nominal exchange rate might cause changes in relative prices in the same or different directions.

This study investigates the impact of real exchange rate fluctuations on the bilateral trade flows by applying the dynamic ordinary least squares (DOLS) method proposed by Stock and Watson [18, p. 783] to the conventional model of trade flows. The following sections contain reviews of some related literature, the theoretical framework and the empirical evidence. The last section provides a summary and conclusions.

REVIEW OF RELATED LITERATURE

This review of literature supports the notion that real exchange rates, relative prices and real income significantly influence bilateral trade flows (exports and imports). It is widely known in the international trade literature that a change in real exchange rates will affect trade flows directly with all other things being equal. A

change in the real exchange rate rather than a change in the nominal exchange rate will affect exports and imports under the Generalized Marshall-Lerner condition. A real depreciation of domestic currency will lead to an improvement in trade flows of a country and vice versa. Miles [12, p. 600] tested the effects of devaluation by entering the exchange rate directly into the trade flows, but found that the results of the tests were not quite convincing. For example, the exchange rate coefficient with respect to trade flows was significant in only three out of 14 cases. Himarios [10, p. 143] reassessed the impact of devaluation on real magnitude of trade flows and found that real exchange rates significantly affected the trade flows. Therefore, the results lend strong support to the traditional view that devaluation can be used as a tool to improve trade flows. Warner and Kreinin [19, p. 96] used conventional equations to specify the determinants of trade flows of 19 developing countries. They found that the effect of real exchange rate changes on the volume of exports are significant as predicted by the theory, but the impact on the volume of imports was not determined. Rose [16, p. 301] analyzed the relationship between the effective real exchange rate and the real trade flows for five major Organization for Economic Cooperation and Development (OECD) countries: the United Kingdom, Canada, Germany, Japan, and the United States. He found no relationship between these two variables, and thus the generalized Marshall-Lerner condition did not hold. The influence of real exchange rate misalignment on exports and imports was examined by Asserery and Peel [1, p. 173] and Ghura and Grennes [8, p. 155]. Asseery and Peel used the concept of real exchange rate instability and found that exports and imports were affected by the instability of real exchange rates, while Ghura and Grennes found that real exchange rate misalignment influenced both imports and exports. These studies suggest that real exchange rate fluctuation does affect trade flows.

The following studies took into account not only the exchange rate but also the relative prices. Wilson and Takacs [20, p. 267] directly estimated the response of trade flows to changes in prices and exchange rates using quarterly import and export equations for six major industrial countries including Canada, Japan, France, United Kingdom, Germany, and the United States. The results showed that trade flows adjusted differently to changes in prices and the exchange rate under the fixed exchange rate regime. Bahmani-Oskooee [3, p. 107] used a distributed lag structure to assess import and export demand functions for a sample of seven developing countries during 1973-1980. The results showed that trade flows adjusted differently to trade stimuli which supported the result from Wilson and Takacs [20, p. 267]. Bahmani-Oskooee also concluded that trade flows are more responsive to changes in the relative prices and to changes in the exchange rates in the long run. Other recent studies that employed structural econometric equations to estimate the parameters of the import and/or export equations include the works of Clarida [5, p. 298], Chua and Sharma [4, p. 253], and Reinhart [15, p. 290]. Clarida and, Chau and Sharma investigated the effects of prices and exchange rates on trade flows without including the real income variables. Reinhart [15, p. 290-312] investigated the effect of devaluation on trade flows and found significant effect of real income and relative price changes on trade flows in most cases as a result of devaluation in 12 developing countries. The results from these studies give strong support to the notion that real income and relative prices significantly influence trade flows.

Based on the review put forth here, the more recent a manuscript on the determinants of bilateral trade flows the more likely the support for the Marshall-Lerner condition. The mixed previous empirical evidence may be contributed by

model choice and trade flow aggregation. Case in point; Rose uses an imperfect substitutes model to test the Generalized Marshall-Lerner condition while Chua and Sharma use a sophisticated formula to compute the real exchange rate but did not take into account income due to lack of comparable data. The relative prices in their analysis are weighted average of export and import prices relative to domestic price level. All studies in this review employed aggregate trade flows which may cause ambiguity in part because not all trading partners may be included in real effective exchange rate computation. The model put forth in the following section employs bilateral trade data to take into account each trading partner.

ANALYTICAL FRAMEWORK

Variables used to estimate the export and import equations are the real exchange rate, domestic income, and foreign income. Quarterly data for these variables are collected from International Financial Statistic Yearbooks and the CD-ROM data base produced by the International Monetary Fund. The exchange rates of the three currencies (baht/US dollar, baht/yen, and baht/Singapore dollar) are obtained from the Bank of Thailand. These exchange rates are the average between selling and buying rates in each quarter. The series includes quarterly data from 1990 to 2000, the latest data available. First, the equations below are estimated.

$$X = X(R, Y^*) \quad (1)$$

and

$$M = M(R,Y) \quad (2)$$

$$R = E\,(P^*/P)$$

Where:

X = the nominal value of exports deflated by the unit value of export
M = the nominal value of imports deflated by the unit value of import,
R = the real exchange rate measured in terms of baht per Foreign currency (period average),
E = nominal exchange rate expressed in terms of baht per foreign currency
P* = the trading partner CPI
P = Thailand CPI
Y = Thailand real income and
Y* = the trading partner real income.

The real income variable is proxied by the GDP volume index. All variables in equation (1) and (2) are in the logarithmic forms. The real exchange rate (R) may capture two effects when the country has an exchange rate depreciation. For example, when EP*/P rises without the change in physical volume of imports, their value measured in domestic currency rises because of the price effect. The higher import spending in terms of domestic currency worsens the trade balance. On the other hand, the volume effects indicate an improvement in trade balance due to higher volume of exports and lower volume of imports because of domestic exchange depreciation. Which effect is stronger depends upon the length of time [7, p. 469].

It is widely shown that most macroeconomic time series exhibit a non-stationary pattern. For example, see Nelson and Plosser [13, p. 139]. Many researchers use unit root test to investigate the dynamic nature of economic time

series data. A time-series that has a unit root is a non-stationary time-series. The series is stationary if its mean and variance are constant over time and the value of covariance between two time periods depends upon the lag between the two time periods, but not on the actual time on which the covariance is computed [9, p. 713]. In other words, if the series is stationary, the stochastic process is fixed in time and the model with fixed coefficients can be estimated from past data. The unit root test of stationarity and the cointegration test are two procedures employed to test the properties of time series data used in the model. Two standard unit root tests of stationarity are performed--Augmented Dickey-Fuller (ADF) test [6, p. 427] and Phillips-Perron (PP) test [14, p. 335]. Both examine the null hypothesis that a unit root at level of a variable exists. When the series is not stationary in its level, it is possible that its first difference is stationary. If the first-difference of all series are stationary, they are said to be integrated at the same order, i.e., order one [I(1)]. In addition, these series may have a long-run relationship or be cointegrated. The ADF test offers a test for cointegration property. When the series are not cointegrated, the dynamic ordinary least squared (DOLS) method as proposed by Stock and Watson [18, p. 783] can be used in the estimation.

$$X_t = a_0 + a_1R_t + a_2Y^*_t + d_R(L)DR_t + d_Y{}^*(L)DY^*_t + e_t \qquad (3) \text{ and}$$

$$M_t = b_0 + b_1R_t + b_2Y_t + d_R(L)DR_t + d_Y(L)DY_t + u_t \qquad (4)$$

where $d_i(L)$ is the lead and lag operators. These operators are used for adjustment and to improve the results. With a small sample size, Stock and Watson suggest one lead and one lag operator to deal with problems in error terms. The estimation of dynamic equations is more efficient with a relatively small sample size and gives more preferable results than other procedures. The DOLS deals with problems of simultaneity and serial correlation in the error. The estimator provides the minimum residual mean square errors. Employing only OLS method in the estimation procedure may cause spurious regression or unreliable results.

EMPIRICAL EVIDENCE

The test statistics of the unit root at level are based on the Augmented Dickey-Fuller and Phillips and Perron tests and reported in Table 1. Table 1 presents the ADF and the PP tests for the null hypothesis that each series contains a unit root against the alternative hypothesis that it does not. Test with and without trends are performed to ensure accuracy since the series may or may not exhibit deterministic trends. The ADF and PP tests with and without a linear trend show that the null hypothesis of a unit root is accepted for all series because the calculated values are less than MacKinnon's critical values [11, p. 267]. The results suggest that there is little evidence that each series will contain more than one unit root. Therefore, each series is nonstationary.

Results of the unit root tests on first differences are shown in Table 2. Table 2 presents the ADF and the PP tests for the null hypothesis that the first difference of each series contains a unit root against the alternative hypothesis that it does not. The ADF and PP tests without a linear trend show that the null hypothesis of a unit root can be rejected for all series (the calculated values are greater than MacKinnon's critical values) even though the two tests give some contradictory results for domestic

real income, and real imports from Japan. Therefore, each series is integrated in the same order, i.e. I (1). When they are integrated at the same order, they could be cointegrated [9, p. 726]. Furthermore, Johansen and ADF procedures for cointegration tests are employed. These two procedures test the null hypotheses of unit root of the residuals from equations 1 and 2. The results shown in Tables 3 and 4 indicate that the series are nonstationary and therefore are not cointegrated because in most cases the calculated values are less than MacKinnon's critical values. In view of the fact that the series are not cointegrated, Stock and Watson's dynamic ordinary least squares method is employed.

Table 1
Unit Root Tests For Stationarity Of Time Series

		Without Trend		With Trend	
Variables		**ADF**	**PP**	**ADF**	**PP**
Ln of Real Exports**:**					
X_{usa} (real exports to USA)		-1.258	-1.394	-3.507	-3.219
X_j (real exports to Japan)		-2.211	-2.698	-1.334	-1.630
X_s (real exports to Singapore)		-1.581	-1.487	-1.654	-1.709
Ln of Real Imports:					
M_{usa} (real imports from USA)		-1.909	-1.896	-1.456	-2.081
M_j (real imports from Japan)		-1.631	-1.552	-1.588	-1.428
M_s (real imports from Singapore)		-2.206	-2.047	-2.783	-2.365
Ln of Real Exchange Rate**:**					
R_{usa} (baht/dollar)		-1.377	-1.204	-1.904	-1.663
R_j (baht/yen)		-2.726	-2.221	-2.997	-2.447
		-0.696	-0.840	-3.013	-2.206
R_s (baht/Singapore dollar)					
Ln of Real Income:					
Y_{usa} (USA GDP index)		-1.945	-3.275	-3.724	-2.904
Y_j (Japan GDP index)		-1.867	-2.290	-2.660	-3.672
Y_s (Singapore GDP index)		-0.970	-1.468	-2.067	-2.131
Y (Thailand GDP index)		-2.320	-3.501	-0.291	-0.805
MacKinnon Critical Values:	1%	-3.623	-3.617	-4.232	-4.224
	5%	-2.945	-2.942	-3.539	-3.535

Table 2
Unit Root Tests Of First Differences Of The Series

	ADF	**PP**
Ln of Real Exports:		
X_{usa} (real exports to USA)	-10.130	-6.811
X_j (real exports to Japan)	-4.258	-7.250
X_s (real exports to Singapore)	-4.190	-6.364
Ln of Real Imports:		
M_{usa} (real imports from USA)	-5.986	-9.985
M_j (real imports from Japan)	-2.601	-3.613
M_s (real imports from Singapore)	-4.252	-5.239
Ln of Real Exchange Rate:		
R_{usa} (baht/dollar)	-3.378	-4.619

		-4.661	-4.889
R_j (baht/yen)		-3.196	-4.201
R_s (baht/Singapore dollar)			
Ln of Real Income:			
Y_{usa} (USA GDP index)		-3.164	-5.246
		-4.925	-8.989
Y_j (Japan GDP index)		-6.453	-6.976
Y_s (Singapore GDP index)		-5.237	-2.644
Y (Thailand GDP index)			
MacKinnon Critical Values:	1%	-3.629	-3.623
	5%	-2.947	-2.945

Table 3
Johansen Cointegration Test

Country	Export		Import	
	With Trend	Without Trend	With Trend	Without Trend
The USA	44.88	25.76	30.71	37.77
Japan	32.43	25.69	27.37	22.35
Singapore	38.79	25.31	32.99	27.94
Critical Value at 5%	34.94	29.68	34.94	29.68

Table 4
ADF Cointegration Test

Country	Export	Import
The USA	-3.57	-6.22
Japan	-2.28	-2.00
Singapore	-2.56	-3.35
Critical Value at 5%	-2.94	

The next procedure is to estimate the export and import equations as specified in equations (3) and (4). The estimated coefficients are shown in Table 5. The results indicate that real income plays an important role in determining trade flows, both exports and imports. Furthermore, these elasticities are highly significant in almost all cases. The sizes of the foreign income elasticities for export to USA, Japan, and Singapore are 1.143, 3.502, and 3.042, respectively. These elastic values are consistent with Reinhart's finding [15]. An elastic income elasticity of export demand suggests that an increase in foreign income will lead to an improvement in trade flows, and vice versa. Recall that U.S. is Thailand's largest export market. It is imperative to point out that even though Japan is not Thailand's largest export market, the real income stagnation of Japan throughout the 1990s did contribute to the deterioration in trade flows. The US income declined slightly from 1990 to the second quarter of 1992 and rose gradually towards the end of the decade. This did

not improve the trade flows because expansions of the Thai's exports to the US are limited by the US slow growth. As evidence from Table 5, a one percent decrease in Japan's income more than offsets a one percent increase in US income. On the contrary, Singapore's income increased dramatically with some fluctuations in the short run. However, this would not be enough to compensate for Japan's income stagnation and slow growth in the US.

By the same token, the domestic income elasticities for imports from USA, Japan, and Singapore are 0.858, 0.760, and 0.553, respectively, compared with the of Reinhart's results ranging from 4.410 to 0.889 for the Asian nations. An inelastic income elasticity of demand for imports implies that a rise in domestic income will lead to deterioration of trade flows, and vice versa. Therefore, the results in this study show that real income is a crucial determinant of trade flows between Thailand and the three major trading partners. Although the popular trade model can explain the trade flows between Thailand and major trading partners, the evidence that Thailand's terms of trade has deteriorated as compared to other developing countries because of the inelasticity of foreign income on the export side may be a new contribution to the literature.

Table 5
Estimates Of Exports And Imports Equations

	Variable	Coefficient	Standard Error	t-statistics	R^2
Export Country:					
The USA	R	0.366	0.193	1.895*	0.761
	Y*	1.143	0.183	6.244**	
	Constant	-2.487	0.736	-3.378**	
Japan	R	0.858	0.222	3.870**	0.701
	Y*	3.502	0.597	5.861**	
	Constant	-14.993	2.735	-5.481**	
Singapore	R	1.115	0.339	3.289**	0.837
	Y*	3.042	0.396	7.686**	
	Constant	-7.089	0.981	-7.225**	
Import Country:					
USA	R	-0.700	0.152	-4.603**	0.870
	Y	0.858	0.079	10.803**	
	Constant	2.099	0.698	3.006**	
Japan	R	-0.492	0.385	-1.276	0.480
	Y	0.760	0.191	3.978**	
	Constant	2.353	1.118	2.106*	
Singapore	R	-0.685	0.178	-3.844**	0.721
	Y	0.553	0.140	3.949**	
	Constant	2.375	0.430	5.519**	

In terms of real exchange rates, the evidence here seems to support the generalized Marshall-Lerner condition. Case in point, this condition holds in all export demand but fails only in the case of import demand from Japan. The real

exchange rate elasticities of export are significant with the positive correct sign. These values are 0.366, 0.858, and 1.115 for the USA, Japan, and Singapore, respectively. Among three major trading partners, the real exchange rate elasticity for exports to the USA is quite low compared with others. This implies that a one percent depreciation of the baht will lead to only 0.366 percent rise in exports even though the USA is the largest market for Thailand's exports. However, the results confirm that when real depreciation of the Thai baht is realized, the Thai export goods will be cheaper in terms of foreign currency so that demand for Thai exports (in quantity terms or real terms as used in the model) must be more. The 1990s pattern of the bilateral real exchange rates shows a relatively stable exchange rate between the baht/US dollar until the second quarter of 1997 when it depreciated due to a switch from fixed to floating exchange rates. In subsequent periods, the tendency seemed to be similar to the pattern prior to 1997. From 1990 to the first quarter of 1995, the baht/yen depreciated and then substantially appreciated up to the second quarter of 1997 when it eventually depreciated again. On the contrary, the baht/Singapore dollar had depreciated from 1990 to the third quarter of 1997 when it began to appreciate.

In all three major trading partners, the real exchange rate elasticities of imports are less than one in absolute values. The expected signs of the real exchange rate elasticity of import are correct for all three countries. However, the coefficient is not significant in the case of Japan. It is imperative to remember that Thailand relies heavily on imports of machinery from Japan. Compared with the same quality imports from other countries, machinery from Japan is relatively less expensive. With the appreciation of the baht from 1995 to the second quarter of 1997, the real value of imports from Japan substantially increased as expected due to high import content of many important manufactured items. Furthermore, imports from Japan are conducted via intrafirm trade in the Thai inward foreign direct investment. Therefore, Thai imports from Japan are insulated from the real exchange rate movements. This may in part explain the insignificant coefficient of real exchange rate elasticity of import demand from Japan. Regarding bilateral trade with Singapore, Thailand is not operating as an entry port for Singapore but Hong Kong is. However, Thailand is one of the production bases that may compete with neighboring countries in high-tech products such as electronics, automobiles, and electrical appliances.

SUMMARY AND CONCLUSIONS

This study aims at assessing the determinants of trade flows between Thailand and three major trading partners. By and large, the evidence from this study indicates that domestic and foreign real income, and real exchange rates seem to be the prime determinants of Thailand's trade flows with the major trading partners. The results from this study show that the generalized Marshall-Lerner condition seems to hold in most cases. For example, a real depreciation improves exports but worsens imports, and vice versa. Furthermore, the trade flows seem to follow the international trade theory in general. Both domestic and foreign real income are crucial determinants of bilateral exports and imports as predicted by the international trade literature.

Thailand's trade deficits are the deficits with its major trading partners, especially Japan which is a net exporting country to Thailand. Based upon the results from this study, the trade policy measures to alleviate the trade deficits via bilateral real exchange rates, domestic and foreign real income may be implemented. In so far

as it is dynamic, a gradual depreciation will improve the bilateral trade flows. Nevertheless, in the case of imports from Japan, changes in real exchange rate do not seem important in this study. If the policy recommendation would be to reduce imports from Japan, that recommendation may not be wise since machinery prices from Japan are lower than those from other countries. A policy measure to stimulate growth may harm the country's trade flows with these three major trading partners, especially Japan because an increase in real income will induce more imports of machinery from Japan**.** Obviously, there are tradeoffs when the alternative policy recommendations are directed at the system's endogenous variables such as real exchange rates, domestic and foreign real income. Above all, these policy recommendations may not matter in the long run. No economic theory suggests that trade deficits are necessarily bad for an economy. Diversification of exports to different trading partners may be an alternative to improve trade flows. The avenue for future research may include consideration of the simultaneity of variables in this study. To synopsize, higher import prices will reduce imports and improve the balance of payments but adversely affects economic growth and in turn affect the real exchange rate that stimulates imports.

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