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Disaggregated Import Demand and Expenditure Components in Malaysia: An Empirical Analysis

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Abstract: This study aims to investigate Malaysian import demand behaviour for consumption, investment and intermediate goods covering the period 1968 to 1998. The determinants involved comprise various final expenditure components (consumption expenditure, expenditure on investment goods, and exports) and relative price. The study adopted cointegration and error correction modeling techniques for analysis. The major findings are as follows. First, the import of consumption, investment and intermediate goods, and its determinants are cointegrated. Second, different import components behave differently with determinants both in the long and short runs. Third, the explanatory variables do jointly Granger cause volume of imports at a disaggregated level. The findings documented in this study have a relevance for policy implications.

1. Introduction

A major characteristic of the Malaysian economy is its openness. Since achieving Independence in 1957, the degree of openness (measured by ratio of imports and exports to Gross Domestic Product) increased quite significantly over the past decades. It was 80 and 113 per cent in 1970 and 1980 increasing to 137 and 210 per cent in 1990 and 1998, respectively (data from Penn World Table - *Mark 5.6)*. During those periods, the import structure also changed dramatically. Import of consumption goods decreased significantly from 32 per cent in 1970 to 17 per cent in 1990, but recorded a constant behaviour of 14 per cent over the period 1995 to 1998 (Table 1). In addition, import of investment goods increased slowly from 28 per cent

Table 1: Share of imports demand by economic function (1970 - 1998) (%)

Year	Consumption goods	Investment goods	Intermediate goods
1970	32	28	40
1975	23	33	43
1980	18	31	51
1985	20	31	48
1990	17	38	46
1995	14	41	45
1996	14	40	45
1997	14	43	43
1998	14	39	48

Note: The figures are calculated of the nominal data obtained from Bank Negara Malaysia, *Monthly Statistical Bulletin*. Various issues.

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in 1970 to 39 per cent in 1998. The import of intermediate goods contributed 40 per cent to total imports in 1970, increasing to 48 per cent in 1998.

The rapid increase in total imports and changes in structure reflect the dynamic process of development experienced by the Malaysian economy. These was a shift from import substitution industrialisation in the 1960s to export-oriented industrialisation in the 1970s, and industrialisation based on heavy industries in the 1980s coupled with a sound macroeconomic policy. It was this shift that enabled the economy to achieve rapid growth and significant structural changes. Table 1 shows that the demand for various components by economic function[1] did not face a significant change from the various policies that came into play in response to the Asian Financial Crisis of 1997-98. Meanwhile, imports growth is expected to be stronger than exports growth due to continued demand for imported materials and equipment to support the ongoing investment activity (Bank Negara Malaysia 2001).

The policy response of the Malaysian Government to the Asian Economic Crisis of 1997-1998 focused on imports demand with a view to controling imports and rectifying trade and current account imbalances. An observation of the period from 1974 to 1997 indicates that Malaysia only enjoyed a current account surplus in the period of 1976 to 1979, and 1987 to 1989. Historical data meanwhile show that the nation's current account consistently registered a deficit during the 1990 to 1997 period with a deficit peak in year 1995 (*World Table* various issues, Work Bank). However, the current account recorded a surplus of RM36,068 millions or 13.7 per cent of GNP in the year of 1998. The sharp turnaround was due to the slower growth of imports as a result of a sharp decline in domestic demand and the negative effect of the depreciated Ringgit on the demand for imports (Malaysia 1999: 41). In addition, the deficit in the current account of the balance of payments had been affected by the declining trade balance resulting from a steady increase in imports, particularly investment and intermediate goods. The National Economic Recovery Plan (NERP) (Malaysia 1998) has outlined several measures to strengthen the trade balance. The policy measurements that relate to imports were as follows: First, to give priority to the development of resource-based industries as these industries are known to have low import content. Second, to accelerate the development of backward linkages for non resource-based industries in order to increase the utilisation of local inputs.

To a certain extent, an understanding of import demand behaviour is essential for several trade policy implications. The present study justifies the following issues. First, the estimates of import price elasticity can be used to evaluate the implacable exchange rate policy for correcting the trade or current account imbalance, particularly in the case of a developing economy like Malaysia. Trade literature has documented well that under Marshall-Lerner condition where the sum of the absolute value of long run import and export demand price elasticities is greater than unity, a devaluation policy is favorable to improve the trade balance. In addition,

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[1] Imports: Consumption goods refer to all goods which are generally in finished form and which are not used in the production process but are utilised directly to satisfy final demand, including food (such as rice and refined sugar) and consumer durables for household use (motor cars, television and radio sets, refrigerators and fans). Investment goods are finished goods used for investment purposes such as plant and machinery (including excavators, bulldozers, rolling mills and tractors). Intermediate goods refer to unfinished and semi-finished goods used for the production of other goods, including products which have to undergo further processing, assembly and transformation (such as raw materials for manufacturing, including raw beef and cane sugar, unmanufactured tobacco, textile, yam, chemical products and preparation parts for motor assembly and electronic components.

[2] A study done by Gafar (1988) on import demand in Trinidad and Tobago estimated that price elasticities are in

Bahmani-Oskooee and Niroomand (1998) stated that in formulating a commercial policy or an exchange rate policy, a major concern of policy makers is the responsiveness of trade flows to relative price changes. The relative prices play a significant role in the determination of trade flows, buttressing policies of devaluation as a way to correct trade imbalances (Reinhart 1995: 291). On the other hand, Heien (1968) argued that the effectiveness of devaluation is that 'for any country a value of the price elasticity between -0.5 and -1.0 is necessary to ensure success of exchange depreciation'.[2]

Secondly, a long run macroeconomic policy measure (fiscal or monetary) can be designed for various components of imports by identifying any long run relationship between disaggregated import and its determinants, particularly macro components of final demand. The rationale is that the import demand function is an equilibrium relationship linking volume of imports demanded to some variables identified by economic theory in the long run. For instance, the Marshall-Lerner condition is justified as a long run phenomenon. This can be related to the recent development of time series econometric literature – cointegration – that if such a long run relationship does exist, the variables included in the model must form a unique cointegrating vector (Engle and Granger, 1987). If this assumption is false on the nonstationary time series of import demand function, then the estimated import demand function of using Ordinary Least Squares (OLS) may lead to a spurious regression.

Finally, this study investigated the speed of adjustment in import demand at a disaggregated level toward equilibrium by estimating an error correction model (ECM) (Engle and Granger, 1987). It is measured by an estimated coefficient of error correction term in an ECM framework (Engle and Granger 1987).

To date, a number of empirical studies have been conducted to investigate Malaysian import demand behaviour. Among them are those of Mohammad (1980), Semudram (1982), Awang (1988), MIER (1990), Tang and Mohammad (2000), Mohammad and Tang (2000) and Tang and Nair (2002). Mohammad (1980) who estimated a dynamic import function for West Malaysia using annual data from 1960 to 1974. The estimated income and price elasticities are 0.7 and -0.8 respectively. Awang's (1988) study documented that the demand function for Malaysian imports is found to be inelastic with respect to both income and relative price with elasticities of 0.29 and-0.28, respectively. However, these studies used nonstationary time series which probably may lead to a spurious regression problem, if the regressed series are not cointegrated (Engle and Granger 1987). Further, Tang and Mohammad (2000) addressed this limitation by estimating an import demand function using the Johansen co-integration approach, and found that the estimated long run elasticity of real income and relative prices are 1.5 and -1.8 respectively. Recently, Tang and Nair (2002) re-examined the aggregate import demand behaviour for Malaysia using the bound testing approach (Pesaran *et al.* 2000). The study involved annual data from 1970 to 1998 as employed by Tang and Mohammad (2000). The results indicate that the volume of imports, real income, and relative price were cointegrated. The estimated income and price elasticities were 1.5 and-1.3 respectively.

A common feature of the existing studies, except for that of Mohammad and Tang (2000) is that these studies generally estimated a traditional form of import demand function by regressing the aggregate imports on real income and relative prices. Considering the bias in

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the range suggested by Heien (1968), indicating that exchange rate policies can be used to correct balance of payments disequilibrium.

[3] Few studies estimate import demand function using limited annual data. Doroodian, Koshal and Al-Muhanna

an approach using a single demand variable (real income) (Giovannetti 1989; Thirlwall and Gibson 1992; Abbott and Seddighi 1996), Mohammad and Tang (2000) followed Abbott and Seddighi's (1996) work to estimate the Malaysian aggregate import behaviour by further disaggregating the final demand into three broad categories, namely final consumption expenditure, expenditure of investment goods, and exports. The other determinant was the relative prices term. Mohammad and Tang (2000) used Johansen's multivariate cointegration and error correction modeling techniques for this estimation. A long run relationship among variables was presented in the model. The study found that different components of expenditure affect the aggregate import demand differently, both in the long run and short run. The estimated long run and short run price elasticities were -0.69 and -0.59, respectively.

On the other hand, a study on disaggregated import demand behaviour is limited. Saleh (1986) estimated a structural model for Malaysian balance of payments, including disaggregated import demand equations. Using annual data from 1963 to 1982, the results of OLS estimation showed that the estimated elasticity of real imports of manufactured goods with respect to lagged relative price (one year) and real GDP were -0.658 and 1, respectively. The real import of investment goods is determined by lagged relative price and real gross capital formation with elasticities of -0.545 and 0.865. Real GDP is the only determinant that was entered into the equation for real imports of other goods. Its estimated elasticity is 0.68. All of these elasticities were statistically significant at 10 per cent level. Further, MIER (1990) disaggregated import demand into three categories, which were imports of primary commodities, imports of oil and imports of manufactures. The estimated long income and relative price elasticities of imports of manufactures were 1.42 and -0.96 and the estimated short run elasticities were 1.35 and -0.912 respectively. However, these studies were based on nonstationary time series.

Thus, the present paper attempts to examine the determinants for disaggregated import demand behaviour by economic function for a small open economy such as Malaysia. The entered determinants are the various components of final expenditure components (final consumption expenditure, expenditure on investment goods, and exports) and relative prices term. Meanwhile, the present study considers the issue of using nonstationary time series by employing cointegration and error correction modeling techniques in estimation.

The paper is organised as follows: Section 2 will discuss the variables used and model specification and Section 3 will present the empirical results. The conclusion is found in the last section.

2. Model Specification and Data

According to Pattichis (1999: 1062), estimating disaggregated import demand function implies that we are less susceptible to the problem of aggregation bias. Tambi (1998) estimated import demand behaviour for Cameroon by disaggregating aggregate imports into consumer goods, raw materials, intermediate goods, and capital goods. In this study, the import demand variable is further disaggregated into three broad categories by economic function that is import of consumption goods (MC), investment goods (MV), and intermediate goods (MI).

In contrast to the conventionally used import demand specification of using a single demand variable, real income as scale variable, this study approaches various components of final demand and its determinants. Following Giovannetti (1989), Abbott and Seddighi (1996), and Mohammad and Tang (2000), the expenditure on private and public sectors, investment expenditure (public and private), and expenditure on exports are used. The justification of using various components of final demand is that the implicit assumption on conventional import demand function is that the import content of each macro component of final expenditure is the same, and a single demand variable i.e. real domestic income is used in the import demand function. However, if, the different macro components of final expenditure have different import contents, the use of a single demand variable would lead to aggregation bias. Thus the regression model may have been mis-specified (Abbott and Seddighi 1996). The other determinant is the relative price variable (the ratio of import price to domestic price level).

Based on the above justifications, a set of disaggregated import demand functions can be written as below:

$$MC_t = f(FCE_t^{+}, EIG_t^{+}, EX_t^{+}, P_t^{-}) \quad (1)$$

$$MI_t = f(FCE_t^{+}, EIG_t^{+}, EX_t^{+}, P_t^{-}) \quad (2)$$

$$MV_t = f(FCE_t^{+}, EIG_t^{+}, EX_t^{+}, P_t^{-}) \quad (3)$$

where MC is imports of consumption goods, MI is imports of intermediate goods, MV is imports of investment goods, FCE is final consumption expenditure, EIG is expenditure on investment goods, EX is exports expenditure, and P is relative price term. According to economic theory, various expenditure components have a positive response on import demand, and negative response of relative price term is expected.

The sample period covered in this study is based on the annual data from 1968 to 1998 (31 observations). The annual data is used because of the non availability of quarterly data, particularly the expenditure components that enter our import demand specification (Mohammad and Tang 2000: 260). The data definition and source are described in Appendix 1. The use of annual data is justified on the ground that seasonal bias of using quarterly series can be avoided. The evidence of seasonal components are observed in Government consumption and investment when expenditures tend to bunch towards the last quarters in order to utilise the allocated budget. However, bias might still occurr in unit root test (as well as residual based cointegration test) using seasonally adjusted series (Davidson and MacKinnon 1993: 714). According to Davidson and MacKinnon (1993: 714), to avoid using seasonally adjusted data to compute unit root test, one possibility is to use the annual data. In addition, Hakkio and Rush (1991) argued that an increase in the number of observations by using monthly or quarterly data does not add any robustness to the results in the tests of cointegration, but the length of the period under use. Another consideration of using annual data is that import demand responses to its determinants are a time phenomenon which require long gestation periods. Thus, it might be safe to take more than a few quarters or even years in the analysis.[3]

This study employed the Phillip-Perron (PP) unit root test (Phillips and Perron 1988) for investigating presence of unit root in a series. According to Schwert (1989), small sample

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(1994) used annual data for the period 1963 to 1990 with 28 observations for Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) for unit root tests, and Johansen and Juselius multivariate trace and max tests for cointegration analysis. Meanwhile, Reinhart (1995) used annual data for the period 1968-1992 (25 observations) for the Johansen (1988, 1991) approach.

4 Using annual data, Sinha and Sinha (1998) followed Pesaran and Persaran's (1997) recommendation to use one

studies reveal that the PP test is more appropriate when the process is generated by ARIMA process. The results of PP test presented in Table 2 indicate that all variables (expect *ln*FCE) are nonstationary, or I(1) (stationary after first difference transformation). The PP test shows that final consumption expenditure (*ln*FCE) is nonstationary, but I(2) (stationary after second difference transformation). Thus, final consumption expenditure series is expressed at first difference ($ln\text{FCE}_t$ - $ln\text{FCE}_{t-1}$) in order to achieve stationary.

Further, this study attempts to determine the presence of a cointegrating relation among the variables in the imports demand functions (1), (2) and (3) using Johansen's multivariate

Table 2: Results of Phillip-Perron unit root tests

Variable	Level	First difference
$ln\text{MC}_t$	-2.589940	-5.209988*
$ln\text{MI}_t$	-2.125439	-6.234306*
$ln\text{MV}_t$	-2.026937	-4.938151*
$ln\text{EIG}_t$	-1.973106	-3.825410*
$ln\text{FCE}_t$ [1]	-1.882910	-2.104493
$\Delta ln\text{FCE}_t$ [2]	-2.086234	-4.101457*
$ln\text{EX}_t$	-1.604628	-4.911877*
$ln\text{P}_t$	-2.783415	-9.640590*
CU_t (see Appendix 1, note 6)	-2.214064	-4.900219*

ln is natural logarithmic form. *p<0.01 (one-tailed test) is based on MacKinnon's critical value. The unit root equation in level included time trend and constant, and without trend variable for first difference analysis. Newey-West suggests 3 of lag truncation for Bartlett kernel. The MacKinnon critical values for level unit root are -3.2169 (10%), -3.5670 (5%) and -4.2949 (1%). First difference are -2.6220 (10%), -2.9665 (5%) and -3.6752 (1%).

Notes: [1] the series found to be integrated of order two, I(2) with the unit root's value of -4.101 at 1% level.

[2] The MacKinon critical value is -3.2203 at 10% level and -3.6852 at 1% level for first difference operation.

approach (Johansen 1988; Johansen and Juselius 1990). The trace test is preferred in this analysis as Johansen (1991) argues that the λ-trace test tends to have more power than the λ-max test, particularly when conflict exists between both tests. The long run cointegrating regressions for (1), (2) and (3) can be specified as follows:

Import for consumption goods:

$$ln\text{MC}_t = a_0 + a_1\,\Delta ln\text{FCE}_t + a_2\,ln\text{EIG}_t + a_3\,ln\text{EX}_t + a_4\,ln\text{P}_t + u_t \quad (4)$$

Import for investment goods:

$$ln\text{MI}_t = b_0 + b_1\,\Delta ln\text{FCE}_t + b_2\,ln\text{EIG}_t + b_3\,ln\text{EX}_t + b_4\,ln\text{P}_t + u'_t \quad (5)$$

Import for intermediation goods:

$$ln\text{MV}_t = c_0 + c_1\,\Delta ln\text{FCE}_t + c_2\,ln\text{EIG}_t + c_3\,ln\text{EX}_t + c_4\,ln\text{P}_t + u''_t \quad (6)$$

where u_t, u'_t, u''_t are random errors assumed to satisfy classical assumptions. *ln* is natural logarithmic form. Δ is first difference operator. It is necessary to replace the I(2) variable, *ln*FCEt with I(1) alternative through some form of differencing (Harris 1995: 95).

If the variables in a cointegrating regression are cointegrated (at least one cointegrating vector), an error correction term, EC_{t-1} (a lagged one period of residual series from a cointegrating equation) may be incorporated into a dynamic specification to form an error correction model (ECM) (Engle and Granger 1987). An ECM can be estimated using Ordinary Least Squares (OLS) estimator. The ECM for import demand function (4), (5), and (6) can be written as below:

Import for consumption goods:

(7)

Import for investment goods:

(8)

Import for intermediate goods:

(9)

A capacity utilisation variable (CU) is incorporated into ECM as short run variables (see Appendix I, Note 6 for its construction). The capacity utilisation variable measures the capacity of a country to produce and supply the goods itself as a short-run phenomenon, and is relevant only if excess demand at home cannot be eliminated by a change in the domestic price level (Thirlwall and Gibson 1992).

3. Empirical Results

In this section, we present the results of cointegration analysis, and the estimation of cointegrating regressions and error correction models. Table 3 documents the results of Johansen's multivariate cointegration test for the regression (4), (5), and (6). Due to limited annual observation availability in this study, we consider one or two lag lengths for VAR, which is sufficient for Johansen approach as recommended by Pesaran and Pesaran (1997).[4] The results reveal that imports demand for consumption, intermediate, and investment goods and its determinants (expenditure on investment goods, final consumption, and exports and relative price) are cointegrated.[5] It implies that all of the series in import demand equations (4), (5) and (6) move together over time, even if some series move at different speeds than others in the short run. This result reveals that disaggregated import demand function in Malaysia is stable over the sample period.

Based on the results from trace test, two cointegrating vectors for consumption goods import, and intermediate good import and three cointegrating vectors for investment goods import were identified. These findings are different from that of Abbott and Seddighi (1996), who found a unique cointegrating vector, but this is not a contradiction to the requirement as the present study finds multiple cointegrating vectors. In common practice, a single cointegrating equation is preferred from a case of multiple cointegrating vectors by considering the estimated long run coefficients that correspond closely to those predicted by economic theory in both magnitude and sign i.e., import demand function (Ghatak *et al.* 1997: 218, footnote 12).[7,8] Therefore, the cointegrating equations are normalised on volume of imports by setting its coefficient to -1. The normalised cointegrating vectors for disaggregated import demand behaviour are stated below:

Import of consumption goods:

$$\hat{lnMC} = 0.168\, lnEIG + 2.602\, \Delta lnFCE + 0.574\, lnEX - 1.805\, lnP + 9.039$$

(s.e.) (0.07) (0.68) (0.075) (0.242)

(t-ratios) (2.396) (3.83) (7.67) (-7.446) (10)

Import of intermediate Goods:

$$\ell nMI = \hat{2}.343\, \ell nEIG + 47.91\, \Delta \ell nFCE - 0.977\, \ell nEX - 8.362\, \ell n\, P + 32.14$$

(s.e.) (4.70) (125.55) (4.273) (22.512)

(t-ratios) (0.498) (0.382) (-0.229) (-0.371) (11)

Table 3: Results of Johansen Cointegration Analysis – Trace Statistics[6]

Eigenvalue	Trace statistics	5 % Critical value	Hypothesised no. of CE(s)
Import for Consumption Goods (*ln* MC) -VAR(2)			
0.750455	89.54826	68.52	None*
0.643904	52.06918	47.21	At most 1*
0.399394	24.19020	29.68	At most 2
Import for Intermediate Goods (*ln* MI) - VAR(1)			
0.725883	85.96853	68.52	None*
0.592218	49.73096	47.21	At most 1*
0.369633	24.61435	29.68	At most 2
Import for Investment Goods (*ln* MV) - VAR(1)			
0.702306	85.68878	68.52	None*
0.538181	51.76151	47.21	At most 1*
0.468717	30.12919	29.68	At most 2*
0.295685	12.42032	15.41	At most 3

The reported critical values are from Osterwald-Lenum (1992, Table 1). * denotes rejection of the null at 5% significance level.

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lag of VAR in order to examine a long run relationship between saving and investment of Latin America. The sample size available in the present study is insufficient to precede higher lag length for VAR, that is VAR(3). In addition, the AIC and BIC are inconclusive. Therefore, we followed the approach adopted by Charemza and Deadman (1992) that is applicable for limited annual data, starting with a three-year lag length and observing that the results were not appreciably altered as lag length was reduced. Lag length was kept as short as possible - one year (Atesoglu 1997: 329).

5 To determine the number of cointegrating relations r, subject to the assumptions made about trends in the series, we can proceed sequentially from r = 0 to r = k-1 until the test statistic fails to reject the null at most r cointegrating relations.

6 Johansen (1991) argued that since the trace test takes account of all N-r of the smallest eigenvalues, it tends to have more power than the max-test. Thus, in conflicting cases, the decision is made based on trace statistics (practised by Ghirmay, Sharma and Grabowski 1999: 220). The test assumption is linear deterministic trend in the data, when the series trend toward time can be observed, except lnP and CU (for short run). All of the series are integrated for order one, whereas FCE (final consumption goods) was integrated for order 2, I(2). Thus, as followed by Kanwar (2000: 540-41) the first differenced lnFCE ($\Delta lnFCE = lnFCE_t - lnFCE_{t-1}$) was entered into cointegrating regression in order to assume the series to be I(1).

7 However, the results of Johansen test show a unique cointegrating vector after adjusting the critical values with a scaling factor proposed in Cheung and Lai (1993) to make finite-sample corrections. The scaling factor used

Import of investment goods:

$$\begin{array}{lllllllll} \widehat{ln\text{MV}} = & 0.730\, ln\text{EIG} & + & 16.29\, \Delta ln\text{FCE} & + & 0.459\, ln\text{EX} & - & 3.617\, ln\text{P} & + \; 12.75 \\ \text{(s.e.)} & (0.348) & & (7.132) & & (0.362) & & & (1.680) \\ \text{(t-ratios)} & (2.096) & & (2.284) & & (1.269) & & (-2.153) & \end{array} \quad (12)$$

In the case of import of consumption goods, all of the explanatory variables are statistically significant at 5 per cent level and in the expected sign. From the estimated model, final expenditure components reveal different effects on import of consumption goods. The estimated price elasticity is -1.8 (significant at 10 per cent level). On the other hand, the computed t-ratios show that none of the determinants are statistically significant (at 10 per cent significance level) for import of intermediate goods.[9] These results seem to contradict that the variables belong to the cointegration space. However, this is not an uncommon phenomenon in a small sample as in the present study since finite-sample analyses can result in bias to the likelihood ratio tests (Johansen approach) toward finding cointegration either too often or to infrequently (Cheung and Lai 1993: 316). Fortunately, the significance of error correction term in ECM provides additional evidence for a cointegration relationship among the variables in a small sample study (see footnote 10). For import of investment goods, the expenditure on investment goods, final consumption expenditure and relative prices are significant at 10 per cent level, except for export expenditure. The above estimations show a significant difference between the coefficients of imports with respect to different macro components of final expenditure. This reveals evidence of aggression bias of using a single demand variable like Real GDP or GNP.

Once a long run relationship (from Johansen test) is identified, an ECM can be estimated following Engle and Granger's (1987) two-step procedure. However, before estimating an

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to adjust the critical values is T/(T-nk), where T is the sample size, n is the number of variables in the model, and k is the lag length in VAR. The results are reported below:

Trace statistic	5 % critical values	Adjusted critical values	Hypothesised no. of CE(s)
Import for consumption goods (*ln* MC) -VAR(2)			
89.54826	68.52 (60.29)	101.14 (88.99)	None #
52.06918	47.21 (40.15)	69.68 (59.26)	At most 1
Import for intermediate goods (*ln* MI) - VAR(1)			
85.96853	68.52	81.70	None*
49.73096	47.21	56.29	At most 1
Import for investment goods (*ln* MV) - VAR(1)			
85.68878	68.52	81.70	None*
51.76151	47.21	56.29	At most 1

The 5% (20%) critical values are obtained from Osterwald-Lenum (1992, Table 1). * (#) denotes rejection of the null at 5% (20%) significance level.

8 The Johansen cointegrating analysis (trace-test) was computed by using EVIEWS 3.1 statistical software. The normalised cointegrating vectors for (4), (5) and (6) are computed from the Johansen test, Ghartey (1998: 477-478) found at least two cointegrating vectors in money demand function for Ghana's case, but only a normalised cointegrating vector i.e. money demand function (p.475, equation (1)) was considered and estimated by using EVIEWS 2.0.

9 We tried to compute the Johansen test with VAR(2) which indicated three cointegrating vectors. The normalised cointegrating vectior is

ECM, we need to confirm that the regressors are weakly exogenous. The weak exogeneity of the regressors is required for efficient inferences of single-equation error correction model (Carone 1996: 40). We used a simple and direct approach adopted from Carone (1996) for weak exogeneity analysis. The results supported weak exogenous for the regressors used in the study when the long-run coefficients were the parameters of interest. The details of the test procedure and results are cited in Appendix 2. Short run dynamic error-correction models (ECMs) can be specified and estimated on the weak exogeneity test results.

Considering the small sample in the present study, one lag length, *l* was entered into ECM (7), (8) and (9). To avoid the 'over-parameterised' problem, 'general to specific' approach was used to derive a parsimonious specification, particularly to solve the uncertainty of the explanatory variables to be included in the model in an ECM. Following the 'general to specific' method (Mohammad and Tang 2000: 264), a general model was tested down sequentially, beginning by deleting the variable with absolute t-ratios less than one.

The estimated final ECMs are shown in Table 4. A battery of diagnostic tests was conducted on the estimated ECMs. The results show significant diagnostic problems. Ramsey RESET tests reject a general specification error. The Jarque-Bera statistics confirm residual normality. Breusch-Godfrey LM tests accept the null of the errors to be serially uncorrelated. The ARCH test fails to reject the null of no ARCH effect. Finally the CUSUM of square plots reveal that all of the estimated coefficients in ECMs are stable over the sample period.

The significance of error correction term (EC_{t-1}) of these ECMs reveal three issues. First, it reconfirms the presence of a long-run equilibrium relationship among disaggregated imports and its major determinants.[10] This finding is consistent with the Johansen test results. Second, the weak form exogeneity hypothesis of the dependent variables can be rejected. Third, the explanatory variables, namely final consumption expenditure, expenditure on investment goods, exports and relative price do jointly Granger cause disaggregate volume of imports. The estimated coefficients of the error correction term indicate that the speed of adjustment among the variables is toward a long run equilibrium within a year. The import of consumption, intermediate and investment goods correct 37 per cent, 5.3 per cent and 30 per cent of the system disequilibrium, respectively and achieve a long run equilibrium relation within a year.

The estimated coefficients of the lagged fist different variable[11] capture short run effects (Engle and Granger 1987). The results show that final consumption expenditure is a major determinant for import of intermediate goods among the final expenditure components. However, the present study does not aim to examine why exports affect different component imports differently. Perhaps this area should be further researched. A possible explanation that can be

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$$\widehat{lnMI} = -2.343\, lnEIG \quad - 16.26\, \Delta lnFCE \quad + 1.73\, lnEX \quad + 4.604\, lnP \quad - 24.13$$
$$\text{(t-ratios)} \quad (-0.649) \qquad (-1.58) \qquad (2.25) \qquad (1.58)$$

The exports variable is statistically significant at 10 per cent level. Its elasticity is the highest, 1.73 compared to two other disaggregated import demand equations. Other determinants (lnEIG, ΔlnFCE and lnP) are statistically insignificant at 10 per cent significance level. However, a reservation for not using VAR(2) is that, the estimated error correction term (ECt-1) of using the above cointegrating regression for imports of intermediate goods is found in an incorrect sign, positive, 0.107 (but significant at 5 per cent level), implying spurious cointegration. A negative significant sign is expected (Engle and Granger 1987).

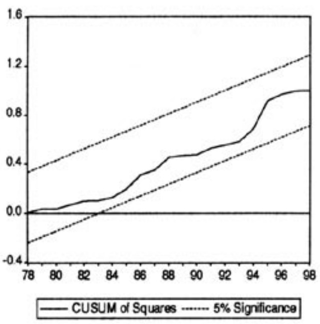
10 Kremers *et al.*'s (1992) study documented that the t-ratio of the estimated coefficient of error correction term can be used to test null of no cointegration. Ghatak et al. (1997: 217 footnote 9) noted "Empirically, in small

drawn here is that the expenditure on exports does affect the volume of disaggregated imports differently because aggregated exports might have different import components particularly imports of investment (capital) goods which are necessary inputs in the production for export

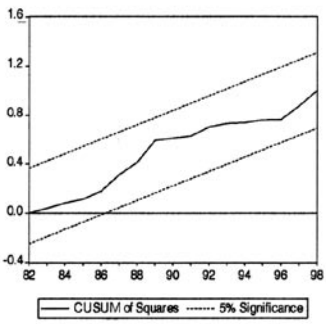
Table 4: Estimation of final error correction models

Volume of imports for: (Dependent variable)	Consumption goods ($\Delta ln MC_t$)	Intermediate goods ($\Delta ln MI_t$)	Investment goods ($\Delta ln MV_t$)
EC_{t-1}	- 0.372 (-2.826)*	- 0.053 (-3.323)*	- 0.261 (-6.789)*
$\Delta ln MC_{t-1}$ / MI_{t-1} / MV_{t-1}	*drop*	- 0.257 (-1.277)	- 0.242 (-1.508)
$\Delta ln EIG_t$	0.114 (1.159)	*drop*	*drop*
$\Delta ln EIG_{t-1}$	*drop*	- 0.326 (-2.102)**	- 0.251 (-1.516)
$\Delta\Delta ln FCE_t$	0.573 (1.554)	1.955 (-3.78)*	2.176 (5.067)*
$\Delta\Delta ln FCE_{t-1}$	*drop*	0.683 (1.483)	*drop*
$\Delta ln EX_t$	0.834 (2.316)**	0.578 (1.694)	1.00 (2.567)**
$\Delta ln EX_{t-1}$	0.550 (2.168)**	0.443 (1.388)	0.614 (1.852)***
$\Delta ln P_t$	- 0.734 (-3.425)*	- 0.511 (2.165)**	- 0.557 (-2.206)**
$\Delta ln P_{t-1}$	0.600 (2.714)**	0.48 (1.972)***	0.712 (2.749)**
ΔCU_t	*drop*	- 0.005 (-1.13)	*drop*
ΔCU_{t-1}	*drop*	*drop*	*drop*
Constant	- 0.068 (-1.5378)	0.084 (1.65)	0.035 (0.691)
Sample period	1970-1998	1971-1998	1970-1998
R-squared	0.770	0.795	0.847
Standard error of regression	0.075	0.079	0.089
DW statistics	1.804	1.778	1.385
F-Statistic	10.055 [0.000]	6.589 [0.00]	13.82 [0.00]
Ramsey RESET (1)	0.0017 [0.967]	0.087 [0.768]	0.179 [0.672]
Jarque-Bera	0.714 [0.699]	0.864 [0.649]	1.806 [0.405]
Breusch-Godfrey LM			
Lag 2	0.846 [0.655]	2.334 [0.311]	4.165 [0.125]
Lag 3	3.266 [0.352]	8.295 [0.04]	5.525 [0.137]
ARCH (1)	0.751 [0.386]	0.25 [0.617]	1.09 [0.296]

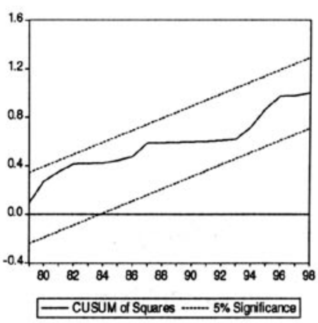
Notes: ( ) refer to t-ratios and [ ] for probability value. *p<0.01, **p<0.05, and ***p<0.1 (two-tailed test) drop: the variable was dropped from the general to specific modeling process.



Imports for Consumption Goods



Imports for Intermediate Goods



Imports for Investment Goods

goods under an export-led growth policy. Meanwhile, statistically, a simple Granger causality test shows that exports expenditure does Granger cause various components of import.[12] In the short run, all of the final macro expenditure variables show different effects on disaggregated import demand. This reveals that different macro expenditure components have different import content, and using a single demand variable may lead to bias. The relative price variable is significant for all economic-wise import demand. The capacity utilisation, (CU) variable was found to be insignificant, and was excluded from the general to specific exercise, This indicates that the country does not have sufficient capacity to produce the imported goods itself in the short run.

4. Conclusion

The present study demonstrates an empirical investigation into disaggregated import demand behaviour in Malaysia. The involved determinants of import demand studied were various final expenditure components such as final consumption expenditure, expenditure of investment goods, and expenditure on exports, and relative prices. The overall evidence renders strong support for the presence of a long run equilibrium relation among variables used in the disaggregated imports function (import for consumption goods, import for investment goods, and import for intermediation goods). This implies that disaggregated import demand behaviour in Malaysia is stable over the sample period. This finding is consistent with that ofMohammad and Tang (2000) who used aggregated imports variable. In addition, the different estimated coefficients of the expenditure components reveal that it contains different import components. A discussion on policy implications is drawn in this section.

First, Arize (1990) estimated the long run price elasticity of demand for Malaysian exports to be -4.06. In this study, the estimated long run price elasticities for imports of consumption goods and investment goods are -1.8 and -3.6 respectively (both statistically significant at 10 per cent level), and it is sufficient to satisfy that a devaluation or a depreciation will have favorable effects on the trade balance with enhancement of competitiveness and export expansion. For the relative price variable, Mohammad and Tang (2000) estimated the long run price elasticity for Malaysian aggregate imports to be -0.69, considering various macro

samples, statistically significant error-correction terms provide further evidence in favor of the presence of a 'genuine' long-run relationship." They used 25 annual observations (1966-1990) and six variables in Johansen maximum likelihood procedure in their analysis (Table 4: 220).

11 The estimated coefficient of the lagged first different variables is not the elasticity, $d\Delta Y/d\Delta X$. The elasticity, e is $d \ln Y/d \ln X$.

12 The results of standard Granger causality test (the reported values are p-value for rejecting the null)

Null Hypothesis:	Lag: 1	2	3
*ln*EX does not Granger Cause *ln*MI	0.07	0.13	0.11
~~*ln*EX does not Granger Cause *ln*MV~~	~~0.02~~	~~0.02~~	~~0.003~~
*ln*EX does not Granger Cause *ln*MC	0.01	0.06	0.09

expenditure components as the determinants. In addition, Tang (2001) found that volume of imports and exports were cointegrated in Malaysia, indicating the effectiveness of macroeconomic policies in correcting the country's trade imbalance.

Second, the findings reveal that different expenditure components have different effects on the import demand both in the long and short runs. Given a high long run and short run coefficient of export and growth of final consumption expenditure, a policy on controlling those final expenditures is more appropriate rather than using single a demand variable, Real GDP. Fiscal policy on reducing particular demand expenditures probably can be successfully implemented to reduce the import pressure. Third, domestic inflation needs to be kept in check as an increase in domestic price will sharply increase the volume of imports for consumption and investment goods.

Finally, the long run price coefficient of intermediate goods is in a positive sign, impliying an insufficient substitutability between imports and domestically produced goods. Therefore, a policy on increasing domestic capability to produce intermediate goods is necessary in order to reduce the pressure of import of intermediate goods. For policy design, priority should be given to the development of resource-based industries or small and medium-sized enterprises (SMEs) to accelerate the development of backward linkages for non resource-based industries that might continue in order to increase the utilisation of local inputs.

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APENDIX 1

Data Definitions and Sources

The annual data used in the analysis are from the period 1968 to 1998. The definitions of involved variables are given below:

1. Volume of imports is disaggregated by economics function that is consumption goods (MC), investment goods (MV) and intermediate goods (MI). The nominal value of these imports (RM million) was obtained from Ministry of Finance's *Economic Report* (various issues). The nominal imports are deflated using import price deflator in 1978 prices.
2. Final consumption expenditure (FCE) data were from Ministry of Finance's *Economic Report* (various issues). It is the sum of private sector and public sector final consumption expenditure. The nominal values are deflated using the implicit deflator for consumption expenditure (1978=100).
3. Expenditure on investment goods (EIG) was obtained from Ministry of Finance's *Economic Report* (various issues). EIG is in real terms (1978=100). It is the sum of gross fixed capital formation by the public and private sectors.
4. Exports expenditure (EX) data were obtained from Ministry of Finance's *Economic Report* (various issues). The series are measured in real terms (1978=100).
5. The relative price (P_t) variable is import price implicit deflator (P_m) divided by GDP implicit price deflator, P_d (1978=100). P_d is calculated by dividing nominal GDP with real GDP and multiplying the result by 100. Data were obtained from Ministry of Finance's *Economic Report* (various issues).

6. The capacity of the country to produce and supply the goods itself is essentially a short-run phenomenon. The capacity utilisation variable, CU_t is defined as the residuals multiplied by 100 from the following regression: $ln IP_t = a + b*time + e$, where IP is an index of industrial production (1978=100), time is a time trend variable, and e is residual. The methodology used to derive the CU variable is from Abbot and Seddighi (1996: 1122). The data on industrial production index were obtained from International Financial Statistics [CD-ROM On-line].

APPENDIX 2

Exogeneity Test

Following Carone (1996: 42-45), we employed a simple and direct way to check the weak exogeneity of import demand function's regressors used in this study (final consumption expenditure, expenditure on investment goods, exports expenditure, and relative price), limited to the case in which the parameters of interest are the long run coefficients to test the significance of the error-correction term in the marginal models (autoregressive marginal model) using the traditional t-statistics test. If the error-correction term is not significant, then the involved regressors can be considered as weakly exogenous. In this study, we initially set three lag lengths for autoregressive marginal models for regressor $ln EIG_t$, $\Delta ln FCE_t$, $ln EX_t$, and $ln P_t$. The variables used in model are in stationary form. Further, the ECC_{t-1}, ECI_{t-1} and ECV_{t-1} were in the one lagged period of residual of cointegration regression (10), (11), and (12) respectively. Two dummies capturing the two inflation shocks that occurred in 1973-74 and 1980-81 were included into the autoregressive marginal model, considering 1 for 1973-74 (dummy 1), and 1 for 1980-81 (dummy 2) respectively (0 for other periods). The results (t-ratio) of the exogeneity test are reported below:

Overall, the error-correction term appears insignificant at 5 per cent significance level (except two error correction terms for $\Delta ln EIG_t$). For the case of $\Delta ln EIG_t$, a cointegrating regression based on aggregate import demand was estimated using OLS estimator. The estimated t-ratio of the error-correction term, $(ln MI-0.42 ln EIG-0.056 \Delta ln FCE-0.67 ln EX +0.54 ln P-1.77)_{t-1}$ in the marginal model of $\Delta ln FCE$ was -0.164, supporting weak exogeneity for $\Delta ln EIG_t$. On the other hand, the results of Granger causality (with three lag length - maximum) show that the included variables do not Granger cause $\Delta ln EIG_t$ at 5 per cent significance level (see Table

A2.2). In sum, we can say that the regressors of $ln\text{FCE}_t$, $\Delta ln\text{EIG}_t$, $ln\text{EX}_t$, and $ln\text{P}_t$ are weakly exogenous.

Table A2.1

	Regressor			
Error-correction term:	$ln\text{EIG}_t$	$\Delta ln\text{FCE}_t$ [1]	$ln\text{EX}_t$	$ln\text{P}_t$
ECC_{t-1}	0.98	1.80	2.00	-1.21
ECI_{t-1}	-0.82	4.02*	1.06	-0.05
ECV_{t-1}	-0.55	4.05*	1.02	-0.13

*p<0.01 (two-tailed test). The reported values are t-ratio for the estimated coefficient of error-correction term. [1] first difference of lnFCE is I(1). ECC, ECI, and ECV are error correction terms for imports of consumption, intermediate, and investment goods respectively.

Table A2.2

Null hypothesis	Probability
*ln*EIG does not Granger cause Δ*ln*FCE	0.38725
*ln*EX does not Granger cause Δ*ln*FCE	0.44079
*ln*P does not Granger cause Δ*ln*FCE	0.10083
*ln*MV does not Granger cause Δ*ln*FCE	0.55621
*ln*MI does not Granger cause Δ*ln*FCE	0.17897
*ln*MC does not Granger cause Δ*ln*FCE	0.56228