IIUM Journal of Economics and Management 14, no. 1 (2006):

ARE IMPORTS AND EXPORTS IN THE OIC MEMBER COUNTRIES COINTEGRATED? A REEXAMINATION

Tuck Cheong Tang*

School of Business, Monash University Malaysia, 2 Jalan Kolej, Bandar Sunway, 46150 Petaling Jaya, Selangor Darul Ehsan, Malaysia (e-mail: tang.tuck.cheong@buseco.monash.edu.my)

ABSTRACT

Applying the recently developed unit root tests with unknown level shift (Lanne, Lutkepohl and Saikkonen, 2002; Saikkonen and Lutkepohl, 2002) and the cointegration test with structural break (Gregory and Hansen, 1996), this study reinvestigates the cointegration relationship between imports and exports for the Organization of the Islamic Conference (OIC) member countries as in Tang and Mohammad (2005). It is found that restrictions are not applicable for testing cointegration between imports and exports for OIC member countries. Interestingly, this study shows cointegration between exports and imports for 9 of the 27 selected OIC member countries (Bangladesh, Cameroon, Chad, Guyana, Indonesia, Mali, Morocco, Niger and Senegal) compared to only 4 countries as demonstrated by Tang and Mohammad (2005). Consequently, relevant policy implications are also discussed in this study.

JEL classification: F14, F35

Keywords: Cointegration, Structural break, Organization of the Islamic Conference (OIC)

*This article benefited from the comments and suggestions made by two anonymous referees. However, all remaining errors are entirely the author's.

1. INTRODUCTION

The exchange rate policy in any country is always accompanied by other macroeconomic policies such as fiscal or monetary instruments and it is difficult to assess the effects of one policy without controlling for the others. In this context, the combined effects of all policies on the trade balance remains an unresolved issue in the empirical research in international economics. However, recent empirical literature proposed that a long-term relationship between imports and exports of a country may indicate that macroeconomic policies, as well as devaluation, can be possibly implemented in order to improve trade imbalances (Bahmani-Oskooee and Rhee, 1997). Additionally, Irandoust and Ericsson (2004) shed light on several important policy implications of a long-terms relationship between imports and exports that motivate a re-examination of the long-term convergence between imports and exports for developed and developing countries. As noted by Irandoust and Ericsson (2004), cointegration between imports and exports may suggest that a country is not in violation of her international budget constraints and that trade imbalances are a short-run phenomenon that in the long-run are sustainable. Moreover, this implies a well-functioning economy because deficits are temporary phenomena balanced by future surpluses. This may relate to the point that macroeconomic policies (fiscal and monetary) have been effective in bringing imports and exports into an equilibrium in the long-term. More precisely, it indicates that there is no productivity gap between the domestic economy and the rest of the world. At the same time, it also implies a lack of permanent technological shocks to the domestic economy. In a country with distorted markets, there is no cointegration between imports and exports, which reflects 'bad policy', suggesting fundamental policy problems. Results of non-cointegration between imports and exports as noted by Irandoust and Erisson (2004, 51) are attributed to technological shocks or the existence of a productivity gap. Recently, this possible relevance has been examined in many studies.

A study by Arize (2002, 102) indicates that knowledge of whether imports and exports are cointegrated is essential for the design and evaluation of current and future macro-policies aimed at achieving the trade balance. Based on the cointegration approach, Bahmani-Oskooee (1994) investigates the effectiveness of Australian external accounts

to macroeconomic policies by investigating the long-term convergence between Australian imports and exports. The study reveals that Australian imports and exports are cointegrated and that the cointegrating coefficient is very close to unity, indicating that Australia's macroeconomic policies have been effective in the long-term. Using Korean data (quarterly data 1963-1991) and Johansen and Juselius's (1990) cointegration technique, Bahmani-Oskooee and Rhee (1997) find that Korea's imports and exports are cointegrated. This leads them to conclude that Korea is not in violation of its international budget constraints, and that exchange rate and other macroeconomic policies are favourable to the country's external balances. Tang (2002) documents a cointegrating relationship between imports and exports for both Malaysia and Singapore, but not for the Philippines, Indonesia and Thailand. These findings, however, are based on annual data from 1968-1998 (1974-1998 for Singapore) and an application of the bounds test (Pesaran, Shin and Smith, 2001).

In addition, using Johansen's technique on quarterly data 1973-1998, Arize (2002) finds that 35 of 50 countries are in favour of cointegration between imports and exports. However, using Stock and Watson's (1988) cointegration technique as a complementary test to the Johansen, all countries, except Mexico, favour a cointegration relationship between imports and exports. The study, therefore, concludes that macroeconomic polices have been effective in the long run and suggests that these countries are largely not in violation of their international budget constraints. The OIC member countries sampled in the study are Indonesia, Malaysia, Pakistan, Egypt, Iran, Jordan, Kuwait, Morocco, Nigeria and Tunisia. The results of the Stock and Watson's (1988) technique supports a cointegration relationship between imports and exports of these countries, but the Johansen test shows a relationship for the case of Jordan and Morocco. Using annual data from 1961 to 1999 (full sample period), and the Gregory-Hansen (1996) cointegration test, Baharumshah, Lau and Fountas (2003) find support for a cointegration relationship between imports and exports for Indonesia, the Philippines, and Thailand, but not for Malaysia.

Using a sample of 27 OIC member nations and using Engle and Granger's (1989) cointegration approach, Tang and Mohammad (2005) find that only four countries exhibited a long-term relationship between the volume of imports and exports. These countries are Benin, Burkina

Faso, Cameroon and Guyana thus, they conclude that exchange rate and monetary or fiscal policies may be effective to improve a country's trade balance in the long run. Countries with no cointegration between imports and exports however, are in violation of international budget constraints, and therefore, exchange rate and other macroeconomic policies are unfavorable to their external balances in the long run.

This study extends the analysis of the export-import long-term relationships to selected OIC countries as in Tang and Mohammad (2005) by applying unit root tests and cointegration tests that allow for level shifts. Crudely speaking, this study precedes an innovation in terms of the methods employed in examining the existence of long-term relationships between imports and exports. One puzzle from the empirical literature is that results of unit root and cointegration tests appear to be sensitive to the possible structural break that one considers. Moreover, the results of unit root and cointegration tests using conventional methods are less accurate than results based on methods which allow for a structural break, and any policy evaluation based on conventional methods ignoring the structural break can be grossly misleading. From the econometric point of view, if a structural change in the deterministic trend is not correctly specified, then unit root and cointegration tests will lead to misleading conclusion that there is a unit root or cointegrating relationship when there is not. In fact, visual observations of the plots of real imports and real exports in Appendix 3 (as circled) essentially suggested structural breaks over the sample period for almost the entire OIC member countries selected in this study. In the literature, none of the studies consider possible structural break in analysing series-stationary and long-term relationships between imports and exports, except for Baharumshah, Lau and Fountas (2003).

Thus, this study considers the use of unit root tests with unknown level shifts developed by Lanne, Lutkepohl and Saikkonen (2002), and Saikkonen and Lutkepohl (2002) in order to test the series stationarity and cointegration with unknown break date on the relationship between imports and exports *vis-à-vis* Gregory and Hansen (1996). In this study, an attempt is made to fill this gap by re-examining the long-term relationship between imports and exports for 27 OIC member countries.

This study proceeds as follows: Section 2 provides a review of the economic background of the selected OIC countries; Section 3 gives a

snapshot and review of the analytical framework, data and method of analysis; Section 4 presents the results; and the final section provides concluding remarks.

2. ECONOMIC BACKGROUND OF SELECTED OIC COUNTRIES

This section briefly discusses the economic background of OIC member countries as in Tang and Mohammad (2005). Appendix 1 shows the OIC member countries selected based on data availability that can provide a sufficient sample span of 30 years.

A basic feature observed in the OIC member countries is the presence of their trade deficits. Visual inspections of the plots of real imports and real exports in Appendix 3 reveal that almost all OIC member countries suffered trade deficits during most of the time of the sample period where imports are higher than exports. However, this is not visible for Indonesia and Malaysia since their exports had higher real values than the imports for most of the time during the sample period. Observing the historical data from 1990 to 2000 (World Bank, 2001), the majority of OIC member countries experienced unfavorable trade deficits. These countries include Bangladesh, Benin, Burkina Faso, Chad, Egypt, Gambia, Guinea-Bissau, Guyana, Jordan, Mali, Mauritania, Morocco, Niger, Pakistan, Senegal, Sierra Leone, Togo and Tunisia. In addition, trade deficits are also present in Algeria for 1990 and 1993-1995, and 1998; Cameroon for 1999; Indonesia for 1995-1997; Iran for 1990-1993 and 1998; Malaysia for 1991 and 1993-1995; Nigeria for 1993; 1998-1999; and Syria for 1991-1998. Cote d'Ivoire and Gabon were free of the problem for the period 1990-2000. In this context, as suggested by SESRTCIC (1987, 43), the OIC member countries' balance of payments situation prompts a special emphasis on the need for intensifying economic cooperation among member countries in order to correct their external imbalances. Looking at the devaluation policy alone, Tang (2003) estimates import demand equations for the eighteen selected OIC member countries, and from the price estimates, he suggests that exchange rates policy such as devaluation is only favourable in improving trade balances for Algeria, Chad, Indonesia and Syria.

From Appendix 2, we can briefly point out the obvious macroeconomic characteristics of the sampled OIC member countries. Firstly, based on the 1999 World Bank classifications, it is interesting to note that almost all of the examined OIC member countries are in the low-income group (seventeen countries), and eight countries are categorised as lower middle-income while only two counties are classified in the upper-middle income group. Secondly, the agricultural sector dominates the economic structure of the selected OIC member countries and, in fact, proves to be a greater contributor to Gross Domestic Product (GDP) over the recent decades (based on the year of 1999) than that of the manufacturing sector. The countries having a share between 30 and 47 percent per annum of agricultural output per GDP (in the year of 1999) are Benin, Burkina Faso, Cameroon, Chad, Gambia, Guyana, Mali, Niger, Nigeria, Sierra Leone and Togo. The lowest share is 2 percent for Jordan. Nevertheless, the share of the value added of manufacturing per GDP (in 1999) is higher than that of the agricultural sector for Egypt, Indonesia, Jordan, Malaysia, Syria and Tunisia. In addition, among the selected OIC member countries, Algeria, Gabon, Indonesia, Iran, Syria, and Tunisia are members of the Organization of Petroleum Exporting Countries (OPEC).[1]

This study also briefly illustrates the macroeconomic performance of the selected OIC countries for the period 1990-1999. The average annual growth of real GDP ranged between -4.8 and 6.3 percent, and the lowest and the highest values are for Sierra Leone and Malaysia, respectively. Most of these countries are in a range of 3 to 5 percent per annum (16 countries) as compared to 8 countries within the 1 to 3 percent average annual growth for 1990-1999. All of the selected OIC countries recorded a positive average growth of exports for the period 1990-1999 except Sierra Leone (-12.2 percent). The average annual exports growth for Bangladesh and Malaysia are 13.2 and 11 percent, respectively, which can be explained by the exports-led growth strategy implemented in these countries. Half of the sample countries have negative growths for imports over the period 1990-1999, namely Gabon, Guinea-Bissau, Iran, Jordan, Niger, Sierra Leone and Togo which indicates the effectiveness of the governmental policies (fiscal or monetary) in improving trade balances. We also observe that import growth is higher than export growth in Algeria, Benin, Burkina Faso, Cameroon, Gambia, Morocco and Nigeria.

Furthermore, inflation is a major determinant of trade flows. It measures the growth of domestic prices (proxied by consumer price index, CPI) in which an increase in inflation will make imports cheaper and consequently, the demand for imports to rise. The average growth of inflation is above 10 percent per annum for the period 1990-1999 as found for Algeria (21.4 percent), Guinea-Bissau (36.7 percent), Guyana (26.1 percent), Indonesia (16 percent), Iran (25.5 percent), Nigeria (29.2 percent), Pakistan (10 percent) and Sierra Leone (41 percent).

On the other hand, exchange rate data (local currency/US$) shows that all of these countries devalued their currencies (positive average growth of exchange rate) for the period 1990-1999 except for Syria. Some countries achieved more than 10 percent exchange rate growth, and they are Algeria (21.7 percent), Egypt (13.6 percent), Guinea-Bissau (30.9 percent), Guyana (18.8 percent), Indonesia (14.9 percent), Iran (31.9 percent), Nigeria (25.3 percent) and Sierra Leone (34.1 percent). However, it is worthwhile to discuss exchange rate regimes as adopted by the selected OIC member countries over the two decades. In this context, this study uses the exchange rate regime classifications which have been constructed by Levy-Yeyati and Sturzenegger (2005) for the period 1974–2000.

Following Levy-Yeyati and Sturzenegger (2005, 1630-33), many selected OIC member countries adopted fixed exchange rate regime for most of the past two decades, while others adopted a mixture over the period 1974–2000. The countries adopting fixed exchange rate regime for most of the period are Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Chad, Gabon, Gambia, Guyana, Jordan, Niger, Senegal, Syria and Togo. However, Mali only adopted a fixed exchange rate regime for the period 1995-2000. On the other hand, Egypt shifted her exchange rate regime from a fixed exchange (1974-1988) to a managed floatregime (1989-1991), and then to a floating exchange rate regime in 2000. Additionally, Guinea-Bissau recently adopted the fixed exchange rate regime (1997-2000) by dropping the float exchange rate regime (1993-1996). Indonesia removed the fixed exchange rate regime implemented over the period 1987-1993 to a managed float regime in 1995 (to 2000). Similarly, Nigeria moved the fixed exchange rate regime (1994-1998) to a float exchange regime in 2000. However, Malaysia implemented the fixed exchange rate regime in 1994 and between 1999 and 2005, but during other periods utilized a float exchange rate regime.

A few countries pegged their exchange rate to a basket of currencies, for example, Algeria for 1974-1993 (and followed float exchange rate regime in 1998-2000), Bangladesh for 1974-2000, and Mauritania for 1974-1994 (but is unclassified for 1999-2000). Interestingly, Pakistan adopted various exchange rate regimes, managed float, fixed and float over the period 1980-1994 and then followed with a float exchange rate in 1995-1998, and an unclassified regime for the period 1999-2000. This type of mixed exchange rate regime also adopted by Sierra Leone (fixed exchange rate regime for 1992-1996; floating exchange rate regime for 1998-1999; and managed float exchange rate regime in 2000), and Tunisia (managed float and float exchange rate regimes between 1986 and 2000). But there is no conclusive data on the exchange rate regime adopted by Iran over the period although it had a floating exchange rate in 2000.

3. DATA, ANALYTICAL FRAMEWORK AND METHODS

The testing procedures of this study are as follows. Using unit root tests (Lanne, Lutkepohl and Saikkonen, 2002; and Saikkonen and Lutkepohl, 2002), this study first examines the stationarity of the imports and exports series owing to the fact that cointegration is testable between nonstationary $I(1)$ series. The second step is to examine a cointegration between exports series and imports series via two approaches: the first is to test the stationarity of the trade balance (TB_t) under the null of a unit root with an unknown regime shift which is a restrictive approach that imposes *a priori* a cointegrating vector of (1, -1) with the constant term equals 0. This study will test the significance of these restrictions before employing this approach. The second approach is conventionally employed in the literature and is less restrictive via the data-driven methods, to test the cointegration between the imports series and the exports series by using Gregory and Hansen (1996) cointegration tests with unknown break date.

3.1 DATA

Three variables are used in this study: volume of imports, volume of exports, and trade balance. The imports (*MM*) and the exports (*EX*) data are measured as indices based on 1995 prices (local currency),

and are obtained from the *World Tables* (*dx EconData*, site licence 2094A), while the trade balance variable is a ratio of exports to imports (by using $\ln EX_t - \ln MM_t$). Due to data unavailability and insufficient sample span of annual data,[2] some countries have been dropped from the analysis. The sample OIC member countries used in this study is illustrated in Appendix 1.

3.2 ANALYTICAL FRAMEWORK

Following Husted (1992), the model of testing the long-run relationships between imports and exports starts with the budget constraint of an individual who is able to borrow and lend freely in the international market. A representative household has the following current-period budget constraint:

$$C_0 = Y_0 + B_0 - I_0 - (1 + ir_0)B_{-1} \quad (1)$$

where C_0 is current consumption, Y_0 is output, I_0 denotes investment, ir_0 is the world interest rate, B_0 is international borrowing (which could be positive or negative), and $(1+ ir_0)B_{-1}$ is the initial debt of the representative household, corresponding to the country's external debt. Since equation (1) must hold for every time period, the period-by-period budget constraints can be added up to form the economy's intertemporal budget constraint which can be expressed as:

$$B_0 = \sum_{t-1}^{\infty} \delta_t TB + \lim_{n \to \infty} \delta_n B_n \quad (2)$$

where $TB_t = EX_t - MM_t = Y_t - C_t - I_t$ which represents the trade balance in the period *t* (income minus absorption), *EX* is exports and *MM* is imports, and $\delta_t = \prod_{s=1}^{t} \beta_s$, where $B_s = 1/(1+ ir_s)$, and δ_t is the discount factor. The crucial element in equation (2) is the last term $\lim \delta_n B_n$, where the limit is taken as $n \to \infty$. When the limit term is nonzero, if B_0 is positive, then the country is "bubble-financing" its external debt and if B_0 is negative, the country is making pareto-inferior decisions (Husted, 1992). Assuming that the world interest rate is stationary with unconditional mean *ir*, equation (1) may be expressed as:

(3)

where $Z_t = MM_t + (ir_t - ir)B_{t-1}$. Solving Equation (3) by forward substitution, the following relationship is obtained (Husted, 1992):

$$MM_t + ir_t B_{t-1} = EX_t + \sum_{j=0}^{\infty} \phi^{j-1}[\Delta EX_{t+j} - \Delta Z_{t+j}] + \lim_{j\to\infty} \phi^{t+j} B_{t+j} \quad (4)$$

where $\phi = 1/(1+ir)$ and Δ is the first-difference operator. The left-hand side of equation (4) represents spending on imports as well as interest payments (receipts) on net foreign debt (assets). Subtracting *EX* from both sides of equation (4) and multiplying the result by (-1), we observe that the left-hand side of equation (4) represents the current account of an economy. By assuming the limit term that appears in equation (4) to equal zero and adding the residual term to equation (4), the following regression model can be obtained:

(5)

where $MM_t^* = (MM_t + ir_t B_{t-1})$ measures imports of goods and services plus net interest payments plus net unilateral transfers. The necessary condition (weak form) for the economy to satisfy its intertemporal budget constraint is the existence of a stationary error structure, which is e_t in equation (5) and should be an *I*(0) process. In other words, failure to detect a cointegration relationship between exports (inflows) and imports (outflows) would indicate that the economy fails to satisfy its budget constraint and, therefore, is expected to default on its debt. Thus, an empirical statement of no cointegration between imports and export is that current account deficits or surpluses of the examined countries are unsustainable and do not move toward external-account equilibrium.

The necessary and sufficient condition - strong form for the intertemporal budget constraint model - is the existence of a vector (α, β) such that e_t is a stationary process and (Baharumshah, Lau and Fountas, 2003, 472-473). This study extends the above framework by assuming a strong form condition

for an intertemporal budget constraint model with ( ) = (0, 1) and imposes it into equation (5), yielding equation (6):

(6) $EX_t = MM_t^* + e_t$

In this context, $e_t = EX_t - MM_t^* \equiv TB_t$. Eventually, the TB_t (trade balance) series approximates e_t.[3] Thus, stationarity of the trade balance series via the rejection of the null hypothesis of a unit root in Engle-Granger sense exhibits empirical support of cointegration between imports and exports implying that the current account is sustainable. However, before adopting this approach, it is a wise strategy to test whether these restrictions are acceptable or not.[4] This can be done by estimating equation (5), and then by testing the joint significance of the restrictions $\alpha = 0$ and via a Wald test (*F*-statistic). The results are reported in Table 1. Surprisingly, the *p*-values are very close to zero and at 10 percent significance level, the null hypothesis of and can be rejected for all the countries except Gambia. Clearly, this finding reveals that the proposed restrictions as in equation (6) cannot be accepted in a satisfactory way, in particular for the 27 selected OIC countries. In this context, this study uses equation (5) without restrictions in examining the cointegration between imports and exports.

$\beta, (\theta)'\gamma$

3.3 METHODS

UNIT ROOT TESTS WITH LEVEL SHIFTS

If there is a shift in the level of the data generation process (DGP), it should be taken into account in testing for a unit root because the conventionally used unit root tests such as the ADF (augmented Dickey-Fuller) test used in Tang and Mohammad (2005) may be distorted if the shift is simply ignored. In this context, a shift function, which is denoted by , may be added to the deterministic term μ_t of the DGP. Hence, a model $y_t = \mu_0 + \mu_1 t + f_t(\theta)'\gamma + x_t$, is considered, where θ and are unknown parameters or parameter vectors and the errors are generated by an AR(*p*) process with possible unit root. Three possible shift functions can be implemented. They are:

1. A simple shift dummy variable with shift date T_B:

$$f_t^{(1)} = d_{1t} = \begin{cases} 0, & t < T_B \\ 1, & t \geq T_B \end{cases} .$$

The function does not involve any extra parameter θ. In the shift term , the parameter γ is a scalar. Differencing this shift function leads to an impulse dummy.

TABLE 1
The Results of Wald Test for Restrictions Imposed

Country	*F*-statistics (*p*-value)	Country	*F*-statistics (*p*-value)
Algeria	39.025	Jordan	25.394
	(0.000)		(0.000)
Bangladesh	11.991	Malaysia	32.011
	(0.000)		(0.000)
Benin	18.256	Mali	18.152
	(0.000)		(0.000)
Burkina Faso	16.144	Mauritania	2.715
	(0.000)		(0.079)
Cameroon	51.256	Morocco	6.688
	(0.000)		(0.003)
Chad	60.410	Niger	26.897
	(0.000)		(0.000)
Cote d'Ivoire	20.171	Nigeria	41.336
	(0.000)		(0.000)
Egypt	39.661	Pakistan	123.753
	(0.000)		(0.000)
Gabon	69.303	Senegal	24.701
	(0.000)		(0.000)
Gambia	0.184	Sierra Leone	80.173
	(0.833)		(0.000)
Guinea-Bissau	34.957	Syria	13.580
	(0.000)		(0.000)
Guyana	11.765	Togo	26.304
	(0.000)		(0.000)
Indonesia	387.465	Tunisia	36.618
	(0.000)		(0.000)
Iran	12.605		
	(0.000)		

Note: The regression equation is estimated by OLS method.

2. The second shift functions based on the exponential distribution function which allows for a nonlinear gradual shift to a new level starting at time T_B:

   In the shift term $f_t^{(2)}(\theta)\gamma$, both θ and are scalar parameters. The first one is confined to the positive real line (>0), whereas the second one may assume any value.

3. The last function can be expressed as a rational function in the lag operator applied to a shift dummy, :

$$f_t^{(3)}(\theta) = \left[\frac{d_{1,t}}{1-\theta L} : \frac{d_{1,t-1}}{1-\theta L}\right]^t .$$

   Now, the actual shift term is $\left[\gamma_1(1-\theta L)^{-1} + \gamma_2(1-\theta L)^{-1}L\right]d_{1t}$, where θ is a scalar parameter between 0 and 1 and is a two-dimensional parameter vector. Both $f_t^{(2)}(\theta)\gamma$ and $f_t^{(3)}(\theta)'\gamma$ can generate sharp one-time shifts at time T_B for suitable values of θ. Thus, they are more general than .

$$f_t^{(1)}(\gamma_1 : \gamma_2) = \begin{cases} 0, & t < T_B \\ 1 - \exp[-\theta(t - T_B + 1)], & t \geq T_B \end{cases}$$

In this context, Lanne, Lutkepohl and Saikkonen (2002), and Saikkonen and Lutkepohl (2002) have proposed a set of unit root tests for the model $y_t = \mu_0 + \mu_1 t + f_t(\theta)'\gamma + x_t$, which is based on estimating the deterministic term first by a generalised least squares (GLS) procedure under the unit root null hypothesis and subtracting it from the original series.[5] Then an ADF type test is performed on the adjusted series which also include terms to correct for estimation errors in the parameters of the deterministic part. As in the case of the ADF statistic, the asymptotic null distribution is non-standard, hence, the appropriate critical values are tabulated in Lanne, Lutkepohl and Saikkonen (2002). For the unknown break date, Lanne, Lutkepohl and Saikkonen (2003) have recommended to choose a reasonably large AR order as a first step and then to pick the break date which minimizes the GLS objective function used to estimate the parameters of the deterministic part.[6]

COINTEGRATION TEST WITH STRUCTURAL BREAK

Gregory and Hansen (1996) augment the standard residual-based test for cointegration, that is, an ADF on the ordinary least squares (OLS) residual. The advantage of this test is that it considers cases where the intercept and/or slope coefficients have a single break of unknown timing. This test procedure does not require information regarding the timing of, or indeed, the occurrence of a break (Gregory and Hansen, 1996, 103). Gregory and Hansen (1996) found that the power of the conventional ADF test with no allowance for regime shifts falls sharply. The cointegrating equation is augmented with dummy variables. For convenience, define a dummy variable $DU_t = 0$, if $t \leq \lambda t$; and 1, otherwise (where T is full sample size, is the integer range). In practice and computation, we consider that breakpoints are allowed, starting at the observation that corresponds approximately to $0.15T$ and ending at approximately $0.85T$. The testable hypotheses are the null of no cointegration against the alternative of cointegration in the presence of a structural change. The present study considers the following three models: (i) the cointegrating equation allowing for a mean shift (hereafter, GH1); (ii) the cointegrating equation allowing for a mean-shift with trend (hereafter, GH2); and (iii) the cointegrating equation allowing for a regime shift (hereafter, GH3). That is, a shift in mean and slope coefficients. Level shift means that there is a shift in the constant term of the cointegrating equation.

The statistical properties of the test statistics used in the present study are ADF statistic (the OLS *t*-statistic as used for the unit root test) and the approximate asymptotic critical values for the ADF (also Z and Z_t) are based on OLS estimates on sample sizes $n = 50$, 100, 150, 200, 250 and 300, with up to four regressors. The results of the ADF for models (i) to (iv) for these three tests over the interval ($0.15T$, $0.85T$) were computed. The minimum ADF *t*-statistics for the three tests are taken for testing the null hypothesis of no cointegration against the alternative hypothesis of cointegration with a one-time regime shift.

4. EMPIRICAL RESULTS

The findings of the unit root tests (Lanne, Lutkepohl and Saikkonen, 2002; Saikkonen, and Lutkepohl, 2002) are summarized and reported

in Table 1. Countries with $I(1)$ imports and exports for which cointegration tests can be further performed are Bangladesh, Cameroon, Chad, Egypt, Guyana, Indonesia, Malaysia, Mali, Morocco, Niger, Pakistan, Senegal, Sierra Leone and Tunisia. For countries where both imports and exports are at stationary levels $I(0)$, cointegration tests are not applicable and no cointegration can be concluded in nature. Those countries are Benin, Gabon, Iran, Jordan, Mauritania, Syria and Togo. Similar application is directed to results where the variables are between $I(0)$ and $I(1)$. Countries that fall in this category are Algeria, Burkina Faso, Cote d'Ivoire, Gambia, Guinea-Bissau and Nigeria. In sum, no cointegration between imports and exports can be made for Algeria, Benin, Burkina Faso, Cote d'Ivoire, Gabon, Gambia, Guinea-Bissau, Iran, Jordan, Mauritania, Nigeria, Syria and Togo.

Table 3 presents the results of the Gregory and Hansen (1996) cointegration tests with structural break for those countries where the nonstationary imports and exports variables are integrated in the same order, $I(1)$. Among the equations GH1, GH2, and GH3, the test statistics

TABLE 2
Degree of Integration for Real Exports Series and Real Imports Series

Country:	Ln*X*	Ln*M*	Country:	Ln*X*	Ln*M*
Algeria	*I*(1)	*I*(0)	Jordan	*I*(0)	*I*(0)
Bangladesh	*I*(1)	*I*(1)	Malaysia	*I*(1)	*I*(1)
Benin	*I*(0)	*I*(0)	Mali	*I*(1)	*I*(1)
Burkina Faso	*I*(0)	*I*(1)	Mauritania	*I*(0)	*I*(0)
Cameroon	*I*(1)	*I*(1)	Morocco	*I*(1)	*I*(1)
Chad	*I*(1)	*I*(1)	Niger	*I*(1)	*I*(1)
Cote d'Ivoire	*I*(1)	*I*(0)	Nigeria	*I*(0)	*I*(1)
Egypt	*I*(1)	*I*(1)	Pakistan	*I*(1)	*I*(1)
Gabon	*I*(0)	*I*(0)	Senegal	*I*(1)	*I*(1)
Gambia	*I*(1)	*I*(0)	Sierra Leone	*I*(1)	*I*(1)
Guinea-Bissau	*I*(1)	*I*(0)	Syria	*I*(0)	*I*(0)
Guyana	*I*(1)	*I*(1)	Togo	*I*(0)	*I*(0)
Indonesia	*I*(1)	*I*(1)	Tunisia	*I*(1)	*I*(1)
Iran	*I*(0)	*I*(0)			

Note: The 0.10 critical value is from Lanne, Lutkepohl and Saikonnen, 2002 (p.678, Table II, T=50). For interested readers, detailed results are available from the author upon request.

are significant for Bangladesh, Cameroon, Chad, Guyana, Indonesia, Mali, Morocco, Niger and Senegal. That is, the null hypothesis of no cointegration can be rejected at the 10 percent significance level, indicating cointegration between imports and exports for those countries with a break date.

Broadly speaking, the results of cointegration between imports and exports may be discussed by economic intuition as noted in Irandoust

TABLE 3
Gregory and Hansen Cointegration Tests (*t*-statistics)

Country	GH1	GH2	GH3
Bangladesh	-7.126*	-5.874*	-7.357*
Cameroon	-4.831*	-5.101*	-4.988*
Chad	-5.881*	-5.940*	-6.043*
Egypt	-4.179	-3.308	-4.197
Guyana	-3.895	-5.605*	-4.127
Indonesia	-2.726	-4.836*	-3.905
Malaysia	-2.430	-2.832	-2.558
Mali	-4.542*	-4.680	-4.967
Morocco	-3.156	-5.324*	-3.772
Niger	-4.138	-7.034*	-5.607*
Pakistan	-4.112	-4.0612	-4.208
Senegal	-4.525*	-6.262*	-4.857*
Sierra Leone	-2.712	-3.637	-2.608
Tunisia	-3.018	-4.314	-3.074

Notes: 1. The 10 percent critical values from Gregory-Hansen (1996, 109, Table 1, m=1) are -4.34 for HG1, -4.72 for HG2, and -4.68 for HG3.

2. *denotes rejection of the null hypothesis of no cointegration against the alternative hypothesis of cointegration with a one-time regime shift.

and Ericsson (2004). First, cointegration between imports and exports may suggest that the country is not in violation of her international budget constraints and that trade imbalances are a short-run phenomenon which in the long-run are sustainable. This implies a well-functioning economy because deficits are temporary phenomena that will be balanced by future surpluses. In this context, it can be concluded that the country's macroeconomic policies (fiscal and monetary policies) have been effective in bringing imports and exports into an equilibrium in the long-run. In addition, there is no productivity gap between the

domestic economy and the rest of the world, which suggests a lack of permanent technological shocks to the domestic economy. Second, no cointegration between imports and exports may suggest a country with distorted markets, and thus, reflects 'bad policy' suggesting fundamental policy problems. In addition, the existence of technological shocks or a productivity gap can also explain the results of no cointegration between imports and exports (Irandoust and Erisson, 2004, 51).

Table 4 summarizes the findings of cointegration between imports and exports of this and other influential studies as highlighted earlier. We first compare the findings of this study with one done by Tang and Mohammad (2005). Adopting the unit root and cointegration tests with a structural break, this study finds more countries which imports and exports are cointegrated, that is, 9 out of 27 OIC member countries. Tang and Mohammad's (2005) study supports cointegration between exports and imports for only 4 countries. This is an empirical improvement even if opposing results ranging from no cointegration to cointegration are found in this study such as for Bangladesh, Chad, Indonesia, Mali, Morocco, Niger and Senegal. For Cameroon and Guyana, the results presented in this study are in line with Tang and Mohammad (2005). Additionally, compared to the work done by Arize (2002), similar results are found only for Indonesia, Morocco and Jordan. However, other sample countries considered in Arize's (2002) study exhibits an opposite finding. Interestingly, the results for the case of Indonesia and Malaysia are in line with Baharumshah, Lau and Fountas (2003), used the Gregory and Hansen, and the Johansen tests, but this is contrary to Tang (2003) when the bounds test is used.

Causal observations made from the summary in Table 4 may provide some conventional technical explanations for different findings of cointegration between imports and exports in OIC member countries. First and foremost, different methods of unit root and cointegration tests bring about different results, particularly those with a structural break. Secondly, this can be linked to the sample period used in the analysis. Conventionally, different time spans may affect the results of unit root and cointegration tests even with a residual-based (Engle-Granger, Gregory-Hansen, and Stock-Watson), or system-based approach (Johansen).

TABLE 4
Comparison of the Results of Cointegration between Imports and Exports

OIC member countries	This study	Tang and Mohammad (2005)	Arize (2002)		Tang (2003)	Baharumshah, Lau and Fountas (2003)	
Method		Engle-Granger	Johansen	Stock-Watson	Bounds test	Gregory-Hansen	Johansen
Algeria	X	X					
Bangladesh	✓	X					
Benin	X	✓					
Burkina Faso	X	✓					
Cameroon	✓	✓					
Chad	✓	X					
Cote d'Ivoire	X	X					
Egypt	X	X	✓	✓			
Gabon	X	X					
Gambia	X	X					
Guinea-Bissau	X	X					
Guyana	✓	✓					
Indonesia	✓	X	✓	✓	X	✓	✓
Iran	X	X	✓	✓			
Jordan	X	X	X	✓			

TABLE 4 (continued)

OIC member countries	This study	Tang and Mohammad (2005)	Arize (2002)		Tang (2003)	Baharumshah, Lau and Fountas (2003)	
Method		Engle-Granger	Johansen	Stock-Watson	Bounds test	Gregory-Hansen	Johansen
Malaysia	X	X	✓	✓	✓	X	X
Mali	✓	X					
Mauritania	X	X	✓	✓			
Morocco	✓	X	X	✓			
Niger	✓	X					
Nigeria	X	X	✓	✓			
Pakistan	X	X	✓	✓			
Senegal	✓	X					
Sierra Leone	X	X					
Syria	X	X					
Togo	X	X					
Tunisia	X	X	✓	✓			

Notes: 1. ✓indicates the imports and the exports are cointegrated.
2. X indicates the imports and the exports are not cointegrated.
3. The results are based on full sample periods.
4. Only the OIC member countries from other studies are presented in this table and, the results of non-OIC member countries are briefly noted in the Introduction section of this study.

5. CONCLUDING REMARKS

Using unit root tests with unknown level shift (Lanne, Lutkepohl and Saikkonen, 2002; Saikkonen and Lutkepohl, 2002) and the cointegration test with structural break (Gregory and Hansen, 1996), this study has revisited the work done by Tang and Mohammad (2005) and finds that for 9 out of the 27 selected OIC member countries, a cointegrating relationship between exports and imports can be established. The countries are Bangladesh, Cameroon, Chad, Guyana, Indonesia, Mali, Morocco, Niger and Senegal. Tang and Mohammad (2005), on the other hand, using conventional methods (namely the Phillips-Perron unit root tests and the Engle-Granger cointegration tests) found cointegration for only four countries.

The findings of cointegration for the case of Bangladesh, Cameroon, Chad, Guyana, Indonesia, Mali, Morocco, Niger and Senegal indicate that these countries are not in violation of their international budget constraints. This reveals that short-run imbalances are not only temporary but also sustainable in the long-run. Furthermore, macroeconomic policies (fiscal and monetary) in these countries have been effective in bringing imports and exports to a convergence toward equilibrium in the long-term – a stable underlying trend towards trade balance equilibrium. More precisely, given the economic theory that there exists a natural tendency towards cointegration in the real trade balance of a well-functioning economy where there are neither permanent productivity shocks nor policy distortions, it suggests that the economy is working properly and implies 'good policy' (Irandoust and Ericsson, 2004).

For the case of Algeria, Benin, Burkina Faso, Cote d'Ivoire, Egypt, Gabon, Gambia, Guinea-Bissau, Iran, Jordan, Nigeria, Malaysia Mauritania, Pakistan, Sierra Leone, Syria, Tunisia and Togo, no cointegration is found between imports and exports. This is interesting to explain as no cointegration is made as a result of unit root cointegration tests via economic rationale. Borrowing the explanations given in Irandoust and Ericsson (2004, 51), the breaking of international budget constraints may lead to a lack of cointegration. This implies that sustained external imbalances are the outcome of distorted markets or 'bad policy', which suggests fundamental policy problems. They added that important reasons for non-cointegration between imports and exports are technological shocks or the 'productivity gap' hypothesis.

However, no study is free from limitations. The first is that this study only include 27 of the 57 OIC member countries due to data unavailability from the well-recognized databases, *World Tables* (World Bank, various issues) for a sufficient time span, although the nominal data series for imports, exports, and GDP are available for other countries (import price and export price variables are not available). However, we do not use this data since nominal imports and exports scaled by nominal GDP as in Arize (2002) failed to capture the actual trend of imports and exports.

Secondly, the analytical framework suggests that the appropriate imports variable comprises of the imports of goods and services plus net interest payments plus net unilateral transfers. However, the available published imports data such as from *World Tables* (World Bank,) and *International Financial Statistics* (International Monetary Fund,), are only for imported goods and services, and does not account for the net interest payments or net unilateral transfers. In fact, these variables are not reported in the published sources as mentioned above, and may explicitly affect the results of cointegration between imports and exports.

The final limitation is that the policy implications are mainly based on findings of cointegration between imports and exports and the general implications suggested in Irandoust and Ericsson (2004) may be applicable to some countries but not to all sampled countries. Hence, we have not made any conclusive comments on the country's trade policies owing to the lack of available information about the trade policies of the selected OIC member countries. This limitation is commonly acknowledged by many researchers when studying low-income (or less-developed) countries like most of the OIC member countries in this study.

END NOTES

1. OPEC consists of eleven oil-producing and exporting countries from Africa, Asia, the Middle East, and Latin America. The OIC member countries can be classified further into (a) Exporters of Oil: Algeria, Bahrain, Gabon, Indonesia, Iran, Iraq, Jamahiriya, Kuwait, Oman, Qatar, Saudi Arabia, Syria, Tunisia and United Arab Emirates; (b) Exporters of Primary Commodities: Bangladesh, Benin, Burkina Faso, Cameroon, Chad, Gambia, Malaysia, Mali,

Mauritania, Morocco, Niger, Senegal, Sierra Leone, Somalia, Sudan, Turkey and Uganda; and (c) Countries whose main source of foreign exchange revenue is services and remittances: Egypt, Jordan, Maldives, Pakistan, Yemen A.R. and Yemen P.D.R.

2. The use of annual data does not discount the results as noted by Davidson and MacKinnon (1993, 714), "…One possibility is to use annual data. This may cause the sample size to be quite small, but the consequences of that are not as severe as one might fear". In addition, Shiller and Perron (1985) have pointed out that the power of these tests (unit root tests) depends more on the span of the data (i.e., the number of years the sample covers) than on the number of observations.

3. Time series plots of e_t and TB_t (measured as trade ratio, defined as exports over imports, $\ln EX - \ln MM$, see Baharumshah, 2001, 295), exhibit similar patterns for all the sample countries.

4. I would like to thank an anonymous referee for this suggestion.

5. An early study on this issue is by Zivot and Andrews (1992).

6. Considering the common practice that the data is annual and the sample size is small, this study set a lag-length of one year which is, by nature, sufficient to address the problem of serial correlation in the residuals. In fact, we initially included two and three lags but some test statistics were not computable because of small sample. This study does not run the correlograms test in order to test the serial correlation in the residuals. However, according to Shiller and Perron (1985), the power of unit root tests depends more on the span of the data (i.e., the number of years the sample covers) than on the number of observations.

REFERENCES

Arize, A. C. "Imports and Exports in 50 Countries Test of Cointegration and Structural Breaks." *International Review of Economics and Finance* 11 (2002):101-15.

Baharumshah, A. Z., E. Lau, and S. Fountas. "On the Sustainability of Current Account Deficits: Evidence from Four ASEAN Countries." *Journal of Asian Economics* 14 (2003): 465-87.

Baharumshah, A. Z. "The Effect of Exchange Rate on Bilateral Trade Balance: New Evidence from Malaysia and Thailand." *Asian Economic Journal* 15, no. 3 (2001): 291-312.

Bahmani-Oskooee, M. "Are Imports and Exports of Australia Cointegrated?" *Journal of Economic Integration* 9, no. 4 (1994): 525-33.

Bahmani-Oskooee, M., and Hyun-Jae Rhee. "Are Imports and Exports of Korea Cointegrated?" *International Economic Journal* 11, no. 1 (1997): 109-14.

Davidson, R., and J. G. MacKinnon. *Estimation and Inference in Econometrics*. New York: Oxford University Press. 1993.

Engle, R. F., and C. W. J. Granger. "Co-Integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55 (1987): 251–76.

Gregory, A.W., and B. E. Hansen. "Residual-Based Tests for Cointegration in Models with Regime Shifts." *Journal of Econometrics* 70 (1996): 99-126.

Hakkio, C. S., and M. Rush. "Cointegration: How Short Is the Long-run?" *Journal of International Money and Finance* 10, no. 4 (1991): 571-81.

Husted, S. "The Emerging U.S. Current Account Deficit in the 1980s: A Cointegration Analysis." *Review of Economics and Statistics* 74 (1992): 159-66.

Irandoust, M., and J. Ericsson. "Are Imports and Exports Cointegrated? An International Comparison." *Metroeconomica* 55 (2004): 49-64.

Johansen, S. "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models." *Econometrica* 59 (1991): 1551–80.

Johansen, S., and J. K. Juselius. "Maximum Likelihood Estimation and Inference on Cointegration – With Applications to Demand for Money." *Oxford Bulletin of Economics and Statistics* 52 (1990): 169-210.

Lanne, M., H. Lutkepohl, and P. Saikkonen. "Test Procedures for Unit Roots in Time Series with Level Shifts at Unknown Time." *Oxford Bulletin of Economics and Statistics* 65, no. 1 (2003): 91-115.

Lanne, M., H. Lutkepohl, and P. Saikkonen. "Comparison of Unit Root Tests for Time Series with Level Shifts." *Journal of Time Series Analysis* 23, no. 6 (2002): 667-85.

Levy-Yeyati, E., and F. Sturzenegger. "Classifying Exchange Rate Regimes: Deeds vs. Words." *European Economic Review* 49 (2005): 1603-35.

Pesaran, M.H., Y. Shin, and R. J. Smith. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics* 16 (2001): 289-326.

SESRTCIC. "Balance of Payments Situation of OIC Member Countries." *Journal of Economic Cooperation Among Islamic Countries* 8 (1987): 43-96.

Shiller, R. J., and P. Perron. "Testing the Random Walk Hypothesis: Power Versus Frequency of Observations." *Economics Letters* 18 (1985): 381-86.

Saikkonen, O., and H. Lutkepohl. "Testing for a Unit Root in a Time Series with a Level Shift at Unknown Time." *Econometric Theory* 18 (2002): 313-48.

Stock, J. H., and M. W. Watson. "Testing for Common Trend." *Journal of the American Statistical Association* 83 (1988): 1097-107.

Tang, T. C., and Mohammad Alias. "Are Imports and Exports of OIC Member Countries Cointegrated? An Empirical Study." *Labuan Bulletin of International Business & Finance* 3 (2005): 33-47. (available at http://wwwkal.ums.edu.my/LBIBF/)

Tang, T. C. "Aggregate Import Demand Function for Eighteen OIC Countries: A Cointegration Analysis." *IIUM Journal of Economics and Management* 11, no. 2 (2003): 167-95.

Tang, T. C. "Are Imports and Exports of the Five ASEAN Economies Co-Integrated? An Empirical Study." *International Journal of Management* 20, no.1 (2002): 88-91.

World Bank. *World Development Report 2000/2001*. Oxford University Press. 2001.

Zivot, E., and D. W. K. Andrews. "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis." *Journal of Business and Economic Statistics* 10 (1992): 251-70.

APPENDIX 1
List of OIC Member Countries

Countries		Countries	
Afghanistan	N/A	Malaysia✓	1960-2000
Albania	1991-2000	Maldives	1995-2000
Algeria✓	1960-2000	Mali✓	1976-2000
Azerbaijan	1995-2000	Mauritania✓	1960-2000
Bahrain	N/A	Morocco✓	1960-2000
Bangladesh✓	1960-2000	Mozambique	
Benin✓	1960-2000	Niger✓	1960-2000
Brunei	N/A	Nigeria✓	1960-2000
Burkina Faso✓	1965-2000	Oman	N/A
Cameroon✓	1960-2000	Pakistan✓	1960-2000
Chad✓	1960-2000	Palestine	N/A
Comoros	1980-2000	Qatar	N/A
Côte d'Ivoire✓	1960-2000	Saudi Arabia	N/A
Djibouti	N/A	Senegal✓	1960-2000
Egypt✓	1960-2000	Sierra Leone✓	1967-1999
Gabon✓	1960-2000	Somalia	N/A
Gambia✓	1966-2000	Sudan	N/A
Guinea	1986-2000	Suriname	1980-2000
Guinea-Bissau✓	1970-2000	Syria✓	1975-2000
Guyana✓	1960-2000	Tajikistan	1993-2000
Indonesia✓	1960-2000	Togo✓	1960-2000
Iran✓	1974-2000	Tunisia✓	1961-2000
Iraq	N/A	Turkey	1987-2000
Jordan✓	1976-2000	Turkmenistan	1993-2000
Kazakhstan	1990-2000	Uganda	1982-2000
Kuwait	N/A	United Arab Emirates	N/A
Kyrgyzstan	1992-2000	Uzbekistan	1994-2000
Lebanon	1989-2000	Yemen	1990-2000
Libya	N/A		

Notes: 1. N/A is not available for data on imports, and exports from *World Tables* (World Bank, various issues).
2. The data are on annual basis.
3. ✓ is the country included in the analysis due to having a reasonable number of observations.

APPENDIX 2
Economic Characteristics of the Selected Sample Countries

Countries	Classification[a]	Value Added as percent of GDP in 1999		Average Growth (percent) for the period 1990-1999				
		Agriculture	Manufacturing	GDP	Exports	Imports	Inflation	Exchange Rate[b]
Algeria	LM	13	11	1.6	2.2	2.8	21.4	21.7
Bangladesh*	L	21	17	4.8	13.2	9.2	4.33	4.2
Benin	L	38	8	4.7	1.9	5.1	7.2	6.6
Burkina Faso	L	32	21	3.8	0.4	3.6	2.7	6.6
Cameroon*	L	44	11	1.3	2.7	4.0	4.2	6.6
Chad*	L	38	11	2.3	5	4.9	6.5	6.6
Cote d'Ivoire	L	24	20	3.7	4.7	2.9	6.0	6.6
Egypt	LM	17	27	4.4	3.1	2.8	9.9	13.6
Gabon	UM	8	5	2.8	2.5	-1.0	5.6	6.6
Gambia	L	30	4	3.3	1.4	2.4	5.2	4.1
Guinea-Bissau	L	23	4	4.2	4.7	-1.2	36.7	30.9
Guyana*	LM	30	8	4.8	9.2	9.3	26.1	18.8
Indonesia*	L	20	25	4.7	9.2	4.8	16.0	14.9
Iran	LM	N/A	N/A	3.4	0.2	-5.5	25.5	31.9
Jordan	LM	2	15	4.8	7.4	-1.3	4.3	2.1
Malaysia	UM	14	35	6.3	11.0	10.9	3.7	3.4
Mali*	L	47	4	3.6	9.6	2.7	6.4	6.6

APPENDIX 2 (continued)

Countries	Classification[a]	Value Added as percent of GDP in 1999		Average Growth (percent) for the period 1990-1999				
		Agriculture	Manufacturing	GDP	Exports	Imports	Inflation	Exchange Rate[b]
Mauritania	L	25	10	4.1	1.6	1.1	5.9	9.2
Morocco*	LM	17	17	2.3	3	6.6	3.4	1.4
Niger*	L	40	6	2.5	1.7	-4.6	4.5	6.6
Nigeria	L	41	5	2.4	2.5	5.2	29.2	25.3
Pakistan	L	26	17	4.0	2.7	1.9	10.0	8.8
Senegal*	L	18	17	3.2	2.6	1.6	4.0	6.6
Sierra Leone	L	44	4	-4.8	-12.2	-5.6	41.0	34.1
Syria	LM	24	27	5.7	4.7	1.0	8.0	0[c]
Togo	L	43	9	1.7	1.5	-1.0	6.5	6.6
Tunisia	LM	13	18	4.6	5.1	3.9	4.7	2.2

Notes: 1. [a] country classification by income based on 1999 GNP per capita (World Bank, 2001) that are L = low income, LM = lower-middle income, and UM = upper-middle income.

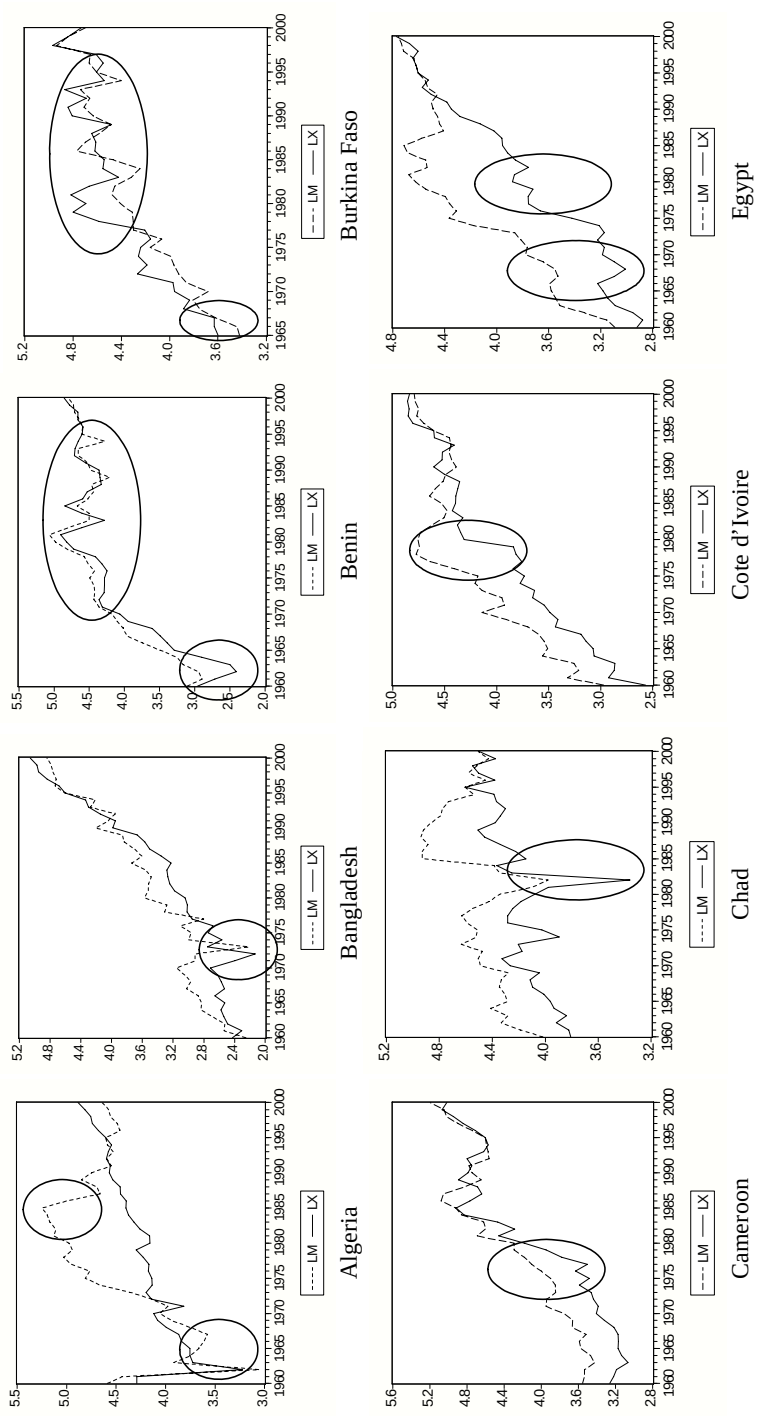
2. [b] based on local currency/US$.

3. [c] fixed the exchange rate to 11.225 local currency/US$ since 1988. Data source is *World Tables*, World Bank (various issues).

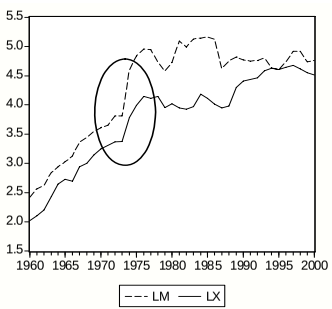
4. *cointegration is found between imports and exports in this study.

APPENDIX 3

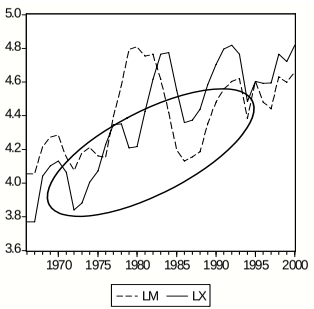
Plots of ln*X* and ln*M* (in 1995 prices)



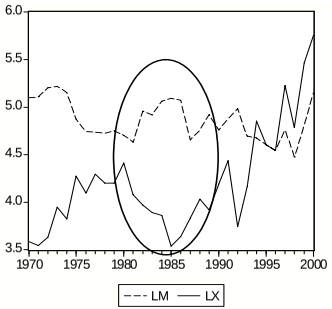
APPENDIX 3 (continued)



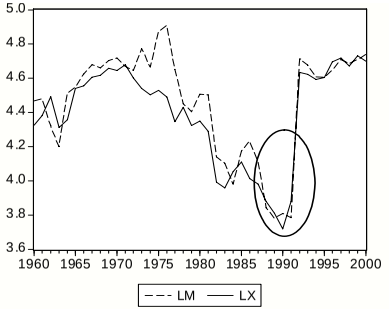
Gabon



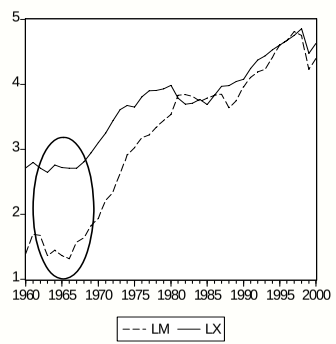
Gambia



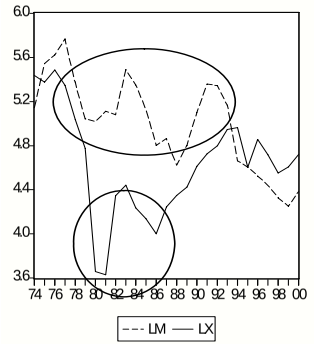
Guinea-Bissau



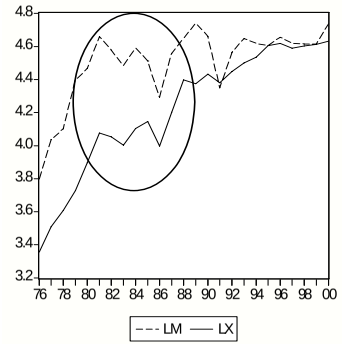
Guyana



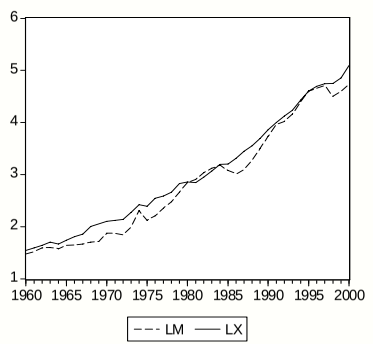
Indonesia



Iran

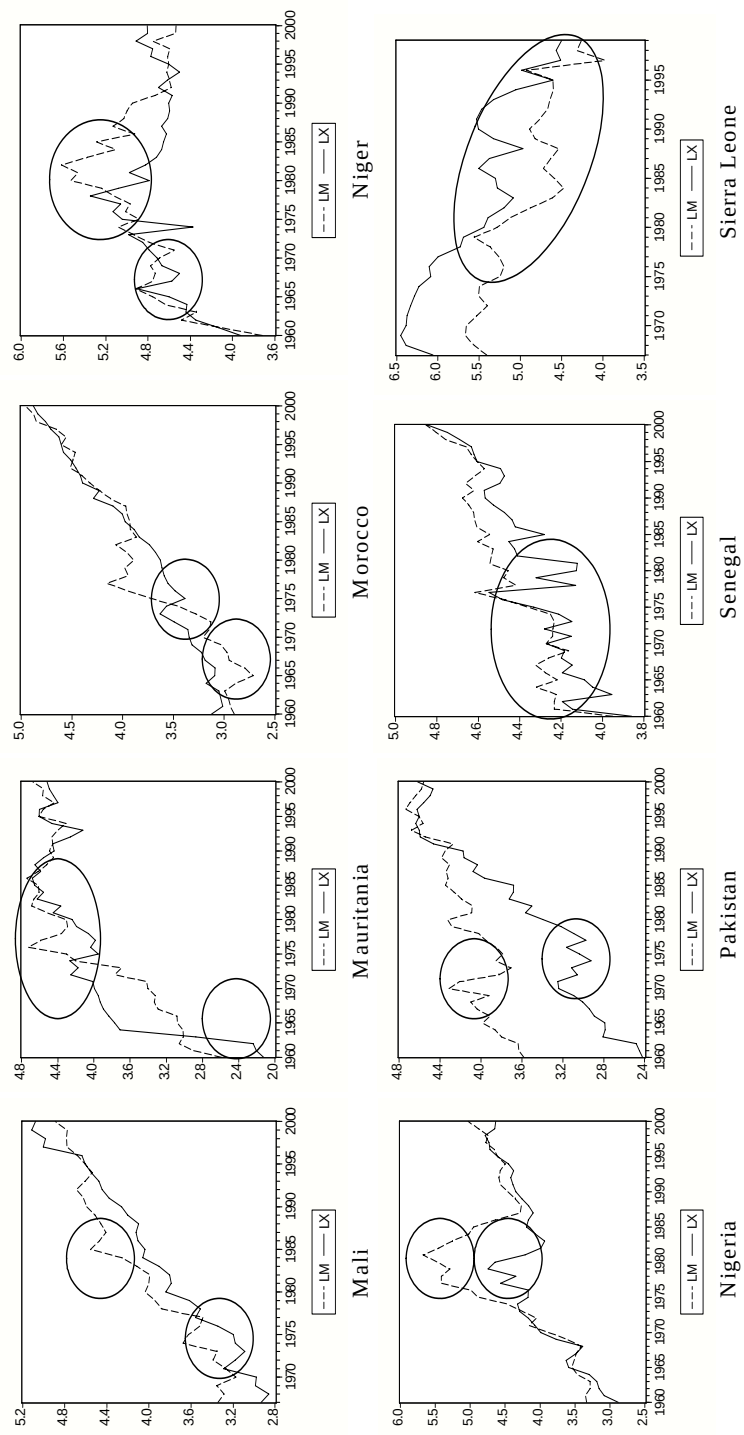


Jordan

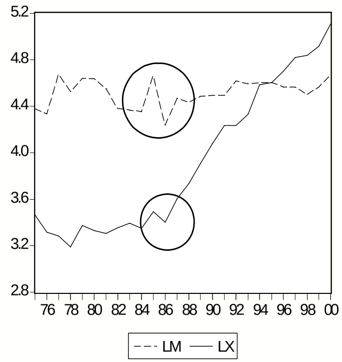


Malaysia

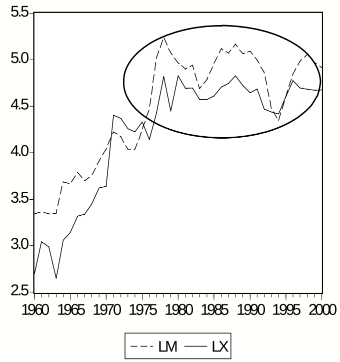
APPENDIX 3 (continued)



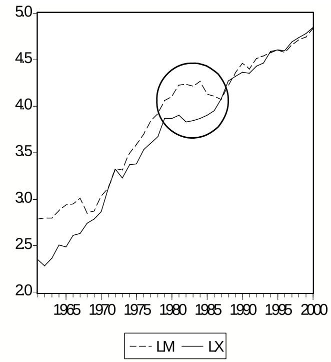
APPENDIX 3 (continued)



Syria



Togo



Tunisia