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### Measuring the extent of regional economic integration in East Asia: The sum of its parts?

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# **MEASURING THE EXTENT OF REGIONAL ECONOMIC INTEGRATION IN EAST ASIA: THE SUM OF ITS PARTS?**

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# **REGIONAL ECONOMIC INTEGRATION IN EAST ASIA: THE SUM OF ITS PARTS?**

## **Abstract**

No single measure of real or financial integration sufficiently captures all of the salient characteristics of the extent of integration between individual economies and of economies within particular regional groups. This paper employs various measures in order to assess the stylised facts around bilateral and regional real and financial integration for the ASEAN5 and the large industrial Asian countries for the period 2000-2009. By using many measures, one should be able to achieve two objectives. The first is to capture many of the main attributes of integration in order to further provide insight into the integration landscape in East Asia. The second is to investigate which individual measure drives the overall level of integration and, in doing so address the question of what might be the possible sources of integration between countries in the region. This has significant policy implications about how to best target policies of the liberalisation in both trade and financial markets as well as informing the ongoing debate about optimal currency areas (OCA) and a possible monetary union in Asia.

## **1. Introduction.**

No single measure of real or financial integration sufficiently captures all of the salient characteristics of the extent of integration between the economies in East and Southeast Asia. Furthermore, no single measure is able to explain what particular or individual aspects of integration drive the overall degree of closeness between economies and of economies within particular regional groups. As such, this paper seeks to employ many and various measures of bilateral real and financial integration for the ASEAN5 + 3 countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand, and China, Japan and Korea.

Moreover, this paper seeks to provide some stylised facts as to the extent of ‘overall’ integration in the region. The objective here is to employ data that is readily available and to construct several measures of integration taking in the real and financial dimensions. By using many measures, one should be able to investigate which individual measure drives the overall level of integration. While each measure may not be perfect (after all, this is why there is such a large literature on each individual measure of real or financial integration), and while the list of measures adopted here may not be exhaustive, there is much value to gaining information about the stylised facts of integration in Asia and to provide insights into the nature of integration in the region. This has significant policy implications about how to best target policies of liberalisation of both trade and finance. The paper also intends to measure the extent of integration between a country and a set of other countries (cluster or region). The questions that we can seek to answer here are: Which countries are ‘closest’ to each other in terms of economic integration? Do different measures of integration produce different results in relation to these clusters or groups?

The measures presented in this paper are, in essence, summaries relating to a particular characteristic of economic integration. By and large, the measures fall into two

categories; real integration and financial integration. Perhaps surprisingly, there appears to be very little work of this type in this area<sup>1</sup> – researchers preferring to pursue the option of refining individual measures rather than examining the interaction of individual measures in an attempt to ascertain a broader perspective of integration in the Asian region. This is not intended to be an exhaustive formal analysis of real and financial integration. Rather, the intention is to provide a set of stylised facts in the hope of further highlighting the integration landscape in East Asia.

As nations in the region continue with their general push towards liberalising trade and finance, one would expect the extent of integration to be higher over time. But is this regional or global integration (see, for instance Eichengreen and Park, 2003)? Many of the financial cooperation initiatives, such as the Asian Bond Fund and the Asian Bond Market Initiative would suggest that, if successful, the greater the likelihood that integration will be more regionally oriented. This paper will provide some insight into whether this characteristic is indeed emerging in the data.

Further to this, information about which individual measures may drive overall integration possibly has some useful policy implications. It may provide insights into the suitability of a number of political instruments of integration (trade agreements vs investment accords, removal of controls over FDI flows vs portfolio vs bank flows, and so on). There is also growing evidence that real and financial integration (as subsets of ‘economic’ integration more generally) is closely connected; it is plausible to consider a situation where trade integration is associated with more synchronous business cycles and together produce spillovers that facilitates monetary integration (see Frankel and Rose, 1998). As such, information about the different dimensions of integration will inform the ongoing debate about optimal currency areas (OCA) and a possible monetary union in Asia. As is very well

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<sup>1</sup> With the exception of a few contributions mentioned below in the next section.

known, OCA is heavily reliant on integration. Is the region sufficiently close so as to justify a currency union? What would be the optimum in terms of the countries in a possible union? Where would the central bank be? Indeed, there are many connections between integration and possible monetary integration. First, exchange rate stability may encourage trade, and therefore encourage the promotion of trade agreements. Second, increase openness and integration (perhaps fortified by trade agreements) render flexible exchange rates less appropriate. Third, while the increased factor mobility associated with a common market may substitute for trade to some extent, it may also substitute for exchange rate adjustment, thus help to meet OCA criteria. Lastly, and by no means the final connection, monetary union may encourage closer synchronicity of business cycles within a region – which may help retrospectively justify monetary integration.

The policy messages that emerge from this issue are vast, but the value added of this paper is that it is essentially a way of gathering the pertinent stylised facts about the integration landscape in Asia. This paper is structured as follows: The following section outlines the data sources, defines each of the measures of integration employed in this study and sets out the methodology under which integration is calculated. Section 3 presents the results for bilateral levels of integration as well as each country's level of integration against regional groups. Two methods deriving an overall integration metric are also presented. Section 4 offers some concluding remarks.

## **2. Measuring the real and financial dimensions of integration. Data and Methodology.**

Measuring the extent of integration through individual metrics is not new and, as is well known, there are many methods that have been employed to measure the degree of real and financial integration (see Cavoli and Rajan, 2009, and for a recent treatment, Kim and Lee

2008). Real integration measures include, among others, business cycle synchronisation (see Imbs, 2006) and trade openness, relative purchasing power parity (PPP) (see Alba and Papell, 2007, Barumshah et al, 2007, Liew et al, 2009 and Kim et al, 2009 for recent contributions to measuring PPP).

Financial integration measures are many and can be divided into arbitrage conditions such as uncovered interest parity (UIP) (see, Chinn, 2006, for instance and Alper et al 2009, Goh et al, 2006), asset market correlations (see Chi et al, 2006 for example), quantity measures using flows data (Lane and Milesi-Ferretti, 2001), macroeconomic measures such as savings/investment correlations and consumption correlations (Kim and Lee, 2008) and many more. Attempts have been made to find a multivariate measure of integration. Takagi and Hirose (2001) and de Brouwer (1999) have employed techniques to combine various measures of financial integration and reduce them to one measure. Chinn and Ito (2008) have also created what is now a very well-known index of capital mobility/financial openness. The advantage of these techniques is that, firstly they capture the breadth of available measures of integration – information is not simply lost by virtue of the non-employment of a measure. Secondly, the index and all the information contained within can be assessed over time. This paper intends to pursue this particular line of inquiry. The measures proposed are as follows:

The first is a measure of *business cycle correlations (BCS)*<sup>2</sup>. These are given by  $\rho_{GDPi,GDPj}$ , where  $GDPi$  is the annual growth rate of GDP for country  $i$ . The correlation coefficient is calculated from non-overlapping 12 monthly observations.<sup>3</sup> A higher value implies greater integration as it would suggest that the pair of countries for which the

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<sup>2</sup> ‘S’ for synchronicity.

<sup>3</sup> Different time windows were examined for robustness. The results did differ a little, not significantly. Non-overlapping observations were chosen so as to not introduce any more serial correlation into the data being analysed. As such, using 12 monthly correlations to obtain an annual observation meant that the data is consistent with how the other measures were taken. The same applies for the equity correlation measure below.

correlation is taken can be subject to, and react in the same way to, common shocks. We know from the OCA literature of the importance of BCS in providing a signal for the plausibility of a regional zone of fixed exchange rates.

The second measure is *deviations from relative PPP (RPPD)*. This is given by  $ABS(\Delta e_t^{ij} + \pi_t^j - \pi_t^i)$  where  $e_t$  is the nominal exchange rate at time  $t$  and  $\pi_t^i$  ( $\pi_t^j$ ) refers to the inflation rate at time  $t$  for  $i$  and  $j$  respectively. A smaller value implies greater integration as the law of one price with respect to goods prices is more likely to hold.

Third, *trade openness or intensity (TI)*. This is given by  $T_{ij}/T_{ALL}$  where  $T_{ij}$  is the trade (exports plus imports) between country  $i$  and  $j$  and  $T_{ALL}$  is all trade recorded for each country pair within the sample examined (not double counted). A higher value means greater integration as it implies that the country pair examined occupy a greater share of total trade in the region.

Fourth, *deviations from uncovered interest parity (UID)*. This is measured by  $ABS(i_t^i - i_t^j - \Delta e_{t+1}^{ij})$ , where  $i_t^i$  and  $i_t^j$  refer to interest rates at  $t$  for  $i$  and  $j$  respectively. A lower value implies greater integration between two countries as the law of one price with respect to financial assets is more likely to apply.

The fifth measure pertains to *equity market correlations (EQ)*. These are given by  $\rho_{Ri,Rj}$ , where  $Ri$  is the annual return for the main stock market index for country  $i$ . The correlation coefficient is calculated from 12 monthly observations. A higher value implies two countries stock markets are more closely aligned, hence indicating a higher level of integration.

The sixth is *FDI openness or intensity (FI)*. This is given by  $(FD_{ij}+FD_{ji})/FD_{ALL}$ . The definitions for the bilateral FDI flows and for  $FD_{ALL}$  are as per the trade intensity measure. Finally, *portfolio investment intensity (PI)* is given by  $(PF_{ij}+PF_{ji})/PF_{ALL}$ . The definitions for the bilateral portfolio (PF) flows and for  $PF_{ALL}$  are as per the trade intensity measure. For

both FI and PI, a higher value is taken to imply higher integration as a higher value suggests that the country pair examined occupy a greater share of total financial flows in the region.

These measures lend themselves appropriately as ways to ascertain the degree of integration between countries for the following reasons:

- a) They are simple and easy to comprehend.
- b) Data are readily available for all countries sampled.
- c) They are underpinned by economic intuition about agent behaviour.<sup>4</sup>

The objective is to use data that is readily and publically available so as to show the ease at which the overall measures can be calculated. The main data source is the international integration statistics database of the ADB's Asia Recovery Integration Center; <http://aric.adb.org/> except the data used to calculate the UID and RPPP measures which were from the IMF's *International Financial Statistics*. The sample selected for this is data from 2000-2009. It is crucial that the measures in the first instance are bilateral. This way, integration can be assessed between country pairs as well as between countries and pre-determined groups. The groups that one might initially consider would be ASEAN5 = [Indonesia, Malaysia, the Philippines, Singapore, Thailand], and the larger regional economies, Plus3 = [China, Japan, Korea]. All 7 measures are presented for the ASEAN5 and the Plus3 nations. This, in itself, is quite instructive in revealing something about the possible extent of integration – the more established nations in terms of development are able to report more comprehensively on integration.

We use the measures as follows: For example we can measure the extent of Indonesia's integration with, say, Malaysia by observing each measure *individually* between the two countries. We can also measure Indonesia's integration with the Plus3 by calculating each measure with China, with Japan and with Korea. For these calculations, we take the

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<sup>4</sup> This is especially the case for RPPD and UID.

average of each bilateral measure, so Indonesia's level of integration, say UID with the Plus3 equals the average of the UIDs between Indonesia and China + the UID between Indonesia and Japan + the UID between Indonesia and Korea. To derive the level of integration between a particular country and the region of which it is a member, the country is left out of the member's group.

Once we have analysed the individual measures of integration, we can use these to create a measure of 'overall' integration. We do this in two ways, the first is to impose cumulative normal distributions to all of the measures such that they all map on to the same distribution. The normalised individual measures are then summed to create an overall measure.<sup>5</sup> The second is to take the raw individual measures of integration and employ principal components analysis to reduce them a single measure. The next section presents the results.

### **3. Results and discussion**

#### *a. Bilateral Integration and Regional Groupings*

This section is divided broadly into two parts. The first examines the extent of (or level of) *bilateral* integration by calculating the level of integration under each individual measure. The second part examines how each country is integrated to a number of regional groupings.

Table 1 presents the extent of bilateral integration for each measure. From Table 1a we can see that the level of business cycle synchronisation is high for Malaysia and the Philippines, Singapore and Thailand. The BCS for Japan/Philippines and Japan/Thailand are also high. The RPPDs in Table 1b also revealed a high level of integration (low RPPD) for pairings involving Malaysia and the Philippines. The same is found for the UIDs in Table 1e

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<sup>5</sup> One can take averages rather than sums, but the effect is much the same. We assume that each country pair in the creation of the regional measure is weighted equally.

where integration levels for Korea are quite high and, albeit to a lesser extent, the equity correlations in Table 1d where Thailand and the Philippines return reasonably high levels.

When one observes the quantity based measures, such as trade, FDI and portfolio investment intensity, the higher levels of integration occurs in the larger economies of Japan, China and Korea. This possibly emphasises the importance of size on trade and finance flows. We can see this effect most emphatically in the case of TI in Table 1c for the Japan-China, Japan-Korea and China-Korea pairings. The results for FI and PI also show that these pairs are significant but, additionally, reveal Singapore as an important source of openness when paired with the larger economies – notably Japan.

From the bilateral measures, two main messages emerge. The first is that Singapore appears to be the country that appears most in more of the individual measures than the other countries. Malaysia also appears to be highly integrated especially in UID and RPPD. The second is that there is a price versus quantity distinction. The ASEAN nations are more highly integrated when the price based measures are employed and China, Japan and Korea appear more integrated when using the quantity measures.

Figure 1 presents the extent of integration (by each measure) of each country with a pre-determined grouping of countries. The results here confirm the patterns mentioned above; that Malaysia, Singapore and Thailand are among the most integrated when one observes the price based measures (RPPD, UID and EQ as given in Figures 1b, 1d, 1e) but the larger regional economies exhibit higher integration when one observes the quantity measures (TI, FI and PI given in Figures 1c, 1f, 1g respectively). Furthermore, across all measures, Figure 1 shows that the new ASEAN nations are among the least integrated generally, both in terms of the extent of integration with each other and with the other groupings in the sample.

Specifically, we can see that Malaysia, the Philippines and Singapore are highly integrated with the plus3 nations under BCS and RPPD. The ASEAN5 nations are highly

integrated with each other when using UID, RPPD and EQ. The plus3 countries are dominant when using TI, FI and PI but Singapore displays high integration in FI and PI. Finally, integration to the plus3 countries is not very strong in the price measures. This is perhaps surprising for the case of Japan – given the extent of development of her financial markets.

*b. Normalised overall measure of integration*

We next use all of the available measures to return an overall measure of integration that captures both real and financial dimensions. This enables us to investigate which individual measure might possibly drives the overall level of integration and, in doing so address the question of what might be the possible sources of integration between countries in the region. Each measure of integration has been normalised to return a value between 0 and 1 where 0= least integrated and 1= most integrated. Prior to making these transformations, the UID and RPPD are inverted such that a larger value now implies more integrated. Each value is then simply summed to present an overall measure of integration for each country against the regional groupings. The benefit of this exercise is that it removes any issue of the scaling of individual measures as each metric is scaled from 0 to 1. As such, we can examine where each individual measure is in a cumulative normal distribution – thus facilitating comparisons.<sup>6</sup> Table 2a and Figure 2 present the overall measure of integration bilaterally and per regional groups, respectively. They are essentially versions of Table 1 and Figure 1 using the normalised measures summed to form an overall measure of integration. From Table 2, we can see that Malaysia/Singapore is the most integrated bilaterally, and that

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<sup>6</sup> Normalising a variable simply allows us to determine where each observation is positioned in its distribution. It doesn't evaluate the variance structure of a variable, and as such, is not appropriate for revealing the suitability of a variable as compared to other variables. Furthermore, when we sum each normalised measure to create one overall measure of integration, we assume each measure is weighted equally. This assumption is relaxed when using the principal components scores below.

China/Thailand is the least integrated. To a great extent, this does confirm the results of the individual measures where the ASEAN5 countries are highly integrated with each other. In fact, this is further confirmed if one observes Table 5b. This table presents the top 3 bilateral integration using the numbers from Table 2a. We can see that Japan appears more frequently in the top 3 for the ASEAN nations than do the other large countries but that, ostensibly, the top 3 for the ASEAN group comprise of other ASEAN countries. Predictably, due to the large country effect, the top 3 for China include Japan and Korea, but the favour is not returned. This is possibly suggestive that the larger economies in the region are not as well integrated with the smaller ones, as the smaller ones are amongst themselves. This is in many respects not surprising, but has some interesting policy implication that will be touched on later. Figure 2 confirms that Singapore and Japan are the most integrated with the whole sample. It also shows that, as outlined above, the extent of integration of all countries to the plus 3 is less than the integration to ASEAN5. This confirms the conjecture that the larger countries are potentially less open.

Figure 3 presents the overall integration where all 7 measures are shown. By construction, each normalised individual measure of integration shows what position it assumes in the distribution. As such, the larger the segment in the each column graph relating to a particular measure, the more that measure contributes to the total.

Generally speaking, if one observes the components of each measure, one sees that no one individual measure dominates the total measure. We see that equity market correlation and business cycle synchronisation are quite influential for the original ASEAN nations. We also see that the effect of UID seems general greater than RPPD. From Figure 3, it can be seen that Singapore and Japan remain the most integrated economies in the sample – and that this result occurs irrespective of which groupings these countries are measured against. Figure presents a couple of interesting results. The first is that Malaysia's level of overall

integration is higher under this measure – highlighting possibly the importance of BCS, RPPD, UID and TI for that country. The second interesting result is from the newer ASEAN nations. It can be seen that Vietnam and Cambodia are the most integrated from this group of countries but that these levels are quite significantly lower than the ASEAN5 and plus3 countries.

*c. Robustness: Principle Components Analysis*

We also present some results of the application of principal components analysis to our measures of integration. The reasons for this are two-fold. Firstly and primarily, we can use the method to act as a robustness test for the above measures of (normalised) integration. The second is to augment the above measures as they are not subject to any formal statistical testing. Principal components analysis is a method that is often used to reduce the number of variables into a single one for the purposes of estimation. It models the variance structure of a set of observed variables using linear combinations of the variables. These linear combinations, or components, may be used in subsequent analysis, and the combination coefficients, or loadings, may be used in interpreting the components. It is essentially an eigenvalue decomposition that returns the optimal weights to a set of variables in a linear combination such that the variance of the linear combination is maximised. See Johnson and Wichtern (1992) for more information. By measuring the structure of the data, we are able to obtain a better sense of how each individual measure contributes to the total score.

After de-meaning the measures as presented for the normalised measure of integration, we present compute the principal components of the estimated (Spearman rank-order) correlation matrix of our series or measures, and display our results in Table 3, and in Figure 4. Using the correlation matrix has the benefit of providing a natural scaling device to the measures as each measure will return a value between zero and one. The difference in scale

between the variables – due principally to RPPD and UID – is significant. Due to non-linearities in the correlations, the use of the Spearman rank-order correlation matrix is employed here as the correlations are calculated on the basis that the variables are monotonically, and not linearly related.<sup>7</sup>

Table 3 presents the eigenvalue scores and loadings. We can see from the first panel that the first principal component explains 39% of the variation in the measures of integration. The second panel shows the weights of each measure in constructing the components. We see that there is a difference in the price vs the quantity based measures in that the price measures return a positive coefficient. The data is able to clearly differentiate between these broad types of measures – suggesting that each type can explain different aspects of the data.

Figure 4 presents the output of the principal components scores for the ASEAN5 and the Plus 3 countries. As with the normalised results, a larger number implies higher integration. This is configured in the same way as Figure 1 in that it shows the level of integration (but this time the level of overall integration) of each nation against country groupings. What is quite obvious from these results is that the Plu3 nations are much less integrated than the ASEAN5 countries and much less integrated than what was being suggested in the earlier tests. The current results also show that the possible overemphasis on the quantity based measures, and the subsequent overestimation of the overall level of integration for the Plus 3 nations found in the normalised metric is mitigated to an extent. While this result is sensitive

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<sup>7</sup> As will be discussed below, the effect of the large countries is weakened in the principal components scores. This effect is due mainly to the choice of correlation matrix. Using ordinary correlations would have the effect of magnifying the effect of Plus3 integration through the quantity measures. By using the Spearman correlations, the differences from the mean of the variables when calculating the correlation coefficient is reduced due to the ranking of the data. As such, the interpretation is simplified in that we are essentially interested in whether two measures move together to show an increase/decrease in integration, or the move apart. What both sets of correlations do show is that the plus 3 nations have a different patten of integration to the ASEAN nations. This has important policy implications.

to the specification of the correlation matrices, it does show that the Plus 3 nations do differ in substantially to ASEAN in terms of overall integration.

#### **4. Some Conclusions and policy implications**

The three East Asian financial centres, and high-income economies of Hong Kong<sup>8</sup>, Japan and Singapore are fairly highly integrated with global capital markets. The recent pace of liberalization in Korea post crisis is also intensifying the country's extent of international financial integration. The lower middle-income Southeast Asian countries, Thailand and Indonesia as well as the Philippines are relatively less financially integrated, but still more integrated, in general, when one compares them to the less-developed ASEAN countries of Brunei, Cambodia, Laos, Myanmar and Vietnam (see Cavoli, 2011).

Our analysis of the extent of real versus financial market integration finds that, overall, the original ASEAN nations – Indonesia, Malaysia, the Philippines, Singapore and Thailand – seem to be more integrated with than the three larger economies. This is the case for both broad measures of real and financial integration and they appear to be especially well integrated with each other. Of these, Singapore and Malaysia appear to be the most connected generally.

The original ASEAN also seem to be more integrated when measured by the price based measures, namely UID, RPPD, equity market correlations and business cycle measures. The quantity measures show that Japan, Korea and China are highly integrated both when measuring the real (trade intensity) and financial (FDI and portfolio intensity). In fact the extent to which these countries are integrated through TI, FI and PI possible overstates the extent of integration when we observe the overall measure.

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<sup>8</sup> Not examined in the empirical section in this work.

The principal components scores and the normalised scores for overall integration are reasonably consistent in that Singapore and Malaysia emerge as those countries with the highest levels. The scores do differ for China, Japan and Korea, with the principal component scores seemingly picking up more of a large country effect and removing the possible overemphasis of the quantity measures for those countries.

There are several interesting policy implications arising from this work. Firstly, it would appear that the financial aspects of integration are more persuasive in the smaller economies of ASEAN and that real integration is more prominently defined in the larger Plus 3 countries. Thus, in terms of those aspects of integration that might more easily be reached by liberalisation, it would appear that finance based liberalisation appear more accessible.

Secondly, there are still quite well defined clusters, or regions, in the sample. From the point of view of the regionalism debate in Asia, there is a strong bias towards the ASEAN5 being influential as a bloc. However, the larger economies are not as well integrated with the smaller ones as the smaller ones are with each other. Further, they are less integrated with each other. This has implications in the design of trade or investment accords, and most certainly has implication in the outlook for monetary regionalism. The political economy landscape regarding regional integration through initiatives such as the Chiang Mai Initiative and Asian Bond Fund have not to date provided sufficient impetus for further economic closeness beyond the ASEAN5 economies. Thus, it might be plausible to consider the monetary regionalism involving the ASEAN5 nations – they have a long history of political connectedness through being the original ASEAN members and are, for the most part, in the middle group of Asian economies in terms of size. This is, course, notwithstanding the more practical political discussions about the precise nature of the currency union and where the central bank will be. Any regional bloc or monetary union, however, involving the three large countries looks unlikely because, at this stage, it is not well supported by the data.

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**Table 1**  
**Bilateral Integration Measures by Type**

**Table 1a**  
**Business Cycle Synchronisation**

	PRC	ID	JP	KR	MA	PH	SG	TH
PRC								
ID	0.78							
JP	0.38	0.33						
KR	0.01	0.07	0.71					
MA	0.57	0.60	0.85	0.64				
PH	0.59	0.65	0.86	0.61	0.94			
SG	0.55	0.61	0.84	0.63	0.88	0.95		
TH	0.32	0.25	0.89	0.58	0.91	0.82	0.75	

**Table 1b**  
**RPPP Deviations**

	CH	ID	JP	KR	MA	PH	SG	TH
CH								
ID	0.798							
JP	0.251	0.313						
KR	0.558	0.207	0.105					
MA	0.304	0.107	0.205	0.069				
PH	0.485	0.084	0.229	0.123	0.023			
SG	0.255	0.123	0.189	0.084	0.015	0.039		
TH	0.272	0.054	0.258	0.118	0.049	0.029	0.069	

**Table 1c  
Trade Intensity**

	PRC	ID	JP	KR	MA	PH	SG	TH
PRC								
ID	1.880%							
JP	23.079%	3.738%						
KR	12.762%	1.425%	9.073%					
MA	3.343%	0.962%	4.116%	1.434%				
PH	1.447%	0.201%	2.155%	0.697%	0.584%			
SG	3.258%	1.513%	4.300%	1.312%	3.161%	0.707%		
TH	2.650%	0.747%	4.911%	0.832%	1.623%	0.457%	0.832%	

**Table 1d  
Equity Market Correlation**

	PRC	ID	JP	KR	MA	PH	SG	TH
PRC								
ID	0.19							
JP	0.25	0.28						
KR	0.21	0.56	0.67					
MA	0.29	0.78	0.37	0.56				
PH	0.37	0.6	0.41	0.26	0.5			
SG	0.41	0.62	0.55	0.59	0.67	0.65		
TH	0.27	0.69	0.54	0.77	0.62	0.44	0.61	

**Table 1e  
UID Deviations**

	CH	ID	JP	KR	MA	PH	SG	TH
CH								
ID	0.046							
JP	0.347	0.326						
KR	0.181	0.188	0.166					
MA	0.136	0.06	0.155	0.114				
PH	0.04	0.086	0.412	0.275	0.193			
SG	0.162	0.14	0.185	0.018	0.039	0.227		
TH	0.163	0.138	0.184	0.018	0.035	0.224	0.001	

**Table 1f**  
**FDI Intensity**

	PRC	ID	JP	KR	MA	PH	SG
PRC							
ID	0.611%						
JP	22.619%	-0.006%					
KR	18.523%	0.001%	4.543%				
MA	1.491%	0.089%	4.690%	1.071%			
PH	0.911%	0.003%	0.903%	0.009%	0.116%		
SG	10.304%	0.022%	11.253%	0.805%	5.415%	0.499%	
TH	0.867%	0.022%	9.744%	0.230%	0.258%	0.152%	4.702%

**Table 1g**  
**Portfolio Intensity**

	PRC	ID	JP	KR	MA	PH	SG
PRC							
ID	0.041%						
JP	15.805%	1.628%					
KR	8.881%	0.453%	29.307%				
MA	0.098%	0.313%	5.868%	1.904%			
PH	0.054%	0.044%	4.323%	0.299%	0.482%		
SG	0.043%	0.521%	14.074%	3.961%	2.970%	0.722%	
TH	0.043%	0.134%	3.054%	2.829%	0.339%	0.046%	0.697%

**Table 2a****Normalised overall bilateral integration**

	PRC	ID	JP	KR	MA	PH	SG	TH
PRC								
ID	2.65							
JP	4.02	2.21						
KR	3.60	2.44	4.90					
MA	2.52	3.34	3.69	3.38				
PH	2.58	3.17	3.22	2.35	3.82			
SG	3.20	3.13	4.72	3.76	4.96	3.99		
TH	2.10	3.02	4.23	3.67	4.02	3.48	4.20	

**Table 2b****Top 3 for each country by Normalised overall bilateral integration**

PRC		ID		JP		KR	
JP	4.02	MA	3.34	KR	4.90	JP	4.90
KR	3.60	PH	3.17	SG	4.72	SG	3.76
SG	3.20	SG	3.13	TH	4.23	TH	3.67
MA		PH		SG		TH	
SG	4.96	SG	3.99	MA	4.96	JP	4.23
TH	4.02	MA	3.82	JP	4.72	SG	4.20
PH	3.82	TH	3.48	TH	4.20	MA	4.02

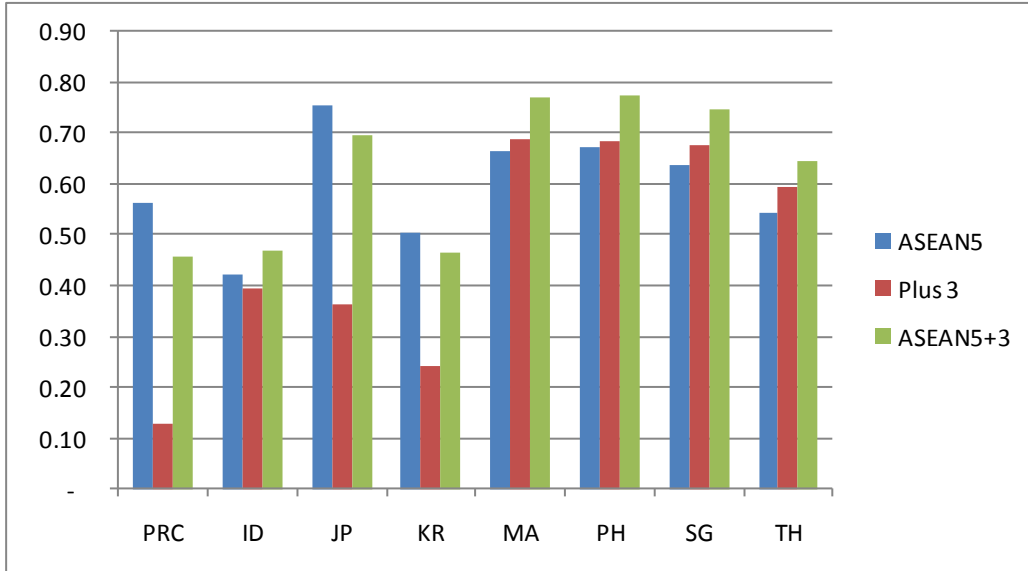
**Table 3**  
**Principal Components Analysis**  
**(Using BCS, UID, RPPP, Trade, Equity, FD, PF)**

<b>Eigenvalues: (Sum = 7, Average = 1)</b>					
<b>Number</b>	<b>Value</b>	<b>Diff</b>	<b>Prop</b>	<b>Cum Value</b>	<b>Cum Prop</b>
1.00	2.74	0.94	0.39	2.74	0.39
2.00	1.80	0.71	0.26	4.53	0.65
3.00	1.09	0.35	0.16	5.63	0.80
4.00	0.74	0.43	0.11	6.37	0.91
5.00	0.31	0.09	0.04	6.68	0.95
6.00	0.22	0.11	0.03	6.89	0.98
7.00	0.11	---	0.02	7.00	1.00

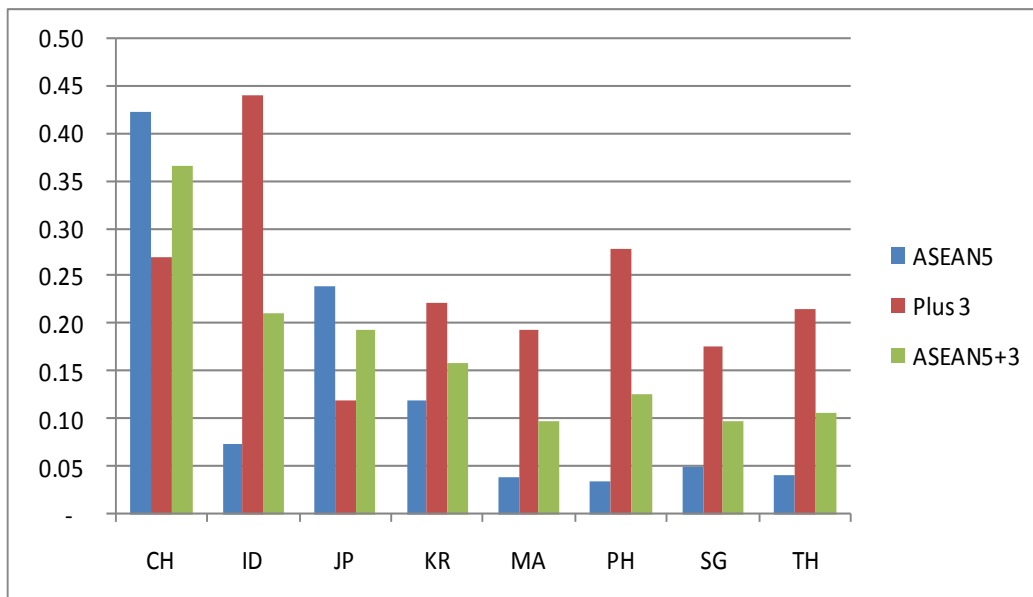
<b>Eigenvectors (loadings):</b>							
<b>Variable</b>	<b>PC 1</b>	<b>PC 2</b>	<b>PC 3</b>	<b>PC 4</b>	<b>PC 5</b>	<b>PC 6</b>	<b>PC 7</b>
BCS	0.21	0.46	- 0.31	0.66	0.45	0.04	- 0.07
EQ	0.44	0.31	0.23	- 0.44	0.16	0.54	- 0.38
FD	- 0.37	0.43	0.28	0.31	- 0.61	0.14	- 0.34
PF	- 0.22	0.58	- 0.15	- 0.47	0.14	- 0.59	- 0.08
RPP	0.49	0.33	- 0.16	- 0.05	- 0.51	0.01	0.60
TR	- 0.52	0.24	0.16	- 0.10	0.30	0.46	0.58
UID	0.24	0.07	0.84	0.19	0.20	- 0.36	0.18

**Figure 1**  
**Regional Integration by Type**

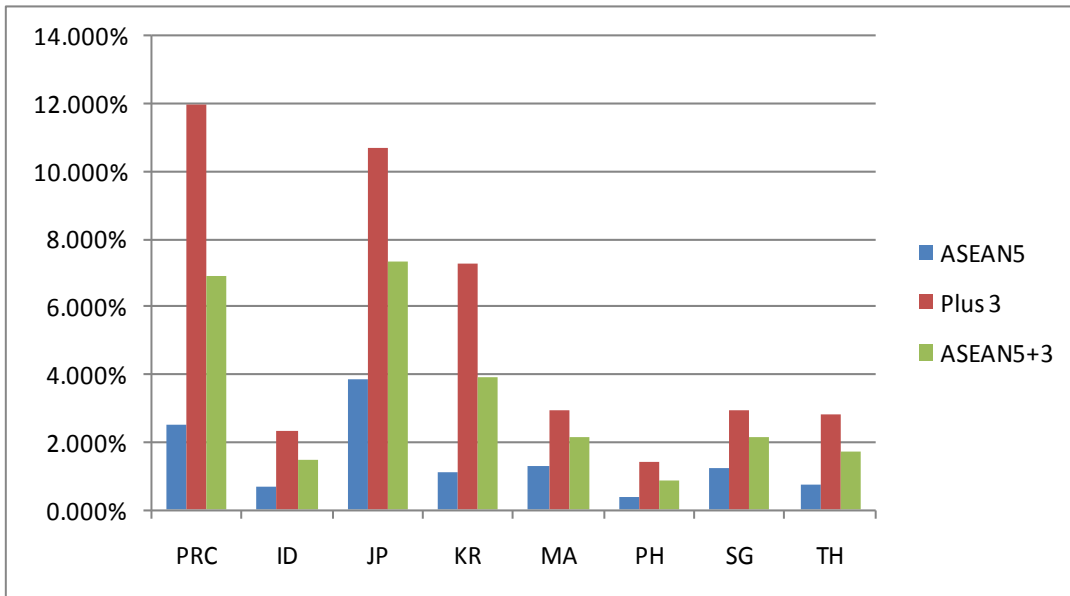
**Figure 1a**  
**Business Cycle Correlation**



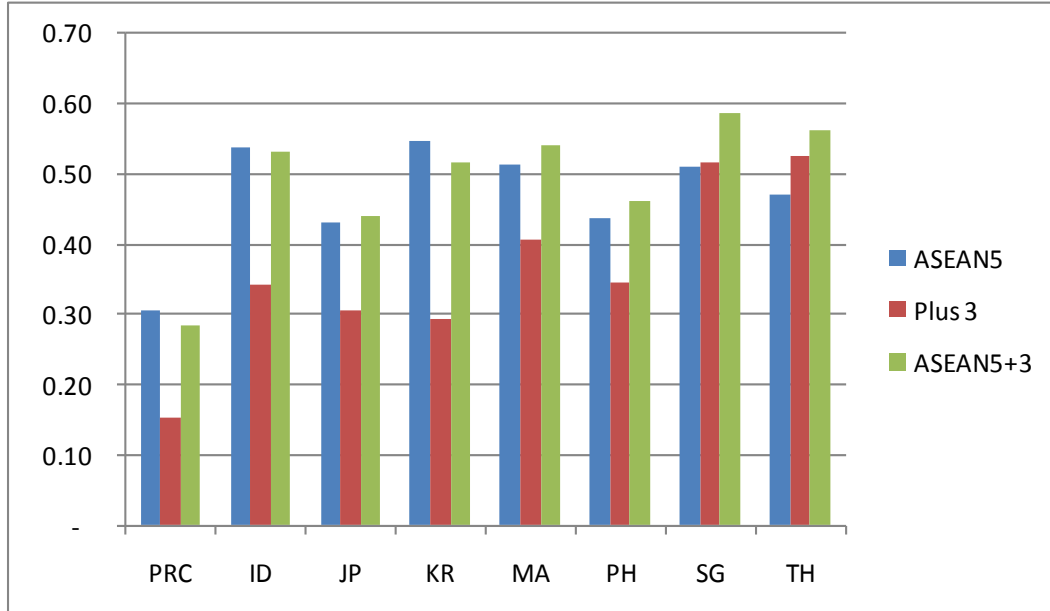
**Figure 1b**  
**RPPD Deviations**



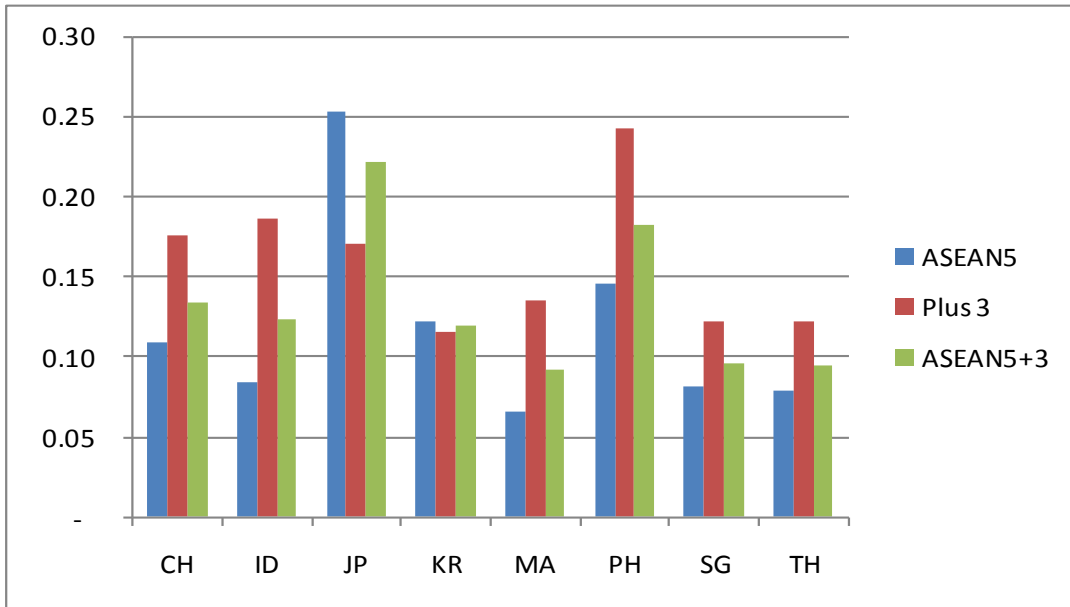
**Figure 1c**  
**Trade Intensity**



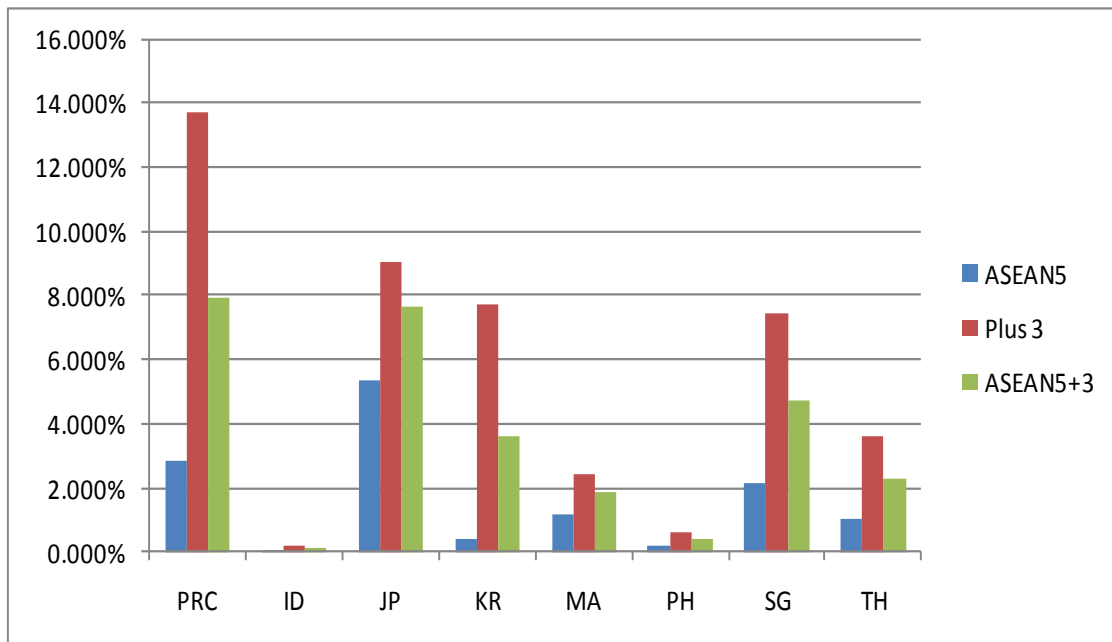
**Figure 1d**  
**Equity Market Correlation**



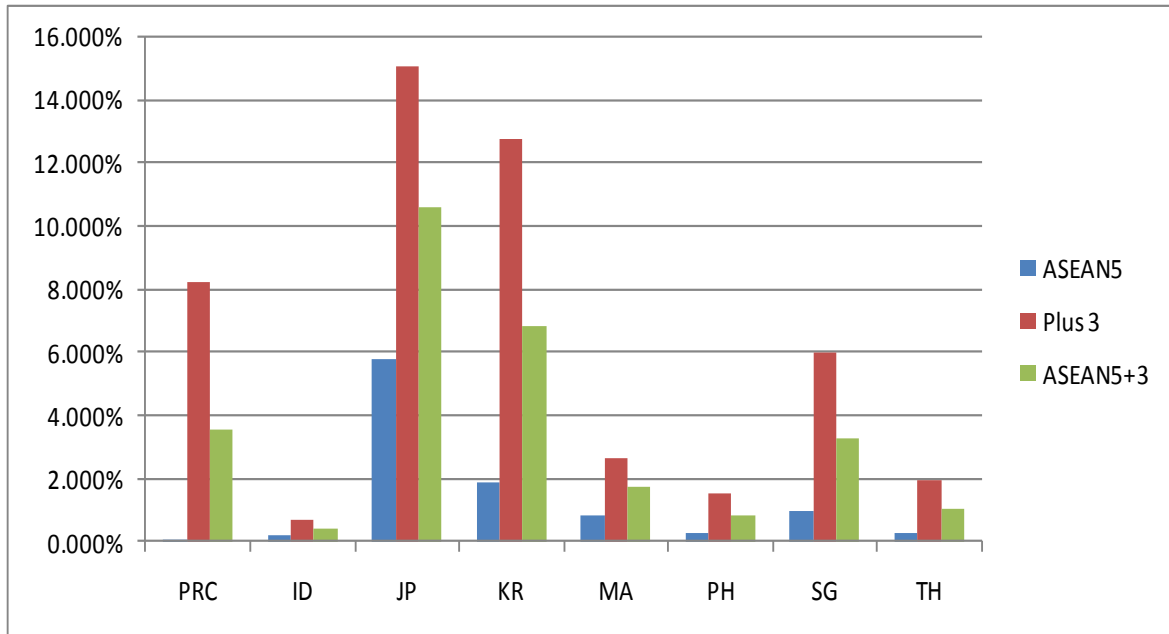
**Figure 1e**  
**UID Deviations**



**Figure 1f**  
**FDI Intensity**



**Figure 1g**  
**Portfolio Intensity**



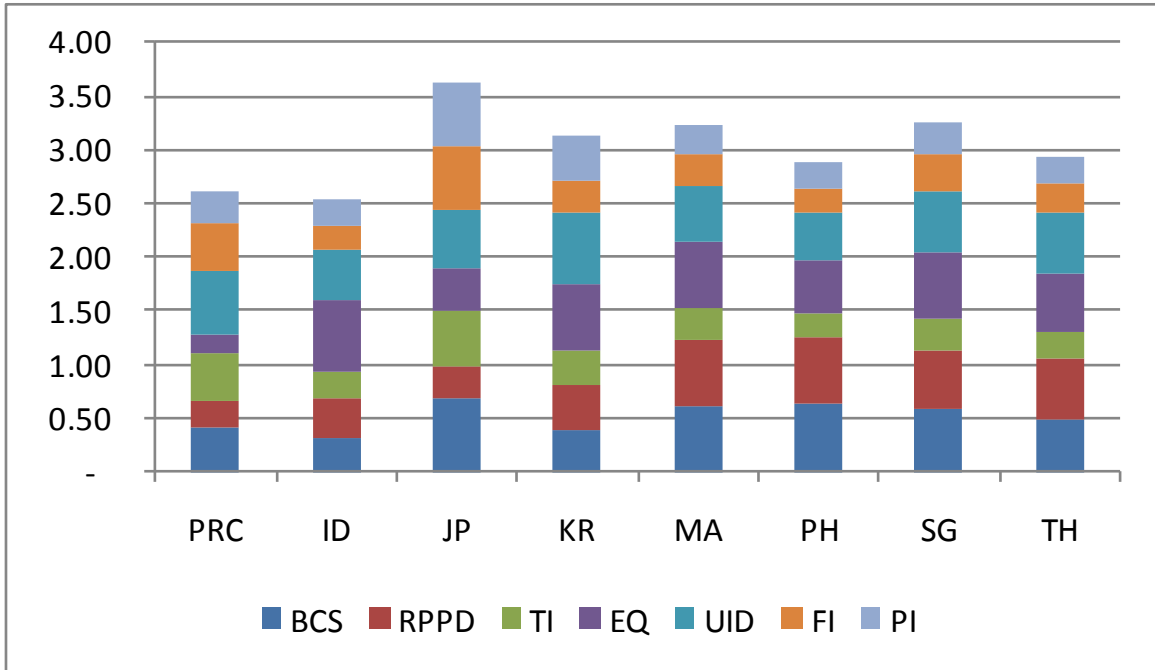
**Figure 2**  
**Overall Integration to regional groupings - normalised**



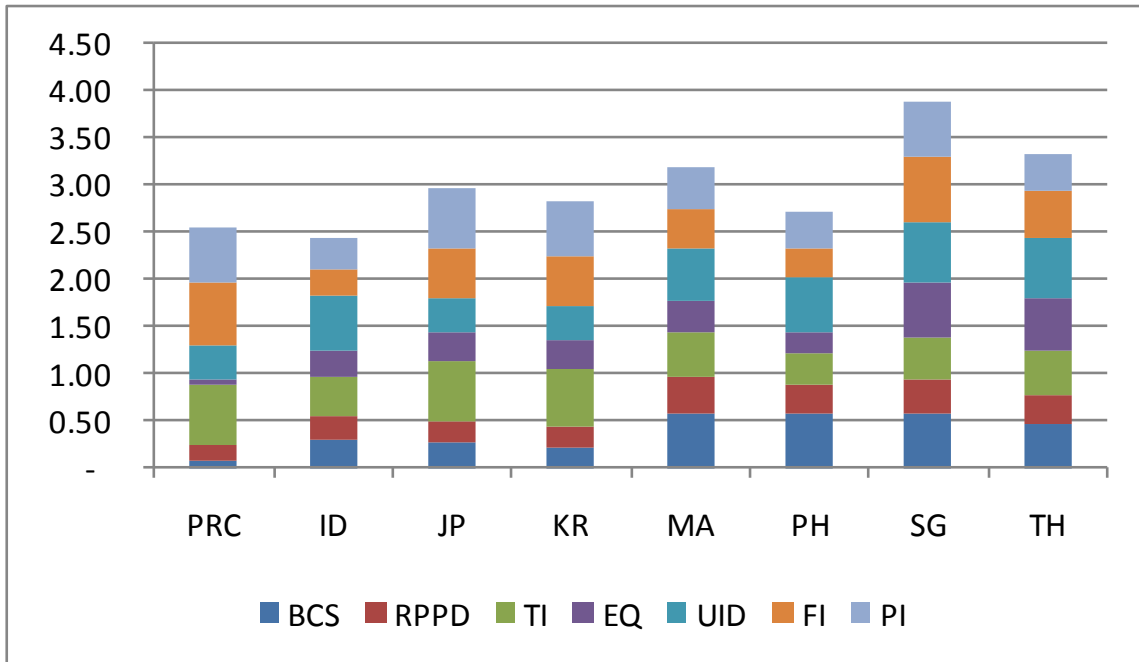
**Figure 3**

**Components of normalised integration to regional groupings**

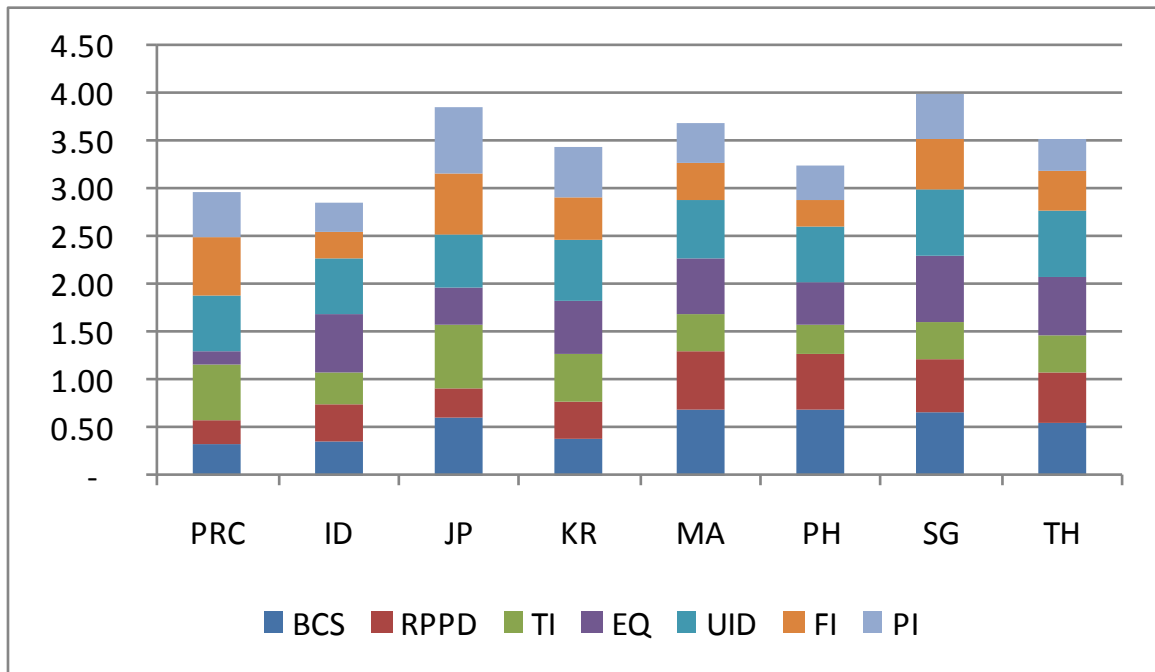
**a. Integration with ASEAN5**



**b. Integration with plus3**



**c. Integration with ASEAN5+3**



**Figure 4**

**Overall Integration using Principal Components  
(7 measures – BCS, UID, RPPP, Trade, Equity, FD, PF)**

