China-Malaysia's long run trading and exchange rate: complementary or conflicting?

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CHINA-MALAYSIA'S LONG RUN TRADING AND EXCHANGE RATE: COMPLEMENTARY OR CONFLICTING?

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Abstract

This paper examines the long run dynamics of exchange rate and bilateral export-import flows between China and Malaysia. Our analysis contributed in using high frequency monthly data for the recent period from January 1990 to January 2008, based on the Autoregressive Distributed Lag bound testing procedure, the fully modified OLS, dynamic OLS and rolling estimations, as well as the generalised impulse response (IRF) and variance decomposition (VDC) analyses. Our empirical findings reveal that the Marshall-Lerner condition holds in the long run but the export-import demands do not adhere to the J-curve pattern. And, expansionary effect is of greater evidence for Malaysia due to real exchange shocks but inconclusive for China. More important, the VDC results imply that China-Malaysia trade is along the sustainable path. In brief, the study supports for the complementary role of China instead of conflicting (competing) features in the China-Malaysia bilateral trading.

Keywords: Exchange rates, J-curve, Marshall-Lerner Condition, ARDL Bound Test, Rolling, FMOLS, DOLS

JEL Classification Codes: C51, F31, F42,

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1.0 Introduction

Malaysia was the first nation among the ASEANs to forge diplomatic relations with China since 1974. Similarly, China recognizes Malaysia as influential player within ASEAN and various ASEAN-driven collaboration platforms such as the ASEAN Regional Forum and the East Asian Summit. Today, China has become Malaysia's major trading partner, whereas Malaysia's production of liquefied natural gas remains as highly demanded energy resource in China. Both economies are of different regulatory regimes, different degrees of development and trade openness, but within a comparable development in exchange rate regime. Malaysia – particularly throughout the capital control regime and, China – for most episodes during 1990s-2010s, were alleged as committed to export-led growth policy based on maintenance of their undervalued currencies against the USD.

In 2007, China's total trade was reported at US$2170 billion (hundred times the total trade in 1978 - US$20.6 billion) and her current account surplus amounting US$372 billion ranked top globally. The trade and growth expansion steadily continue in the wave of global crises but subjected to various confrontations. Despite the advantages in labour costs and investment magnetism, it was claimed that the Chinese foreign exchange regime has posed the economic giants as a formidable competitor and offers further threat to the crowding out of other developing Asian, including Malaysia (Findlay, 1998; Choi, 2001; Zhang and Wan, 2007; among others). Such policy practice is odd when East Asians have devoted for regional economic integration and committed to the ASEAN-China Free Trade Area. Malaysia has, in fact, suffered a continuous of 7-year trade deficits against China (mainland) since 2002, which peaked at $4.2 billion in 2007.

Two appealing and related questions thus arise. First, has the emergence of China shown complementary or conflicting (competing) features to Malaysia, or the other way? Second, is the devaluation strategy expansionary or contractionary?

At present stage, neither the theoretical nor the empirical work has established definitively whether currency devaluation (nominal or real) has caused output expansion or deterioration (Bahmani-Oskooee and Miteza, 2003), or even if exchange rate plays a role in determining trade flows (Bahmani-Oskooee and Wang, 2006; Ahmad and Yang, 2007). The issue has become more vital following the China's accession to WTO (November 2001) as well as the emergence of ASEAN+6 Free Trade Area due to the Chiang Mai Initiative (2000), the Bali Dialogue (2003) and the Singapore Declaration (2007). The need for an amendment of regional trade policy and currency arrangements anchoring by China is well understood but less being investigated.

Motivated by the concerned issues, this study investigates the long run and dynamic nexus of China-Malaysia bilateral trade balances, exchange rates and national income. Thus far, to our best knowledge, no empirical study has yet investigated the China-Malaysia case using separated export and import demand models that encompass high frequency monthly data from January 1990 to January 2008 – a period of crises, trade expansion and major changes in currency regime for both China and Malaysia. Relevant studies have previously worked on the Malaysian or Chinese case but not for China vis-a-vis Malaysia after the major currency adjustment in July 2005 (e.g., Baharumshah (2001) for Malaysia-US-Japan and Thailand-US-Japan, 1980Q1-1996Q4; Bahmani-Oskooee and Harvey (2006, 2010) for Malaysia-14 trading partners, 1983Q1-2002Q1, 1973Q1-2001Q3; Ahmad and Yang (2004) for China-G7, 1974-1994; Bahmani-Oskooee and Wang (2006) for China-13 Trading partners without Malaysia, 1983-2002).

Our analyses tackle the possible transmission channels via macro-variables (e.g. domestic output, foreign income) as in standard international trade model. But unlike previous studies that assume constant parameters of the models over time, we take concerns of changes in the economic environment in the past decades. Additional rolling analysis is conducted to capture the potential time-varying parameters so that the stability and predictive accuracy of our models can be evaluated. The Marshall-Lerner condition and income effect are investigated via the combination the elasticity and absorption approaches of balance of payment, using the three advanced methods for single-equation cointegration tests. These include the Autogressive Distributed Lag (ARDL hereafter) bound test (Pesaran, *et al.*, 2001), the fully modified OLS (Phillips and Hansen, 1990) and the dynamic OLS (Stock and Watson, 1993)[1].

Of all, the ARDL procedure can be applied irrespective of whether the regressors are stationary, i.e. I(0), or stationary at first difference, i.e. I(1), or mutually cointegrated. It avoids the conventional pre-testing procedure of unit roots in Johansen-Juselius cointegration technique and has the advantage of easily understood within the context of traditional error correction modelling approaches. Regardless of the possible exogeneity of explanatory variables, the long and short-run parameters can be obtained by applying OLS to an autoregressive distributed lag model with appropriate lag length, and with appropriate asymptotic inferences (Duarte and Holden, 2001).

[1] The fully modified OLS (FMOLS) estimator is asymptotically unbiased and has fully efficient mixture normal asymptotics allowing for standard Wald tests using asymptotic Chi-square statistical inference. Then, dynamic OLS (DOLS) involves augmenting the cointegrating regression with lags *and leads* of the first-differenced regressor so that the resulting cointegrating equation error term is orthogonal to the entire history of the stochastic regressor innovations.

Alternatively, the J-curve phenomenon and the income response following shocks in real exchange rates are graphically illustrated via the generalised impulse response function (IRF) analysis from the unrestricted vector autoregression (VAR) framework. VAR is capable for analyzing the dynamic impact of random disturbances on the system of variables. In our case, an impulse response function traces the effect of a one-time shock to one of the innovations of real exchange rates on current and future values of the export or import variables and national income. If J-curve is present, countries are able to correct external imbalances via exchange rate devaluation after temporal adjustments of external competitiveness, or otherwise. Likewise, a positive response of national income should present if devaluations are indeed expansionary, or otherwise. In addition, we also conduct generalized variance decomposition analysis (VDC) in an attempt to gauge to what extent shocks to certain macro variables are explained by other variables considered in the system. Information from application of these tools should provide some further evidence on the out-of-sample causal effects as well as contribute to enhancing our insights upon how variables react to system-wide shocks and how these responses propagate over time.[2]

The present study is organized in the following manner. Section 2 reviews the historical facts of exchange rates and trade in Malaysia and China. Section 3 then presents the literature arguments whereas section 4 shows the theoretical representation of trade-exchange model that forms the basis of our empirical model. This is followed by the estimation procedures and data description. Estimation results are discussed in section 5. Finally, in the closing section 6, conclusions are drawn.

[2] See Masih and Masih (1999) for further details about the methodology of IRF and VDC.

2.0 Preliminary Facts

Historically, the Malaysian ringgit was trading as a free float currency at around RM2.50 per USD since early 1970s. Managed floating was promoted since 1980s and some overvaluations were found in the 1st half of 1990s during the soft-pegged against USD (Table 1). During the 1997 Asian financial crisis, Malaysian ringgit suffered sharp depreciation by more than 40% within a year to about RM 4.00/USD. Bank Negara Malaysia (BNM, central bank of Malaysia) decided to impose capital control and peg ringgit to the USD in September 1998 at RM3.80.

Table 1: Exchange Rates Regime

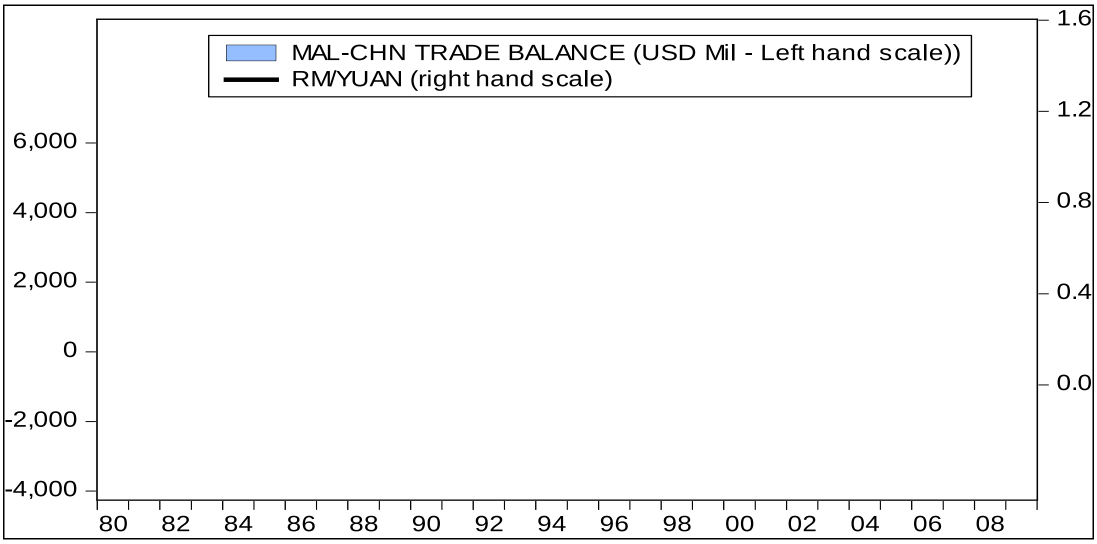
Country	Horizon	Exchange Rate System Classification
China	June 1969 - December 1973	• Renmimbi is introduced
	January 1974 - February 1981	• De facto crawling band around USD (+/- 2%)/Multiple rates
	March 1981 - July 1992	• Managed floating/ Multiple rates
	August 1992 - December 1993	• De facto crawling band around USD (+/- 2%)/Multiple rates, premium peaks at 124% on June 1991
	January 1994 – June 2005	• De facto peg to USD, unification of markets
	July 2005 – current	• De facto band to USD and a basket of currency (+/- 0.3%)
Malaysia	June 1967 – September 1975	• Peg to Pound Sterling. Malaysian Ringgit is introduced
	September 1975 – July 1997	• De facto band around USD (+/- 2%). Officially the ringgit is pegged to a basket of currencies
	August 1997 – September 1998	• Freely floating
	September 1998 – June 2005	• Peg to USD. Capital control was implemented
	July 2005 – current	• Managed Floating

Sources: IMF, modified and updated from Reinhart and Rogoff (2002).

On the other hand, renminbi was pegged to the USD and a dual-track currency system was instituted since 1978. Renminbi was only usable locally while foreign exchange certificates are forced on foreigners. China abolished the dual-track system and introduced single free floating currency effective January 1, 1994 and the renminbi turn freely convertible under current account transaction effective December 1996. In the following decade until 2005, renminbi was tightly pegged at 8.2765 yuan to the USD (Table1). On July 21, 2005 People's Bank of China announced the 2.1% revaluation to 8.11 yuan per USD and move from USD pegging to managed-floating based on a basket of foreign currencies. On July 21, 2005, BNM responded to China's de-pegging announcement within an hour after the 7-year pegging. Akin to the Chinese policy, BNM allows the ringgit to operate in a managed floating system based on a basket of several major currencies. Together, both renmimbi and ringgit show analogous trend of subsequent appreciation against the weakened USD in the new millennium. By June 2008, the USD exchanges for 3.20 Malaysian ringgits, whereas the yuan is traded at around 6.95 yuan (June 2008), appreciated about 16% since 2005.

While China has continuously experienced trade expansion for the past three decades, Malaysia's external surplus has significantly increased since 1998 since the currency depreciation owing to Asia crisis. In 2007, Malaysia's surplus has achieved RM 26 billion and ranked 15th in the world. Presently, Malaysia's major trading partners are China, the US, Singapore, Japan and ASEAN members. Both China and Malaysia have committed to regional trading and economic cooperation. In 2008, Malaysia has contributed about 25% of intra-ASEAN trading whereas China has become the third major trading partner of ASEAN after Japan and the European Union, contributing about 11% of intra-ASEAN trading. Bilateral trading between China-Malaysia was minor in the 1980s (see Figure 1). The figure slightly improved to $4.7 billion in 1990 or about 8% of Malaysian trading. But in 2009, the Malaysia-China (plus Hong Kong) trade reached $59 billion - about 18.9% of Malaysian global trading and surpassing the Malaysia-US trade share (10.9%). However, there were 7-year trade deficits before the major correction in 2009.

Figure 1: Malaysian-China Exchange Rate and Trade Balance, 1980-2009



Source: IMF

3.0 Literature Review

Conventional inspection foresees a nominal devaluation will translate into a real currency depreciation to boost net exports and hence the resulting growth. But there would be a perverse temporal negative response of the trade balance to a real depreciation in short run, followed by the larger export and import elasticities that would improve the trade balance (Dornbusch and Krugman, 1976; Krugman and Baldwin, 1987; Helkie and Hooper 1987). The so-called J-curve phenomenon is mainly due to the overtaken price effect of volume effect at early stage. This is later supported by Onafowora (2003) who found varying degree of J-curve effects among ASEAN-US and ASEAN-Japan via the analysis of generalized impulse response functions. On the contrary, Rose and Yellen (1989) rejected both the exchange rate-trade balance nexus and J-curve effect among US-G7, thus casting doubt on the effect of devaluation on the trade balance. Zhang (1998), based on Chinese variables in the 1990s, found that the causal effect only runs from trade balance to exchange rate but not the reverse way. Subsequent studies by Baharumshah (2001), Bahmani-Oskooee and Wang (2006), Ahmad and Yang (2007) also failed to discover firm evidence of the negative short-run J-curve effect for Asian economies, with limited support of positive long-run effect of foreign exchange on trade balance. Besides, empirical studies not only reported J-curve but also S-curve. Backus et al. (1994), for instance, deployed the dynamic-general equilibrium models and found that the trade balance correlated negatively with current and future movements in the terms of trade, but positively correlated with past movements. Over time, the cross correlation function of the trade balance and the terms of trade display an S-shape. Marwah and Klein (1996) then estimated trade balance equations for US and Canada. They found a tendency for trade balances to worsen first after depreciation and then to improve, but after several quarters there appeared to be a tendency to worsen again, which too produce an S-pattern. Using disaggregated data, Bahmani-Oskooee and Ratha (2007) extended the literature by finding strong support for the S-curve between Japan and her trading partners.

While the impact of currency devaluation on trade gains on is inconsistently understood, its support for output expansion is neither well-established. On one hand, devaluation generates an expansionary effect via aggregate demand; on the other hand, it has a negative impact on the aggregate supply through its effect on the cost of imported intermediate inputs. In literature, arguments that currency devaluations are more contractionary and inflationary for developing countries than for industrial countries have been observed in Eichengreen and Hausmann (1999), Calvo and Reinhart (2001), among others, which partially explained the practice of rigid exchange rate regime by many developing countries. Particularly, the simultaneous occurrence of currency depreciation and recession during the Mexico crisis (1995) and the Asian financial crisis (1997) appears to contradict the conventional view that devaluations are expansionary, as noted by Rajan and Shen (2002) and Ahmed et al. (2002). The reversals of pegged exchange rates policy during crisis as governments ran out of reserves, witnessed the sharp declines in investor confidence, heavy capital outflows and concordant deteriorations of output and inflation performance. In mixed finding, Bahmani-Oskooee and Miteza (2003) revealed that devaluations have been contractionary for Indonesia and Malaysia, but expansionary for the Philippines and Thailand. Kim and Ying (2007), in addition, observe that devaluation can be contractionary in the post-crisis period for East Asia as well as for Mexico and Chile. Yet, Bahmani-Oskooee and Wang (2006) employed disaggregate quarterly data to discover that the Chinese income instead of the yuan has played the major role in the Chinese trade balance determination. Shi (2006), in similar observation, found that though the yuan appreciation is generally contractionary, but given the scale of capital flows, shocks to the capital account likely play a much bigger role than the yuan in Chinese growth.

4.1 Export Demand and Import Demand Models

The exchange rate devaluation-international trade relationship has long been a major topic of study in international economics. The conventional elasticity approach was firstly addressed by Bickerdike-Robinson-Metzler (BRM, 1920; 1947; 1948) and was later make known by Marshall and Lerner (1923; 1944) as the Marshall-Lerner condition (MLC henceforth). According to MLC, the demand elasticity of both exports and imports must exceed one to improve trade balances from devaluation. There is an excess supply of currencies when the exchange rate is above the equilibrium level and excess demand when it is below. Only with this condition a nominal devaluation will affect real exchange rates to enhance competitiveness and hence improves trade balances. Since then, the MLC has become the underlying assumptions of currency devaluation policy. We posit that the demand for import goods depends upon the relative price of imports and domestic income, expressed as :

$$IM_{CH(MY)} = IM_{CH(MY)}\left(RP_{CH(MY)}, Y_{CH}\right) \qquad (1)$$

where $IM_{CH(MY)}$ represent China demand for imports from Malaysia, $RP_{CH(MY)}$ is the relative imported price of Malaysia goods to domestic price in China, and Y_{CH} refers to China real income. Letting $FX_{\frac{CH}{MY}}$ represents the nominal exchange rate, defined as the unit of yuan per ringgit, the relative price of imported goods can be expressed as:

$$RP_{CH(MY)} = FX_{\frac{CH}{MY}}\left(\frac{P_{MY(EX)}}{P_{CH}}\right) = FX_{\frac{CH}{MY}}\left(\frac{P_{MY}}{P_{CH}}\right)\left(\frac{P_{MY(EX)}}{P_{MY}}\right) = \left(\frac{1}{RFX_{\frac{CH}{MY}}}\right)RP_{MY(CH)} \qquad (2)$$

where $RFX_{\frac{CH}{MY}} = \dfrac{P_{CH}}{FX_{\frac{CH}{MY}} P_{MY}}$

$P_{MY(EX)}$ is the Malaysian currency price of its exports, P_{CH} and P_{MY} are the price indexes of all goods in China and Malaysia, respectively, $RFX_{\frac{CH}{MY}}$ is the real exchange rate, defined as the relative price of yuan to Malaysian goods, i.e. $RFX_{\frac{CH}{MY}} = \frac{P_{CH}}{FX_{\frac{CH}{MY}} P_{MY}}$, and $RP_{MY(CH)}$ is the relative price of Malaysian exports to Malaysian produced goods. With real exchange rates, $RFX_{\frac{CH}{MY}}$ thus defined, an increase (decrease) in its value indicates a real devaluation (appreciation) of the Chinese yuan. Substituting $RP_{CH(MY)}$ from equation 1, we obtain:

$$IM_{CH(MY)} = IM_{CH(MY)}\left(\frac{RP_{MY(CH)}}{RFX_{\frac{CH}{MY}}}, Y_{CH}\right) \quad (3)$$

Similarly, the foreign country's demand for imports depends upon foreign income as domestic relative export prices:

$$IM_{MY(CH)} = IM_{MY(CH)}\left(RP_{CH(EX)} RFX_{\frac{CH}{MY}}, Y_{MY}\right) \quad (4)$$

Given that domestic exports are foreign imports and vice versa, that is,

$$EX_{CH(MY)} = IM_{MY(CH)} \text{ and } EX_{MY(CH)} = IM_{CH(MY)} \quad (5)$$

Thus, in our empirical model we express the balance of trade as a function of the real exchange rate and the levels of domestic and foreign incomes. Taking natural logarithm of both sides, the following model is obtained, with a stochastic term added to capture short-term departures from long run equilibrium:

$$\ln(EX_t) = a_{EX} + b_{EX} \ln(Y_{MY,t}) + c_{EX} RFX_t + \varepsilon_{EX,t} \quad (6)$$

$$\ln(IM_t) = a_{IM} + b_{IM} \ln(Y_{CH,t}) + c_{IM} RFX_t + \varepsilon_{IM,t} \quad (7)$$

where ln represents natural logarithm, and ε_t represents a white noise process. Given the definition of the real exchange rates ($RFX_{YUAN/RM}$), c_{EX} is to be positive and c_{IM} to be negative. However, the absolute sum of c_{EX} and c_{IM} must exceed unity for the Marshall Lerner condition to holds, that is, if a real devaluation of the domestic currency improves the trade balance. In both Eq (6) and (7), both b_{EX} and b_{IM} are necessarily positive as indication of positive income effects.

4.2 Estimation Procedures

This study employs the ARDL Bounds test advanced by Pesaran et al. (2001). Similar procedure was adopted in recent studies of trade-exchange rates relationship (e.g. Ahmad and Yang, 2004; Bahmani-Oskooee and Wang, 2006; Bahmani-Oskooee and Harvey, 2006). The approach of ARDL follows a 2-step procedure. The first is to identify the cointegration of the series involved applying a bound test on the following export and import demand functions:

$$\begin{aligned}\Delta \ln(EX_{CH,t}) = a_o + \sum_{i=1}^{12} b_i \Delta \ln(EX_{CH,t-i}) + \sum_{i=1}^{12} c_i \Delta \ln(Y_{MY,t-i}) + \sum_{i=1}^{12} d_i \Delta RFX_{t-i} \\ + \lambda_1 \ln(EX_{CH,t-1}) + \lambda_2 \ln(Y_{MY,t-1}) + \lambda_3 RFX_{t-1} + \kappa_1 Trend_t \\ + \kappa_2 D97_t + \kappa_3 DFIX_t + e_t\end{aligned} \quad (8)$$

$$\begin{aligned}\Delta \ln(IM_{CH,t}) = a_o + \sum_{i=1}^{12} b_i \Delta \ln(IM_{CH,t-i}) + \sum_{i=1}^{12} c_i \Delta \ln(Y_{CH,t-i}) + \sum_{i=1}^{12} d_i \Delta RFX_{t-i} \\ + \lambda_1 \ln(IM_{CH,t-1}) + \lambda_2 \ln(Y_{CH,t-1}) + \lambda_3 RFX_{t-1} + \kappa_1 Trend_t \\ + \kappa_2 D97_t + \kappa_3 DFIX_t + e_t\end{aligned} \quad (9)$$

Noted that in the above models, a time trend (*Trend*), and two structural breaks dummies, i.e. *D97* and *DFIX* are added to capture the impact of the 1997 Asian financial crisis and the regime of fixed exchange rates of Malaysia. The bound test involved the test of null hypothesis of non-existence of long run relationship, which is defined as:

$$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = 0 \quad \text{against} \quad H_A : \lambda_1 \neq 0, \lambda_2 \neq 0, \lambda_3 \neq 0 \quad (8a)$$

$$H_0 : \kappa_1 = \kappa_2 = \kappa_3 = 0 \quad \text{against } H_A : \kappa_1 \neq 0, \kappa_2 \neq 0, \kappa_3 \neq 0 \qquad (9a)$$

The critical value bounds of the F-statistics for different numbers of regressors are tabulated in Pesaran *et al*. (1996). Cointegration is confirmed irrespective of whether the variables are $I(1)$ or $I(0)$ if the computed F-statistic falls outside the upper bound; and rejected if falls outside the lower bound. Nevertheless, if F-statistic falls within the critical value band, no conclusion can be drawn without knowledge of the time series properties of the variables. Once cointegration is confirmed, the second step is to estimate the ARDL models:

$$\begin{aligned}\alpha(L,r)\ln\left(EX_{CH,t}\right) = \beta(L,m)\ln\left(Y_{MY,t-m}\right) + \delta(L,n)RFX_{t-n} + d_1 Trend_t \\ + d_2 D97_t + d_3 DFIX_t + \mu_t\end{aligned} \qquad (8b)$$

$$\begin{aligned}\alpha(L,s)\ln\left(IM_{CH,t}\right) = \beta(L,p)\ln\left(Y_{CH,t-p}\right) + \delta(L,q)RFX_{t-q} + d_1 Trend_t \\ + d_2 D97_t + d_3 DFIX_t + \mu_t\end{aligned} \qquad (9b)$$

where L is the back-shift operator such that $Ly_t = y_{t-1}$. The lag orders *r*, *m*, *n* for export demand model, and *s*, *p*, *q* for import demand model are selected based on AIC lag selection criterion. The long run coefficients for the response of dependent variable to a unit change in the independent variable can then be calculated based on Pesaran *et al*. (1996).

4.3 Data Description

Our analyses are all based on high frequency monthly data. The sample period spanned from January 1990 to January 2008, a period of trade expansion and major changes in currency regime for both China and Malaysia. Real exchange rates ($RFX_{MY/CHN}$) are compiled by having the nominal exchange rates adjusted for relative price changes proxy by consumer price index (CPI) series; whereas trade balance ratios are computed based on the export-import series. Then, domestic and foreign incomes are represented by the domestic industrial production index (IP) as GDP is not available for high frequency monthly observation. All trade series are sourced from the Direction of Trade Statistics compiled by IMF while the CPI, IP and exchange rates series are sourced from DataStream.

5.1 Empirical Results and Discussion

Descriptive statistics for all the series are reported in Table 2. All the time series basically are not univariate normal. To avoid spurious regression problem, the stationarity of all the series are examined using the Augmented Dickey Fuller (ADF) unit root test for both intercept and intercept plus trend models. The ADF results suggest that the data are mix of I(0) and I(1) series; where the export and import trade series and real yuan/ringgit exchange rate series are not stationary. The conventional Johensen-Juselius cointegration test may thereby inappropriate and the ARDL Bound test is preferred.

Table 2: Summary of Descriptive Statistics and Unit Root Tests

	$\ln(EX_{CH})$	$\ln(IM_{CH})$	$\ln(Y_{MY})$	$\ln(Y_{CH})$	RFX
Mean	5.2574	5.8142	4.3959	4.7307	0.6447
Std. Dev.	1.1677	1.2378	0.3820	0.0512	0.2231
Maximum	7.4795	7.9654	4.9712	4.8629	0.9899
Minimum	3.0751	3.3438	3.5752	4.3682	0.0696
Jarque-Bera	10.0452***	13.6371***	13.5503***	1129.8340***	44.7863***
Unit Root 1	0.1548	0.2319	-4.3057***	-3.9077***	-2.5356
Unit Root 2	-1.8850	-2.4701	-4.3921***	-3.8125**	-2.0368

Note: Figures in the parenthesis are probability values. Std. Dev. denotes standard deviation. Asterisks ** and *** denote significance at the 5% and 1% levels, respectively. Normality refers to Jarque-Bera normality test, where rejection of hull hypothesis implies non-normal distribution. Test for stationarity test refers to Augmented Unit Root (ADF) test, where Unit Root 1 is the model with intercept only and Unit Root 2 is the model with intercept and time trend. Rejection of null hypothesis reflects stationarity.

In Table 3, the Bound test results up to lag 12 for the export and import models are reported in Panel A and Panel B, respectively. The critical value bounds of the F-statistics for different numbers of regressors (*k*) are tabulated in Pesaran *et al*. (1996). Two sets of critical values are provided, with an upper bound calculated on the basis that the variables are I*(0)* and , a lower bound on the basis that they are I*(1)*. The critical values for this bounds test are generated from an extensive set of stochastic simulations under differing assumptions regarding the appropriate inclusion of deterministic variables in the error correction model. Under the Bound test framework, the results confirm the existence of cointegrating relationship in both the export and import demand model for the lag length 1-2. The cointegration tie becomes less evident and indecisive when lag lengths are extended. However, too many lags tend to make the model less parsimonious and reduce the degrees of freedom and we hold by the lag 1-2 results. In addition, time trend play an important role in mitigating the cointegrating relationship, especially for the import demand model. Besides, we also cannot discount the exposure to the structural breaks dummy variables of the 1997 crisis and fixed exchange rate regime. In brief, the results imply that long run relationship exists among the variables in which the real exchange rates, domestic production and foreign incomes can be treated as the long run forcing variables for the explanation of the respective export and import demand model.

Table 3: ARDL Bound Tests for Cointegration, 1990-2008

Export Demand	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Lag 12
with intercept only	5.50***	4.04	3.20	2.30	2.14	2.28	2.20	2.27	1.90	1.82	2.21	1.80
with intercept and D97	6.05***	4.27	3.19	2.22	2.04	2.11	1.89	1.87	1.36	1.29	1.69	0.94
with intercept and DFix	6.77***	5.07	3.94	2.78	2.33	2.41	2.63	3.09	2.61	2.71	2.81	2.08
with intercept, D97 and DFix	8.57***	6.14***	4.21	3.00	2.39	2.39	2.55	2.95	2.38	2.42	2.52	1.66
with intercept and trend	13.14***	6.70***	4.21	3.12	3.09	2.46	2.22	2.11	2.41	1.67	1.74	1.58
with intercept, trend and D97	13.12***	6.70***	4.19	3.06	3.10	2.48	2.09	1.88	2.02	1.29	1.53	0.99
with intercept, trend and DFix	16.85***	9.29***	6.22***	4.63	4.42	3.59	3.47	3.53	4.16	2.95	2.44	2.35
with intercept, trend, D97 and DFix	18.22***	10.10***	6.37***	4.74	4.40	3.56	3.37	3.37	3.84	2.65	2.30	1.94
Import Demand	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 7	Lag 8	Lag 9	Lag 10	Lag 11	Lag 12
with intercept only	1.11	0.63	0.35	0.22	0.20	0.15	0.09	0.12	0.10	0.21	0.85	0.13
with intercept and D97	1.50	1.06	0.70	0.52	0.52	0.51	0.30	0.37	0.37	0.45	0.97	0.42
with intercept and DFix	1.46	1.02	0.85	0.82	0.64	0.85	0.77	0.95	0.87	1.21	4.34	2.04
with intercept, D97 and DFix	1.69	1.25	0.98	0.90	0.76	0.94	0.80	0.98	0.92	1.24	4.28	2.01
with intercept and trend	13.13***	6.82***	4.80	3.52	3.53	2.88	3.37	3.16	3.17	4.06	4.54	3.00
with intercept, trend and D97	14.72***	8.01***	5.64	4.18	4.10	3.36	3.56	3.29	3.29	4.16	4.75	3.12
with intercept, trend and DFix	12.82***	6.51***	4.53	3.35	3.24	2.77	3.21	3.13	3.12	4.16	7.04***	4.21
with intercept, trend, D97 and DFix	14.55***	7.76***	5.32	3.86	3.73	3.09	3.30	3.15	3.15	4.15	6.95***	4.08

Notes: For model with intercept only with k=2, 95%, the bound is F(3.793, 4.855); for model with intercept and trend, the bound is F(4.903, 5.872). The asterisk *** denotes value exceeded upper bound.

Looking at Table 4, the coefficients on domestic and foreign income show consistent signs to those predicted by economic theory where demand is the main determining factor of exports and imports. In our analysis, domestic ($\ln(Y_{CH})$) and foreign ($\ln(Y_{MY})$) incomes are consistently positive and significant. $\ln(Y_{MY})$ is reported at 1.8967, 3.3221 and 3.1416 in the export models whereas $\ln(Y_{CH})$ is reported at 9.0327, 14.8974 and 11.5279 in the import models. Hence, as far as domestic and foreign incomes are concerned, the China-Malaysia trading is demand driven. Nevertheless, the income effect of Chinese import demand is greater than that of export demand. With export promotion as its engine of growth and China being the top trading partner, Malaysia is benefiting from such high-income elasticity. In addition, the Malaysian fixed exchange rate regime plays significant role in both models that it expanded Chinese imports (from Malaysia) but discouraged Chinese exports (to Malaysia). The 1997 crisis dummies somehow show similar but insignificant signs. Thus far, the findings have suggested that Malaysia cleaves to better gains in the bilateral trading.

Then, the MLC hypothesis can be testified based on the long-run elasticity estimation of real exchange rate for both export and import demand models (Table 4). For the export demand model, a negative relationship between the bilateral Chinese exports (to Malaysia) and the real exchange rates ($RFX_{YUAN/RM}$) is overwhelmingly reported by ARDL [2, 2, 2], FMOLS [4] and DOLS [14, 14]. The respective long run elasticity is -0.8074, -0.8455 and -1.1303. The negative relationship indicates that decrease in $RFX_{YUAN/RM}$ (appreciation of yuan against ringgit) resulted in an increase of Chinese exports to Malaysia. The results contradict the conventional view that export gains are due to real devaluation of yuan. It neither supports the argument that

Chinese undervalued exchange rate regime offers threat to the crowding out of other developing Asian economies, at least for Malaysia.

Table 4: Estimates for Long run Elasticity

Export Demand Model, $\ln(EX_{CH})$			
	ARDL [2,2,2]	FMOLS [4]	DOLS [14, 14]
$\ln(Y_{MY})$	1.8967* (1.1241)	3.3221*** (0.1396)	3.1416*** (0.1711)
RFX	-0.8074* (0.4514)	-0.8455*** (0.2663)	-1.1303*** (0.2059)
DFix	-0.3403*** (0.0983)	-0.4367*** (0.1145)	-0.3139** (0.1220)
*D*97	-0.1423 (0.2007)	-0.3363** (0.1691)	-0.4865 (0.3488)
Trend	0.0105* (0.0057)	-	-
Intercept	-3.5657 (4.0717)	-8.4533*** (0.6136)	-7.6530*** (0.6555)
Import Demand Model, $\ln(IM_{CH})$			
	ARDL [2,2,2]	FMOLS [1]	DOLS [1, 1]
$\ln(Y_{CH})$	9.0327*** (3.4113)	14.8974*** (6.0590)	11.5279** (4.5372)
RFX	0.8498* (0.4601)	-2.0434 (1.4637)	-0..7074 (0.9019)
DFix	0.6033** (0.2648)	1.4823*** (0.5550)	1.2627*** (0.3415)
*D*97	0.0678 (0.2390)	0.7657 (0.9616)	0.1161 (0.7022)
Trend	0.0169*** (0.0016)	-	-
Intercept	-39.2570** (16.1978)	-63.4485** (28.5481)	-48.6072** (21.3771)

Note: Asterisks *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. Standard Errors are reported in the parentheses ( ). Optimal lags for each estimation method are selected by the Akaike Information criteria. ARDL[2,2,2] denotes lag 2 selected for dependent variables and two other endogenous variables, FMOLS[4] denotes optimal lag of 1 selected, whereas DOLS[14, 14] means lead=14 and lag=14.

However, the real exchange elasticities are inconsistent in the import models. ARDL [2, 2, 2] predicts that the $RFX_{YUAN/RM}$ positively related to IM_{CH} but FMOLS[1] and DOLS [1, 1] reported negative relationship. If negative relationship holds, an appreciation of yuan ($RFX_{YUAN/RM} \downarrow$) resulted in lesser import demand from Malaysia due to relative expensive import prices. Otherwise if positive relationship holds, currency devaluation ($RFX_{YUAN/RM} \uparrow$) will cause imports more expensive and hence deterioration in the Chinese terms of trade. As volume effects fail to be large enough to offset the price effect, it implies the loss of real national income and more units of exports have to be given to obtain a unit of imports. Additionally, devaluation could be inflationary as it raises the cost of imported intermediate inputs and this affects supply side of the economy. Nevertheless, despite the inconsistency of real exchange in demand models, the absolute sums of the export and import elasticises have all exceeded unity. We cannot reject that MLC holds for the China-Malaysia trading relationship. This is consistent with the theoretical prediction that real depreciation (yuan) improves Chinese trade balance in the long run.

Next, we proceed to the rolling analysis in Figure 2 to capture the potential time-varying parameters in our models. Among all, we highlight the potential structural shifts that may affect the coefficients being estimated:

(a) 1992 – official market rate was lower than the internal settlement rate and the swap rate, suggesting a constant pressure for the yuan to depreciate, which peak at 1992.

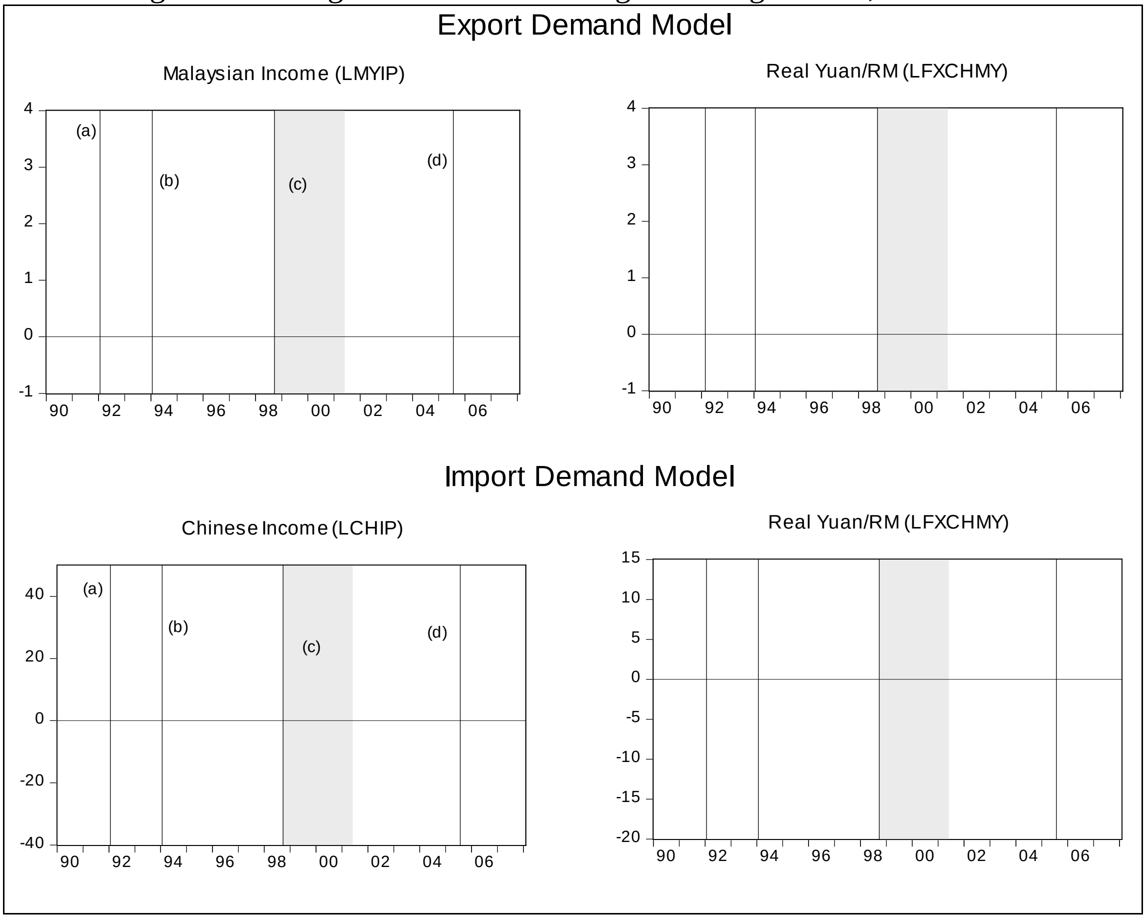
(b) 1994 – China unified the official and swap market rates by moving the official rate to the then prevailing swap market rate, 8.7Yuan/USD1.

(c) 1998-2001 – capital control by the Malaysian government.

(d) 1998-2005 – Malaysian ringgit was pegged against the USD at RM3.8.

Apparently, coefficients of variables in the export demand model are more stable than coefficients in the import demand model. In export model, Chinese income ($\ln(Y_{MY})$) remains positive and shows up-ward trending during 1991-2008 with some positive impacts of (a) and (b). As for real exchange rate ($RFX_{YUAN/RM}$), some negative impacts of (a) and (b) were captured. Still, it remains stable with downward trending. On the other hand, the rolling coefficients of Malaysian income ($\ln(Y_{MY})$) vary over the sample. A sharp increase in (a) and decrease in (b), followed by negative trending before the positive adjustments during 2003-2008. Likewise, $RFX_{YUAN/RM}$ coefficients are also unstable and show downward trending since (c). The results are considered consistent with the point estimates of long run coefficients reported earlier in Table 4.

Figure 2: Rolling Estimates for Cointegration Regressions, 1990-2008



Note: the rolling analysis computes parameter estimates over a rolling window of a fixed size through the sample of 1990:Jan - 2008:Jan based on the FMOLS cointegration regression.

Another major concern in this study involves the verification of the J-curve phenomenon in the short- and moderate-term. When there is currency devaluation, we generally expect that the trade balance deteriorates at first, because the price change occurs quickly while trade quantities (volume) change more slowly. After a moderate time period, the volume effects become large enough to offset the price effect that the trade balance improves to present the so-called J-curve. For such purpose, we proceed to the generalised impulse response function (IRF) analysis that provides sufficient information to draw a conclusion on the existence of J-curve. An IRF traces the effect of a one-time shock to one of the innovations (exports or imports) on current and future values of the real exchanges rates from an unrestricted vector autoregression.

The respective generalised IRF of Chinese exports and imports series to unit shocks of real exchange rates (yuan/RM) is shown in Figure 3a and 3b. Although the IRF reflect stationary response of both export and import series to generated unit shocks of real exchange rates, there is no clear pattern of J-curve for Chinese export series. The export series depicted a M-shape adjustment to real exchange shocks as 1% depreciation of Chinese yuan brings to about 2% drop in Chinese exports to Malaysia immediately, recovery after the second month, but further drop after the third month, pick up a little in the fifth month, but the impact die out slowly after ten months. As for the Chinese import series, the J-curve adjustment is more apparent but incomplete. A 1% real depreciation of yuan leads to drop in Chinese imports from Malaysia by a maximum of about 2.5% with a similar magnitude as the export initial adjustment, but the increase in Chinese imports from Malaysia follows an increasing path thereafter and the impact also die out slowly after ten months. In other words, the volume effect fail to offset the price effect, implying that the unit value of imports has increased resulting in an increase in total value of imports against a constant or an insignificant change in the value of exports, over time.

Figure 3a: Response of China Exports (to Malaysia) to Real Exchange Rate Shocks

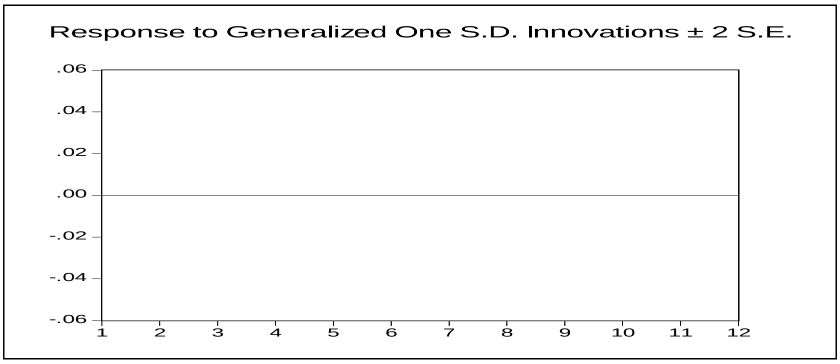


Figure 3b: Response of China Imports (from Malaysia) to Real Exchange Rate Shocks

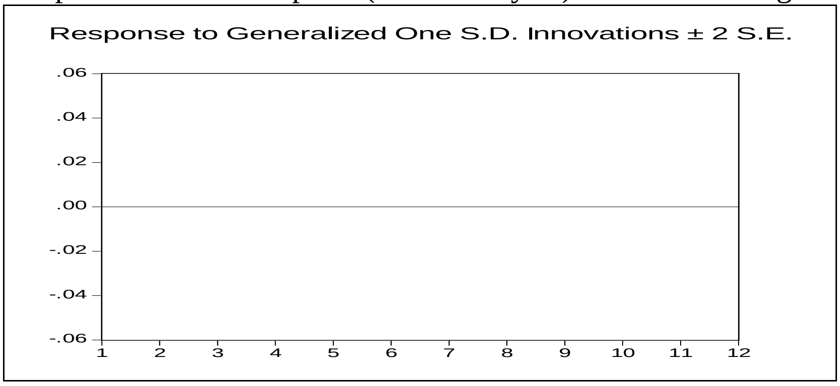
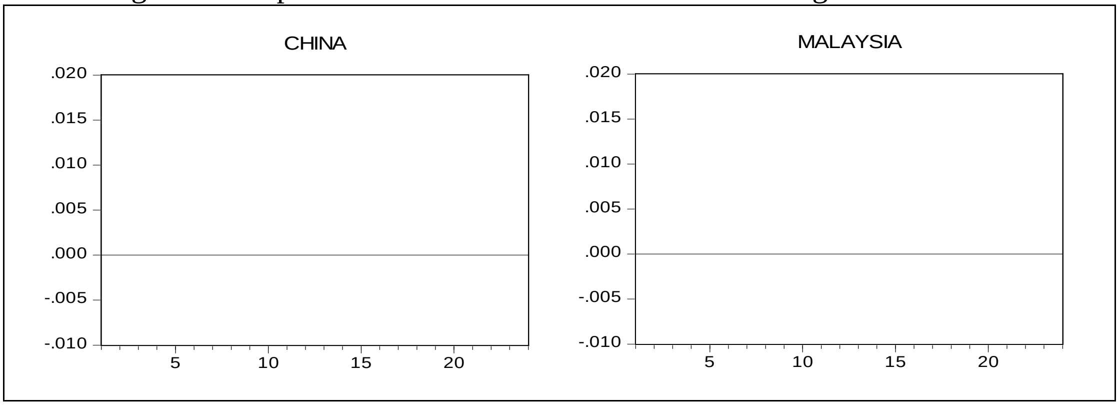


Figure 4 then report the generalised IRF of both the Chinese and Malaysian industrial production to unit shocks of real exchange rates. Clearly, Malaysia shows greater response to the foreign exchange shocks, perhaps due to the greater openness of Malaysian economy. An initial 1% depreciation of renminbi brings to about 3% drop in Malaysian production immediately but some 5% consistent gains after a quarter. As for China, the deterioration of production due to currency depreciation is observed in the 2nd – 3rd month, with some improvement of production in the following months. However, after a year, production responses negatively in gradual form. In brief, China's exports gains due to real yuan devaluation are uncertain but import losses are more evident, and the impacts of depreciation gradually die out within a year. Expansionary effect due to real exchange shocks has been observed for Malaysia but again, inconclusive for China. Putting together, the shock adjustments are temporal and our study supports for the Chinese complementary role instead of conflicting (competing) features in the China-Malaysia bilateral trading.

Figure 4: Response of National Income to Real Exchange Rate Shocks



Note: Estimations are based on impulse response to generalized one S.D. innovations ± 2 S.E.

Generalized VDC from one-standard deviation shocks to each variable in export and import models over 1 to 36 months are listed in Figure 5a-5b. For export model, the Chinese export ($\ln(EX_{CH})$) appears to be more endogenously determined. After 8-month horizon, 82% of its variance is explained by its own shocks. But after 36-months, the own innovations dropped to 65.3%, with about 28% and 6.7% of the variance being explained by Malaysian industrial production ($\ln(Y_{MY})$) and real exchange rate respectively. By comparison, the real exchange of yuan/RM seems to be more exogenous as most of its shock is explained by its own innovations. For example, at the end of 24 months, 91.12% of RFX variance is still explained by its own shocks. However, in the import model, it is the real exchange rate that was relatively endogenous as compared to the Chinese import ($\ln(IM_{CH})$) and Chinese Income ($\ln(Y_{CH})$).

Figure 5a: Variance Decomposition Analysis for Export Demand Model

Variance Decomposition of	Horizon	% of Forecasted Variance Explained by Innovations in		
		$\ln(EX_{CH})$	$\ln(Y_{MY})$	RFX
$\ln(EX_{CH})$	1	100.00	0.00	0.00
	4	85.48	6.58	7.95
	8	82.22	8.38	9.40
	16	76.55	14.15	9.31
	24	71.78	19.99	8.23
	36	65.30	27.98	6.72
$\ln(Y_{MY})$	1	6.34	93.66	0.00
	4	6.60	92.22	1.18
	8	5.30	88.57	6.14
	16	6.59	83.86	9.54
	24	9.24	79.68	11.08
	36	13.17	75.36	11.47
RFX	1	0.85	0.24	98.92
	4	0.23	2.05	97.72
	8	0.43	3.28	96.30
	16	1.05	5.42	93.53
	24	1.63	7.25	91.12
	36	2.18	9.48	88.34

Note: the VAR optimal lag = 5 is chosen based on the Akaike Information Criteria.

At present stage, the VDC finding does not seem to provide clear insights. We decided to proceed further with the combined analysis that all variables from export and import models are included in one VAR framework. The VDC result is shown in Figure 5c. Several findings are worth noting. For instance, in the case of Chinese exports (to Malaysia), its forested variances are mostly explained by the Chinese imports (from Malaysia) and Malaysian industrial production ($\ln(Y_{MY})$) as much as 13% and 21.6% respectively, after a 36-month horizon. Then, in the similar horizon, the variances of Chinese imports are mainly explained by innovations in Chinese exports (37.37%) and Malaysian production (26.83%). Likewise, about 12.3% and 25.39% of Malaysian production's variances again, are explained by Chinese export and import respectively. Such finding indicates some lead-lag relationship and trivariate causal effects among the Chinese export-import and Malaysian industrial production. By econometric prediction, the close association of export-import implies that Chine-Malaysia trade is along the sustainable path. And, the Malaysian production is closely linked to the trade sustainability.

Figure 5b: Variance Decomposition Analysis for Import Demand Model

Variance Decomposition of	Horizon	% of Forecasted Variance Explained by Innovations in		
		$\ln(IM_{CH})$	$\ln(Y_{CH})$	RFX
$\ln(IM_{CH})$	1	100.00	0.00	0.00
	4	98.73	0.99	0.28
	8	98.63	1.04	0.32
	16	99.04	0.69	0.27
	24	99.26	0.52	0.23
	36	99.43	0.38	0.19
$\ln(Y_{CH})$	1	4.33	95.67	0.00
	4	4.14	92.33	3.53
	8	3.88	92.98	3.14
	16	3.54	92.78	3.69
	24	3.48	91.73	4.78
	36	3.51	90.53	5.96
RFX	1	0.74	7.51	91.75
	4	0.93	14.16	84.91
	8	1.32	16.47	82.21
	16	2.14	22.25	75.61
	24	3.13	25.97	70.90
	36	4.87	28.36	66.78

Note: the VAR optimal lag = 5 is chosen based on the Akaike Information Criteria.

On the other hand, the relatively leading role of Chinese income (industrial production) seems to be more pronounced with the real exchange of yuan/RM (RFX). For example, after 24-month horizon, approximately 80.2% of the variance of

$\ln(Y_{CH})$ is explained by its own shocks and only 3.3% is explained by RFX. But for RFX, 22% of the forecasted error variance is explained by $\ln(Y_{CH})$.

Figure 5c: Variance Decomposition Analysis for Combined Model

Variance Decomposition of	Horizon	% of Forecasted Variance Explained by Innovations in				
		$\ln(EX_{CH})$	$\ln(IM_{CH})$	$\ln(Y_{CH})$	$\ln(Y_{MY})$	RFX
$\ln(EX_{CH})$	1	100.00	0.00	0.00	0.00	0.00
	4	93.17	0.78	2.05	0.85	3.16
	8	87.93	3.12	3.58	2.81	2.56
	16	78.15	7.79	3.90	8.25	1.91
	24	70.31	10.51	3.38	14.15	1.65
	36	61.20	13.01	2.78	21.64	1.37
$\ln(IM_{CH})$	1	43.43	56.57	0.00	0.00	0.00
	4	44.16	54.12	0.24	1.33	0.14
	8	45.07	50.22	0.29	4.16	0.26
	16	43.30	44.45	0.25	11.48	0.52
	24	39.78	40.67	0.23	18.71	0.62
	36	35.06	37.37	0.21	26.83	0.53
$\ln(Y_{CH})$	1	5.22	2.27	92.51	0.00	0.00
	4	7.15	2.13	86.79	0.39	3.55
	8	9.71	1.86	84.16	0.85	3.42
	16	12.33	1.73	81.30	1.39	3.25
	24	13.25	1.70	80.19	1.53	3.33
	36	13.53	1.69	79.65	1.54	3.59
$\ln(Y_{MY})$	1	9.07	3.32	0.02	87.60	0.00
	4	13.08	9.16	0.48	76.14	1.13
	8	12.51	14.47	0.57	71.03	1.41
	16	11.80	19.88	0.58	65.59	2.15
	24	11.88	22.85	0.66	61.63	2.97
	36	12.30	25.39	0.88	57.37	4.07
RFX	1	1.27	0.05	7.79	0.27	90.62
	4	0.36	1.05	15.71	1.38	81.50
	8	0.24	2.64	18.86	2.75	75.50
	16	0.76	4.63	21.17	5.61	67.82
	24	1.49	5.11	22.06	8.20	63.15
	36	2.20	4.95	22.59	11.31	58.96

Note: the VAR optimal lag = 3 is chosen based on the Akaike Information Criteria.

5.0 Conclusion

The ARDL bound test, the FMOLS and DOLS estimations, and the generalized IRF and VDC analyses confirm that the real exchange rates, domestic production and foreign incomes are significant in explaining the China-Malaysia bilateral export and import demands. Our results hold several implications in the area of sustainable regional trading, on both methodological and more substantive levels. First, the income effect on both export and import models suggest that Malaysia cleaves the major gaining. Second, the real exchange effect on export model indicates that China's export expansion was not mainly due to yuan depreciation. However, when both export and import models are considered, the MLC holds to imply that yuan devaluation improves the Chinese trade balance against Malaysia in the long run.

Third, J-curve is unclear while trade adjustments following real exchange shocks are temporal and the result supports for the Chinese complementary role in bilateral trading. This is partially consistent with Zhang (1998, 1999) – at least for the China-Malaysia case, that the effect of currency depreciation is found to be not sizable and China's reforms have not produced an economic system under which economic agents have become responsive to market signals to allow changes in exchange rates to influence the trade balance. Fourth, expansionary effect is of greater evidence for Malaysia due to real exchange shocks but inconclusive for China.

Fifth, when both export and import models are combined, the VDC analysis confirms that the China-Malaysia trade is along the sustainable path. Some lead-lag effects are also found among Chinese export-import and Malaysian industrial production. On the whole, the exchange rate regime and trading diversification within our analysis period have shown the Chinese complementary role rather than conflicting features in regional trading, at least in the long run. There are no clear supports that the emergence of China and her currency strategy offers further threat to the crowding out Malaysia as formidable export competitor. Indeed, Malaysia may experience better economic gains in the market structure and product diversification as well as the economies of scale, on account of the liberalization process of China since 1990s. It is, perhaps, the best timing for both nations to make full advantage of the ASEAN-China Free Trade Area, as platform for closer economic collaboration and hence greater trade and growth expansion.

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