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International trade and regional income convergence: the ASEAN-5 evidence

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Keywords

ASEAN-5, trade liberalisation, income convergence, structural breaks and causality

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by

Kankesu Jayanthakumaran and Reetu Verma

Abstract

This paper intends to show that that multilateralism and regionalism are complementary and that regional income convergence is likely with the like-minded and committed regionalism that often has links geographically and culturally. In this direction this paper examines the association between international trade, income per capita, regional income convergence in ASEAN-5 by applying the LP (Lumsdaine and Papell, 1997) approach, which allows two endogenous structural breaks. The paper further explores the causal relationships among the above variables by using Granger causality tests. We used intra-ASEAN-5's (of the 5 founding counties) historical data by isolating the following different historical policy interventions: the introduction of Preferential Trade Agreement (PTA) in 1977 (regionalism), the unilateral liberalisation following the severe recession of the mid-1980s (non-discriminatory multilateralism), the ASEAN Free Trade Area (AFTA) formation (regionalism) in 1992 and ASEAN and more Regional Trade Agreements such as ASEAN plus China plus Korea plus Japan; India plus Malaysia; Thailand plus United States.

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JEL Codes:

Introduction

This paper proposes the hypothesis that multilateralism (non-discriminatory) and regionalism (Regional Trade Agreements – RTAs) are complementary and that regional income convergence is likely with the like-minded and committed RTAs that often has links geographically and culturally. The inter-links and complementarity nature of RTAs and multilateralism is complex but extensively discussed in the literature (Ethier, 1998: Ornelas, 2005: Koopmann 2003: Freund 2000: Lee and Shin, 2006). The globally-oriented commitments of ASEAN-5 countries can be viewed as a strengthening force rather than a detrimental force for the region. The ASEAN-5 countries experience on enhancing positive aspects of regionalism without ignoring the potential benefits that arise from globally-oriented commitments are likely to trigger regional economic activities and factor mobility through creating links between the regional firms and industries. The expectation is that the regionally-oriented trade and investment reforms tend to allocate resources within the region in response to elimination of quotas and removal of tariffs in the traditionally protected sectors and tend to motivate regional income convergence in the light of comparative advantage and trickle down effect (flowing income to the poor over time).

This paper first examines the association between trade per person, income per capita and regional income convergence in ASEAN-5 nations, in order to present an analysis of trade policy interventions in regional income convergence by exploiting comparative advantage and by allowing the income flow to the rich nation to poor through trickle down effects. Next it evaluates causal links between trade per person, income per capita and regional income convergence. Finally it concludes with a brief evaluation of the role of trade policy intervention in pushing the economies of ASEAN-5 countries towards reducing income gap. Section 2 reviews the theoretical and empirical aspects of trade liberalisation and regional income convergence. Section 3 discusses trade liberalisation and regional income convergence in ASEAN-5 countries. Section 4 deals with methodology and 5 with results. Section 6 presents our conclusions.

Trade liberalisation and regional income convergence

It is expected that the removal of protection likely to promote efficiency by removing the allocative distortions in line with comparative advantage, lower 'x-inefficiency' through exposure to foreign competition, and raise long-run rate of growth through exposure to

greater technical change and access to long-run economies of scale in an open environment. Solow proposes factor-price equalisation theorem which show that free trade tend to equalise (or converge) factor prices and endowments across the countries. According to Solow, per capita income convergence arises from per capita capital- stock convergence. Countries concerned tend to move toward the similar capital-labour ratio and the similar factor prices. Based on Solow perspective, Slaughter (1997) shows three possible ways that international trade likely to have an impact on per capita income; enforcing factor price equalisation theorem as indicated above, mediating international flows of technology and trading capital goods. However, factor price equalisation theory address only the factor prices but not factor quantities. It does show outcomes in steady-state free-trade equilibria and does not show the process of trade liberalisation. Empirical studies accommodate the above issues by considering proxies such as high levels of trade between countries and the removal of obstacles of trade in their analytical framework. For example, Ben-David (1996) hypothesises those countries that trade a great deal with one another tend to converge. Ben-David (1996) further analyses the relationship between trade liberalisation and income convergence and suggests that it is the former that produces the latter, rather than the other way around.

Early studies focus the evidence on trade to per-capita income convergence are Ben-David (1996), and Sachs and Warner (1995). Slaughter (1997) indicates that the above authors directly relate a trade policy change to per-capita convergence obtains positive relationship and suggests more work in this regard. The recent literature tends to focus the evidence on globalisation to international income convergence (Pritchett, 1997; Baddeley, 2006; Ghose, 2004) arrived at mixed results. Pritchett (1997) and Baddeley (2006) show that wealthier countries grew faster than the poor countries and the current era of globalisation has not been associated with convergence in economic outcomes. In contrast, Ghose (2004) concludes that improved trade performance in the light of trade liberalisation stimulated the growth performance across the countries concerned and reduced the international inequality without reducing inter-country inequality.

The catching-up or convergence hypothesis says that poor economies within the region (RTAs) are expected to grow faster than wealthier economies in the process of regional integration. There are three arguments in this regard from the literature survey. First, the late-

comers (poor economies) can easily adopt existing technologies which the pioneers developed through their efforts. Trade raises factor prices for late-comers and thus per-capita income. Second, as the growth theory assumes diminishing returns to factor inputs, the capital productivity is higher among late-comers who are subject to capital-scarce. The expectation is that capital-labour ratio converges across the region and thus per-capita income. Third, workers are likely to move from low-productivity agricultural activities to various ranges of high-productivity manufacturing and service sectors in which they have cost advantages. These arguments are subject to criticism as wealthier countries in the region have (a) their accumulated experience of developing leading edge technologies, (b) the poor economies tend to adopt labour intensive technology instead of capital intensive technology and (c) accessing increasing returns to factor inputs and (Slaughter, 1997; Ghose 2004). The convergence hypothesis can not only be interpreted at the growth aspect as mentioned above but also distributional outcomes widely known as income trickle down effect. It is expected that the higher the integration across the region higher will be the trickle down effect as regionally-oriented trade and investment reforms tend to allocate resources within the region in response to comparative advantages and trickle down the income to the respective growing sectors over time.

The inter-links and complementarity nature of regionalism (discriminatory RTAs) and multilateralism (non-discriminatory) is complex but extensively discussed in the literature (Ethier, 1998; Ornelas, 2005; Koopmann 2003; Freund 2000; Lee and Shin, 2006). Although RTAs are by nature discriminatory, they are capable of deeper trade reforms since they are more like-minded and committed and often linked geographically and culturally. The access of wider regional markets motivates deep economic and institutional integrations. Additional economic reforms enhance the regional cost advantage and eventually allowing the region to reach multilateralism and gain globally-oriented efficiency. The marginal regionally-oriented trade and investment reforms (removal of protection) tend to allocate resources within the region in response to elimination of quotas and removal of tariffs in the traditionally protected sectors. On the other hand, globally-oriented reform policies are likely to trigger regional economic activities and factor mobility through creating links between the regional firms and industries due to lower transaction and transport costs. Regional member countries are relatively capable of exploiting the advantages mainly because of lower transportation costs, similar ethnic and cultural links and lower transaction costs.

Studies attempt to focus on RTAs to income convergence (Moon, 2006; Niebuhr and Schlitte, 2004; Lopez-Bazo, Vaya and Artis, 2004) are arrived at mixed results. Convergence within a group of nations does not imply a reduction in international inequality but does imply a convergence within a group motivated by population growth rates, investment rates, human capital and policy interventions. For example, Niebuhr and Schlitte (2004) conclude that per capita incomes in the 15 European Union countries converged between 1950 and 2000 at an estimated average rate of about 1.6%. Moon (2006) concludes that East Asia as a whole tends to converge through the period 1980-2000. Park (2000) finds no evidence of convergence in Intra-Southeast Asian countries. Lopez-Bazo, Vaya and Artis (2004) study the externalities of production across the European region concludes that spill overs are far from negligible, are robust, and may cause non-decreasing returns at the spatial aggregate level. Studies attempt to focus on trade to income convergence at a country level (Yao, Zhang and Feng, 2005; Silva and Leichenko, 2004) reveal mixed results. Silva and Leichenko (2004) investigates the effects of trade on income inequality across regions/states in the United States and concludes uneven impacts of globalisation. Yao, Zhang and Feng (2005) show a clear evidence of divergence in per-capita rural (and urban) incomes and total expenditures.

Trade liberalisation and income convergence: ASEAN-5 countries

Trade liberalisation

Malaysia, Indonesia, Thailand, the Philippines and Singapore formed the ASEAN-5 group in 1967 to promote cooperation in economic, social and cultural areas and to promote regional peace and stability.¹ Since then, four different trade policy changes are prominent focusing multilateralism and RTAs by the ASEAN-5 countries: the introduction of Preferential Trade Agreement (PTA) in 1977, the unilateral liberalisation following the severe recession of the mid-1980s, the ASEAN Free Trade Area (AFTA) formation in 1992 and the proliferation of RTAs in the 2000s such as ASEAN plus China plus Korea plus Japan; India plus Malaysia; Thailand plus United States.

¹ The ASEAN-6 emerged by incorporating Brunei in 7 January 1984. The ASEAN-10 countries emerged by incorporating Burma, Cambodia, Laos, and Vietnam in the 1990s. Our research focuses on the ASEAN-5 founding nations mainly because of continuous data availability.

Preferential Trade Agreements (PTAs) became effective in 1977 which outlined a mechanism whereby the member countries could liberalise trade at a pace that was acceptable. Initially, 71 items were selected with a voluntary product-by-product approach under the PTAs. By June 1986, this is extended to 12647 items using a more efficient across-the-board approach. The ASEAN-5 countries were unable to reach stable agreements in terms of items under the PTA in order to enhance economic benefits associated with trade creation mainly because they were producing the same type of labour-intensive commodities.

Following the severe recession of the mid-1980s, and the steady fall in the price of oil, important policy reforms (deregulation, trade, finance, tax and foreign direct investment) have been initiated by the ASEAN-5 countries at their own pace (Tan, 2004). The extent of reforms varies between these countries and over time but trade liberalisation as the bottom-line of all reform exercises remained the same. The measures taken by the ASEAN-5 countries reduced the inefficiencies and transaction costs in the system and accelerated economic growth which in turn resulted in 'innovative and bold regional experiments' (Ariff, 1994). The advantage of similar cultural values, low wages and strong fundamentals promoted export-oriented foreign investments and exports among the ASEAN-5 countries. In brief, the ASEAN-5 countries were integrated more than ever partly due to regional economic cooperation initiated by them and partly due to anonymous market forces initiated by globally oriented policies. Evidence shows that the unilateral liberalisation taken by the ASEAN-5 countries outside the ASEAN framework in the late 1980s united the ASEAN members in economic cooperation and contributed to increased intra-ASEAN trade flows (Imada, 1993; Ariff, 1994; Kettunen, 1998).

To reap the potential economic benefits from the region, the ASEAN Free Trade Area (AFTA) was formed in 1992.² The Common Effective Preferential Tariff (CEPT) Agreement, which was agreed upon under the AFTA, identified commodities (the inclusion list) that were traded within the ASEAN region and were ready for tariff reduction, thus meeting the 40 per cent ASEAN's content requirement. These commodities were subject to reducing tariffs to 0-5 per cent by the year 2002/2003, although the new members of ASEAN - Cambodia, Laos,

² The preparation for forming the AFTA began in 1990. The AFTA Council was formed as an institutional arrangement which comprised Ministers from the ASEAN member States and the Secretary-General of the ASEAN. The AFTA Council was made responsible for supervising, coordinating and reviewing the implementation of the CEPT agreement that covered manufacturing, processed and unprocessed agricultural commodities.

Burma and Vietnam - were scheduled to reduce tariff rates to the 0-5 per cent level according to different timetables. The CEPT recognised that tariff reductions should move ahead on both the "fast" and "normal" tracks. Tariffs on goods in the fast track met the reduction of tariffs requirement by 2000 and in the normal track by 2003. About 81 per cent of tariff lines within the ASEAN countries are covered by either the fast or normal track. It is now covering nearly 98 per cent of all tariff lines.³ Commodities that are not ready for tariff reductions are put under the temporary exclusion list. Tariffs on these commodities will also ultimately be lowered to 0-5 per cent. The average CEPT tariff rate in the inclusion list has been reduced from 12.76 per cent in 1993 to 2.68 per cent in 2003 (US-ASEAN Business Council, 2004). After 1992, agreements have also been reached for intra-ASEAN investment, non-tariff barriers, services, intellectual property, customs and tourism.

In the 1990s, the extension of AFTA to new members in the region such as Burma, Cambodia, Laos, and Vietnam has renewed the interest in the ASEAN broader regional integration and the commitment to 'open regionalism' and 'new regionalism'. In the 2000s, AFTA and its member nations collectively and individually attempted to enter in more RTAs within and outside Asia such as ASEAN plus China plus Korea plus Japan; India plus Malaysia; Thailand plus United States. The prospects of ASEAN's decision in 2003 to create an ASEAN Economic Community by 2020 were another important agenda in the pipeline. This would necessitate an ASEAN Customs Union to be formed (Plummer, 2006).

Income convergence

Widely used measures as proxies for income inequality are Gini coefficient and Theil index. Theil index enables one to decompose overall changes in the region into changes within constituent groups of countries and suitable for regional analysis. However, the Theil index lacks a straightforward representation and the appealing interpretation as like Gini coefficient. To measure the level of income inequality (relative poverty means income inequality) we have constructed Theil index by dividing the ASEAN region into five original member countries and calculated the convergence/divergence of income within the region.

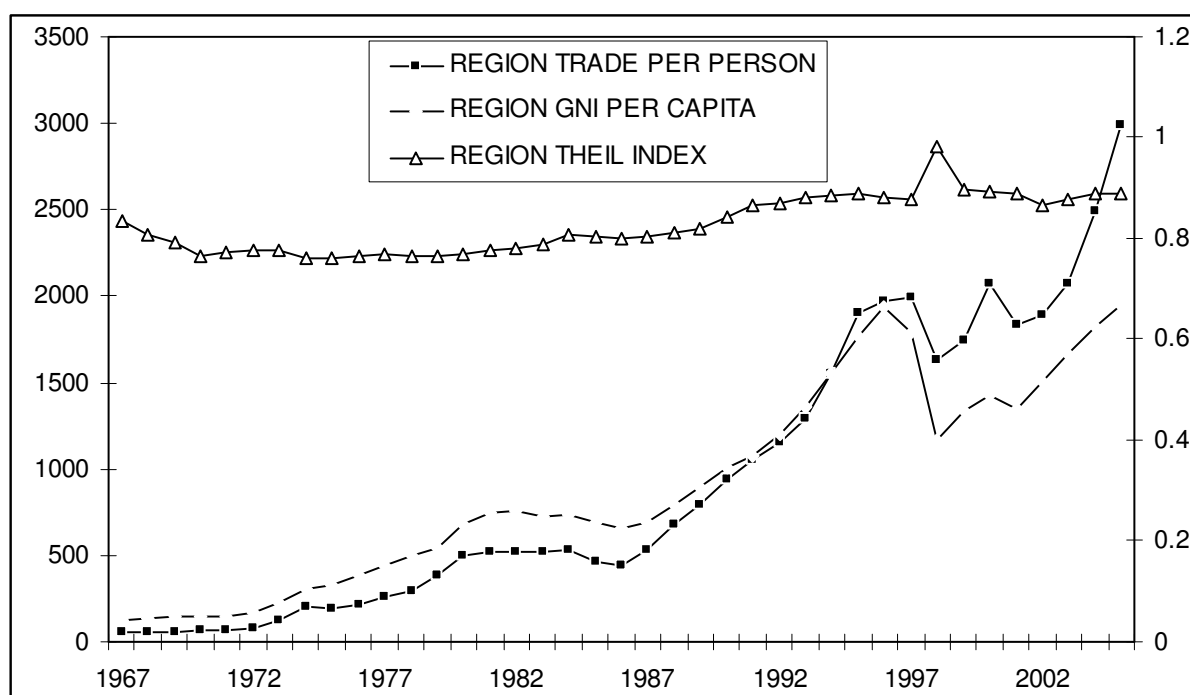
³ The CEPT status for ASEAN-5 in 2001 was as follows: tariff lines in the inclusion list 37391, in the temporary exclusion list 239, in the general exception list 175, and in the sensitive list 144.

The Theil measure of inequality reveals an indicator of the relative distribution of income across the nations by measuring the proportion of each nation's income share to the region to its population share to the region and summing these figures to the region. Let the country i populating share of the region be p_i , $\sum_i p_i = 1$; the country i income share of the region by y_i , $\sum_i y_i = 1$; the region R_g population share of the nation be $p_g = \sum_i p_i$, $i \in R_g$; and the region R_g income share of the region be $y_g = \sum_i y_i$, $i \in R_g$. The measure can be written as;

$$J_r = (1/n_g) \sum_{i \in R_g} \left(\frac{p_i}{p_g} \right) \div \left(\frac{y_i}{y_g} \right)$$

Where, n_g is the number of countries in the region R_g . When $J_r > 1$, the country concerned has less than its proportional share of national income. In other words, population share is larger than income share implying higher levels of inequality across countries. When, $J_r < 1$, the country concerned receives a larger share of income than its share of population.

Figure 1: Trade per person, GNI per capita and Theil (convergence) index: ASEAN-5



Source: computed from World Bank (2006)

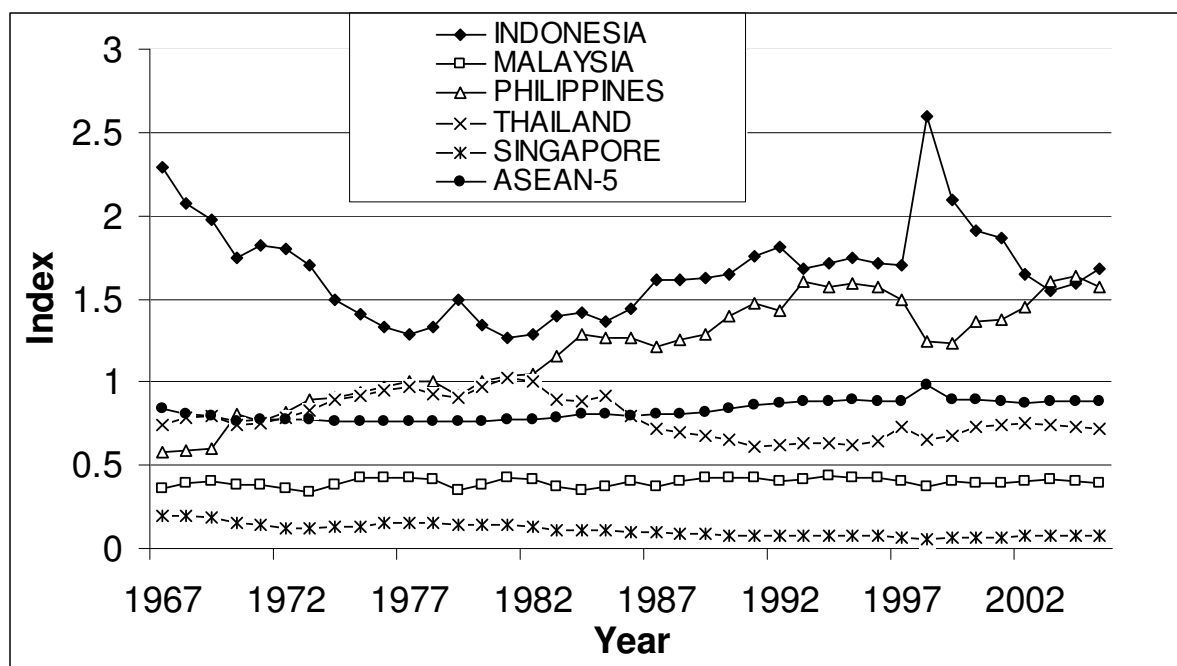
Figure 1 shows the trade per person and GNI per capita and Theil index for the 5 founding ASEAN countries as a whole. It is evident in this figure that these major partners seem to have experienced a relative boost in their trade per person and GNI per capita after the 4 following approximate dates: 1977, 1987, 1992 and 2002. The Asian financial crisis is also

visible with a sudden drop in 1997-1998. The ASEAN-5 recovered from then on. Another notable aspect of 'Figure 1' is that trade per person exceeds income per capita in 1992 and the gap widened after the Asian crisis.

Theil values over the study period indicate that the ASEAN-5 region receives a larger share of income, on average, than its share of population (Figure 2). Theil values show that divergence (inequality) across the member countries increased from 0.76 in 1970 to 0.89 in 1995 and remained the same thereafter except in 1998. In 1998, the ratio has gone around 0.98 reflecting the consequences of convergence. This is followed by deteriorating income due to Asian crisis. Figure 1 show convergence with rising international trade and income.

Theil values for individual countries are depicted in Figure 2. Theil index is greater than one ($J_r > 1$) for Indonesia and the Philippines indicating that these two countries are having less than its proportional share of national income. Over the study period, the Theil index for both countries was subject to instable and reached its maximum 2.59 for Indonesia in 1998 and 1.60 for the Philippines in 1993. The index is less than one ($J_r < 1$) and stable for Malaysia and Singapore over the study period indicating that they are receiving larger share of income than its share of population. Thailand is a notable country which converged comfortably by increasing the income especially after 1988.

Figure 2: Theil Index: Indonesia, Malaysia, Philippines, Thailand, Singapore, and ASEAN-5 as a whole.



Source: computed from World Bank (2006)

Methodology

This study tests the hypothesis that multilateralism and regionalism are complementary and that regional income convergence is likely with the like-minded and committed regionalism that often has links geographically and culturally. To determine the impact of government interventions on trade and regional income convergence/divergence, this paper investigates the unit root analysis in the presence of structural breaks by applying Lumsdaine and Papell's (LP, 1997) approach. Historical time series data of trade per person (proxy for government intervention on trade) and GNI per capita (proxy for efficiency) and trade per person and Theil's index (proxy for income convergence/divergence) covers the periods 1967 to 2005.

It is well known that traditional tests of stationarity in time series are biased towards not rejecting the null hypothesis of non-stationarity when structural changes are present.⁴ Perron's (1989) procedure is characterized by a single exogenous (known) break in accordance with the underlying asymptotic distribution theory. Perron used a modified Dickey-Fuller unit root tests that included dummy variables to account for one known or exogenous structural break. However, Perron's known assumption of the break date was criticized, most notably by Christiano (1992) as 'data mining'. Christiano argued that the data based procedures are typically used

⁴ *Vide* Perron (1989).

to determine the most likely location of the break and this approach invalidates the distribution theory underlying conventional testing. Since then, several studies⁵ have developed using different methodologies for endogenously determining the break date. These studies have shown that this endogenous approach lessens the bias in the usual unit root tests. As Perron (1997, p.356) states: "...if one can still reject the unit-root hypothesis under such a scenario it must be the case that it would be rejected under a less stringent assumption".

However, these studies only capture the single most significant break in each variable. Lumsdaine and Papell (1997) argued that consideration of only one endogenous break may be not sufficient and under such circumstances it could lead to loss of information when actually more than one break exists. Further to this, Ben-David *et al* (2003) argued that "just as failure to allow one break can cause non-rejection of the unit root null by the Augmented Dickey –Fuller (ADF) test, failure to allow for two breaks, if they exist, can cause non-rejection of the unit root null by the tests which only incorporate one break" (2003:p. 304). While Maddala and Kim (2003) believe that allowing for the possibility of two endogenous break points provides further evidence against the unit root hypothesis.

Lumsdaine and Papell (1997) introduce a procedure to capture two structural breaks and argue that unit roots tests that account for two significant structural breaks are more powerful than those that allow for a single break. LP uses a modified version of ADF test which are augmented by two endogenous breaks as follows:

$$\Delta y_t = \mu + \beta t + \theta DU1_t + \gamma DT1_t + \omega DU2_t + \phi DT2_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

where Δ represents the first difference operator and y_t is the time series being tested. $DU1_t$ and $DU2_t$ are dummy variables that capture structural changes in the intercept at $TB1$ and $TB2$ ($1 < TB < T$, TB is the break date), respectively. The other two dummy variables (*i.e.* $DT1_t$ and $DT2_t$) capture shifts in the trend variable at time $TB1$ and $TB2$ respectively. $DU1_t = 1$ if $t > TB1$ and zero otherwise; $DU2_t = 1$ if $t > TB2$ and zero otherwise; $DT1_t = t - TB1$ if $t > TB1$ and $DT2_t = t - TB2$ if $t > TB2$ and zero otherwise. The LP model allows for two breaks in both intercept and slope term of the trend function where the break points, $TB1$ and $TB2$ are selected based on the minimum value of the t statistic for α . The general to specific approach

⁵ Studies include Banerjee, Lumsdaine and Stock (1992), Zivot and Andrews (1992), Perron and Vogelsang (1992) and Perron (1997).

(the t test) was used in this study to select the optimal lag length (k) as suggested by Ng and Perron (1995) with $K_{max}=8$. The null hypothesis of a unit root is rejected in favour of the alternative hypothesis of stationary around two breaks, if the t -statistic for α is larger in absolute values than the appropriate critical values.

This study then evaluates the causal links between trade and GNI per capita and trade and Theil's index. A time series (X_t) causes another time series (Y_t) in the Granger sense if the present y can be predicted better by using past values of x than by not doing so, considering also other relevant information, including past values of y . Y is said to be Granger-caused by x if x helps in the prediction of y or equivalently if the coefficients on the lagged x 's are statistically significant. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term. The Granger causality test is applied based on stationary dataset. Hence, it was made sure that all the variables were stationary by running the LP test taking the first difference for all the I(1) variables. The empirical results presented in this paper are calculated within a simple Granger-causality test in order to test whether TRADE "Granger causes" THEIL and vice versa; and whether TRADE "Granger causes" GNI and vice versa. Thus the following equations for the Granger causality model in bivariate VAR are carried out for all the countries:

$$TRADE_t = \alpha_{t1} + \sum_{j=1}^p \alpha_{11,j} TRADE_{t-j} + \sum_{j=1}^p \alpha_{12,j} GNI_{t-j} + \varepsilon_{t1} \quad (2)$$

$$GNI_t = \alpha_{t2} + \sum_{j=1}^p \alpha_{21,j} GNI_{t-j} + \sum_{j=1}^p \alpha_{22,j} TRADE_{t-j} + \varepsilon_{t2} \quad (3)$$

$$TRADE_t = \alpha_{t1} + \sum_{j=1}^p \alpha_{11,j} TRADE_{t-j} + \sum_{j=1}^p \alpha_{12,j} THEIL_{t-j} + \varepsilon_{t1} \quad (4)$$

$$THEIL_t = \alpha_{t2} + \sum_{j=1}^p \alpha_{21,j} THEIL_{t-j} + \sum_{j=1}^p \alpha_{22,j} TRADE_{t-j} + \varepsilon_{t2} \quad (5)$$

where α_{t1} and α_{t2} are the constants; ε_{t1} and ε_{t2} are error terms; and p is the lag length. A test of joint significance of these lagged terms ($\alpha_{12,j} = 0, j = 1, \dots, p$ and $\alpha_{22,j} = 0, j = 1, \dots, p$) constitutes a short-run Granger causality test. Equations (2) and (3) tests for the causality between TRADE and GNI while equation (4) and (5) tests for causality between TRADE and THEIL.

The coefficients of lagged value, $\beta_{12,j}$ β for $j = 1, \dots, p-1$, in equation (2) and (4) represent short-run effects of GNI and THEIL on TRADE and $\beta_{21,j}$ for $j = 1, \dots, p-1$, and in equation (3) and (5) represent short-run effects of TRADE on GNI and THEIL. The Granger causality test states that if X ‘Granger cause’ Y , but Y does not ‘Granger cause’ X , then one may conclude that past values of X should be helpful in predicting the future value of Y , but the past value of Y is not helpful in forecasting X . Based on the estimated OLS coefficients for the equations (3) and (4), four different hypotheses about the relationship between TRADE and GNI can be formulated:

(i) Unidirectional Granger-causality from TRADE to GNI if:

$$\sum_{j=1}^p \alpha_{22,j} \neq 0 \text{ and } \sum_{j=1}^p \alpha_{21,j} = 0.$$

(ii) Unidirectional Granger-causality from GNI to TRADE if:

$$\sum_{j=1}^p \alpha_{12,j} \neq 0 \text{ and } \sum_{j=1}^p \alpha_{11,j} = 0$$

(iii) Independence between TRADE and GNI. In this case there is no Granger-causality if

$$\sum_{j=1}^p \alpha_{12,j} \text{ and } \sum_{j=1}^p \alpha_{22,j} \text{ are not statistically significant.}$$

(iv) Bidirectional (or feedback) causality between TRADE and GNI if:

$$\sum_{j=1}^p \alpha_{12,j} \neq 0 \text{ and } \sum_{j=1}^p \alpha_{22,j} \neq 0$$

Hence by obtaining one of these results it seems possible to detect the causality relationship between TRADE and GNI for ASEAN-5. Same can be said for detecting the causal relationship between TRADE and THEIL index (proxy for convergence/divergence) for ASEAN-5. The lag length selection, p , is very important to the Granger causality test because it affects the test results significantly (Khan and Leng, 1997; Seo, 1997). In this study, the lag length, p , was selected for each variable by the Schwarz Bayesian Criterion (SBC).

Our analysis covers 39 years (1967-2005). All variables are in ratios and expressed in natural logs. We obtained the data for trade (export plus imports), GNI, exchange rate and population from World Bank dx spreadsheets (2006). (**Software used**)

Results

The results in Table 1 and Figure 3 show the two most significant structural breaks which affected the variables in the ASEAN-5 region using the LP procedure. TB1 and TB2 indicate the time of the structural breaks. For majority of the variables, the endogenously determined structural breaks are significant at least the five per cent level. The test detected break points in trade per person in 1987 and 1999. These breakpoints coincide with multilateral trade liberalization by individual member countries of ASEAN and the recovery from Asian crisis respectively. The break for GNI occurred in 1989 (not significant at the 10% level) and 1998, the later coinciding with the recovery from Asian crisis. The break points for THEIL index (proxy for convergence/divergence) occurred in 1981 and 1989 coinciding with oil crisis and multilateral trade liberalisation respectively. Both events push the region to converge and that the region approaches close to the point where share of income to the share of population equal. As indicated in Figure 2, income dispersion gap widened in the Philippines and Indonesia while its narrow down in Thailand. Malaysia and Singapore remained same.

Table 1: Estimating the Time of Structural Breaks by Lumsdaine and Papell (LP) Approach

$$\Delta y_t = \mu + \beta t + \theta DU1_t + \gamma DT1_t + \omega DU2_t + \varphi DT2_t + \alpha y_{t-1} + \sum_{i=1}^k c_i \Delta y_{t-1} + \varepsilon_t$$

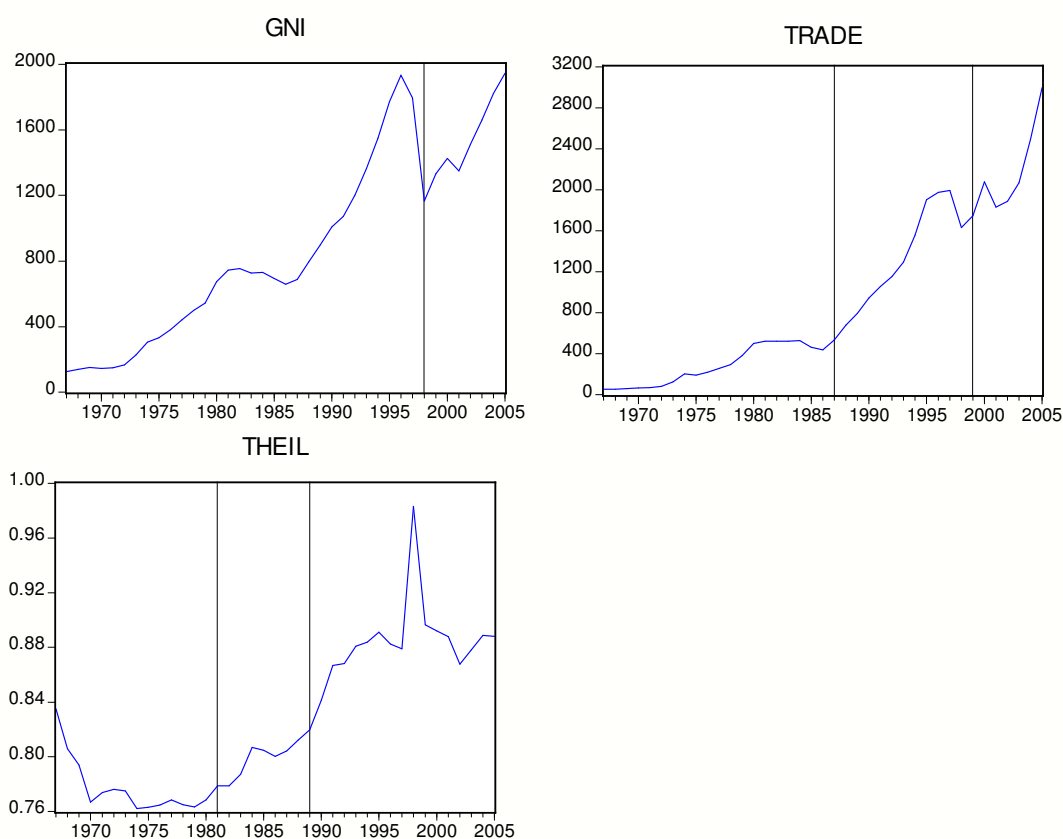
VARIABLE	TB1 TB2	k	μ	β	θ	γ	ω	φ	α
GNI	1989+ 1998	8	6.1606 (5.2327)	-0.5653 (-4.5237)	-1.5280 (-2.0852)	0.2633 (1.5230)	-2.5908 (-3.1709)	0.6255 (1.5230)	-1.7317 (-5.7392)
THEIL	1981 1989	5	3.0823 (4.2407)	-1.0503 (-5.3512)	-3.1072 (-3.5263)	1.6005 (4.6315)	2.8320 (3.1096)	-1.2655 (5.0621)	-1.6538 (-7.4423)*
TRADE	1987 1999	6	2.8840 (5.3749)	0.1935 (4.7420)	2.8049 (4.1888)	-0.9634 (-6.3272)	1.3282 (1.8211)	-0.2997 (-1.9256)	-2.7603 (-6.7659)

Following LP (1997) and Ben-David *et al* (2003), with annual data we have also assumed that $K_{max}=8$.

* Critical value at 5% level of significance is -6.82. t -statistics for α are in parentheses.

+ The break is not significant.

Figure 3: Plots of the ASEAN-5 Series and Endogenously Estimated Timing of Structural Breaks by the Lumsdaine and Papell Test



The empirical results show that the t-statistics for $\mu, \beta, \theta, \gamma, \omega$ and φ are significant in almost all cases. Given the fact that all of the estimated coefficients for the indicator and trend dummy variables are statistically significant for majority of the variables, it can be argued that the estimated structural break dates are indeed significant. Figure 3 shows the plot of series of each of the variables employed and their corresponding significant structural breaks. It shows that the resulting break dates for the three variables coincide with major turning points in the intercept and /or trend of the variables under study.

Table 2 also indicates that the unit root null hypothesis cannot be rejected for GNI and TRADE at the five per cent level as the t-statistic is below the critical value of -6.82. However THEIL index (proxy for convergence/divergence) was found to be stationary in the presence of two structural breaks at the five per cent significance level.

The result of the Grange causality test show that the null hypothesis that GNI does not 'Granger cause' trade can be rejected at the 1 per cent level (p-value: 0.0000) whereas the null hypothesis that trade does not 'Granger cause' GNI is inconclusive. Therefore, we conclude that there is a one-way causal relationship flows from GNI to trade.

The results of the Granger causality test show that that the null hypothesis that trade does not 'Granger cause' Theil index can be rejected at the 5 per cent level (p-value: 0.0021), whereas the null hypothesis that Theil index does not 'Granger cause' trade can be rejected at the 1 per cent level (p-value 0.0000). Based on the results we conclude that there is a two-way causal relationship between the flows from trade to convergence and convergence to trade.

Table 1: Results of Granger Causality Test

Ho	p	Chi-sq	d.f	prob
TRADE does not cause GNI	4	7.9510	4	0.0934
GNI does not cause TRADE	4	28.5458	4	0.0000***
TRADE does not cause THEIL	4	16.7950	4	0.0021**
THEIL does not cause TRADE	4	36.8628	4	0.0000***

** significant at the 5% level; *** significant at 1% level;

Conclusions

This study demonstrate that multilateralism and RTAs are complementary and that regional income convergence is likely with the like-minded and committed regionalism that often has links geographically and culturally. Applying the Lumsdaine and Papell (1997) model for detecting breaks in the trend function of univariate trade performance time series data (trade per person), we found significant trend break in 1987 and 1999 which is coincided with the economic reforms focusing multilateralism by individual member countries of ASEAN-5 and recovery from Asian crisis respectively. In our analysis we focused intra-ASEAN-5's various trade policy changes by isolating the following different historical policy interventions: the introduction of Preferential Trade Agreement (PTA) in 1977 (regionalism), the unilateral liberalisation following the severe recession of the mid-1980s (non-discriminatory multilateralism), the ASEAN Free Trade Area (AFTA) formation (regionalism) in 1992 and ASEAN and more Regional Trade Agreements such as ASEAN plus China plus Korea plus Japan; India plus Malaysia; Thailand plus United States. The significant break in 1987 is an indication that multilateralism has greater impact on trade in the region rather than regionalism. A significant trend break occurred in the GNI per capita in 1998 which coincide with the recovery from Asian crisis of 1997.

It is important to note that these tests are concerning only two breaks in the series and unable to detect the presence of more than two structural breaks. Future work in this area, therefore, will need to consider multiple structural breaks which are capable of capturing the other breaks in the series. Our results from Granger causality test show that there is a one-way causal relationship flows from GNI to trade. If causality is assessed at an early stage of the process, then flows of trade could appear to be leading to income. This could be reversed at a later stage when the income increases the capability of exporting and importing by poor countries in the region.

Theil values over the study period indicate that the ASEAN-5 region receives a larger share of income, on average, than its share of population (Figure 2). Indonesia and the Philippines are having less than its proportional share of national income. Malaysia and Singapore are receiving larger share of income than its share of population. Thailand converged comfortably by increasing the proportional share of income especially after 1988. Our

analysis show that the breakpoint for Theil index in 1981 and 1989 are coincided with oil crisis and economic reforms by individual countries respectively. Both events have increased the income inequality of Indonesia, the Philippines and Thailand but contributed to the income convergence within the region (Figure 2). Results from Granger causality test indicate that there is a two-way causal relationship between the flows from trade to convergence and convergence to trade. If causality is assessed at an early stage of the process, then flows of trade could appear to be leading to income convergence. This could be reversed at a later stage when the income convergence increases the capability of exporting and importing by poor countries in the region.

REFERENCES

- Ariff, M. (1994) Open regionalism a la ASEAN, *Journal of Asian Economics*, 5 (1), pp. 99-117.
- Backfield, J. (2004), Does income inequality harm health? New cross-national evidence, 45 (3), pp. 231-248.
- Baddeley, M. (2006) Convergence or divergence? The impacts of globalisation on growth and inequality in less-developed countries, *International Review of Applied Economics*, 20 (3), pp. 391-410.
- Banerjee, A., R. L.Lumsdaine and J.H. Stock (1992), 'Recursive and Sequential Tests of the Unit Root and Trend-Break Hypothesis: Theory and International Evidence', *Journal of Business and Economic Statistics*, 10, pp.271-287.
- Ben-David, D. (1996), Trade and convergence among countries, *Journal of International Economics*, 40, pp. 279-298.
- Cantarero, D., Pascual, M. and Maria Sarabia, J. (2005), Effects of income inequality on population health: new evidence from the European Community household panel, *Applied Economics*, 37, pp. 87-91.
- Christiano, L.J. (1992), 'Searching for a Break in GNP', *Journal of Business and Economic Statistics* 10, pp.237-249.
- Darity, W. Jr., and Davis, L. S. (2005), Growth, trade and uneven development, *Cambridge Journal of Economics*, 29 (1), pp. 141-170.
- Ethier, W. J. (1998) Regionalism in a multilateral world, *The Journal of Political Economy*, 106 (6), pp. 1214-1245.
- Freund, C. (2000) Multilateralism and the endogenous formation of preferential trade agreements, *Journal of International Economics*, 52, pp. 359-376.
- Fukase, E. and Winters, L. A. (2003) Possible dynamic effects of AFTA for the new member countries, *The World Economy*, 26 (6), pp. 853-871.
- Ghose, A. K. (2004), Global inequality and international trade, *Cambridge Journal of Economics*, 28 (2), pp. 229 – 252.

- Glynn, J; Perera, N; Verma, R. (2007), 'Unit Root Tests and Structural Breaks: A Survey with Applications', *Journal of Quantitative Methods for Economics and Business Administration*, June, pp. 63-79.
- Imada, P. (1993) Production and trade effects of an ASEAN Free Trade Area, *The Developing Economies*, 31 (1), pp. 3-23.
- Jayanthakumaran, K. and Pahlavan, M. (2006) Australia and New Zealand CER agreement and breakpoints in bilateral trade: an application of the Wald-type test, *Applied Econometrics and International Development*, 6 (2), pp. 203-212.
- Kettunen, E. (1998) Economic integration of the ASEAN countries, in L.V. Grunsvan, (Ed.), *Regional Change in Industrialising Asia*. Ashgate, Sydney.
- Koopmann, G. (2003) Growing Regionalism – a major challenge to the multilateral trading system, *Intereconomics*, 38 (5), pp. 237-241.
- Krueger, A. O. (1999) Are preferential trading arrangements trade-liberalizing or protectionist?, *Journal of Economic Perspectives*, 13, pp. 105-124.
- Lee, J. W. and Park, I. (2005b) Free trade areas in East Asia: discriminatory or non-discriminatory?, *The World Economy*, 28 (1), pp. 21-48.
- Lee, J. W. and Shin, K. (2006) Does Regionalism lead to more global trade integration in East Asia?, *North American Journal of Economics and Finance*, 17, pp. 283-301.
- Lopez-Bazo, E., Vaya, E. and Artis, M. (2004), Regional externalities and growth: evidence from European regions, *Journal of Regional Science*, 44 (1), pp. 43-73.
- Lumsdaine, R. L., and D. H. Papell (1997), 'Multiple Trend Breaks and the Unit Root Hypothesis', *Review of Economics and Statistics*, 79 (2), 212-218.
- Macinko, J. A., Shi, L., Starfield, B. and Wulu, jr. J. T. (2003), Income inequality and health: a critical review of the literature, *Medical Care Research Review*, 60 (4), pp. 407-452.
- Maddala, G.S. and In-Moo Kim (2003), *Unit Root, Cointegration and Structural Change*, Cambridge University Press, Fifth Edition, UK.
- Moon, W. (2006), Income convergence across Nations and Regions in East Asia, *Journal of International and Area Studies*, 13 (2), pp. 1-16.
- Niebuhr, A. and Schlitte, F. (2004), Convergence, trade and factor mobility in the European Union – implications for enlargement and regional policy, *Intereconomics*, 39 (3), pp. 167 – 177.

- Nissan, E. and Carter, G. (1993), *Income inequality across regions over time*, *Growth and Change*, 24, pp. 303-319.
- Ornelas, E. (2005) Trade creating free trade areas and the undermining of multilateralism, *European Economic Review*, 49, pp.1717-1735.
- Park, D. (2000), Intra-Southeast Asian income convergence, *ASEAN Economic Bulletin*, 17 (3), pp. 285-292.
- Pascual, M. Cantarero, D. and Maria Sarabia, J. (2005) Income inequality and health: do the equivalence scales matter?, *Atlantic Economic Journal*, 33, pp. 169-178.
- Perron, P. (1989), 'The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis', *Econometrica*, 57 (6), pp.1361–1401.
- Perron, P. (1997), 'Further Evidence on Breaking Trend Functions in Macroeconomic Variables', *Journal of Econometrics*, 80 (2), pp.355-385.
- Perron, P. and T. J. Vogelsang, (1992), 'Nonstationarity and Level Shifts with an Application to Purchasing Power Parity', *Journal of Business and Economic Statistics*, 10, pp. 301–320.
- Pesaran, M. H and Pesaran, B. (1997) *Working with Microfit 4.0, Interactive Econometric Analysis*. Oxford University Press, Oxford.
- Plummer, M. G. (2006) *An ASEAN customs union?*, *Journal of Asian Economics*, 17, pp. 923-938.
- Pritchett, L. and Summers, L. H. (1996), Wealthier is healthier, *The Journal of Human Resources*, 31 (4), pp. 841-868.
- Pritchett, L. (1997), Divergence, big time, *Journal of Economic Perspectives*, 11 (3), pp. 3-17.
- Rajan, R. S. (2005) Trade Liberalisation and the new regionalism in the Asia_Pacific: taking stock of recent events, *International Relations of the Asia-Pacific*, 5, pp. 217-233.
- Resosudarmo, B. P. and Vidyattama, Y. (2006), *Regional income disparity in Indonesia: a panel data analysis*, 23 (1), pp. 31- 44.
- Richardson, J. D. (1995), Income inequality and trade: how to think, what to conclude, *The Journal of Economic Perspectives*, 9 (3), pp. 33- 55.
- Rodgers, G. (1979), Income and inequality as determinants of mortality: an international cross-section analysis, *Population Studies*, 39, 343-351.

- Sachs, J. and Warner, A. (1995), Economic reform and the process of Global integration, *Brookings Papers on Economic Activity*, 1, pp. 1-118.
- Silva, J. A. and Leichenko, R. M. (2004), Regional income inequality and international trade, *Economic Geography*, 80 (3), pp. 261 – 286.
- Slaughter, M. J. (1997), Per-capita convergence and the role of international trade, *The American Economic Review*, 87 (2), pp. 194-199.
- Tan, G. (2004) *ASEAN: Economic Development and Cooperation*. Eastern University Press, Singapore.
- US-ASEAN Business Council. (2004) *The ASEAN Free Trade Area and other Areas of ASEAN Economic Cooperation*, Available: www.us-asean.org/afta.asp [accessed 14 February 2005].
- Wildman, J., Gravelle, H. and Sutton, M. (2003), Health and income inequality: attempting to avoid the aggregation problem, *Applied Economics*, 35, pp. 999-1004.
- Winters, A. (1999) Regionalism versus multilateralism, in R. Baldwin, D. Cohen, A. Sapir and A. Venables (eds.), *Market Integration, Regionalism and the Global Economy*, Centre for Economic Policy Research, Cambridge, UK.
- World Bank (2006) *World Tables, DX Database*. World Bank, Washington, DC.
- Yao, S., Zhang, Z. and Feng, G. (2005), Rural-urban and regional inequality in output, income and consumption in China under economic reforms, *Journal of Economic Studies*, 32 (1), pp. 4-24.
- Zivot, E. and K. Andrew (1992), 'Further Evidence On The Great Crash, The Oil Price Shock, and The Unit Root Hypothesis', *Journal of Business and Economic Statistics*, 10 (10), pp.251–70.