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Evidence of Ongoing Convergence Within ASEAN

[1]Hway-Boon Ong and [2]Muzafar Shah Habibullah
[1]Economics Unit, Faculty of Management, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia
[2]Department of Economics, Faculty of Economics and Management,
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

Abstract: This study provides evidence of ongoing real macroeconomic convergence of the founding members of ASEAN namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand. Firstly, the long run macroeconomic relationship of ASEAN-5 is measured by their respective real gross domestic product. Secondly, the ongoing convergence of ASEAN-5 is examined. The empirical findings suggest that there is long run macroeconomic linkages and ongoing convergence among ASEAN-5. Hence, ASEAN-5 is deemed compatible but ASEAN's effort of re-organizing its supportive institutions will further improve the compatibility of its members. However, besides outstanding macroeconomic performance, the realization of a serious economic union would also depend on political stability and the sincerity of political leaders.

Key words: ASEAN, ongoing convergence, cointegration

INTRODUCTION

The formalization of economic relationship among countries can be observed through the establishment of economic blocs where formal and continuous collaboration were officially documented. Based on the World Development Indicators, there are four main groups of economic bloc, namely, the Asia Pacific, European and North American block; the Latin American and the Caribbean; African; as well as the Asian economic blocks. The Association of Southeast Asian Nations, ASEAN, established in 1967, is located within the Asia Pacific region.

In no particular order, Indonesia, Malaysia, the Philippines, Singapore and Thailand established the ASEAN on 8 August 1967 in Bangkok. Brunei (joined in 1984), Vietnam (joined in 1995), Laos and Myanmar (joined in 1997) and Cambodia (joined in 1999), were the newer members of ASEAN. Some economic indicators of ASEAN are revealed in Table 1. It is noted that within ASEAN, Singapore has the highest GDP per capita, to be followed by Brunei and Malaysia. Cambodia, Laos and Myanmar record the bottom three lowest level of income generated in 2005. In general, economies with higher levels of income have a higher percentage of literate population where many have better access to information and information technology through Internet usage. These relatively better performing economies are also enjoying better quality of life where life expectancy is up to approximately 70 years old. People living in the less developed economies in Southeast Asia, however, are expected to live up to about 60 years old.

Besides, ASEAN has a long history of existence within Southeast Asia. It has also successfully established a framework to an ASEAN free trade area, commonly known as AFTA, in 1992. Although the prospect of the so called free trade area remains bright and promising (Park, 2007), its development is relatively slow. Perhaps the 1997 Asian financial crisis, international terrorism, earth quakes and tidal waves, the tsunami, as well as the outbreak of diseases like the Severe Acute Respiratory Syndrome (SARS) and the avian flu, have hindered the development of AFTA. However, these devastating events are also indications of the need to accelerate regional co-operation to avoid or mitigate aggravation of future adverse shocks.

On the other hand, ASEAN is also a member of the Asia-Pacific Economic Co-operation (APEC). Within APEC, three economies with the highest Gross Domestic Product (GDP) per capita were the US with USD39,991.00, Japan USD36,184.00 and Australia USD30,695.00. The three poorest economies are Indonesia, Papua New Guinea and Vietnam, with USD1,003.00, USD686.00 and USD494.00, respectively. The US, Japan and China are three economies with the largest market demand with GDP of USD11,750.4 billion, USD4,621.2 billion and USD1,601 billion, respectively. However, the combination of Indonesia, Malaysia, the Philippines, Singapore and Thailand's (hereafter known as ASEAN-5) total exports are USD460,617 million and their total imports are USD393,491 million. Except for the US, the amount of exports and imports for ASEAN-5, is the highest as compared to each APEC member economies, individually. Moreover, a steady increase in population within ASEAN

Corresponding Author: Ong Hway Boon, Economics Unit, Faculty of Management, Multimedia University, 63100 Cyberjaya, Selangor, Malaysia Tel: 603-8312 5665 Fax: 603-83125590

Table 1: Some economic indicators of ASEAN

Country	GDP per capita (PPP US$) 2005	Life expectancy (year) 2005	Adult literacy (% of ages 15 and above) 1995-2005	Internet users (per 1,000 people) 2005
Singapore	29,663	79.4	92.5	571
Brunei	28,161	76.7	92.7	277
Malaysia	10,887	73.7	88.7	435
Indonesia	3,843	69.7	90.4	73
Vietnam	3,071	73.7	90.3	129
Thailand	8,677	69.6	92.6	110
Philippines	5,137	71.0	92.6	54
Cambodia	2,727	58.0	73.6	3
Laos	2,039	63.2	68.7	4
Myanmar	1,027	60.8	89.9	2

The GDP per capita stated in Table 1 is converted to US dollars and adjusted based on purchasing power parity, calculated in the Human Development Report 2007/08. Data for GDP per capita, life expectancy and Internet usage per 1,000 people represents information obtained for 2005. The percentage of adult literacy rate denotes literacy rate for 1995-2005. Human Development Report 2007/2008, United Nations

Table 2: Key indicators of APEC

Member economy (Year joined)	Area ('000 km^2)	Population (million)	GDP (US$bn)	GDP per capita (US$)	Exports (US$m)	Imports (US$m)
Australia (1989)	7,682	19.5	622.7	30,695	70,779	93,200
Brunei Darussalam (1989)	6	0.36	5.2	14,352	3,996	1,859
Canada (1989)	9,971	31.3	970.3	30,439	271,572	263,324
Chile (1994)	757	15.6	89.3	5,571	21,461	19,413
China (1991)	9,561	1,294	1,601	1,227	438,473	413,096
Hong Kong, China (1991)	1	7	164	23,592	228,654	233,194
Indonesia (1989)	1,904	217.5	222	1,003	72,360	43,211
Japan (1989)	378	127.5	4,621.2	36,184	471,913	383,361
Korea (1989)	99	47.4	667.4	13,806	193,817	178,827
Malaysia (1989)	333	23	112.5	4,418	120,693	99,600
Mexico (1993)	1,973	101.8	663.1	6,377	156,422	165,410
New Zealand (1989)	271	3.8	92.9	23,120	16,261	18,466
Papua New Guinea (1993)	463	5.7	4.0	686	3,585	1,367
Peru (1998)	1,285	26.5	66.2	2,290	8,420	8,162
Philippines (1989)	300	78.6	84.2	1,019	43,190	47,005
Russia (1998)	17,075	143.8	517.8	4,016	132,089	62,869
Singapore (1989)	1	4.2	103.6	23,999	144,121	127,996
Chinese Taipei (1991)	36	22.5	307.5	13,359	144,059	127,506
Thailand (1989)	513	64.3	165.7	2,556	80,253	75,679
United States (1989)	9,373	288.5	11,750.4	39,991	724,771	1,257,121
Vietnam (1998)	331	80.2	40.4	494	20,838	25,773

APEC Secretariat (2005)

is a source of labor and potential market demand. These key indicators are presented in Table 2.

It is interesting to note APEC's vast list of 21 member economies of Australia, Brunei Darussalam (hereafter known as Brunei), Canada, Chile, The People's Republic of China (hereafter known as China), Hong Kong China, Indonesia, Japan, South Korea (hereafter known as Korea), Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, The Republic of the Philippines (hereafter known as Philippines), The Russian Federation, Singapore, Taiwan, Thailand, US and Vietnam. This wide membership coverage spread out across the globe would allow APEC to outspeak any one individual country on its own. However, it would be challenging to formulate one fundamental policy to foster a significant economic union. Even the EMU took more than half a century to adopt euro among 12 of its then 15 member economies in 1999. As such, APEC with its 21 members of diverse economic, political and social background can expect a longer and intricate progress in achieving notable economic co-operation.

Hence, in October 2004, APEC leaders agreed that Regional Trade Agreements (RTAs) and Free Trade Agreements (FTAs) play a constructive role in accelerating liberalization in the region, thus contributing to the achievement of the Bogar goals and advancing to the World Trade Organization (WTO) process. They are also committed to greater transparency in RTAs and FTAs to facilitate public understanding of the scope and effect of these agreements. As such, in order to complement, rather than substitute APEC, efforts to promote AFTA is a rational approach to quicken the pace of economic cooperation among its members. But would AFTA be of significance to its members?

ASEAN's continuous effort to foster closer political ties as well as to strengthen economic co-operation are justified from its huge market opportunities, its democratic political belief, with the exception for Myanmar and its close proximity within the Southeast Asian region. Moreover, in recent years, regional co-operation and preferential trade arrangements have proven favorable intra-ASEAN trade (Sharma and Chua, 2000; Thornton

and Goglio, 2002). Although the 1997 Asian financial crisis and the September 11 event in 2001 had hampered the growth of ASEAN's economy, the gradual increase in intra-ASEAN trade (Ng, 2002; Kim, 2002; Shin and Wang, 2003) is apparent, with clear and positive correlation between intra-industry trade and business cycle synchronization (Cortinhas, 2007).

Several studies have analyzing economic unions through the generalization of optimum currency area theory. Yet, many have employed the cointegration technique to analyze the existence of real convergence of economies intending to form an economic alliance (Bremnes *et al.*, 2001; Sayek and Selover, 2002; Pascual, 2003; Wang and Dunne, 2003; Lim and McAleer, 2004). The cointegration test is employed to test for short and long run relationships among variables in question as well as to determine linkages or co-movement of variables. Besides, the cointegration analysis has also been used to investigate the time-varying characteristics of cointegration between financial and real macroeconomics aggregates.

Recently, Brada *et al.* (2005) used the cointegration analysis to investigate the convergence of non-stationary monetary macroeconomics aggregates of sample countries. They examined the time-varying characteristics of cointegration between financial and real macroeconomics aggregates of European Union nations. The rolling cointegration was used to obtain the time-varying or gradual estimates of the convergence of variables within the European Unions and between transition economies and the European Unions.

Hence, it is the motivation of this study to address the ongoing efforts of ASEAN-5 towards a rewarding regional co-operation. Specifically, this study is conducted in two folds. Firstly, to examine the degree of cointegration of ASEAN-5 economies. The long run macroeconomic relationship of ASEAN-5, measured by their respective real gross domestic product would give light to the level of linkages among ASEAN . Secondly, to ascertain the ongoing or time-varying convergence of the combinations of ASEAN-5 economies. Since the degree of cointegration may change over time due to changes in parameters or stochastic properties, the time varying cointegration analysis would be appropriate to detect gradual change in the degree of convergence among ASEAN-5 economies.

MATERIALS AND METHODS

This research studies the ongoing convergence of ASEAN-5 economies, namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand, the five founding members of ASEAN. Quarterly GDP series for the sampling period from Q1:1980 to Q4:2004 are extracted

from the International Financial Statistics published by the International Monetary Fund. As for unavailable earlier quarterly series like Q1:1980 to Q4:1989 GDP of Philippines, Q1:1980 to Q4:1990 GDP of Malaysia and Q1:1980 to Q4:1992 GDP of Thailand, they are interpolated from their annual series using Chow and Lin (1971) procedure. Although the study of GDP represents the overall macroeconomic activities (Cheung and Fujii, 2000; Shin and Wang, 2003; Brada *et al.*, 2005), they have to be factorized by the purchasing power parity (Kravis *et al.*, 1978) to ensure reasonable international comparison.

Nonetheless, a non-stationary time series cannot be regressed under the standard econometrics technique since it reveals spurious relationships about the variables. Spurious regressions tend to provide very promising regression results where R^2 is usually very high and tend to escalate as sample size increase. Spurious regressions are meaningless, misleading and invalid. As such, it is necessary to check the stationarity of time series prior to any other econometric analysis.

For the purpose of this study, the Augmented Dickey-Fuller (ADF) and the Kwiatowski *et al.* (1992), generally known as KPSS, are used to test for the existence of unit root problems in all series. Subsequently, the real macroeconomics aggregate is examined as follows:

$$Y_{A_{jt}} \equiv (Y_{A1}, Y_{A2}, ..., Y_{A5}) \tag{1}$$

where, j = 1, 2,…8; A1 represents Indonesia, A2 Malaysia, A3 Philippines, A4 Singapore and A5 Thailand; while Y represents log of real gross domestic product. If $Y_{A_{jt}}$ is cointegrated, it can be generated by a Vector Error Correction Model (VECM). As given by a VAR of order ρ:

$$y_t = \hat{\theta}_0 + \hat{\theta}_1 y_{t-1} + ...\hat{\theta}_\rho y_{t-\rho} + \hat{\sigma}d_{t-1} + \hat{\varepsilon}_t \tag{2}$$

$$\Delta y_t = \Pi_0 + \sum_{i=1}^{k-1} \Pi_i \Delta y_{t-1} + \Pi y_{t-1} + \hat{\sigma}d_t + \varepsilon_t \tag{3}$$

where, d_t is a vector of deterministic variables, $\Delta y_t = y_t - y_{t-1}, \Pi_0 = \hat{\theta}_0, \Pi_i = -\sum_{j=i+1}^{\rho} \hat{\theta}_j$ and $\Pi = \sum_{i=1}^{\rho} \hat{\theta}_i - 1$

The Johansen-Juselius (1990) trace statistic tests the null hypothesis if at most r cointegrating vectors among a system of n time series exists, where $0 \le r \le n$, for $H_0: r \le r_0$ against the $H_1: r > r_0$ The trace statistics is computed as follows.

$$\text{Trace} = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \tag{4}$$

where, $\hat{\lambda}_i$ are the estimated eigenvalues from Π and it is the n-r smallest squared canonical correlations of y_{t-1} with respect to Δy_t corrected for lagged differences. T is the sample size actually used for estimation. If the null hypothesis could not be rejected, that reveals a common stochastic trend, an implication of a considerable degree of integration among the economies.

On the other hand, the maximum eigenvalue tests for exactly r cointegrating vectors of H_0: $r \leq r_0$ against the H_1: r = r+1. The maximum eigenvalue statistics is as follows.

$$\text{Maximum eigenvalue} = \lambda_{max} = T \ln(1 - \hat{\lambda}_{i+1}) \qquad (5)$$

where, $\hat{\lambda}_i$ are the estimated eigenvalues from Π and T is the number of observations used for estimation. If the null hypothesis of exactly r cointegrating vectors could not be rejected, that will imply that there is common stochastic trend.

Next, the ongoing convergence estimation introduced by Brada *et al.* (2005), is used to examine the degree of convergence during different sub-sample period of the full sample using Johansen cointegration rank tests. The ongoing convergence of the rolling cointegration technique captures the change in the degree of cointegration over time due to changes in parameters or stochastic properties. In this study, the rolling

cointegration of the trace statistics is conducted to examine ongoing cointegration among ASEAN-5 economies. The trace statistics, scaled by adjusted 95% critical values, are obtained by using 40 + k observations sample frame, where k is the lag length determined via the Akaike Information Criterion (AIC). Thus, a value of more than 1 indicates rejection of the hypothesis of no cointegration at 5% level.

RESULTS AND DISCUSSION

At the 5% level of significance, the ADF tests reveal that all series, at constant and with trend, are not stationary, at level. All series are found to be stationary after taking the first difference. Similarly, KPSS tests suggest that all series, at constant and with trend, are I(1) at the 5% level of significance (Table 3).

Besides, the Johansen-Juselius tests for multiple cointegrating vectors are reported in Table 4. The trace tests of the null hypothesis of at most one cointegrating vector for ASEAN-5 is rejected at the 5% level, an indication of two cointegrating vectors within ASEAN-5. At the 5% level, the maximum eigenvalue statistics re-confirms the previous trace test results. That is to say that there is an initial convergence within the region, a positive indication for closer economic co-operation with lesser adverse impact on any individual economy.

Table 3: Results for ADF and KPSS

	ADF				KPSS			
	At levels		First difference		At levels		First difference	
Variables	Constant (t_u)	Trend (t_r)	Constant (t_u)	Trend (t_r)	Constant (Zt_u)	Trend (Zt_r)	Constant (Zt_u)	Trend (Zt_r)
LnY_Indo	-0.7235(1)	-2.2414(1)	-5.4348(1)**	-5.4104(1)**	1.0217(8)**	0.1795(8)**	0.0794(4)	0.0571(4)
LnY_My	-0.8829(2)	-2.1930(2)	-4.1691(3)**	-4.1526(3)**	1.0175(8)**	0.2035(8)**	0.0727(9)	0.0770(9)
LnY_Ph	-1.8632(2)	-1.7056(2)	-3.4612(4)**	-3.7436(4)**	1.0751(8)**	0.2011(8)**	0.1975(4)	0.040(4)
LnY_Sp	-1.2778(2)	-0.7935(2)	-3.5306(6)**	-3.6908(6)**	1.17510(8)**	0.2245(8)**	0.2204(5)	0.0914(7)
LnY_Th	-1.3588(1)	-1.4051(1)	-6.5666(1)**	-6.5346(1)**	0.5433(8)**	0.2271(8)**	0.1254(4)	0.1096(4)

** (*): Denotes rejection of the null hypothesis at the 5 and 10% level, respectively

Table 4: Multivariate cointegration tests

Hypothesis		ASEAN-5
Trace test		
H_0	H_1	
r = 0	r ≥ 1	110.986**
r ≤ 1	r ≥ 2	56.333**
r ≤ 2	r ≥ 3	27.368
r ≤ 3	r ≥ 4	12.713
r ≤ 4	r = 5	1.751
Maximum eigenvalue test		
H_0	H_1	
r = 0	r = 1	54.652**
r ≤ 1	r = 2	28.965**
r ≤ 2	r = 3	14.656
r ≤ 3	r = 4	10.961
r ≤ 4	r = 5	1.751

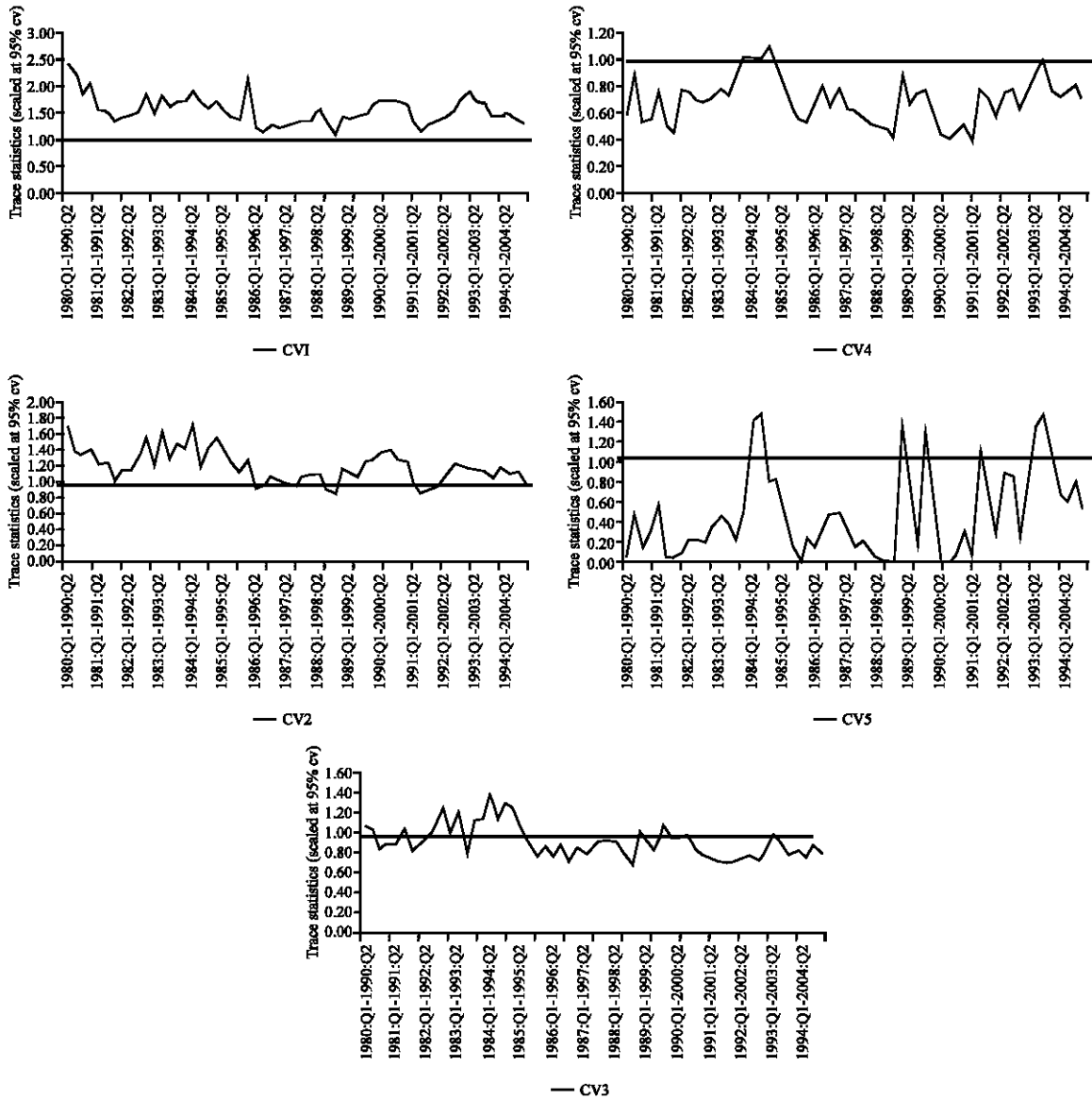**, *Denotes rejection of the hypothesis at the 5% (10%) level

Fig. 1: Ongoing convergence of ASEAN-5

Subsequently, the ongoing convergence analysis reveals that there is at least one cointegrating relationship for the sample frame rolling forward at 42 observations throughout the whole sample (Fig. 1).

CONCLUSION

This study provides significant evidence of ASEAN's regular effort in promoting regional economic cooperation within Southeast Asia. With at least two cointegrating relationships among ASEAN-5, there is evidence of long run macroeconomic linkages among ASEAN-5, a significant implication to foster closer economic ties with lesser adverse impact on any individual economy. The ongoing convergence of at least one cointegrating relationship among ASEAN-5 further support the proposition of continuous economic collaboration within ASEAN-5.

Thus, the empirical findings suggest that all ASEAN-5 are compatible but ASEAN's recent effort of re-organizing its financial systems will further improve the compatibility of its members. For instance, the merger of financial institutions in Malaysia and the restructuring of Indonesia and Thailand's financial system as required under the IMF financial crisis financing scheme are efforts worth noting as efforts to better prepare AFTA for a stronger, liberalized and resilient financial system.

Table 5: Intra-ASEAN export (2000-2003)

Country			Brunei	Cambodia	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Total
2000	Total	(in US$ million)	2,169.2	1,367.5	62,124.0	98,154.5	1,193.9	38,078.3	138,352.5	68,700.9	410,140.6
	Intra-ASEAN	(in US$ million)	639.5	76.0	10,883.7	24,408.6	393.5	5,982.6	37,784.0	12,708.2	92,876.0
	Intra-ASEAN	(%)	29.0	6.0	18.0	25.0	33.0	16.0	27.0	22.0	23.0
2001	Total	(in US$ million)	3,530.5	1,495.1	56,317.6	88,031.6	2,218.4	32,150.2	121,686.8	64,925.6	370,355.8
	Intra-ASEAN	(in US$ million)	774.8	72.6	9,507.1	21,024.2	951.3	4,986.0	32,815.4	12,194.6	82,325.9
	Intra-ASEAN	(%)	22.0	5.0	17.0	24.0	43.0	15.0	27.0	22.0	22.0
2002	Total	(in US$ million)	2,690.9	1,916.1	57,158.8	93,277.2	2,452.2	35,208.2	125,042.7	66,108.2	383,854.3
	Intra-ASEAN	(in US$ million)	684.2	91.9	9,933.5	22,127.1	1,221.3	5,529.7	33,962.6	12,840.4	86,390.7
	Intra-ASEAN	(%)	25.4	4.8	17.4	23.7	49.8	15.7	27.2	19.4	22.5
2003	Total	(in US$ million)	3,211.1	2,115.7	61,058.2	99,377.6	4,463.8	36,231.2	143,483.3	80,450.1	430,391.0
	Intra-ASEAN	(in US$ million)	632.9	101.5	10,725.4	26,630.8	3,060.2	6,581.7	35,842.9	16,143.9	99,719.3
	Intra-ASEAN	(%)	19.7	4.8	17.6	26.8	68.6	18.2	25.0	20.1	23.2

ASEAN Statistical Yearbook 2004. Information for Vietnam and Laos were omitted due to unavailability of published data

Table 6: Intra-ASEAN import (2000-2003)

Country			Brunei	Cambodia	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Total
2000	Total	(in US$ million)	1,067.6	1,404.6	33,514.8	79,647.5	2,219.4	31,387.4	134,680.0	61,935.3	345,856.6
	Intra-ASEAN	(in US$ million)	534.4	549.1	6,781.2	15,934.9	1,113.3	4,955.4	33,291.3	10,049.4	73,209.0
	Intra-ASEAN	(%)	50.1	39.1	20.2	20.0	50.2	15.8	24.7	16.9	21.3
2001	Total	(in US$ million)	1,310.0	1,502.0	30,962.1	73,097.9	2,811.0	29,550.8	115,919.0	61,975.4	317,128.2
	Intra-ASEAN	(in US$ million)	544.8	1,091.7	5,726.8	15,254.3	1,319.2	4,664.8	28,991.0	9,241.4	66,834.0
	Intra-ASEAN	(%)	41.6	72.7	11.2	20.9	46.9	15.8	25.0	16.2	20.1
2002	Total	(in US$ million)	1,600.4	1,664.8	31,288.9	78,797.8	2,118.1	33,576.4	116,336.4	62,729.9	328,112.7
	Intra-ASEAN	(in US$ million)	627.5	598.0	6,995.5	17,245.2	1,190.8	5,542.0	30,441.4	9,683.1	72,323.5
	Intra-ASEAN	(%)	39.2	35.9	22.4	21.9	56.2	16.5	26.2	15.4	22.0
2003	Total	(in US$ million)	1,351.9	2,906.4	32,550.7	80,091.1	1,843.3	37,496.5	127,320.7	75,759.4	359,320.0
	Intra-ASEAN	(in US$ million)	616.9	1,694.9	8,030.3	14,329.5	967.8	6,398.1	31,085.7	11,699.4	74,822.6
	Intra-ASEAN	(%)	45.6	58.3	24.7	17.9	52.5	17.1	24.4	15.4	20.8

ASEAN Statistical Yearbook 2004, Information for Vietnam and Laos were omitted due to unavailability of published data

Nevertheless, there are some issues that ASEAN leaders have to take note of in order for AFTA to progress further. Firstly, the underlying incentive structure behind the process of integration should be made known to all ASEAN member economies and not be wiped out with some other trade and non-trade restrictions. The initial change towards free trade may be painful as the economy needs time to make the necessary adjustment but in time, sufficient incentive would make the effort worth while. As for newer ASEAN members, namely, like Vietnam, Laos, Myanmar and Cambodia, ASEAN-5 could provide some assistance by drafting special preferential trade guidelines to boost trade among ASEAN members in preparation to include all ASEAN members into AFTA.

Moreover, a more serious regional co-operation would require governing authorities to put in practice what has been agreed upon during discussions and signing of MOUs among ASEAN. In concurrence with Ramayandi (2005), the process of ASEAN integration would involve considerable incentive structure and proper institutional set-up. Hence, now is the time for ASEAN-5 to formulate reasonable and workable strategy to complete transformation of ASEAN into a FTA.

APPENDIX

From 2000 to 2003, Singapore was the main intra-ASEAN exporter, to be followed by Malaysia and third

Thailand. Similarly, Singapore remained as the main intra-ASEAN importer since 2000 up to 2003, to be followed by Malaysia and third Thailand. Table 5 provides information for intra-ASEAN exports and Table 6 provides for intra-ASEAN import.

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