CHINA AND ASEAN-5 BILATERAL TRADE RELATIONSHIP

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ABSTRACT

This paper examines the China-ASEAN bilateral trade relationship, using the Gravity model where the per capita income difference is included in the specification for testing the hypothesis. The empirical results based on Bounds test proposed by Pesaran *et al*. (2001) reveal that the transportation cost and real GDP are statistically significant determinants of bilateral trade. The trade distance remains an important deterrent to China-ASEAN trade, and higher economy size of a country has positive and significant influence on bilateral trade flows. The significant positive sign of the per capita GDP difference (*PGDPdiff*) variable suggests that Linder Hypothesis does not hold for the entire region.

Key words: regional economic cooperation, Free Trade Area, bilateral trade flows.
JEL : F1, F15

INTRODUCTION

China's rapid development and prosperity has drawn much attention in recent years. The continuous high growth of China's economy has had a significant impact on the world economy, particularly the regional economy, including the ASEAN-5 namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand. China and ASEAN countries are geographically neighbours. The long standing good neighbourhood relationship has laid a solid foundation for their mutual economic development and greater potential for trade co-operation. Over the past decade, trade relationship between China and ASEAN had been influenced mainly by the growth and expansion of both economies, especially soon after China's drive towards economic modernization. There has been respectable growth in China's total trade, from around USD 8.4 billion in 1991 to over USD 130.5 billion in 2005.[d] In recent years, ASEAN has become China's fifth largest trading partner next to the United States (US), Hong Kong, Japan and the European Union. On the other hand, China is the sixth largest trading partner of ASEAN.

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[d] Total trade = imports from ASEAN + exports to ASEAN (Source: 'Direction of Trade' Statistics Yearbook of the IMF).

At the ASEAN-China Summit in November 2001, both China and ASEAN mutually agreed to establish a China-ASEAN free trade agreement within a span of 10 years. On 4 November 2002, China and ASEAN formally signed a landmark framework agreement in Cambodia to establish an FTA by 2010. Both China and ASEAN had identified that their joint development is best served via closer economic integration. However, there is still an open question whether the proposed China-ASEAN Free Trade Agreement will ultimately provide greater opportunities for gainful co-operation and integration in trade or otherwise create greater competition from China in ASEAN home markets as well as major export markets. Does the proposed China-ASEAN Free Trade Agreement really bring China and ASEAN mutual prosperity rather than trade-off? Some argued that the vigorous China-ASEAN trade is mainly due to their complementarities within manufacturing industries. Jin (1993) and Cao and Low (1998) found negligible degree of competition between China and ASEAN. They found that there is large potential and mutual benefit for economic co-operation between ASEAN and China. On the other hand, Tyers, Phillips and Findlay (1987), Herschede (1991) and Voon (1997) suggested that the emergence of China as an exporter of labour-intensive manufactures delivers increasing competitive pressure on ASEAN exporters. As we know, China and ASEAN's exports are still heavily dependent on the major markets of US, Europe and Japan. The overlapping composition of their major export items, especially in textiles and apparel, and other labour-intensive manufactures, as well as electronic products had resulted in serious competition in the world market between the two economies.

The Gravity model[e] pioneered by Tinbergen (1962) and Linneman (1966), in view of its simplicity and empirical robustness, is employed in this study to analyse the pattern of bilateral trade flows between China-ASEAN by using a recently developed bound testing approach proposed by Pesaran, *et al*. (2001). This approach has several advantages: (i) it allows testing for the existence of a cointegrating relationship between variables in levels irrespective of whether the underlying regressors are I(0) or I(1); (ii) it is considered more appropriate than the Johansen-Juselius multivariate approach for testing the long run relationship amongst variables when the data are of a small sample size (Pesaran *et al*., 2001); and (iii) ARDL covers both the long-run and short-run relationships of the variables tested. For these reasons, the ARDL procedure has become increasingly popular in recent years and we begin the empirical analysis with this procedure.[f]

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[e]The Gravity model has been used extensively to provide a natural framework and a useful multivariate approach for assessing the impact of regional trading blocs on the level and direction of bilateral trade flows. See Helpman and Krugman (1985) for the underlying theory of the model. Anderson (1979), Bergstrand (1985), and Evenett and Keller (2002) provide further discussion on the use of the Gravity approach in trade literature. Moreover, Elbadawi (1997) reveals that Gravity equation is superior in terms of its ability to incorporate the factors that cannot be accommodated by the conventional factor endowment theory such as intra-industry trade (by considering market size and scale economies) and the efficiency of resource reallocation, following trade liberalisation (by introducing dummy variables).

[f] The empirical procedure is on the lines adopted by various recent studies. These include (i) Ghatak and Siddiki (2001) on India's exchange rate; (ii) Atkins and Coe (2002) on Fisher effect in the US and Canada; (iii) Bahmani-Oskooee and Ng (2002) on Hong Kong's money demand; (iv)Vita and Abbott (2002) on savings and investment in the US; (v) Bahmani-Oskooee and Goswami (2003) on J-curve in Taiwan; (vi) Pattichi and Kanaan (2004) on Balassa-Samuelson Hypothesis; (vii) Tang (2004) on Japan's money demand,; (viii) Liu and

This paper seeks to shed some light on the viability of the Gravity model to the proposed Regional Trade Area (RTA) between China and ASEAN. As China's level of income per capita slowly approaches that of ASEAN, we expect that the closer the level of income per capita, the greater the bilateral trade volume, *ceteris paribus*. The level of income per capita was only USD 342 in China in 1995, compared to USD 1,359 for ASEAN as a whole. The former accelerated to USD 1,100 in 2003, a level comparable to that in Indonesia and the Philippines. It was thus only slightly lower than per capita income of ASEAN at USD 1,265 (Wattanapruttipaisan, 2005). The main objective of this paper is to identify whether Linder Hypothesis holds in China-ASEAN bilateral trade relationship. Linder (1961) hypothesized that nations with similar demands would develop similar industries. These nations would then trade with each other in similar but differentiated goods. Furthermore, this paper also aims to explore the factors that explain the China-ASEAN trade flows via a modified Gravity model for each of the five ASEAN countries and China. The choice of China-ASEAN 5 economies is based on the increasing importance of export production sharing between China and ASEAN economies. However, this study only focuses on the ASEAN-5 economies, given the unavailability of data in other ASEAN countries.

This paper is organized as follows: Section 2 discusses the literature review; Section 3 discusses the analytical framework; Section 4 contains the empirical results; and Section 5 provides some concluding comments.

LITERATURE REVIEW

The Linder theory is generally demand-side oriented. Linder (1961) suggested that the pattern of trade derives from "overlapping demand". Hence, countries primarily produce goods for the domestic market and export the surplus. It is reasonable to say that countries that attempt to acquire this surplus would have demand patterns similar to those of the exporting country, the so called demand-driven trade. Thus, the trade patterns in manufacturing are dependent on the similarity of preference among nations. Linder suggested that per capita income can be used as a proxy for preferences. The hypothesis can then be tested by comparing per capita income between trading partners. The smaller the difference is between the average incomes of the respective countries, the higher the expected trade.

The pioneer study by Sailors *et al*. (1973) and later work by Greytak and McHugh (1977) as well as Ellis (1983) adopted rank correlation analysis to test Linder hypothesis and found evidence favourable to the Linder theory. Their studies were seriously criticized as they

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Shu (2004) on stock market and consumption in selected Asian economies; (ix) Nieh and Wang (2005) on Taiwan's exchange rate determination; and (x) Choong, *et al*. (2005) on foreign direct investment, financial development and economic growth in Malaysia.

failed to employ regression analysis in controlling for the effects of distance on trade intensities. However, the empirical evidence based upon the regression analysis of the Linder hypothesis was rather mixed. On the one hand, Kennedy and McHugh (1980, 1983) and Qureshi *et al.* (1980) tested the theory in terms of changes in propensities to trade against changes in income differences between two points in time to control for distance and found no support for the Linder model. Bergstrand (1989) made the theoretical link between the Linder model and the Gravity model specification, but found little or no evidence to support Linder's hypothesis. On the other hand, Thursby and Thursby (1987), based upon the Gravity-type trade model derived from an underlying demand and supply model, found overwhelming support for the Linder hypothesis, using a sample of 17 countries from 1974 to 1982. They also found strong support for the fact that increased exchange rate variability reduced bilateral trade flows. Kristensen and Zhang (1998) relate the trade shares to both the Linder effects and the trade diversion effects associated with the formation of trade blocks in the European Economic Community (EEC) from 1971 to 1992. The empirical result of this study confirms the existence of Linder effects on trade shares among industrialized countries. The formation of trade blocks involves trade diversion effects. The results indicate that the trade diversion effects are greatest for the countries with per capita incomes close to the European average. The convergence in income level tends to increase intra EEC trade due to the Linder effect.

Arnon and Weinblatt (1998) use a simple Gravity equation model to analyse the nature of bilateral trade flows among and between the 35 developed and less developed countries. Their results are not in accord with the common viewpoint. This study provides empirical evidence supporting the comprehensive validity of Linder's hypothesis for all country groups with both high and low income. This means that the trade enhancing effect of income similarities exists when trade flows take place between both similar and non-similar countries. Although the effect of non-similar countries is much weaker, it is statistically significant. The results of their study indicates that the closer the level of income per capita, the greater the bilateral trade volume, *ceteris paribus*. Chow and Shachmurove (1999), based upon the time series analysis, examine the degree to which the taste similarity explains trade patterns between the 'Four Tigers' East Asian New Industrial Countries (NICs), and their major OECD markets. They used an extensive disaggregated data set, including all manufactured exports from the East Asian NICs to various major OECD markets, from 1965 to 1990. Their results suggested 'Linder hypothesis' as a useful model in explaining the rapidly emerging North-South trade.

McPherson *et al*. (2001) support the Linder hypothesis for five out of the six East African developing countries, namely, Ethiopia, Kenya, Rwanda, Sudan and Uganda. However, there is no significant relationship between trade intensity and the similarity of per capita income levels between Tanzania and its trading partners. They capture both time-series and cross-section elements of the trade relationship by employing a panel data set from 1984 to 1992. This finding implies that these countries trade more intensively with others who have similar per capita income levels, as predicted by Linder. Choi (2002) examines the bilateral trade data covering 63 countries, all constituting countries in the UN Trade Matrix except for a few countries in the former Soviet Bloc for the period 1970, 1980, 1990, and 1992. He employs a modified Gravity-type trade model and a fixed-effects panel data model, and found that countries with a smaller difference of per capita GNP tend to trade more. It was also found that richer countries trade more. Furthermore, the empirical results show that the coefficients of Linder variables grow as time goes by. The result indicates that the proliferation of Free Trade Areas and globalization in the 1990s may have strengthened the Linder hypothesis.

Bohman and Nilsson (2007) suggested a new approach to assess the Linder hypothesis, incorporating the distribution of income within a country. They develop two different variables to capture the similarity in demand structures between two trading partners and the size of the market, constituting a market overlap. These variables are included in a one-sided Gravity model. The results imply that similarity in structure of demand acts as a catalyst of trade flows between countries. This similarity is more important for the differentiated goods than homogenous goods.

EMPIRICAL MODEL AND METHODOLOGY

The methodology adopted in this study is based upon the Gravity model used by Sharma and Chua (2000). However, it incorporates the per capita differences between countries *i* and *j* to test for the Linder Hypothesis, as used by Roberts's study (2004). The Gravity model adopted by Sharma and Chua (2000) is similar to the one used by Roberts (2004), but the two variables of GDP as well as per capita GDP under study are in the product form. Given that the sample size in this study is limited with a total of 25 observations, we will adopt the Gravity model used by Sharma and Chua (2000), since this model is appropriate when smaller observations are used. The modified Gravity equation used in this study is in natural logs as shown below.

$$\log \ Trade_{ij} = C + \beta_1 \log(RGDP_i.RGDP_j) + \beta_2 \log(PGDP_i.PGDP_j) + \beta_3 \log TC_{ij} + \beta_4 \log(PGDPdiff)_{ij} + \varepsilon_{ij} \quad (1)$$

Where

$Trade_{ij}$ is the trade flows between country i and j;

$RGDP_i.RGDP_j$ is the product form of the real gross domestic product between country i and j

$PGDP_i.PGDP_j$ is the product form of the per capita gross domestic product between country i and j

TC_{ij} is the transportation cost between country i and j;

$PGDPdiff_{ij}$ is the per capita GDP difference between country i and j, express in absolute terms to test for Linder hypothesis.

The dependent variable $Trade_{ij}$ is the sum of export and import between country i and j in US dollar. For the independent variables, the real GDP (*RGDP*) for both countries is entered as product form in order to take into account the size of the economy. The effects of the economic size on trade flows are indeterminate, either trade enhancing or trade inhibiting. The product form of per GDP per capita (*PGDP*) for both countries is used as a proxy for the income level. The coefficients for *RGDP* and *PGDP* are expected to have a positive sign. TC_{ij} is the transportation cost which proxies the distance between a particular country i to a particular country j. Thus transportation cost is expected to have an inverse relationship on trade flows. The *PGDPdiff*, expressed in absolute term, is to test for Linder Hypothesis in which it indicates that countries with similar levels of income per capita will exhibit similar taste, produce similar but differentiated products and trade more amongst themselves. A negative sign on the per capita GDP difference variable will support the Linder Hypothesis. Finally, ε_{ij} is the error term.

The above model is examined, using the time series techniques of bounds test developed by Pesaran *et al*. (2001). The greatest advantage of the bounds test is the asymptotic distribution of the *F*-statistic which is non-standard under the null hypothesis of no cointegration relationship between the examined variables, irrespective of whether the explanatory variables are purely *I*(0) or *I*(1), or mutually cointegrated. This means that the bounds test allows the *I(1)* and *I(0)* variables as regressors, that is, the order of integration of interested variables are not necessarily the same. However, according to Pesaran *et al*. (2001), the dependent variable RGDP must be I(1) variable.

The unrestricted error correction model (UECM) for Equation (1) where the included lagged differenced variables of order p can be written as follows:

$$\begin{aligned}\Delta \log Trade = {} & \mu_0 + \mu_1 \log(Trade_{ij})_{t-1} + \mu_2 \log(RGDP_i.RGDP_j)_{t-1} + \\ & \mu_3 \log(PGDP_i.PGDP_j)_{t-1} + \mu_4 \log(TC_{ij})_{t-1} + \\ & \mu_5 \log(PGDPdiff_{ij})_{t-1} + \mu_6 \Delta \sum_{i=1}^{p} \log(Trade_{ij})_{t-i} + \\ & \mu_7 \Delta \sum_{i=1}^{p} \log(RGDP_i.RGDP_j)_{t-i} + \mu_8 \Delta \sum_{i=1}^{p} \log(PGDP_i.PGDP_i)_{t-i} \\ & + \mu_9 \Delta \sum_{i=1}^{p} \log(TC_{ij})_{t-i} + \mu_{10} \Delta \sum_{i=1}^{p} \log(RGDPdiff_{ij})_{t-i} + e_t \end{aligned} \quad (2)$$

where Δ is a first difference operator, μ_0 is an intercept and e_t is the error terms. All variables are expressed in natural logarithms. Equation (2) indicates that bilateral trade flows in terms of bilateral trade tends to be influenced and explained by its past values. The structural lags are determined by using minimum Akaike's information criteria (AIC). Once the long run relationship amongst the variables is established, Equation (2) can be used to estimate the coefficients of the long-run elasticity. The estimate of the long run coefficient of independent variables is given by:

$$\hat{\theta}_i = -\frac{\hat{\mu}_k}{\hat{\mu}_1}$$ [*i* = (*RGDP.RGDP*), (*PGDP.PGDP*), *TC*, *PGDPdiff*; *k* = 2, 3, 4, and 5, respectively)

where $\hat{\mu}_k$ and $\hat{\mu}_1$ are the OLS estimators of Equation (2). On the other hand, the short-run elasticity between the variables is captured by the coefficients of the first differenced variables in Equation (2).

Equation (2) is employed to test the cointegration relationship between trade flows and its determinants by using the bounds test proposed by Pesaran *et al*. (2001). There are two steps in testing the cointegration relationship between *Trade* and its explanatory variables. First, Equation (2) is estimated by ordinary least square (OLS) technique. Second, the presence of cointegration can be traced by restricting all estimated coefficients of lagged level variables equal to zero. That is, the null hypothesis is H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = 0$ (no cointegrating relationship) against its alternative H_A: at least one of the μ_k's is different from zero (a cointegrating relationship exists). If the computed Wald test (F-statistic) is less than lower bound critical value, then the null hypothesis of no cointegration is failed to reject. Conversely, if the computed F-statistic is greater than upper bound critical value, then the null hypothesis is able to reject and conclude that there is long-run steady state equilibrium amongst the variables. However, if the computed value falls within lower and upper bound critical values, then the result is inconclusive. The critical value bounds for the F-statistic are provided in Pesaran *et al*. (2001).

Bilateral trade, real GDP, per capita GDP, transportation costs, per capital GDP differences series are the variables involved. The most important source of trade data for the China-ASEAN trade directions are collected from the Direction of Trade Statistics Yearbook of the International Monetary Fund (IMF), various issues. Real GDP and GDP per capita data are obtained from the World Bank World Development Indicators Database (2005). The transportation cost data, that is the proxy for distance, is collected from Wan Hai Line Sdn. Bhd. They are annual data from 1979 to 2003.

EMPIRICAL RESULTS

In Table 1, the results of the bounds cointegration test show that the null hypothesis of H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = 0$ against its alternative H_A: at least one of the μ_k's is different from zero is easily rejected at the 1% significance level. All the computed *F*-statistic is greater than the upper critical bound value of 5.06, thus indicating the existence of a steady-state long-run relationship among Real GDP, GDP per Capita, Transportation Cost and per capita GDP difference.

The estimated coefficients of the long-run relationship between Real GDP, per capita GDP, Transportation Cost and per capita GDP difference for the ASEAN 5 are expected to be significant, as highlighted in the following equations based on the result obtained from Table 2(I):

Indonesia:

$$TR_t = 118.0728 + 10.6789 RGDP_t - 14.3181 PGDP_t - 4.3689 TC_t + 1.4186 PDIF_t$$

Malaysia:

$$TR_t = 5.6377 + 0.6417 RGDP_t - 8.7094 PGDP_t - 1.9412 TC_t + 1.8545 PDIF_t$$

Philippines:

$$TR_t = 294.4534 + 7.5000 RGDP_t - 6.0507 PGDP_t - 4.5960 TC_t + 0.7357 PDIF_t$$

Singapore :

$$TR_t = 12.5942 + 1.3490 RGDP_t - 1.7344 PGDP_t - 1.3947 TC_t + 0.3738 PDIF_t$$

Thailand:

$$TR_t = 11.6998 + 3.3277 RGDP_t - 3.1803 PGDP_t - 2.0239 TC_t + 0.1225 PDIF_t$$

The estimated RGDP elasticities are positive and statistically significant in each of our estimated models at the 1% significance level (5% significant level for Indonesia) except Malaysia. These findings are consistent with the hypothesis that trade increases with the size of the economy. A large domestic market promotes division of labour and provides opportunities for trade in a wide variety of goods, whereas the insignificant positive sign for Malaysia may imply that the political ties are more important than the economic size in China-Malaysia relations as suggested by Oguledo and Macphee (1994). The estimated coefficients on the log of RGDP for the five ASEAN countries under the investigated range varies from 0.6417 to 10.6789, which means that when the RGDP between the ASEAN-5 and their trade partner China increases by 1 percent, ASEAN-5 trade will increase by 0.6417 to 10.6789 percent.

The Linder hypothesis is used to reveal whether trade flows are large among similar levels of output per capita countries by including the absolute value of the difference in per capita GDP for a country pair. The coefficients of PDIF elasticities are also positively significant in each of our estimated models (at 1% significant level for Indonesia and Thailand; 5% significant level for Malaysia and Philippines; and 10% significant level for Thailand). The estimated coefficients on the log of PDIF for the five ASEAN countries range from 0.1225 to 1.8545, indicating that when the PDIF between the ASEAN-5 and the trade partner China increases by 1 percent, ASEAN-5 trade will increase by 0.1225 to 1.8545 percent. These empirical results indicate that the Linder Hypothesis is not supported by the ASEAN region and China. This finding is similar to Roberts (2004).

As we know, transportation cost is a well known barrier in the Gravity model. The estimated transportation cost elasticities are in line with the priori in which we obtained negative and statistically significant results in each of our estimated models at least at 5% significant level. The estimated coefficients on the log of transportation cost for the five ASEAN countries under investigation range from 1.3947 to 4.5960. This means that when the transportation cost (distance) between the ASEAN-5 and the trade partner China increases by 1 percent, ASEAN-5 trade will decline by 1.3947 to 4.5960 percent.

Interestingly, we found that the coefficients of the per capita GDP are inconsistent with the previous studies that a positive relationship should be observed between the per capita GDP and trade. The exception is Thailand which is in line with priori and highly significant. Theoretically, the higher the income level, the greater the production capacity and the larger the amount they can export as well as the greater the domestic consumption and import demand. Higher income level also suggests greater ability of the exporters to produce and export at lower cost, all else remaining constant. The findings of this study, however, show a negative relationship ranging from 1.73 to 14.31 between these two variables. This finding is in accord with Glejser (1968), who found the income of the exporting countries to have a negative impact on trade flows. In general, the higher the income level and the standard of living, the larger the domestic demand for a variety of higher quality goods and services. The insignificant per capita GDP may be explained by the fact that the rise in ASEAN domestic demand promotes the various kinds of imported goods and services among ASEAN members as well as their major trading partners such as Japan and the United States, not from China.

The dynamic short-run relationship among the relevant variables is shown in Table 2, Panel II. The short-run relationship can be obtained by restricting the coefficient of the variables with its lags equal to zero (using Wald test). If the null hypothesis of no relationship is rejected, then we conclude that there exists short-run relationship of a relevant variable with bilateral trade flows. From this test, we found that all the explanatory variables has short-run relationship with bilateral trade flows at a 1% significance level for Indonesia (except per capita GDP at 10% significance level) and at 5% significant level for Malaysia (except transportation cost at 1% significance level). However, per capita GDP differences (per capita GDP) are statistically insignificant determinants of bilateral trade flows for Philippines and Thailand.

The robustness of the model has been confirmed by several diagnostic tests such as Breusch-Godfrey serial correlation LM test, ARCH test, Jacque-Bera normality test and Ramsey RESET specification test as shown in Table 2, Panel III. All the tests revealed that the model has the desired econometric properties. Moreover, the model has a correct functional form and the model's residuals are serially uncorrelated, normally distributed and homoskedastic. Thus, the results reported are valid for reliable interpretation.

CONCLUSION

In this paper, we have estimated the trade potentials for China-ASEAN relationship using the Gravity model. The Gravity model fits well with the data as it provides plausible transportation cost and Real GDP (economy size) elasticities. The coefficient for transportation cost and Real GDP is statistically significant, implying that trade distance remains an important deterrent to China-ASEAN trade. Moreover, the higher economic size of a country positively influences bilateral trade flows. Interestingly, the coefficients of the per capita GDP are inconsistent with the previous studies that a positive relationship should be observed between the per capita GDP and trade. The significant positive sign of the per capita GDP difference variable (PGDPdiff) does not support the position that China-ASEAN FTA exhibits trade based on similar demand patterns. This finding is in line with the World Bank's classification of China as a low income economy; Indonesia, Thailand, and Philippines as low middle income economies; Malaysia as a middle income economy; and Singapore as a high income economy. Again, this means that the Linder Hypothesis does not hold for the entire region. As a consequence, their manufacturing sectors are less likely to produce differentiated goods targeted for each others market.

In terms of policy implications, the results of the model shows the statistical significance of the coefficients of trade distance variable proxied by the transportation costs implies that trade potential between China-ASEAN economies can be improved by a comprehensive development of the transport infrastructure. This infrastructural development will shorten the economic distance between the integrating countries. Trade increases with the size of the economy as a large domestic market promotes division of labour and provides opportunities for trade in a wide variety of goods. Strengthening such an integrated supply chain from ASEAN region to fit in as a supplement to China can also empower the ASEAN economies to compete more effectively with other producers in major markets worldwide. The results of the model show that an integrated supply chain between China and ASEAN may fit well and complement each other — different varieties of goods are exported by countries with different relative factor endowments. The trade potential for China-ASEAN Free Trade Agreement can be based on differences across countries in the availability of factor resources as well as differences across products in the use of these factors in producing the products. China imports resource-based commodities (hydrocarbons, wood, and fat and oil products), intermediate goods and components from the regional economies to be re-exported to the developed economies. ASEAN imports of electrical machinery, computer equipment, hydrocarbons, cotton and tobacco are among the top five in 2003 from China. These indicate that the supply of factors of production cannot be ignored in China-ASEAN trade trend. The basis of trade among China-ASEAN may be based on the differences of resource endowment.

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APPENDIX

Table 1. Bounds Test for Cointegration Analysis

Critical Value	Lower Bound Value	Upper Bound Value
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

Critical Values are cited from Pesaran *et al*. (2001), Table CI (iii), Case III: Unrestricted intercept and no trend.

	Computed F-statistic:
Indonesia	25.1312***
Malaysia	19.6853***
Philippines	14.6901***
Singapore	30.4165***
Thailand	7.0689***

Table 2. Long-run Elasticities and Short-run Causality of Bilateral Trade

I. Long-run Estimated Coefficient

Variable	Indonesia	Malaysia	Philippines	Singapore	Thailand
RGDP	10.6789**	0.6417	7.5000***	1.3490***	3.3277***
PGDP	–14.3181**	–8.7094**	–6.0507**	–1.7344***	3.1803***
TC	–4.3689**	–1.9412**	–4.5960**	–1.3947***	–2.0239***
PDIF	1.4186***	1.8545**	0.7357**	0.3738***	0.1225*

II. Short-run Causality Test (Wald Test *F*-Statistic):

Variable	Indonesia	Malaysia	Philippines	Singapore	Thailand
Δ RGDP	43.3203***	8.2853**	19.3945***	-3.9086***	8.4838**
	[0.0219]	[0.0024]	[0.0058]	[0.0178]	[0.0019]
Δ PGDP	6.0546*	9.1262**	19.3014***	1.00382	8.1384**
	[0.0617]	[0.0180]	[0.001]	[0.3489]	[0.0195]
Δ TC	47.6250***	27.2147***	5.2503**	3.8586***	2.1933*
	[0.0016]	[0.0021]	[0.0481]	[0.0062]	[0.0707]
Δ PDIF	19.9184***	-2.7846**	1.7593	2.8044**	3.3723
	[0.1290]	[0.0264]	[0.1043]	[0.0083]	[0.0387]

Notes:
Key: RGDP = Real GDP; PGDP = GDP per Capita; TC = Transportation Cost; PDIF = per capita GDP difference. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

III. Diagnostic Checking

	Indonesia	Malaysia	Philippines	Singapore	Thailand
<u>Serial Correlation test</u>					
Lag (1)	4.2973	2.2720	0.0250	0.5293	0.5318
	[0.1298]	[0.2062]	[0.8805]	[0.4942]	[0.4985]
Lag (3)	1.2395	1.8976	1.1638	3.5244	1.2443
	[0.5647]	[0.3634]	[0.4518]	[0.1275]	[0.4308]
<u>Jarque Bera Test</u>					
	0.1696	0.3216	0.4238	0.1811	0.8028
	[0.9187]	[0.8514]	[0.8090]	[0.9133]	0.6695
<u>ARCH Test</u>					
Lag (1)	0.4121	0.0753	0.0042	2.2566	0.1688
	[0.5289]	[0.7868]	[0.9487]	[0.1266]	[0.6862]
Lag (3)	2.2567	0.8214	0.7817	1.0465	0.0661
	[0.1267]	[0.5034]	[0.5236]	[0.4104]	[0.9768]
<u>Ramsey RESET Test</u>					
Lag (1)	1.7771	1.3242	0.8664	0.1818	1.4854
	[0.2533]	[0.3139]	[0.3946]	[0.6846]	[0.2772]
Lag (3)	0.3003	1.0153	0.3652	0.1366	3.3886
	[0.8269]	[0.5309]	[0.7849]	[0.9330]	[0.1714]

Notes:
Probability values are quoted in square brackets. AR(*i*) and ARCH(*i*) for i = 1,3 denote LM-type Breusch-Godfrey Serial Correlation LM and ARCH test, respectively, to test for the presence of serial correlation and ARCH effect at lag *i*. JB and RESET stand for Jarque-Bera Normality Test and Ramsey Regression Specification Error Test respectively.