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THE RELATIONSHIP BETWEEN TERMS-OF-TRADE AND TRADE BALANCE IN ASEAN-5

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ABSTRACT

This study examines the relationship between career strategies and career success. The three dimensions that measured career strategies were enhancing promotability, strengthening external contacts, and improving image with superiors. Meanwhile, the dimension that measured career success was subjective career success. Data were gathered through the distribution of questionnaires to employees at a manufacturing organization (n=185). Correlation and regression analysis were used to examine the relationship between career strategies and career success. The results indicated that there were no relationships between overall career strategies and career success. However, in terms of career strategies dimensions, only two were positively correlated with career success, namely, strengthening external contacts and improving image with superiors. The multi-regression results suggest that improving image with superiors was the most important factor in influencing individual's career success. The findings were discussed and recommendations for future research were also put forward.

Keywords: *Career success; career strategies.*

ABSTRAK

Kajian ini melihat hubungan antara strategi kerjaya dan kejayaan kerjaya. Tiga dimensi digunakan untuk mengukur strategi kerjaya iaitu promotability, strengthening external contacts dan improving image with superior. Sementara dimensi yang mengukur kejayaan kerjaya adalah kejayaan kerjaya subjektif. Data dikumpul melalui soal selidik dan diedar di organisasi pembuatan (n=185). Analisa korelasi dan regreasi digunakan untuk melihat hubungan antara strategi kerjaya dan kejayaan kerjaya. Keputusan kajian mendapati tidak wujud hubungan antara strategi kerjaya keseluruhan dan kejayaan kerjaya. Namun begitu, dari aspek dimensi strategi kerjaya,

dua dimensi mempunyai hubungan korelasi yang positif dengan kejayaan kerjaya, iaitu strengthening external contacts dan improving image with superior. Keputusan regresi berganda menunjukkan dimensi improving image with superior sebagai faktor paling penting yang mempengaruhi kejayaan kerjaya. Penemuan kajian dan cadangan untuk kajian lanjut turut dibincangkan.

INTRODUCTION

There is an ongoing debate upon the relationship between terms-of-trade and trade balance. Harberger (1950) and Laursen and Metzler (1950) argued that an exogenous increase or decrease in terms-of-trade would lead to an increase or a decrease in trade balance. This theoretical prediction is well known as the Harberger-Laursen-Metzler (HLM) effect. Otto (2003) employed a structural vector autoregression (SVAR) model to examine the HLM effect for a number of small developing and developed economies. The variables included in the SVAR model are trade balance, terms-of-trade, and real output. On the whole, the results showed that the HLM effect exists. The variance decompositions for trade balance indicated that on average terms-of-trade shocks are marginally more important in explaining fluctuations in trade balance of developing economies than developed economies.

On the other hand, Sachs (1981) argued that the relationship between terms-of-trade and trade balance depends on the duration of the terms-of-trade shock. If the terms-of-trade shock is temporary, an increase in terms-of-trade would lead to an increase in trade balance and vice versa. However, if the terms-of-trade shock is permanent, the final result is ambiguous. Obstfeld (1982) showed that a permanent increase in terms-of-trade would lead to a deficit in trade balance. Backus, Kehoe, and Kydland (1994) provided a theoretical interpretation of international data on the counter cyclical movements in terms-of-trade and trade balance. They reported that there is tendency for trade balance to be negatively correlated with current and future movements in terms-of-trade, but positively correlated with past movement. They call the relationship between terms-of-trade and trade balance as the S-curve. Thus, the relationship between terms-of-trade and trade balance could be a matter of time. For a small open economy, it is generally agreed that in a shorter period, an increase in terms-of-trade will lead to an increase in trade balance and in a longer period, an increase in terms-of-trade will lead to a decrease in trade balance. Nonetheless, the empirical evidence of this matter is mixed.

Kouassi, Decaluwe, Kapombe, and Colyer (1999) investigated the relationship between current account balance and terms-of-trade within a context of the vector error correction model (VECM) for Cote-d'Ivoire. They included current account balance, terms-of-trade, domestic income, foreign income, and foreign interest in the VECM. The results indicated that there is a long-run relationship between terms-of-trade and current account balance. Moreover, current account balance was found to (Granger) cause terms-of-trade and not vice versa. Dynamic simulations indicated that a significant portion of fluctuations in terms-of-trade is explained by current account balance.

Generally, the results in the literature relating to terms-of-trade and trade balance relationship are mixed. Moreover, there are not many econometric studies that focus directly on the relationship between terms-of-trade and trade balance (Otto, 2003). Furthermore, studies focused mainly on the movements of terms-of-trade and trade balance or the correlation between them, and not the long-run relationship between terms-of-trade and trade balance. The mixed results indicated that the relationship between terms-of-trade and trade balance has not been fully explored. More specifically, do changes in terms-of-trade cause changes in trade balance or does the causation run in the reverse direction (Kouassi *et al*., 1999). The main aim of this study was to investigate the long-run relationship between terms-of-trade and trade balance in the ASEAN-5, namely Indonesia, Malaysia, Philippines, Singapore, and Thailand, over the period from 1965 to 2002. A dummy variable, that is zero for the period from 1960 to 1996, and one for the period from 1997 to 2001 was used to capture the contagion impact of the Asian financial crisis of 1997-1998, which could have an impact on import and export prices and therefore, the estimation results.

Each country of the ASEAN-5 has a different degree of openness to international trade. Furthermore, commodities and compositions of exports and imports are not the same from one country to another. Thus, this study investigated if the relationship between terms-of-trade and trade balance holds across countries that have a different degree of openness to international trade, and different commodities and composition of exports and imports. Moreover, this study examined the Granger causality between terms-of-trade and trade balance. Terms-of-trade was defined as the ratio of export price to import price, which is also known as commodity terms-of-trade or barter terms-of-trade. The Dickey and Fuller (1979) (DF) and Phillips and Perron (1988) (PP) unit root test statistics were used to examine

the stationarity of the data. The Johansen (1988) (J) cointegration method was used to examine the long-run relationship between terms-of-trade and trade balance.

The rest of this article is structured as follows. Section 2 gives an introduction of the ASEAN-5, while Section 3 gives a literature review of the terms-of-trade and trade balance. Section 4 explains the data and methodology in this study. Section 5 discusses the empirical results. Finally, the article gives some concluding remarks.

THE ASEAN-5: AN INTRODUCTION

This section gives an introduction of the ASEAN-5 in terms of economic structure, openness to international trade, and international trade. Generally, the economic structure of each country of the ASEAN-5 is not the same. For Indonesia, in 1985, 40.9%, 35.8% and 23.3% of gross domestic product (GDP) were from services, industry, and agriculture, respectively. In 2003, 43.6%, 39.9%, and 6.6% of GDP were from industry, services, and agriculture, respectively. For Malaysia, in 1985, 44.1%, 40.5%, and 15.4% of GDP were from industry, services, and agriculture, respectively. In 2003, 48.6%, 45.5%, and 9.5% of GDP were from industry, services, and agriculture, respectively. For the Philippines, in 1985, 40.4%, 35.1%, and 24.5% of GDP were from services, industry, and agriculture, respectively. In 2003, 53.2%, 32.3%, and 14.4% of GDP were from services, industry, and agriculture, respectively. For Singapore, in 1985, 68.8%, 30.2%, and 1% of GDP were from services, industry, and agriculture, respectively. In 2003, 66.4%, 32.7%, and 0.1% of GDP were from services, industry, and agriculture, respectively. For Thailand, in 1985, 52.4%, 31.8%, and 15.8% of GDP were from services, industry, and agriculture, respectively. In 2003, 46.3%, 44.0%, and 9.8% of GDP were from services, industry, and agriculture, respectively, as shown in Table 1. Generally, the industrial sector was the most important contributing sector to GDP for Malaysia and Indonesia. On the other hand, services were the most important contributing sector to GDP for Singapore, Philippines, and Thailand.

International trade is important for the ASEAN-5. However, the degree of openness to international trade varies from one country to another. The measure of openness to international trade is expressed by the share of international trade to GDP. Indonesia is relatively less open to international trade, where the measure of openness to international trade in 1985 was 45.4, while in 2003, the measure of openness to international trade was 56.9. The Philippines and Thailand were

Table 1
Some Facts of ASEAN-5

	1985	1990	1995	2000	2001	2002	2003
Indonesia							
Agriculture of GDP (%)	23.3	19.4	17.1	17.2	17.0	17.4	16.6
Industry of GDP (%)	35.8	39.1	41.8	46.1	45.5	44.5	43.6
Services of GDP (%)	40.9	41.5	41.1	36.7	37.5	38.1	39.9
Openness to international trade	45.4	49.0	54.0	76.4	76.8	65.1	56.9
Malaysia							
Agriculture of GDP (%)	15.4	15.2	12.9	8.7	8.5	9.1	9.5
Industry of GDP (%)	44.1	42.2	41.4	46.5	48.1	48.3	48.6
Services of GDP (%)	40.5	42.6	45.7	44.8	43.4	42.6	45.5
Openness to international trade	104.7	146.9	192.1	229.3	214.5	211.8	208.8
Philippines							
Agriculture of GDP (%)	24.5	21.9	21.6	15.8	14.9	14.7	14.4
Industry of GDP (%)	35.1	34.5	32.1	32.2	32.5	32.5	32.3
Services of GDP (%)	40.4	43.6	46.4	52.0	52.6	52.8	53.2
Openness to international trade	45.9	60.8	80.5	108.9	100.3	98.4	99.0
Singapore							
Agriculture of GDP (%)	1.0	0.4	0.2	0.1	0.1	0.1	0.1
Industry of GDP (%)	30.2	33.0	33.3	34.4	32.2	33.3	32.7
Services of GDP (%)	68.8	66.6	66.5	65.5	67.7	66.6	66.4
Openness to international trade	277.5	306.5	289.0	298.0	280.0	277.5	299.1
Thailand							
Agriculture of GDP (%)	15.8	12.5	11.0	10.4	10.4	9.0	9.8
Industry of GDP (%)	31.8	37.2	39.3	40.5	40.7	42.5	44.0
Services of GDP (%)	52.4	50.3	49.7	49.1	48.9	48.5	46.3
Openness to international trade	49.2	75.8	90.4	124.9	125.4	122.2	124.5

Sources: Asian Development Bank and International Monetary Fund.

relatively open to international trade. For the Philippines, the measure of openness to international trade in 1985 was 45.9, while in 2003, the measure of openness to international trade was 99.0. For Thailand, the measure of openness to international trade in 1985 was 49.2, while in 2003, the measure of openness to international trade was 124.5. On the other hand, Singapore and Malaysia were relatively very open to international trade. For Singapore, the measure of openness to international trade in 1985 was 277.5, while in 2003, the measure of openness to international trade was 299.1. For Malaysia, the measure of openness to international trade in 1985 was 104.7, while in 2003, the measure of openness to international trade was 208.8, also shown in Table 1. Thus, Singapore and Malaysia have a relatively high degree of openness to international trade. This is followed by Philippines and Thailand. Finally, Indonesia has a relatively low degree of openness to international trade.

In the period from 1985 to 2003, Indonesia exported mainly to Japan, the United States, and Singapore and at the same time imported mainly from Japan. Indonesia exported mainly mineral products while imported mainly machines, mineral products, and chemical products. Malaysia exported mainly to the United States, Singapore, and Japan while importing mainly from the United States, Japan, and Singapore. The main exports were machines and mineral fuels while importing were machines. The Philippines exported mainly to the United States, while importing mainly from Japan and the United States. The main exports and imports were machines. Singapore exported mainly to Malaysia, the United States, and China, while importing mainly from Malaysia, the United States, and Japan. The main exports of Singapore were machines, mineral products, and chemical products, and the main imports of Singapore were machines and mineral products. Thailand exported mainly to the United States and Japan while importing mainly from Japan and the United States. In the same period, the main exports of Thailand were machines and crude materials, and imports were machines. The export and import trading partners of the ASEAN-5 were about the same. The United States was one of the important trading partners for the ASEAN-5.

In summary, the industrial sector is the most important contributing sector to GDP for Malaysia and Indonesia, while the service sector is the most important contributing sector to GDP for Singapore, Philippines, and Thailand. Singapore and Malaysia has a very high degree of openness to international trade. Philippines and Thailand has a high degree of openness to international trade, but Indonesia has a low degree of openness to international trade. The commodities and

compositions of exports and imports in each country of the ASEAN-5 are not the same. Nonetheless, the export and import trading partners of ASEAN-5 are about the same.

TERMS-OF-TRADE AND TRADE BALANCE: A LITERATURE REVIEW

There is a large amount of literature regarding the relationship between terms-of-trade and trade balance. Harberger (1950), and Laursen and Metzler (1950) showed that an increase in terms-of-trade would lead to an increase in trade balance, and vice versa. This analysis is based on the Keynesian consumption function. An improvement in terms-of-trade raises the national income of an economy, that is, domestic output measured in terms of importable or in terms of the true consumption bundle would increase. However with a short-run marginal propensity to consume less then unity, there is a less than proportional increase in consumption spending. As a result, the level of private saving is increased. If other things remain constant, this would lead to an improvement in trade balance of an economy (Otto, 2003).

The relationship between terms-of-trade and trade balance is also discussed in an intertemporal optimising framework with certainty or uncertainty. One finding of the relationship between terms-of-trade and trade balance in an intertemporal optimising framework with certainty is that the contemporaneous response of trade balance to terms-of-trade shock depends on the persistence of the shock. The shock that produces transitory changes in terms-of-trade would lead to the HLM effect. Nonetheless, as the effect of the shock becomes more persistent, the HLM effect is reduced. In the standard two-period model of a small open economy, permanent changes in terms-of-trade have no effect on trade balance (Sachs, 1981; Otto, 2003).

The intertemporal optimising framework with certainty has been extended by a number of authors. Obstfeld (1982) showed that an unanticipated permanent improvement in terms-of-trade would lead to a deficit in trade balance. Persson and Svensson (1985) found that the relationship between terms-of-trade and trade balance depends on the values of particular parameters in the model, and this is the case for both transitory and permanent changes in terms-of-trade. Ostry (1988) obtained similar results in a model that includes non-traded goods and a role for the real exchange rate in transmitting terms-of-trade shock to trade balance. The main results from the intertemporal

optimising framework with certainty are that the relationship between terms-of-trade and trade balance depends on the persistence of terms-of-trade shock and the form of the rate of time preference on future utility (Otto, 2003).

Backus *et al.* (1994) demonstrated the relationship between terms-of-trade and trade balance in an intertemporal optimising framework with uncertainty, but complete in contingent-claims markets. They defined terms-of-trade as the ratio of import price to export price. They use data for a number of Organisation for Economic Co-operation and Development (OECD) countries. They reported the relationship between terms-of-trade and trade balance as the S-curve. In the model, both terms-of-trade and trade balance are endogenous. The fundamental source of uncertainty is shocks to technology and government expenditure. For certain parameterisations of the model, it is able to replicate a number of features in the data, including the S-curve. The key elements to obtain the S-curve in the model are the type of underlying shocks and capital accumulation.

The relationship between terms-of-trade and trade balance for a small open economy has also been discussed. Mendoza (1992) has developed a theoretical model of a single economy that faces only exogenous terms-of-trade to the economy. Contingent claims markets are incomplete and agents able to trade a single asset internationally, that is, a non-contingent risk-free bond. Mendoza (1992) calibrated the model to the Canadian economy and found that the model produced a positive correlation between terms-of-trade and trade balance. Mendoza (1995) extended the earlier model to allow for capital accumulation and endogenous labour choice. The model produced both a counter-cyclical trade balance and a positive correlation between terms-of-trade and trade balance. Mendoza (1995) established a number of empirical regularities for terms-of-trade and trade balance using data for the G-7 and 23 developing economies. The results showed that terms-of-trade and trade balance is positively correlated. However, the size of the correlation was relatively low and seemed to be unrelated when the degree of persistence of terms-of-trade shock increases (Otto, 2003).

Otto (2003) employed a SVAR model to examine the HLM effect for a number of small open developing and developed economies. The sample period was typically from 1960 to 1997. The variables included in the SVAR model were trade balance, terms-of-trade, and real output. On the whole, the results showed that there is the HLM effect. For the vast majority of 55 small open economies examined, an immediate

effect of a positive shock to terms-of-trade is an increase in trade balance. This finding was similar across both developing and small OECD economies. However, trade balance is reduced when terms-of-trade shocks become more persistent. The variance decompositions for trade balance indicate that on average terms-of-trade shocks are marginally more important in explaining fluctuations in trade balance of developing economies than developed economies.

Kouassi *et al.* (1999) investigated the relationship between current account balance and terms-of-trade within a context of VECM for Cote-d'Ivoire over the period from 1960 to 1995. They included current account balance, terms-of-trade, domestic income, foreign income and foreign interest in the VECM. The results indicated that there is a long-run relationship between terms-of-trade and current account balance. Moreover, current account balance was found to Granger cause terms-of-trade and not vice versa. They claimed that the results were in accordance to the finding of Bahmani-Oskooee and Janardhanan (1995). Finally, dynamic simulations indicate that a significant portion of fluctuations in terms-of-trade is explained by current account balance. The finding that terms-of-trade is explained by current account balance contradicts with the findings of Otto (2003).

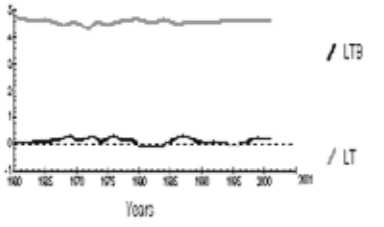
DATA AND METHODOLOGY

In this study, terms-of-trade (TOT_t) is defined as $(P_{x,t}/P_{m,t}) \times 100$, where $P_{x,t}$ is the export price (1995 = 100) and $P_{m,t}$ is the import price (1995 = 100). Trade balance (TB_t) is defined as $(X_t/P_{x,t}) / (M_t/P_{m,t})$, where X_t is the export of goods and services and M_t is the import of goods and services. The export price (1995 = 100) and the import price (1995 = 100) were obtained from the World Bank. The value of exports and the value of imports were obtained from the International Monetary Fund. The data were taken annually. Generally, the data were over the period from 1960 to 2001, except for Singapore. The data for Singapore were over the period from 1979 to 2001. All the data were transformed into logarithms. The plot of terms-of-trade and trade balance for each country of the ASEAN-5 is presented in Figure 1. Generally, terms-of-trade and trade balance series fluctuated and they moved towards a direction.

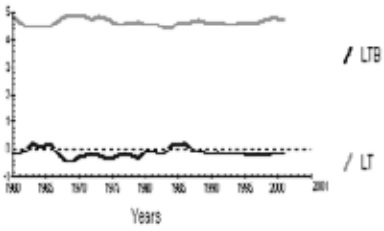
The DF and PP unit root test statistics were used to examine the stationarity of the data. The DF unit root test statistic is computed by estimating the following auxiliary regression:

Indonesia

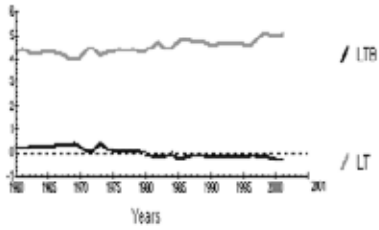
Malaysia



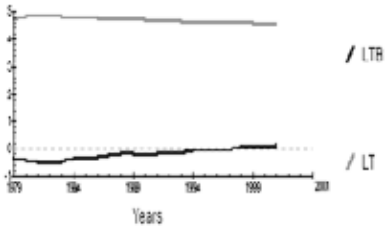
The Philippines



Thailand



Singapore



Notes: The light colour line (LT) indicates logarithm of terms-of-trade. The dark colour line (LTB) indicates logarithm of trade balance.

Figure 1
The plots of logarithms of terms-of-trade and trade balance against time

$$\Delta y_t = \beta_{10} + \beta_{11} t + \beta_{12} y_{t-1} + \sum^{p}_{i=1} \beta_{13i} \Delta y_{t-i} + u_{1,t} \quad (1)$$

where Δ is the first difference operator; y_t is a series being examined; t is a time trend and p is the number of lagged differences included such that the disturbance term, $u_{1,t}$ in equation (1) is white noise. The DF t-statistic ($t_{\beta 12}$) is to test the null hypothesis of a unit root or equivalently to test the coefficient of $\beta_{12} = 0$ against the alternative hypothesis of $\beta_{12} < 0$. If the null hypothesis is accepted then y_t is said

to be a different stationary series. Equation (1) is used to compute the Augmented Dickey-Fuller unit root test statistic. If p is equal to zero, then it is equivalent to the Dickey-Fuller unit root test.

The PP unit root test statistic is computed by estimating the following equation:

$$y_t = \beta_{20} + \beta_{21} t + \beta_{22} y_{t-1} + u_{2,t} \quad (2)$$

where $u_{2,t}$ is a disturbance term. The test statistic, $Z(t_{\beta 22})$ is computed to test the null hypothesis of a unit root or equivalently to test the coefficient of $\beta_{22} = 1$ see Phillips and Perron (1988) for a detailed discussion of the test statistic.

The J cointegration method was used to test the long-run relationship between terms-of-trade and trade balance. The J cointegration method proposes two likelihood ratio tests to test the number of cointegrating vectors in the system, namely the maximum eigenvalue (λ_{Max}) and trace (λ_{Trace}) statistics, which are computed respectively as:

$$\lambda_{Max} = -T \ln (1 - \lambda_{r+1}) \quad (3)$$

$$\lambda_{Trace} = -T \sum^{p}_{i=r+1} \ln (1 - \lambda_i) \quad (4)$$

where ln is the logarithm; T is the sample size and λ_i is the eigenvalue. The λ_{Max} test statistic tests the null hypothesis (H_0) of r cointegrating against the alternative hypothesis (H_a) that there are {r+1} cointegrating vectors in the system. The λ_{Trace} test statistic tests the H_0 that has at most r cointegrating vectors in the system, that is, the number of cointegrating vectors is less than or equal to r. The likelihood ratio test statistics can be sensitive to the choice of the lag length used in the estimation of the test statistics. Thus, the choice of the lag length in this study is determined by the Schwarz Bayesian criterion.

When the series is cointegrated, the testing of Granger causality is in an error correction model. More specifically, the error correction models estimated in this study were:

$$\Delta \ln TB_t = \beta_{30} + \sum^{a}_{i=1} \beta_{31i} \Delta \ln TB_{t-i} + \sum^{b}_{i=1} \beta_{32i} \Delta \ln TOT_{t-i} + \gamma_1 EC_{1,t-1} + u_{3,t} \quad (5a)$$

$$\Delta \ln TOT_t = \beta_{40} + \sum^{c}_{i=1} \beta_{41i} \Delta \ln TB_{t-i} + \sum^{d}_{i=1} \beta_{42i} \Delta \ln TOT_{t-i} + \gamma_2 EC_{2,t-1} + u_{4,t} \quad (5b)$$

where TB_t is trade balance; TOT_t is terms-of-trade; $EC_{i,t-1}$ (i = 1, 2) is the first lag of the disturbance term, which is obtained from the cointegrating regression, and $u_{i,t}$ (i = 3, 4) is a disturbance term. The joint test of lag variables, namely $\Delta \ln TB_t$ and $\Delta \ln TOT_t$ respectively, by the mean of the F-statistic is significantly different from zero, which implies the presence of Granger causality. For example, if the joint test of lag variables of $\Delta \ln TOT_t$ in equation (5a) is significantly different from zero, it implies that terms-of-trade Granger causes trade balance. The minimum final prediction error criterion proposed by Akaike (1970) was used to determine the optimal lags of the model. When the series is not cointegrated, the testing of Granger causality is carried out without including an error correction term in the estimation. The testing procedure is the same as mentioned earlier.

EMPIRICAL RESULTS AND DISCUSSIONS

The results of the DF and PP unit root test statistics are reported in Table 2. The lag length used to compute the DF test statistic is based on Akaike (1973) information criterion (AIC). For the PP unit root test statistic, the results that are reported are based on three truncation lags, which were used to compute the test statistic after considering truncation lag one, truncation lag two, and truncation lag three in computing the test statistic. The results of the DF and PP unit root test statistics showed that the null hypothesis of a unit root for level data is not rejected. However, they rejected the non-stationary hypothesis for differenced data, except terms-of-trade of Malaysia, terms-of-trade of Singapore, terms-of-trade of Thailand, and trade balance of Singapore. For terms-of-trade of Malaysia and Singapore, the DF unit root test statistic showed that it is integrated of order one while the PP unit root test statistic showed that it is integrated of order zero. For terms-of-trade of Thailand, the DF unit root test statistic showed that it is integrated of order zero while the PP unit root test statistic showed that it is integrated of order one. For trade balance of Singapore, the DF unit root test statistic showed that it is integrated of order one while the PP unit root test statistic showed that it is integrated of order zero. On the whole, all the variables, namely terms-of-trade and trade balance, are said to be integrated of order one in this study.

The contagion impact of the Asian financial crisis, 1997-1998, which could have an impact on import and export prices and therefore the estimation results, is captured by including a dummy variable

Table 2
The Results of the Dickey and Fuller (1979) and Phillips and Perron (1988) Unit Root Test Statistics

	$t_{\beta 12}$ - trend	$Z(t_{\beta 22})$ - trend
Indonesia		
ln TB_t	-1.7949(1)	-1.7333(3)
Δ ln TB_t	-4.8111**(2)	-6.7541**(3)
ln TOT_t	-1.1864(0)	-1.7169(3)
Δ ln TOT_t	-5.1457**(0)	-6.3599**(3)
Malaysia		
ln TB_t	-3.1105(1)	-2.7125(3)
Δ ln TB_t	-4.9909**(0)	-5.2016**(3)
ln TOT_t	-2.3180(2)	-4.4837**(3)
Δ ln TOT_t	-7.7970**(1)	-8.7869**(3)
Philippines		
ln TB_t	-2.8056(0)	-2.6726(3)
Δ ln TB_t	-5.4576**(0)	-5.5539**(3)
ln TOT_t	-2.5864(1)	-2.7150(3)
Δ ln TOT_t	-4.9047**(0)	-4.8999**(3)
Singapore		
ln TB_t	-3.3015(0)	-3.5487*(3)
Δ ln TB_t	-4.2815**(1)	-3.8309**(3)
ln TOT_t	-3.2955(1)	-4.4867**(3)
Δ ln TOT_t	-3.6072*(1)	-3.8265*(3)
Thailand		
ln TB_t	-2.0964(2)	-2.9340(3)
Δ ln TB_t	-7.6188**(1)	-6.5872**(3)
ln TOT_t	-3.7825*(1)	-3.2005(3)
Δ ln TOT_t	-5.9787**(2)	-7.2398**(3)

Notes: $t_{\beta 12}$ is the DF t-statistic. $Z(t_{\beta 22})$ is the PP t-statistic. Values in parentheses are the lag length used in the estimation of the unit root test statistics. Critical values for $t_{\beta 12}$ ($Z(t_{\beta 22})$) with a drift and a time trend (trend) at the 1% and 5% for sample size 45 are -4.18 and -3.51, respectively (MacKinnon, 1996). ** Denotes significance at the 1% level. ** Denotes significance at the 5% level.

(zero for the period from 1960 to 1996 and one for the period from 1997 to 2001) in the estimation of the cointegrating vector by using the J cointegration method. The results of the likelihood ratio (LR) test statistic that tests the dummy variable being zero are reported in Table 3. On the whole, the LR test statistic is not rejected at the 5% level for all countries examined, except Thailand. This implies that all countries examined will be estimated without the dummy variable, except Thailand.

Table 3
The Likelihood Ratio (LR) Test Statistic

	LR TEST STATISTIC
Indonesia	1.5623
Malaysia	2.2399
Philippines	1.5060
Singapore	3.3818
Thailand	13.7516*

Notes: The LR test statistic tests that the dummy variable to capture the contagion impact of the Asian financial crisis is zero. * Denotes significance at the 1% level.

The results of the J cointegration method are reported in Table 4. The results of the λ_{Max} and λ_{Trace} test statistics are computed with restricted intercepts and no trends. For Malaysia, the λ_{Max} test statistic showed that the null hypothesis, that is, $r = 0$ was not rejected at the 95% critical value. However, the λ_{Trace} test statistic for the null hypothesis, that is, $r = 0$ was rejected at the 95% critical value. Thus, there is a long-run relationship between terms-of-trade and trade balance. For the Philippines, the λ_{Max} and λ_{Trace} test statistics showed the same conclusion as for Malaysia. On the other hand, the λ_{Max} and λ_{Trace} test statistics for both Indonesia and Singapore showed that the null hypotheses, that is, $r = 0$ were not rejected at the 95% critical value, respectively. This implies that terms-of-trade and trade balance is not cointegrated. For Thailand, the λ_{Max} test statistic showed that the null hypothesis, that is, $r = 0$ was rejected at the 95% critical value but the null hypotheses, that is, $r <= 1$ and $r <= 2$ were not rejected at the 95%

critical value. On the other hand, the λ_{Trace} test statistic for all the null hypotheses showed was not rejected at the 95% critical value. Thus, it was concluded that there is a long-run relationship between terms-of-trade and trade balance.

Table 4
The Results of the Johansen (1988) Likelihood Ratio Test Statistics

	Λ_{MAX} TEST STATISTIC		Λ_{TRACE} TEST STATISTIC	
H_0:	r=0	r<=1	r=0	r<=1
H_a:	r=1	r=2	r≥1	r≥2
Indonesia	9.26	1.12	10.37	1.12
Malaysia	14.81	7.18	21.98*	7.18
Philippines	13.17	7.36	20.52*	7.36
Singapore	8.21	0.40	8.61	0.40
c.v. (95%)	14.88	8.07	17.86	8.07

	λ_{Max} Test Statistic			λ_{Trace} Test Statistic		
H_0:	r=0	r<=1	r<=2	r=0	r<=1	r<=2
H_a:	r=1	r=2	r=3	r≥1	r≥2	r≥3
Thailand	21.43*	3.70	.002	25.12	3.70	.002
c.v. (95%)	21.12	14.88	8.07	31.54	17.86	8.07

Notes: The VAR=1 is used in all the estimation, except Malaysia. For Malaysia, the VAR=2 is used in the estimation. c.v. denotes critical value. * Denotes significance at the 95% critical value.

The results of cointegration tests showed that there is a long-run relationship between terms-of-trade and trade balance for Malaysia, Philippines, and Thailand. Thus, the cointegrating vector normalised by trade balance is estimated for the pair of terms-of-trade and trade balance that is cointegrated. The results of the estimated cointegrating vector normalised by trade balance are reported in Table 5. Terms-of-trade and trade balance are found to be negatively cointegrated. Thus, an increase in terms-of-trade would lead to a decrease in trade balance in the long-run. This finding is consistent with the postulate of Obstfeld (1982) that in the long-run, an increase in terms-of-trade would lead to a decrease in trade balance. The negative long-run relationship is also consistent with the finding by Otto (2003), who found that an immediate effect of a positive shock to terms-of-trade in both small OECD and developing economies is an increase in trade balance, but the effect is reduced when the terms-of-trade shock

becomes more persistence. For Thailand, the Asian financial crisis 1997-1998, and the implementation of the measures to improve its economy were found to improve its deficit in trade balance.

Table 5
The Results of the Normalised Cointegrating Vector

Malaysia	$LN\ TB_T = -\ 1.7611\ LN\ TOT_T$
Philippines	$LN\ TB_T = -\ 1.1567\ LN\ TOT_T$
Thailand	$LN\ TB_T = -\ 1.0155\ LN\ TOT_T + 0.3755\ D_T$

Note: D_t denotes the dummy variable to capture the contagion impact of the Asian financial crisis.

Table 6
The Results of Granger Causality Test

	$\Delta \ln TOT_t \rightarrow \Delta \ln TB_t$	$\Delta \ln TB_t \rightarrow \Delta \ln TOT_t$
Indonesia	2.3425	0.6169
Malaysia	9.7494**	1.3556
Philippines	1.6532	2.3643
Singapore	1.8098	5.6396*
Thailand	0.7430	5.7334*

Notes: The arrow "→" denotes no Granger causality. ** Denotes significance at the 1% level. * Denotes significance at the 5% level.

The results of the Granger causality test are reported in Table 6. There is no evidence that terms-of-trade Granger causes trade balance and vice versa, except for Malaysia, Singapore and Thailand. For Malaysia, terms-of-trade was found to Granger cause trade balance and not vice versa. On the other hand, trade balance was found to Granger cause terms-of-trade and not vice versa for Singapore and for Thailand. The finding that trade balance Granger causes terms-of-trade and not vice versa is consistent with the finding of Kouassi *et al.* (1999). Generally, the results showed that Granger causality between terms-of-trade and trade balance is mixed in the ASEAN-5. There is no evidence of Granger causality between terms-of-trade and trade balance which implies that any changes in terms-of-trade would be

transformed quickly in trade balance. The past effect of terms-of-trade on trade balance would be very small. Moreover, any changes in trade balance would have no effect on terms-of-trade. Terms-of-trade Granger causes trade balance and not vice versa is consistent with the general belief in international economics that terms-of-trade of a small open economy affects its trade balance and not vice versa. On the other hand for a large open economy, its trade balance could have an impact on its terms-of-trade.

The results of the J cointegration method showed that there is a long-run relationship between terms-of-trade and trade balance, except for Indonesia and Singapore. For Malaysia, Philippines, and Thailand, an increase in terms-of-trade is found to lead to a decrease in trade balance. Kouassi *et al.* (1999) found that current account balance and terms-of-trade are cointegrated. Moreover, Obstfeld (1982) argued that an increase in terms-of-trade would lead to a decrease in trade balance in the long-run. Otto (2003) found that the effect of a shock to terms-of-trade on trade balance decreases when the shock to terms-of-trade becomes more persistent. On the other hand, Bahmani-Oskooee and Janardhanan (1995) reported no strong evidence of a long-run relationship between terms-of-trade and trade balance for a panel of 24 countries. Cashin and McDermott (1998) argued that the relationship between terms-of-trade and trade balance is also theoretically ambiguous. There are many factors that could contribute to the relationship between terms-of-trade and trade balance, such as the persistence of terms-of-trade shock and the substitution and income effects of terms-of-trade shock. Generally, more persistent positive impact of terms-of-trade shock would have an adverse impact on trade balance. If substitution effect of terms-of-trade shock is larger than income effect of terms-of-trade shock, trade balance is expected to be better and vice versa.

The mixed results of the relationship between terms-of-trade and trade balance in ASEAN-5 may partly be caused by economic structure, degree of openness to international trade, and baskets of exports and imports being different. There is evidence that terms-of-trade and trade balance is related when countries are more open to international trade. Also, there is evidence that terms-of-trade Granger causes trade balance and trade balance Granger causes terms-of-trade.

CONCLUDING REMARKS

This study had investigated the long-run relationship between terms-of-trade and trade balance in the ASEAN-5. This study also examined

Granger causality between terms-of-trade and trade balance. The DF and PP unit root test statistics showed that generally all variables are integrated of order one. The results of the J cointegration method showed that terms-of-trade and trade balance are cointegrated, except for Indonesia and Singapore. In other words, there is a long-run relationship between terms-of-trade and trade balance. The results of Granger causality were mixed. For Indonesia and Philippines, there is no Granger causality between terms-of-trade and trade balance. For Malaysia, terms-of-trade Granger causes trade balance and not vice versa. Finally, for Singapore and Thailand, trade balance Granger causes terms-of-trade and not vice versa. The mixed results of the relationship between terms-of-trade and trade balance are consistent with the ongoing debate in the literature regarding terms-of-trade and trade balance. One explanation is the different degree of openness to international trade and commodities, and that compositions of exports and imports are not the same from one country to another and thus, the relationship between terms-of-trade and trade balance would be different. There is evidence that terms-of-trade and trade balance is related when countries are more open to international trade. Moreover, there is evidence that terms-of-trade Granger causes trade balance and trade balance Granger causes terms-of-trade.

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