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Aggregate Import Demand and Expenditure Components in five ASEAN Countries: An Empirical Study

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ABSTRACT

This paper examines the long run relationship between aggregate imports and expenditure components of five ASEAN countries using Johansen multivariate cointegration analysis. The ASEAN-5 countries considered are Malaysia, Indonesia, the Philippines, Singapore and Thailand. Annual data for the period 1968-1998 are used with the exception of Singapore, with a shorter sample period, 1974-1998. The final demand expenditure variable is disaggregated into public and private consumption expenditure, investment expenditure and exports. The use of a disaggregated demand variable, as opposed to the use of a single demand variable, is justified by the possibility that each final demand component may have different import contents. The approach employed in this study avoids the problem of aggregation bias. The results of Johansen's multivariate test reveal that import demand is cointegrated with its determinants for all ASEAN-5 countries. Short-run variations in import demand found to be influenced by variations in relative prices and macro components of final demand. Import demand is also found to be elastic with respect to relative prices for all ASEAN-5 countries except the Philippines. The findings provide a relevant for policy implications.

INTRODUCTION

The main objective of this paper is to examine the long run relationship between import demand and the components of final expenditure, and relative prices for ASEAN-5 countries using Johansen multivariate cointegration analysis. The ASEAN-5 countries considered are Malaysia, Singapore, Thailand, Indonesia, and the Philippines. The components of final expenditures are final consumption expenditure, expenditure of investment goods, and exports. An error correction model is proposed to model the short run response of imports to its determinants.

This study is justified by the following considerations. First, this study differs from most of earlier studies, which used a single demand variable in their specifications. This approach implicitly assumes that the import content of each final demand component is the same. If this assumption is not true, the use of a single demand variable will lead to aggregation bias. By disaggregating final demand we are able to estimate the separate effects of each component on import demand.

Second, the findings will be useful for evaluating the efficacy of exchange rate policy to correct the trade balance deficits as experienced by most ASEAN countries in the years before the 1997 Asian Financial Crisis. The efficacy of exchange rate policy is based on whether the Marshall-Lerner condition is met or not. Relative prices do play a significant role in the determination of trade flows, buttressing policies of devaluation as a way to correct trade imbalances (Reinhart 1995: 291). Trade theorists and analysts (for instance, Heien 1968) have long argued that for devaluation or depreciation to be effective in correcting trade imbalances, a value of the price elasticity of demand between –0.5 and –1.0 is necessary. This condition allows trade flows to respond to changes in relative prices in a significant and predicable manner (Reinhart 1995).

Third, the use of cointegration methodology is more acceptable in the sense that, we are less open to the criticism of spurious regression should the variables involved in the import demand specification be non-stationary in their levels.

The paper is structured as follows. The next section gives a review of selected recent studies on import demand. This is followed by a section on model specification, and investigation of the stationarity properties of the variables appearing in the import demand function. Section four reports the empirical findings. Section five reports the ECM analysis of short run behaviour of aggregate imports. The last section provides a summary and policy implications of the study.

REVIEW OF LITERATURE

This section reviews selected studies on import demand for the respective countries.

Malaysia

Mohammad (1980) estimated a dynamic import demand function for West Malaysia using time-series data for the period 1960-1974. The income elasticity of demand for imports is found to be approximately 0.7. The estimated price elasticity of import demand is found to be –0.8. Awang (1988) found import demand to be inelastic with respect to both income and relative price with short run elasticities of 0.29 and –0.28 respectively. The MIER Annual Model (MIER, 1990) disaggregated imports into three categories: imports of primary commodities, imports of oil and imports of manufactures. Short run income and relative price elasticities of imports of manufactures are 1.35 and –0.91 respectively. The corresponding estimates of long run elasticities are 1.42 and –0.96. But these findings are based on non-stationary data.

Tang and Mohammad (2000) examined the long run relationship between Malaysia's aggregate imports and income and relative prices using Johansen cointegration analysis. Annual data for the period 1970 to 1998 were used. The estimated long run elasticities of import demand with respect to income and relative prices are found to be 1.5 and –1.8 respectively. The short run elasticity of import demand with respect to income and relative prices are 1.5 and –0.6 respectively. In the short run, growth in imports is influenced by growth in income and relative prices. However, in the error correction analysis, the insignificance of the lagged error correction term implies that there is no disequilibrium in the long run relationship and that the model is specified correctly without the error term.

Mohammad and Tang (2000) examined the long run relationship between aggregate imports and the components of final demand expenditure and relative prices using Johansen multivariate cointegration analysis. Annual data for the period 1970 and 1988 were used. The cointegration analysis found the major determinants of aggregate imports in the long run to be consumption expenditure, investment expenditure, exports and relative prices. The partial elasticities of import demand with respect to consumption expenditure, investment expenditure and exports are 0.73, 0.78 and 0.385 respectively. The elasticities of import demand with respect to the three components of final demand expenditure are not similar. The import price elasticity is fairly inelastic at –0.69, a value that is much lower compared to that obtained by Tang and Mohammad (2000). In the short run analysis of import demand behaviour using error correction modeling, it is foud that 63.7 per cent of the disequilibrium is corrected within a single year (the lagged error correction term is significant at the 1 per cent level). Short run variations in aggregate imports are mainly determined by variations in macro components of final demand expenditure viz. investment expenditure and exports, and relative prices.

Singapore

Lim, Chow and Tsui (1996) applied demand systems specification to estimate Singapore's import demand function, and used the homogeneity restriction to yield efficient and consistent estimators in order to deal with simultaneity bias, measurement errors and omitted variables. This approach yielded better estimates than those obtained using the traditional log-linear model. The authors used augmented Dickey-Fuller test, but did not use the Johansen and Juselius (1990) methodology probably because of the limited data available.

Aggregate imports are disaggregated into three categories: agriculture and mining; fuels; and manufacturing. Annual data for the period 1975-1992 were used. The main results obtained in their study are as follows. First, the respective demand in each sector is typically most price elastic with respect to its sector price. Second, the income elasticities are positive for all three sectors as expected *a priori*. A 1 per cent increase in income would lead to a 1.9 per cent increase in both agriculture and mining, and manufacturing imports, and 0.49 per cent increase in fuels imports.

Indonesia

Reinhart (1995) specified and estimated an import demand function for Indonesia using annual data for the period 1970-1992. The estimated long run elasticities of imports with respect to income and relative price were 1.6 and –0.9, respectively. The author using Johansen method found no cointegration between imports and the other variables in the import function. Senhadji (1998), based on annual data for the period 1960-1993 estimated the long run elasticities of income and price to be 0.98 and –1.56, respectively. However, the Phillips-Ouliaris residual test failed to reject the null of no cointegration. The corresponding short run income and price elasticities were found to be 0.36 and –0.62.

Thailand

Bahmani-Oskooee (1986) using quarterly data of 1973-1980 found that imports were inelastic, with estimated relative price and income elasticities –0.308 and 0.946, respectively. Sinha (1997) used Johansen Multivariate procedure to estimate Thailand aggregate import demand function for the period 1953-1990, and found aggregate import demand to be price inelastic

(–0.77), and cross price inelastic (0.3) but highly income elastic (2.15). Senhadji's (1998) study found that the variables appearing in Thailand's import demand model for 1960-1993, viz. real imports, ratio of imports deflator to GDP deflator and income (GDP minus exports) are not cointegrated. However, the estimated long run elasticities of income and prices were respectively, 1.67 and –1.43. The corresponding short-run elasticities were reported at 0.55 and –0.51. A recent study (Mah, 1999) reported that the estimated income and price elasticities of import demand were respectively, 0.74 (insignificant) and –1.53 for the period 1963-92.

The Philippines

Apostolkis (1991) reported that the elasticities of income and relative price of Philippines's import demand were 0.67 and –2.73, respectively. A recent study by Senhadji (1998) estimated (OLS) that the long run income and prices elasticity of Philippines's import demand were at 2.25 and –2.73 respectively. Using annual data for the period 1960-93, they found that import demand was not cointegrated with its determinants (using Phillips-Ouliaris residual test). The short run elasticities were 0.44 and –0.36 for income and prices, respectively.

In contrast, a study by Bahmani-Oskooee and Niroomand (1998) using Johansen (1988) and Johansen and Juselius (1990) cointegration methodology, found that there existed at least one cointegrating vector among the variables of import demand function (volume of imports, relative prices and domestic income). The estimated long run elasticities of income and relative prices were 1.35 and –1.01, respectively. Both studies found the Philippines import demand to be elastic with respect to income and relative prices. The relatively high-income elasticity suggests that import demand is strongly driven by economic growth. If imports are biased towards imports of consumption goods, *ceteris paribus*, the country may face balance of payments problems in the longer run.

THE MODEL AND DATA

The traditional specification of an import demand function relates the quantity of import demand to domestic real income and relative prices. The former is often proxied by an aggregate demand variable. The composition of expenditure is also argued to be important, if the various components of expenditure have different import contents (Giovannetti 1989; Thirlwall and Gibson 1992; Abbott and Seddighi 1996; and Mohammad &

Tang 2000). If this were the case, the use of a single demand variable would lead to aggregation bias. Indeed, if the composition of demand changes, the aggregate import propensity would change even if the disaggregated marginal propensities are unchanged (Giovannetti 1989: 960).

In this study, final demand expenditure is disaggregated into consumption expenditure (private and public sectors), investment expenditure (public and private sectors) and exports.

The other important explanatory variable identified by economic theory is the price of imports relative to the domestic substitutes. The demand for imports is hypothesised to be inversely related to the relative prices term. An increase in relative prices leads to a fall in quantity of imports demanded, and *vice versa*. The small country assumption is invoked here. Import supply elasticities are assumed to be infinite. Consequently, import prices may be treated as exogenous.

On the basis of the above assumptions, the long-run import demand function is specified as follows:

$$M_t = f(FCE_t, EIG_t, EX_t, P_t) \quad (1)$$

where FCE is final consumption expenditure, EIG is expenditure on investment goods, EX is exports and P is relative price.

In this study we specified and estimated import-demand using the log-linear form as follows:

$$\text{Ln}\, M_t = \alpha_0 + \alpha_1 \text{Ln}\, FCE_t + \alpha_2 \text{Ln}\, EIG_t + \alpha_3 \text{Ln}\, EX_t + \alpha_4 \text{Ln}\, P_t + u_t \quad (2)$$

where u_t is a random error assumed to satisfy the classical assumptions. Ln stands for natural logarithms. From economic theory, the signs for the coefficients α_1, α_2 and α_3 are expected to be positive, and α_4 to be negative.

The log-linear specification has been adopted by a number of studies (Faini et al. 1992; Boyland et al. 1980; Goldstein & Khan 1985 and Beenstock et al. 1986). In all these studies, a single aggregate demand variable has been used as an explanatory variable. Exceptions are studies by Giovannetti (1989) and Mohammad and Tang (2000).

Annual data from 1968 to 1998 are used in this study, with the exception of Singapore (1974-98) due to data availability. All variables are in natural logarithmic form. Data sources and definitions are given in the Appendix 1. We are not able to use quarterly data, as they are not available for a sufficiently long period for all the variables that appear in the import demand function, especially variables pertaining to the components of GDP. Quarterly figures may however be generated from annual data. Mithani and Goh (1999) outlined some methods to generate quarterly figures from annual data. Ahmed and Tongzon (1998) used constructed real GDP quarterly data for Malaysia supplied by Abeysinghe and Lee (1994), and for Indonesia, the Philippines and Thailand, quarterly data were generated from annual data obtained from International Financial Statistics using the Otani-Riechel's procedure used by the IMF. Their sample period is 1975 to 1993.

We are aware of the fact that the econometric techniques used in this paper are sensitive to the sample size or number of observations. When we use hard data collected by the relevant agencies, there is less criticism on the possibility of measurement errors. In this case we would have to generate quarterly figures from annual data for a number of variables, in particular the expenditure components of final demand. But measurement errors may be more serious when data used are constructed data. If measurement errors are correlated with regresors, use of OLS may lead to biased and inconsistent estimates. Another consideration when using quarterly data is that, seasonality effect needs to be addressed.

We can quote a number of studies on import demand functions using a limited number of annual data. Doroodian, Koshal and Al-Muhanna (1994) used aggregate annual data for the period 1963-1990 (28 observations). The authors used Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) unit root tests and Johansen and Juselius multivariate trace and maximal eigenvalue cointegration tests. Reinhart (1995) used annual data for the period 1968-1992 (25 observations). The authors used Johansen (1988, 1991) procedure in the context of a VAR model. Bahmani-Oskooee and Niroomand (1998) used annual data for the period 1960-1992 (33 observations). They estimated import and export demand functions for about 30 countries. ADF tests and Johansen (1988) and Johansen and Juselius (1991) cointegration analysis were carried out. A final example is Lim et al. (1996) who used annual data for the period 1975-1992 (18 observations). The authors used ADF test. The authors did not use the Johansen and Juselius (1990) methodology probably because of the limited data available.

In carrying out a cointegration analysis, what matters is the length of the sample period and not so much the number of observations. As stated by Hakkio and Rush (1991), increasing the number of observations by using monthly or quarterly data does not add any robustness to the results in tests of cointegration. Sinha (1997) adopted this justification and employed cointegration approach (Johansen multivariate procedure) to analyse aggregate import demand function for Thailand using annual time series data for the 1953-1990 period.

We began by investigating the stationarity properties of the variables appearing in the import demand function. According to Phillips (1987), regressions involving levels of variables that are I(1) but not cointegrated will yield spurious results. The implication of this is that, only cointegrated variables are to be used in regressions that involve levels of the variables.

Both the Augmented Dickey Fuller (ADF) and the Phillips-Perron (PP) tests were conducted. The PP test was designed to be robust in the presence of autocorrelation and heteroscedasticity. The regression equation for the ADF test (Dickey and Fuller 1979) is given as follows.

$$\Delta Y_t = a + bt + cY_{t-1} + \sum_{i=1}^{k} d_i \, \Delta Y_{t-i} + e_t \tag{3}$$

where Δ is the first difference operator, t refers to time trend, and k is additional terms in the lagged differences for the Augmented Dickey-Fuller (ADF) test. e_t is the regression error assumed to be stationary with zero mean and constant variance. The Phillips and Perron (1988) test is also based on equation (3) but without the lagged differences. Both tests were carried out to reject the null hypothesis of a unit root ($c = 0$ for ADF, and $c = 1$ for PP).

The data definitions and sources are given in Appendix 1. The results on the degree of integration of each series involved are reported in Appendix 2. The results show that all series are I(1) i.e. they become stationary after first differencing.

Once the order of integration is established, and that the variables are all I(1), the search for a unique cointegrating vector using sets of variables which are integrated of the same order, is carried out. Johansen's multivariate cointegration tests are utilised for this purpose (Johansen 1988; Johansen & Juselius 1990). This approach can be used to establish the number of distinct cointegrating vectors. It does not have the drawbacks of the Engle and Granger (1987) approach to cointegration (Abbott & Seddighi 1996: 1120). Having established that the variables entering the import demand function are I(1), we then proceed to determine the lag length of the VAR, using the approach to ensure the residuals are white noise and have a normal distribution.

If the variables entering the import demand function are cointegrated, the ECM model is specified as follows:

$$\Delta \ell nM_t = b_0 + b_{1i}\,\Delta \ell nM_{t-1} + \sum_{i=0}^{n} b_{2i}\,\Delta \ell nFCE_{t-i} + \sum_{i=0}^{n} b_{3i}\,\Delta \ell nEIG_{t-i}$$
$$+ \sum_{i=0}^{n} b_{4i}\,\Delta \ell nX_{t-i} + + \sum_{i=0}^{n} b_{5i}\,\Delta \ell nP_{t-i} + \sum_{i=0}^{n} b_{6i}\,\Delta CU_{t-i} \quad (3)$$
$$+ \mathrm{b}_7\,\mathrm{EC}_{\mathrm{t}-1} + \mathrm{error\_term}$$

where CU is capacity in the manufacturing sector for Malaysia and Singapore, where data are available. Δ stands for first difference operator. EC_{t-1} is the error correction term, the lagged residuals from the cointegrating regression. This term is included if the variables appearing in the import demand function are cointegrated.

EMPIRICAL FINDINGS

This section reports the results of cointegration analysis. The Johansen-Juselius (JJ) method of cointegration tests is based on the maximum likelihood estimation of the VAR model. The trace statistics with the assumption of linear deterministic trend in the data (since there seems to be a linear trend in all the non-stationary series) are reported in Table 1.

TABLE 1. Trace test of Johansen cointegration method

Country:	Eigenvalue	Likelihood Ratio	5 Percent Critical Value	*Adjusted* 5 Percent Critical Value #	Hypothesized No. of CE(s)
Malaysia (1)	0.71247	83.3578	68.52	81.68	None*
Indonesia (2)	0.91444	151.0631	68.52	101.11	None*
Thailand (1)	0.82518	96.0575	68.52	81.68	None*
Philippines (2)	0.88108	116.1867	68.52	101.11	None*
Singapore (1)	0.88562	117.3623	68.52	85.65	None*

Note: The 5 percent critical values, 68.52 for trace test are obtained from Osterwald-Lenum (1992, Table 1). # The *adjusted* critical values are computed with a scaling factor proposed in Cheung and Lai (1993) to make finite-sample corrections. * denotes rejection of the hypothesis at 5% significance level based on adjusted critical values, and ( ) refers to optimal lag-length of VAR.

The null hypothesis of no cointegration can be rejected at 5 per cent level of significance of the trace statistics (see likelihood ratio's column). Thus, we are confident that there is at least one cointegrating vector among the variables of import demand function for each country. Thus, the variables of the import demand function namely, volume of imports, expenditure on investment goods, final consumption expenditure, exports and relative prices are cointegrated for ASEAN 5 countries.

The estimated normalised long run cointegration equations based on Johansen method are reported as follows.

1. Malaysia:

$$\ln \hat{M} = 5.713 + 0.5288 \ln EIG + 0.2563 \ln FCE + 0.3791 \ln X - 1.55271 \ln P$$

se	(0.1238)	(0.2339)	(0.0808)	(0.2101)
t-value	(4.2699)	(1.0958)	(4.6944)	(–7.39)

2. Indonesia:

$$\ln \hat{M} = 6.1749 + 1.2807 \ln EIG - 0.9863 \ln FCE + 0.7490 \ln X - 1.3075 \ln P$$

se	(0.3360)	(0.4966)	(0.1471)	(0.2161)
t-ratios	(3.8119)	(–1.9861)	(5.0905)	(–6.0499)

3. Thailand:

$$\ln \hat{M} = 6.1165 + 0.2066 \ln EIG + 0.0195 \ln FCE + 0.6709 \ln X - 1.0309 \ln P$$

se	(0.1415)	(0.2050)	(0.1165)	(0.2641)
t-value	(1.4607)	(0.0951)	(5.7598)	(–3.9029)

4. Philippines:

$$\ln \hat{M} = -3.2382 + 0.4489 \ln EIG + 1.0386 \ln FCE + 0.3306 \ln X - 0.4076 \ln P$$

se	(0.0255)	(0.1346)	(0.0682)	(0.0650)
t-value	(17.6172)	(7.7164)	(4.8502)	(–6.2678)

5. Singapore:

$$\ln \hat{M} = -11.1566 + 0.5667 \ln EIG + 1.7434 \ln FCE - 0.7569 \ln X - 1.3261 \ln P$$

se	(0.1136)	(0.6339)	(0.4287)	(0.3159)
t-value	(4.9890)	(2.7502)	(–1.7654)	(–4.1985)

The results may be summarized as follows. First, all the estimated coefficients have the correct signs, and most of them are significant at 5 per cent level of significance, with the exception of the Ln FCE variable for Malaysia and Thailand. The export variable is also not significant at the 5 per cent level for Singapore. Second, the estimated coefficients for the final demand components for each country appear to be different. This supports the approach of disaggregating the demand variable. Third, in all countries except the Philippines the estimated import price elasticity exceeds unity. The estimate for Thailand is approximately unity.

SHORT-RUN BEHAVIOUR OF AGGREGATE IMPORTS

In this section we report the results from an analysis of the short-run behaviour of aggregate imports. A dynamic error correction model has been estimated. The lagged residual from the long-run cointegrating equation was incorporated into the ECM. To save degrees of freedom, one lag length is used in the ECMs (Ghatak, Milner & Utkulu 1997: 221). We also carried out tests on the residuals to ascertain whether they are white noise and have normal distribution or not. The lag length used for general ECM is 1 for Malaysia, Indonesia, Thailand, The Philippines and 2 for Singapore. The specific ECMs are reported below:

1. Malaysia:

$$\Delta \text{Ln}\,\hat{M}_t = \underset{(-3.259)^{*}}{-0.171} + \underset{(2.035)^{***}}{0.275}\,\Delta \text{Ln EIG}_t - \underset{(-1.746)^{***}}{0.227}\,\Delta \text{Ln EIG}_{t-1} + \underset{(2.019)^{***}}{1.00}\,\Delta \text{Ln FCE}_t$$

(t-ratios)

$$+ \underset{(2.804)^{**}}{1.268}\,\Delta \text{Ln FCE}_{t-1} + \underset{(2.717)^{**}}{0.943}\,\Delta \text{Ln X}_t + \underset{(1.855)^{***}}{0.484}\,\Delta \text{Ln X}_{t-1} - \underset{(-3.08)^{*}}{0.653}\,\Delta \text{Ln P}_t$$

$$+ \underset{(3.777)^{*}}{0.776}\,\Delta \text{Ln P}_{t-1} - \underset{(-1.694)}{0.007}\,\Delta \text{Ln CU}_t - \underset{(-1.01)}{0.005}\,\Delta \text{Ln CU}_{t-1} - \underset{(-4.910)^{*}}{0.793}\,\text{EC}_{t-1}$$

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

Period (adjusted): 1970-1998
R-squared: 0.881 Adjusted R-Sq: 0.804 DW: 1.912
F-statistic: 11.421 (0.00) RESET [1]: 0.642 (0.423)
Breusch-Godfrey LM [2]: 0.334 (0.846)
Breusch-Godfrey LM [3]: 2.186 (0.535)

The results may be summarized as follows. First, all the estimated coefficients have the correct signs, and most of them are significant at 5 per cent level of significance, with the exception of the Ln FCE variable for Malaysia and Thailand. The export variable is also not significant at the 5 per cent level for Singapore. Second, the estimated coefficients for the final demand components for each country appear to be different. This supports the approach of disaggregating the demand variable. Third, in all countries except the Philippines the estimated import price elasticity exceeds unity. The estimate for Thailand is approximately unity.

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1. Malaysia:

$$\Delta \text{Ln}\,\hat{M}_t = -0.171 + 0.275\,\Delta\text{Ln EIG}_t - 0.227\,\Delta\text{Ln EIG}_{t-1} + 1.00\,\Delta\text{Ln FCE}_t$$

(t-ratios) (–3.259)* (2.035)*** (–1.746)*** (2.019)***

$$+ 1.268\,\Delta\text{Ln FCE}_{t-1} + 0.943\,\Delta\text{Ln X}_t + 0.484\,\Delta\text{Ln X}_{t-1} - 0.653\,\Delta\text{Ln P}_t$$

(2.804)** (2.717)** (1.855)*** (–3.08)*

$$+ 0.776\,\Delta\text{Ln P}_{t-1} - 0.007\,\Delta\text{Ln CU}_t - 0.005\,\Delta\text{Ln CU}_{t-1} - 0.793\,\text{EC}_{t-1}$$

(3.777)* (–1.694) (–1.01) (–4.910)*

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F-statistic: 11.421 (0.00) RESET [1]: 0.642 (0.423)
Breusch-Godfrey LM [2]: 0.334 (0.846)
Breusch-Godfrey LM [3]: 2.186 (0.535)

Jarque-Bera: 1.593 (0.451) ARCH [1]: 0.764 (0.382)
White Heteroskedasticity: 24.853 (0.304)
CUSUM and CUSUM of Squares show that the parameters are stable over the sample period.
Note: ( ) refers to probability value.

2. Indonesia:

$$\Delta \text{Ln}\,\hat{M}_t = -0.049 - 0.549\,\Delta \text{Ln}\,M_{t-1} + 0.128\,\Delta \text{Ln}\,EIG_t + 0.376\,\Delta \text{Ln}\,EIG_{t-1}$$
(t-ratios) (–1.038) (–2.56)** (1.118) (2.416)**

$$+1.254\,\Delta \text{Ln}\,FCE_{t-1} + 0.500\,\Delta \text{Ln}\,X_t + 0.384\,\Delta \text{Ln}\,X_{t-1} - 0.492\,\Delta \text{Ln}\,P_t$$
(2.63)** (2.129)** (1.57) (–2.959)*

$$-0.745\,\Delta \text{Ln}\,P_{t-1} - 0.093\,EC_{t-1}$$
(–3.035)* (–1.041)

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

Period (adjusted): 1970-1998
R-squared: 0.751 Adjusted R-Sq: 0.634 DW: 2.086
F-statistic: 6.379 (0.00) RESET [1]: 1.919 (0.166)
Breusch-Godfrey LM [2]: 0.990 (0.609)
Breusch-Godfrey LM [3]: 1.895 (0.594)
Jarque-Bera: 1.979 (0.372) ARCH [1]: 0.464 (0.496)
White Heteroskedasticity: 18.663 (0.413)
CUSUM and CUSUM of Squares show that the parameters are stable over the sample period.
Note: ( ) refers to probability value.

3. Thailand:

$$\Delta \text{Ln}\,\hat{M}_t = -0.078 + 0.374\,\Delta \text{Ln}\,EIG_t + 1.613\,\Delta \text{Ln}\,FCE_t$$
(t-ratios) (–3.437)* (3.608)* (4.803)*

$$+0.290\,\Delta \text{Ln}\,X_t + 0.246\,\Delta \text{Ln}\,P_{t-1} - 0.417\,EC_{t-1}$$
(1.960)*** (1.168) (–4.512)*

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

Period (adjusted): 1970-1998
R-squared: 0.889 Adjusted R-Sq: 0.864 DW: 2.084

F-statistic: 36.666 (0.00) RESET [1]: 1.278 (0.258)
Breusch-Godfrey LM [2]: 1.908 (0.385)
Breusch-Godfrey LM [3]: 3.357 (0.340)
Jarque-Bera: 0.153 (0.926) ARCH [1]: 0.001 (0.973)
White Heteroskedasticity: 17.107 (0.072)
CUSUM and CUSUM of Squares show that the parameters are stable over the sample period.
Note: ( ) refers to probability value.

4. The Philippines:

$$\Delta Ln\,\hat{M}_t = -0.031 + 0.431\,\Delta Ln\,EIG_t + 1.117\,\Delta Ln\,FCE_t + 0.656\,\Delta Ln\,FCE_{t-1}$$
(t-ratios) (–1.245) (5.517)* (1.975)*** (1.410)

$$+ 0.314\,\Delta Ln\,X_t - 0.192\,\Delta Ln\,P_t + 0.154\,\Delta Ln\,P_{t-1} - 0.454\,EC_{t-1}$$
(2.898)* (–1.403) (1.155) (–3.00)*

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

Period (adjusted): 1970-1998
R-squared: 0.860 Adjusted R-Sq: 0.813 DW: 1.735
F-statistic: 18.355 (0.00) RESET [2]: 4.034 (0.133)
Breusch-Godfrey LM [2]: 1.194 (0.550)
Breusch-Godfrey LM [3]: 8.174 (0.043)
Breusch-Godfrey LM [4]: 9.621 (0.047)
Jarque-Bera: 0.998 (0.607) ARCH [1]: 1.11(0.292)
White Heteroskedasticity: 13.492 (0.488)
CUSUM and CUSUM of Squares show that the parameters are stable over the sample period.
Note: ( ) refers to probability value.

5. Singapore:

$$\Delta Ln\,\hat{M}_t = 0.136 + 0.369\,\Delta Ln\,EIG_t - 0.923\,\Delta Ln\,FCE_{t-1}$$
(t-ratios) (3.816)* (3.291)* (–1.637)

$$-0.330\,\Delta Ln\,X_{t-1} - 0.837\,\Delta Ln\,P_t - 0.251\,\Delta Ln\,P_{t-2}$$
(–2.34)** (–3.694)* (–1.517)

$$+ 0.007\,\Delta Ln\,CU_t + 0.010\,\Delta Ln\,CU_t + 0.004\,\Delta Ln\,CU_{t-2} - 0.401\,EC_{t-1}$$
(4.900)* (5.383)* (1.851)*** (–3.473)*

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

Period (adjusted): 1977-1998
R-squared: 0.904 Adjusted R-Sq: 0.862 DW: 1.828
F-statistic: 12.524 (0.00) RESET [1]: 0.008 (0.929)
Breusch-Godfrey LM [2]: 1.235 (0.539)
Breusch-Godfrey LM [3]: 1.504 (0.681)
Jarque-Bera: 0.354 (0.838) ARCH [2]: 3.407 (0.182)
White Heteroskedasticity: 15.295 (0.642)
CUSUM and CUSUM of Squares show that the parameters are stable over the sample period.
Note: ( ) refers to probability value.

The main results of the ECM analysis are as follows. First, on the basis of various diagnostic tests, the ECMs fitted the data reasonably well. Second, the significance of the lagged error correction terms in all country ECMs at 1 per cent level, with the exception of Indonesia, indicates an adjustment of short run disequilibrium to a long run equilibrium. The size of corrections of previous disequilibria, are estimated to be 79.3 per cent (Malaysia), 41.7 per cent (Thailand), 45.4 per cent (Philippines), and 40.1 per cent (Singapore). The significance of the lagged error correction terms also indicates weak-exogeneity of the independent variables, and Granger-causality from independent variables to import demand. The insignificance of the lagged error correction term in the case of Indonesia shows that import demand is not cointergrated with its determinants (Kremers, et al. 1992). However, we have a reservation of not using the result from a single equation approach that checks for cointegration based on the t-ratio of the error-correction term in a conditional error-correction model. The singe equation approach (like ECM) is not appropriate in situations where there are more than one cointegration vectors. If there are more than two variables in the model, there can be more than one cointegratinon vector as in present study. A more powerful test to detect the number of cointegrating vectors is system-based approach, like Johansen's (1988) multivariate test. Since the Johansen test (Table 1) rejects the null of none cointegrating vector for Indonesia case, therefore, we can conclude that the variables in Indonesian import demand function are cointegrated (at least one cointegration vector).

Third, short-run variations in import demand in the ASEAN-5 countries are mainly determined by the variations in the macro components of final demand expenditure and relative prices.

Note: *, ** and *** denote significance at 1%, 5% and 10% level.

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Third, short-run variations in import demand in the ASEAN-5 countries are mainly determined by the variations in the macro components of final demand expenditure and relative prices.

SUMMARY

This study investigated the long-run relationship between quantity of import demand with it's determinants viz. public and private consumption expenditure, investment expenditure and exports, and relative prices for five ASEAN countries. The ASEAN countries chosen in this study are Malaysia, Thailand, Singapore, Indonesia and the Philippines. Disaggregating demand variable into its components is justified in terms of the possibility of each expenditure component having different import contents. By so doing, this study avoids the possibility of aggregation bias.

The main findings of this study may be summarised as follows. The use of traditional specification of the import demand function in log-linear form, and disaggregating final demand variable, appear to be useful. The use of Johansen's multivariate cointegration analysis shows that import demand is cointegrated with its determinants for all ASEAN-5 countries. The ECM analysis shows that, short-run variations in import demand are influenced by variations in relative prices and macro components of final demand. An important finding is that import demand is elastic with respect to relative prices. Only in the case of the Philippines that import demand is not price elastic.

The estimation of import demand functions is important for several reasons viz. structural analysis (to test trade theory), to forecast future imports and to evaluate the impact of government policies and exogenous shocks. In this study, the magnitudes of the price elasticity indicate that the Marshall-Lerner condition is easily met. This suggests that devaluation or a prolonged depreciation may be effective in correcting trade deficits. The 1997 Financial Crisis which affected all the ASEAN-5 countries (to a lesser extent Singapore), which resulted in depreciation of the respective countries' currencies, have improved their export competitiveness, leading to improvements in their trade balances and increased accumulation of international reserves. On the other hand, this finding also suggests that competition for export markets among the ASEAN-5 countries, especially among the countries which produce homogenous goods such as resource-based products (palm oil, rubber, wood-based) will be stiffer, given prolonged depreciation. This is more so in the case of Malaysia where the Ringgit is still tied with the US dollar at a fixed level. A stronger dollar inevitably negates the competitiveness of Malaysian exportables relative to her counterparts. A more thorough investigation is needed in order to understand better the Malaysian export competitiveness and economywide repercussion should the current exchange rate policy and peg level are to be sustained in the longer run.

The findings from this study may be connected to that of Ahmed and Tongzon's (1998) study on economic linkages among the five founding members of ASEAN viz. Malaysia, Indonesia, Thailand, Singapore, and the Philippines. Using Vector Autoregression, variance decomposition and impulse response analyses applied to quarterly real GDP data for the 1975-93 period, the authors found that Indonesia is the dominant economy that influences the other ASEAN economies. Spillover effects from the other ASEAN economies on Indonesia were found to be not significant. The Singapore and Malaysian economies are most closely linked because of geographical closeness, economic and cultural factors. In our study, the estimated long run elasticity of Indonesian import demand with respect to expenditure on investment goods and exports are 1.28 and 0.75 respectively. An implication of these results is that growth in the final demand components would lead to growth in Indonesian imports in the long run. Part of the imports would be from other ASEAN member countries. Similarly growth in Malaysian import demand would be beneficial to Singapore's economy.

APPENDIX 1

DEFINITION OF VARIABLES AND DATA SOURCES

The annual data used for all countries are for the period 1968 to 1998 (expect Singapore). All series are in natural logarithmic form (Ln). The definitions of involved variables are given below (excluding Singapore):

1. M: Volume of imports (RM million), that is Nominal imports deflated by import price deflator.
2. FCE: Final consumption expenditure It is the sum of private sector and public sector final consumption expenditures. The series are deflated by the implicit deflator for consumption expenditure.
3. EIG: Expenditure on investment goods is the sum of gross fixed capital formation by the public and private sectors (in real terms).
4. X: Exports expenditure on goods and services that are measured in real term.
5. P: The relative price variable is import price deflator divided by GDP implicit price deflator.
6. CU: The capacity of the country to produce and supply the goods itself, is essentially a short-run phenomenon. The capacity utilization variable (CU) is defined as the residuals multiplied by 100 from the following regression: $\text{Ln IP}_t = a + b\ \text{time} + e$, where IP is an index of industrial production, and e is residual.

The sources of data are listed as:

1. Malaysia

   The data covered the period from 1968 to 1998. Asian Development Bank's KIDAP (Key Indicators of Developing Asian and Pacific countries) has provided early data for the year 1968 and 1969. Annual data for 1970-1998 are from Ministry of Finance's *Economic Report* (various of issues). 1978=100 was used as base year. A Production Index is available to capture a country's capacity utilisation in short term.

2. Indonesia

   Sample period is for the period 1968 to 1998. Data for 1968-1987 are from The World Bank, *World Tables* (various of issue). Asian Development Bank, KIDAP (Key Indicators of Developing Asian and Pacific Countries) provided data for 1988-1998. The implicit index is based on 1993.

3. Thailand

   The sample period is 1968-1998. The generated base year is 1988. World Tables provided the annual data from 1968 to 1988 and KIDAP for the following data source.

4. Philippines

   The data sources are *World Tables* (for annual data 1968-74) and *KIDAP* (1975-1998). All implicit index deflators with base year 1985=100.

5. Singapore

   International Financial Statistics Yearbook (1999) has provided a set of available annual data from 1974 to 1998. The base year is 1995. In contrast to other countries, the volume of imports and exports (measured by index) are collected from line 73 and 72 respectively. Import price index is from line 76.x. The two components of final expenditures, final consumption expenditure (sum of government and private sector) are deflated by GDP deflator (1995=100). The manufacturing production index allows us to include capital utilisation in short run analysis.

APPENDIX 2

RESULTS OF UNIT ROOT TESTS

Singapore Variables		ADF	PP
1.	ln M	–2.8772 (2)	–2.6786 (2)
	Δ ln M	–2.9893 (3)***	–3.3849 (2) **
2.	ln X	–2.1447 (1)	–2.8568 (2)
	Δ ln X	–3.4871 (1)**	–4.4720 (2)*
3.	ln EIG	–2.0914 (1)	–2.4025 (2)
	Δ ln EIG	–2.6906 (1)***	–5.0588 (2)*
4.	ln FCE	–1.8490 (1)	–2.0939 (2)
	Δ ln FCE	–3.4955 (1)**	–4.2322 (2)*
5.	ln P	–3.4780 (1)***	–2.2950 (2)
	Δ ln P	–2.5148 (1)	–3.8733 (2)*

Thailand Variables		ADF	PP
1.	ln M	–2.3814 (1)	–1.7875 (3)
	Δ ln M	–2.9573 (1)***	–2.3317 (3)
2.	ln X	–1.5889 (1)	–1.8868 (3)
	Δ ln X	–2.7063 (1)***	–4.9044 (3)*
3.	ln EIG	–2.5966 (1)	–1.7962 (3)
	Δ ln EIG	–2.7883 (1)***	–2.8204 (3)***
4.	ln FCE	–2.2179 (1)	–1.9300 (3)
	Δ ln FCE[1]	–0.8361 (2)	–1.7190 (4)***
5.	ln P	–3.3053 (4)***	–1.5372 (3)
	Δ ln P	–5.2800 (1)*	–6.4045 (3)*

Malaysia Variables		ADF	PP
1.	ln M	–3.4085 (2)***	–2.1119 (3)
	Δ ln M	–3.6418 (2)**	–5.4233 (3)*
2.	ln X	–1.4280 (2)	–1.6046 (3)
	Δ ln X	–3.6608 (1)**	–4.9119 (3)*
3.	ln EIG	–2.8676 (2)	–1.9731 (3)
	Δ ln EIG	–3.4152 (2)**	–3.8254 (3)*
4.	ln FCE	–2.5150 (1)	–1.8829 (3)
	Δ ln FCE[1]	–1.8114 (1)***	–1.6915 (0)***
5.	ln P	–2.5819 (2)	–2.7834 (3)
	Δ ln P	–4.6773 (1)*	–9.6406 (3)*

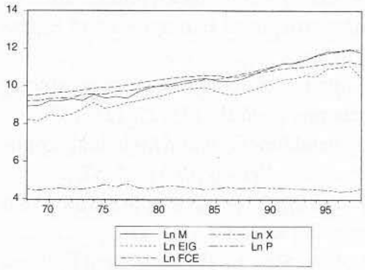
Philipines Variables		ADF	PP
1.	ln M	–3.9223 (1)**	–2.2265 (3)
	Δ ln M	–3.7537 (1)*	–2.2023 (3)
2.	ln X	–2.5364 (1)	–2.9952 (3)
	Δ ln X	–4.3184 (1)*	–5.5598 (3)*
3.	ln EIG	–2.7585 (1)	–2.0060 (1)
	Δ ln EIG	–3.9852 (1)*	–3.3262 (3)**
4.	ln FCE	–3.0643 (2)	–2.1708 (3)
	Δ ln FCE	–2.8123 (1)***	–4.0629 (3)*
5.	ln P	–3.2319 (4)***	–2.5532 (3)
	Δ ln P	–4.0554 (1)*	–4.6788 (3)*

Indonesia Variables		ADF	PP
1.	ln M	–2.2040 (1)	–2.1182 (3)
	Δ ln M	–2.9560 (1)***	–4.1651 (3)*
2.	ln X	–1.9205 (1)	–2.2930 (3)
	Δ ln X	–1.9941 (2)	–4.1787)3)*
3.	ln EIG	–1.2234 (2)	–0.7432 (3)
	Δ ln EIG	–2.5439 (1)	–4.1374 (3)*
4.	ln FCE	–2.9978 (1)	–2.3747 (3)
	Δ ln FCE	–2.7402 (3)***	–2.8298 (3)***
5.	ln P	–1.6189 (1)	–1.7099 (3)
	Δ ln P	–2.8525 (1)***	–4.0106 (3)*

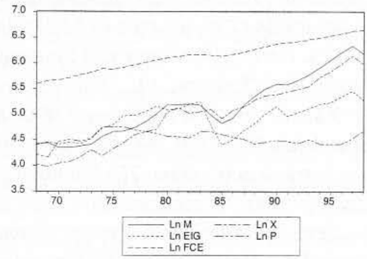
Note: *, ** and *** denote significance at 1%, 5% and 10% based on MacKinnon critical values. ( ) refers the optimal lag. The unit root equation included a constant and trend for level and only constant for first difference analysis, exemption for note 1 without constant and trend in order to achieve stationary.

APPENDIX 3

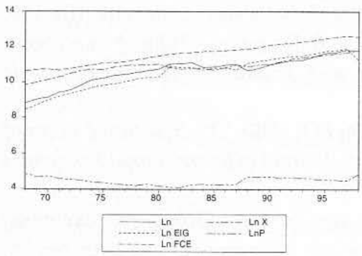
PLOT OF PARTICIPATING SERIES



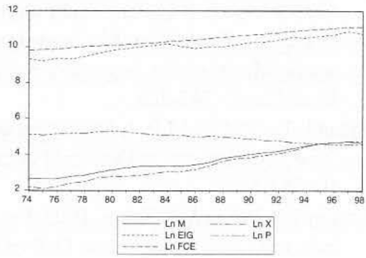
Plot of imports demand series of Malaysia



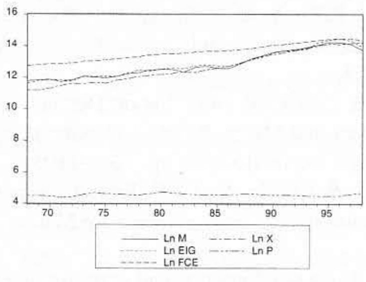
Plot of import demand series for the Philippines



Plot of import demand series for Indonesia



Plot of import demand series for Singapore



Plot of imports demand series of Thailand

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