Are Optimal Currency Areas Optimal for All?

A Reassessment of the Case for Asian Monetary Union

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"*Does Asia need a common currency? My answer is, yes*." Robert Mundell (2003)

Abstract: This paper is a pioneering attempt to include India with east and Southeast Asia to study the existence of the economic criteria for a common currency. The analysis in this paper shows that significant complementarities in trade exist among these countries, most of them experience similar shocks and labor mobility is already present. These results point to the fact that the cost of adopting a single currency may be minimal, while huge benefits could accrue from enhanced trade. The paper also recognizes the importance of yen for the success of the monetary union in Asia.

JEL Classification: F33, F36, F42, E32

Keywords: Common Currency, Optimum Currency Areas, Monetary Union, Asia, India.

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1. Introduction:

While the last decade witnessed a strong trend towards regional trading blocs, the recent success of the euro has also prompted policymakers and academicians to look for other optimum currency areas (OCA). There has been some work done for ASEAN and NAFTA (Bayoumi and Eichengreen, 1994 and Bayoumi and Mauro, 1999), West Africa (Masson and Pattillo, 2001) and South Asia (Saxena, 2005). The growth prospects of free trade agreement for ASEAN + 3 (China, Japan and South Korea) have also been analyzed by Hoa (2002). However, the importance of India's economic integration with the rest of Asia has been conspicuously missing from this literature. Given the geographic location, one would expect more economic cooperation among the South Asian economies. The analysis of South Asia in Saxena (2005) demonstrates that some of the major economies like India, Pakistan and Sri Lanka can form an OCA, using various criteria from the literature on OCA. The paper argues that the benefits of a common currency would accrue from moving trade from the informal to the formal sector and from the peace that economic integration would bring between India and Pakistan. However, the reluctance on the part of Pakistan to solve the Kashmir issue has forced India to look East for economic cooperation.

The Association of South East Asian Nations (ASEAN) was formed in 1967 with five original members, namely, Indonesia, Malaysia, Philippines, Singapore and Thailand. This was expanded to include Brunei Darussalam (1984), Vietnam (1995), Laos and Myanmar (1997) and Cambodia (1999). The objectives of this association have been to accelerate economic growth, social progress and cultural development in the

region and to promote regional peace and stability. Over time, ASEAN has made significant achievements, which includes increased trade among the ASEAN nations.[2]

The integration of India with ASEAN is highly desirable. In 1992, in a move to strengthen its cooperation in an increasingly interdependent world, ASEAN intensified its cooperative relationships with its Dialogue Partners, which includes India. This regional cooperation is imperative because attempts at sub-regional cooperation like ASEAN and SAARC have failed to exploit the full potential of the regional economic integration in Asia (Kumar, 2002a). The author argues that this failure is a direct result of limited complementarities at the sub-regional levels, but there exist wide range of complementarities at pan-Asian level, which could provide for extensive and mutually beneficial linkages. In addition, the distinct Asian identity has been shaped by history and cultural exchanges over several centuries.[3] In 1997, ASEAN + 3 signed a joint statement providing for framework for cooperation towards the 21st century.[4] Although there needs to be significant work done for integration of India with ASEAN + 3, the signing of free trade agreement with Singapore and negotiations for free trade with Thailand that are underway are promising, to say the least.[5] The recent emphasis by the government of India to revive the *Silk Route* is testimony to the commitment of India to integrate with the East (Ved, 2003).

Asia has lately been working towards demonstrating its own identity to the world. In the aftermath of the Asian crisis in 1997, Indonesia, Thailand and South Korea resorted to IMF for loans. However, the problems with the IMF conditionalities led

[2] See http://www.aseansec.org for details.
[3] Refer to Kumar (2002a) for specific examples.
[4] Throughout the paper, the term ASEAN + 3 refers to ASEAN, China, Japan and Korea and ASEAN + 4 refers to ASEAN + 3 + India, unless otherwise specified.
[5] Refer to Kumar (2002b) for details on institutional framework for India's economic links with East Asia.

Japan and other Asian countries to propose the formation of the Asian Monetary Fund. While this proposal did not go well with the U.S. and the IMF, ASEAN + 3 nonetheless have gone ahead with a regional swap agreement (Chiang Mai Initiative) system to deal with regional currency crises. The new wave of regionalism (the EU, the NAFTA, MERCOSUR, etc) has paved way for Asia to show its supremacy by forming an Asian Economic and Monetary Union (AEMU), which according to Baohua (2002) is not a new concept but dates back to Confucius 2500 years ago. Recent disagreement within the Security Council at the UN regarding war with Iraq has brought out the urgency to give a unified front to the United States, which dominates all the international political and economic negotiations. [6]

Due to the recent success of Euro, Asia can even venture to go as far as Europe to adopt a single currency. This process requires tremendous amount of political will and economic readiness. The aim of this paper is to see if ASEAN + 4 satisfy the economic criteria for OCA. Since Mundell's (1961) and McKinnon's (1963) seminal work on OCA, researchers have focused on four inter-relationships between the countries that would impinge on the benefits of adopting a common currency, namely:

1. Extent of trade: If potential members of a union trade a lot with each other, monetary union would reduce transaction costs.
2. Nature of disturbances: If the countries experience similar shocks, the cost of giving up monetary policy independence would decrease.

[6] Refer to Agarwala (2003) for the case for a single currency in Asia, so that we can move to a multipolar world of international finance from the current unipolar system dominated by the US dollar.

3. Degree of labor mobility: High labor mobility across borders can be a useful mechanism for adjusting to asymmetric shocks that lead to high unemployment in a subset of the members of the union.
4. Fiscal transfers: If region-specific shocks prevail, a federal fiscal system would provide regional insurance (in the form of federally funded unemployment insurance benefits), thereby attenuating the impact of regional shocks on interregional income differentials.

Using the criteria set out by this literature, this paper looks at the possibility of an OCA for the ASEAN + 4 region. The rest of the paper is organized as follows. Section 2 investigates the basic statistics of the ASEAN+4 countries. Section 3 discusses the potential of a currency union for ASEAN+4 using the criteria listed above. Section 4 concludes.

2. Economic Development of ASEAN, China, India and Korea

A similar level of economic development is crucial among potential members of a currency area in order to facilitate economic integration. A similar average level of education, skill and productivity of the work force would help moderate the flow of labor across borders, which could otherwise put social and fiscal strains on the immigrant country.[7] Entry into a monetary union leaves fiscal policy as the only macroeconomic tool for stabilization purposes. Therefore, fiscal policy should not be unduly strained by differences in social and economic structures. Table 1 illustrates economic and social

[7] While the movement between high and low skilled workers could be complementary, one must recognize that economic strains could increase if immigration is in the same skilled category.

indicators of ASEAN5, China, India and Korea for the year 1999.[8] The year 1999 was chosen so that sufficient time had elapsed since the Asian crisis and to exclude the global recession, which started in 2000. It can be seen from the table that the majority of the population is in the working age group. The ASEAN5 and China, Korea and India preclude aging as a major problem in the near future, which could put undue pressure on fiscal resources and threaten the existence of the union.

Economic indicators for India are comparable to those of ASEAN5 (Indonesia, Malaysia, Philippines, Singapore and Thailand), China and Korea. The services sector constitutes about 48% of GDP for India, which is in line with other economies' services sector. A similar economic structure may make them vulnerable to similar economic shocks, which strengthens the argument to use common currency.[9] All these economies are sufficiently open, with trade contributing to at least one-fourth of GDP. The more open an economy, the greater will be the benefits that would accrue from elimination of exchange rate risks by using the same currency.[10]

The social indicator that distinguishes India from the ASEAN5, China and Korea is (il)literacy. While Korea has found its niche in building brand names like Samsung, Hyundai and LG and Singapore has decided to offer world class infrastructure, India has decided to invest in intellectual services (Economic Times, 2003). Hence, India's comparative advantage in these intellectual services complements with the rest of the region.

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[8] While we include Japan in the rest of the paper, we exclude it from the discussion on economic development because it is a developed economy and does not compare well with the other countries. However, the discussion later shows how Japan's current economic problems can be eased with economic integration with the rest of Asia.

[9] Rose and Engel (2002) find that business cycles are more tightly synchronized for members of a currency union than between countries with sovereign currencies.

[10] Frankel and Rose (1996, 1997) find that countries with closer trade links also tend to have more tightly correlated business cycles.

Solid macroeconomic policies and performances are also required for countries in a potential monetary union in order to prevent a poor performer from imposing externalities on the union. All budget and current account balances are either in surplus or small deficits. Short- term debt (as a % of total external debt) is less than 25% for all countries, except for Korea (27%). The present value of debt is also sustainable. A burgeoning external debt may pose a significant cost to the union by increasing sovereign default risk and widening interest rate spreads.

Comparing ASEAN + 4 with other geographic regions

Table 2 illustrates the mean and standard deviation of growth and inflation. ASEAN has an average growth rate of 5.5% and inflation of 16%. This high average inflation is mainly due to high inflation in Lao People's Democratic Republic (37%) and Indonesia (63%).[11] When we exclude these countries, the average inflation declines to 6.8%. The average growth rate for China, India, Japan and Korea is 6% (mainly due to high rates of growth in China (7%) and Korea (8%)), while the average inflation is 7.7%. The average growth rate is higher for ASEAN+4 and inflation lower than for ASEAN. In addition, the variability in inflation rates is also reduced. While ASEAN+4 show much higher growth and inflation rates than Western Europe, the variability is also higher.

Although stability of growth and inflation is important, a positive correlation of growth and inflation for the ASEAN5+4 nations (Table 3) would suggest that the countries may be cyclically synchronized. Bayoumi and Eichengreen (1994) find some country groups with positive correlation for output but not inflation in case of Western Europe. According to these correlations, 77% of the correlations in output growth rates

[11] This high inflation rate in Indonesia is a result of the hyperinflation in the 1960s. When we exclude this period, the average inflation for Indonesia falls to about 13%, where high inflation in the aftermath of the Asian crisis is still included (58% for 1998 and 20% for 1999).

and 70% of the inflation correlations are positive for ASEAN5 + 4. These positive correlations may suggest synchronized business cycles. However, we will analyze the correlation of demand and supply shocks to explore this matter further in the next section.

3. Is ASEAN+4 an Optimal Currency Area?

Criterion 1: Trade

The literature on OCA emphasizes trade as the main channel through which benefits from a common currency will be enjoyed (Frankel and Rose, 2000). Hence, if countries trade a lot with each other, they are likely to benefit from low transaction costs and elimination of exchange rate risks. Rose (1999) finds that two countries that share the same currency trade three times as much as they would with different currencies. Glick and Rose (2001) find that bilateral trade rises/falls by about 100% as a pair of countries forms/dissolves a currency union, *ceteris paribus*. Rose and Engel (2002) find that members of international currency unions tend to experience more trade and less volatile exchange rates. It is not clear if trade is a pre-requisite for forming a currency union or vice versa. The two are endogenous decisions and hence, suffer from the famous *Lucas Critique*. Nonetheless, it would be helpful to see if these countries could potentially gain from lower transaction costs if they were to move to a single currency.

Figure 1 illustrates intra-ASEAN trade, which for almost all countries has risen over time. The average trade for the latest period (1991-2000) varies from as low as 12% for the Philippines to about 60% for Lao People's Democratic Republic. Figure 2 shows that Chinese, Japanese, Korean and Indian trade with ASEAN has gone up from 1950s to

2000. The average trade with ASEAN during 1991-2000 is about 7% for China, 8% for India, 11% for Korea and 15% for Japan.[12]

While present levels of trade of China, India, Japan and Korea with ASEAN are small, there exists potential for trade among the ASEAN + 4 countries, which is calculated using the *COS* measure, developed by Linnemann (1966). This index measures the degree of commodity correspondence between the exports of a country and the imports of another country. It varies between zero (no similarity or correspondence at all) and one (perfect similarity) and is the cosine of the angle between the vector of country i exports and the vector of country j imports in an n-dimensional commodity space. If the subscripts i, j and k refer to the exporting country, importing country and commodity class, respectively, the measure is defined as (Beers and Linnemann, 1992):

$$(1) \qquad COS_{ij} = \frac{\sum_k E_{ik} . M_{jk}}{\sqrt{(\sum_k E_{ik}^2 . \sum_k M_{jk}^2}}$$

This measure has been estimated for SAARC countries in Panchmukhi (1990) and for various developing and developed countries in Beers and Linnemann (1992). Table 4 (a through h) depict the COS measures for India, Korea, China and Japan from 1996 through 2000 for 5-digit SITC codes. The data is taken from PC-TAS.[13] Indian primary exports (industries 0-4) exhibit significant complementarity with all the countries (Table 4a), while goods similar to the Indian manufactured exports (industries 5-8) are imported by all countries except Korea. Indian manufactured imports (Table 4b) are

[12] Elliott and Ikemoto (2003) find that the Asian crisis generated a stronger desire to source imports from within the ASEAN region.

[13] Data on Cambodia, Lao People's Democratic Republic, Myanmar and Vietnam is not available. Complementarity is assumed if the COS measure is higher than 0.4. It may be noted that a COS measure of 0.4 is high because the measure is estimated at 5-digit SITC code.

complementary to all the countries' exports, while Indian imports of primary products are similar to the exports of Japan, Korea, Indonesia, Malaysia and Philippines. Korean primary exports are similar to the imports for all except Malaysia and Indonesia (Table 4c), while manufactured exports are complementary to the imports of all countries. All the Korean imports are similar to the exports by all countries, except for all goods for Thailand and manufactured products for Indonesia (Table 4d). Chinese exports and imports of both primary and manufactured goods are complementary to the imports and exports by all the countries (Table 4e and 4f). All of Japan's exports are complementary to the imports of all countries, except primary imports of Philippines (Table 4g). The COS measure shows complementarities for all of Japanese imports (Table 4h).

The existence of significant complementarities but low current bilateral trade testifies to the gains that can accrue from free trade zones and the eventual use of a common currency. When country A exports good *k* to the world and country B imports the same good from a third country, even when the unit cost of this good from importing it from country A is lower, is termed as *cost of non-cooperation*. According to Das (2002), if the existing trade complementarities are exploited between India and Thailand, India could save around $4.6b and Thailand $7.9b in imports expenditures, which represent about 10% and 14% of the total import expenditures, respectively. These are enormous costs that can be eliminated through free trade and common currency.

This emphasis on trade is worthwhile because trade enhances growth. Frankel and Romer (1999) show that trade has a quantitatively large and robust positive effect on income. Frankel and Rose (2000) argue that currency unions stimulate trade, which in turn boosts output. Frankel, Romer and Cyrus (1996) suggest strong growth effects of

trade on East Asian economies. All the papers that study the impact of trade on growth use gravity model. Hoa (2002) extends the gravity model to time series and estimates the effects of ASEAN trade with China, Japan and Korea on ASEAN growth using two-stage least squares. He finds that trade between ASEAN and each of the three East Asian economies has significant and positive effect on ASEAN growth. We estimate the same model for the impact of India's trade with ASEAN on ASEAN growth for the period 1960-2000. The results obtained are:

$$ASEAN\_growth = 0.04 + 3.38 * ASEAN\_India\_trade + 0.03 * DUM67 - 0.03 * DUM79 - 0.06 * DUM97 \quad (2)$$

where all coefficients are significant at 1% level of significance. The estimates indicate positive and highly significant effect of ASEAN trade with India and the formation of ASEAN (DUM67) on ASEAN output growth. The results also show negative impacts of the second oil shock (DUM79) and the Asian crisis (DUM97) on ASEAN output growth. Hence, these results along with Hoa (2002) results reveal the positive impact of Chinese, Indian, Japanese and Korean trade with ASEAN on ASEAN growth. Since trade has positive impact on growth and common currency encourages trade, hence there is a strong case for a common currency for this region.

Criterion 2: Patterns of Shocks

Using the methodology outlined by Blanchard and Quah (1989) and Bayoumi (1992) (described in Appendix 1), we estimate the structural vector autoregression (VAR)

model on annual data for ASEAN8 plus China, India, Japan and Korea (see Appendix 2 for data sources).[14] The estimated results are presented in tables 5 and 6.[15]

Our main interest in this empirical exercise is to extract the supply and demand shocks. A positive correlation of supply shocks signals that countries would require a synchronous policy response, which is crucial as the countries entering the union have to accept a common monetary policy. Highly related demand shocks may be less important, as they may stem from divergent monetary policies, which would no longer occur after the monetary union. Tables 5a and 5b report the correlation of supply and demand shocks among the ASEAN + 4 countries. While the estimated correlation coefficients of supply shocks ranged between –0.39 and 0.68 for Western Europe, –0.59 and 0.72 for the Americas (Bayoumi and Eichengreen (1994)) and –0.41 and 0.29 for South Asia (Saxena 2005), the correlation coefficients for ASEAN + 4 range between-0.002 and 0.857. Indeed, 73% of the correlations for supply shocks are positive, indicating that they might be suitable candidates for an OCA.

The correlation coefficients for demand shocks ranged from -0.21 to 0.65 for Western Europe, –0.45 to 0.7 for the Americas (Bayoumi and Eichengreen (1994)) and –0.3 to 0.57 for South Asia (Saxena 2005). The range for ASEAN+4 is –0.017 and 0.603 and about half of the correlations are positive.

Size of disturbances and speed of adjustment: The typical size of disturbances is another important economic characteristic since larger disturbances can have very disruptive effects, and may require policy independence (e.g., monetary policy) to offset

[14] Data for real GDP and CPI is not available for Brunei Darussalam and Cambodia. Annual data is used in order to make this study comparable to Bayoumi and Eichengreen (1994) and Saxena (2005).
[15] In order to conserve space, variance decompositions and impulse response functions are not shown here and their discussion omitted since they are not directly relevant for the analysis.

them. Similarly, if the speed with which the economies adjust to disturbances is slow, then the cost of fixing the exchange rate and losing policy autonomy increases (Saxena, 2005).

In order to assess the size of disturbances, we use the long-run effect on output from the impulse response functions for the size of supply shocks and the sum of the first year's impact on output and prices for the demand shocks. For the speed of adjustment, we estimate the response after two years as a share of the long run effect (following Bayoumi and Eichengreen (1994)).

Table 6 displays the size and the speed of adjustment for supply and demand disturbances for different geographic regions. While the size of the supply and the demand disturbances for ASEAN + 4 is larger than that of Western Europe, the speed of adjustment is significantly faster. Within the ASEAN + 4 region, the size of the supply disturbances is smallest in India and largest in Japan. At least 75% of the adjustment from supply shock is completed within two years for all countries, except Japan. But Japan and Malaysia have the smallest and Indonesia the largest demand disturbances. While India and Singapore seem to adjust fastest to demand shocks, Vietnam takes the longest time. Since demand disturbances may not be so important after the entry into the union, this might not be a hindrance. However, Japan's extremely slow adjustment to supply shocks could be problematic. This might also be reflective of the decade long recession in Japan. As we argue in the concluding section, the slow Japanese recovery might gain momentum from this regional integration.

Criterion 3: Labor Mobility

Labor mobility has been emphasized in the optimum currency area literature as it helps the members of a monetary union to adjust to asymmetric shocks by allowing labor to move from areas of high unemployment to low unemployment. The objective of the integrated human resource development strategy for ASEAN is "to enhance labor mobility by way of skills upgrading, re-tooling, training in new skills, a system of recognition of skill certificates and credentials within and among countries in the ASEAN region. To this end, the Hanoi Plan of Action adopted by the ASEAN summit in December 1998 called for the establishment of networks of professionals, accreditation bodies and mutual recognition of technical and professional credentials and skill standards beginning in 1999."[16] By 2001, ASEAN Occupational Safety and Health Network (ASEAN-OSHNET) was launched and the ASEAN committee of civil service commissions is now included in the ASEAN institutional framework.[17]

The size and direction of labor mobility and the quality of labor migration has varied across countries. While Singapore has historically depended on unskilled migrant labor, ethnically homogenous Japan and, to a lesser extent, Korea had practiced tight labor controls on in-migration until very recently. On the one hand, Philippines and Vietnam have a long history of exporting labor; on the other hand, Thailand and Malaysia already experience a huge inflow of illegal immigrants. Malaysia imports most labor from Indonesia, while Thailand is a major source of destination of economic and political refugees from Myanmar in the 1990s (Manning, 2000). In any event, intra-Asian

[16] www.aseansec.org; http://www.aseansec.org/8754.htm
[17] http://www.aseansummit2001.org.bn/org/as2001/hpa.doc

migration has increased from one million at the beginning of the 1980s to 6.5 million in 1997. Major host countries include Japan, Hong Kong, Singapore, and Taiwan, and major exporters are Indonesia and the Philippines. Korea, Malaysia and Thailand are both exporters and importers of migrant workers (Kwack, 2004). While Kwack believes that this increased migration within Asian countries has been closely associated with increased inter-regional trade and investment, Manning attributes the high migration of the 1990s to increased growth in the region and low growth of labor due to falling fertility rates in the 1970s and 1980s leading to tighter labor markets. Manning argues that while the movement of unskilled labor has predominated, skilled, professional and business migration has also intensified. This trend has continued even in the face of the Asian crisis.

Labor mobility is difficult to measure. However, Masson and Taylor (1993) assume that if migration is for employment then mobility will result in lower unemployment rate differentials across regions and over time. Table 7 compares dispersion of unemployment rates across regions covering the period from 1980-2000. The average dispersion is smallest for East and South East Asia (1.23) and largest for the EU (2.06). If our assumption is correct, labor mobility is highest in Asia, which is required if countries decide to go in for a single currency.

In short, labor mobility is already reasonably high within the Asian region. This can be given a boost through the Hanoi Plan of Action. In fact, Sussangkarn (1997) argues that the incentives for labor mobility are enhanced by the fact that intra-ASEAN trade is much smaller than the intra-EU trade. Consequently, adjustment to shocks can be accomplished through labor mobility.

Criterion 4: Fiscal Transfers

The issue of fiscal federalism has been widely discussed in the literature on currency areas. Currently, Asia does not have any transfer of fiscal resources from one country to another, but something along the lines of EU[18] can be discussed later in the negotiations. The Chiang-Mai Initiative is a step in the right direction to help countries in times of crisis.

However, Eichengreen (1997) and Fatas (1998) have argued against fiscal federalism. Eichengreen feels that it may discourage factor mobility and may encourage national labor unions to demand higher wages as the burden of unemployment benefits falls on the entire union (and this may create more socially inefficient unemployment). Fatas believes that the potential to provide interregional insurance through (European) fiscal federalism is too small to compensate for the problems associated with its design and implementation.

4. Conclusions

This paper is a pioneering attempt to include India with east and Southeast Asia to study the existence of the economic criteria for a currency union in Asia. The analysis in this paper shows that Chinese, Japanese, Indian and Korean trade with ASEAN has risen in the last decade and this increase in trade has a positive impact on ASEAN growth. There are significant complementarities in the trade structure too, which suggest that these countries should work towards a Common Market. Labor is already mobile across the region and can help facilitate adjustment to shocks. The positive correlations for

[18] Euro area collects a union-wide VAT, which is distributed according to some agreed upon rules.

supply shocks testify that the loss from giving up independent monetary policy would be minimal. However, the slow adjustment of Japanese economy might suggest a threat to the union. But if Japan's idle capacity in construction industry can be utilized by other countries, say like India, Japan's recovery could be faster. These complementarities can be quickly exploited if Asia decides to deepen its monetary and financial cooperation.

What should the new currency look like? Against which currency should Asian nations peg their exchange rates? It was not until the 1980s that the Deutschemark was acknowledged as the anchor currency. While Europe had institutional, economic and political groundwork already laid out, like the Common Market and later the Economic Community, which facilitated the move to a single currency, Asia lacks this foundation. However, Mundell (2003) argues that Asia could leap frog to a currency area if the potential members are willing to use an internal or external currency anchors. Internal anchor in the form of yen would be desirable but huge fluctuations in the yen-dollar exchange rates would be disastrous for the other economies. Hence, a stable yen-dollar exchange rate can go a long way in promoting the idea of a common currency in Asia.

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Appendix 1: Empirical methodology to study demand and supply shocks

Although structural vector autogressions are very standard in the literature, yet we will describe this methodology. In order to examine the nature of the shocks affecting the ASEAN, China, India, Japan and Korea, we employ the procedure developed by Blanchard and Quah (1989) and extended by Bayoumi (1992) to identify demand and supply shocks affecting real GNP. In Blanchard-Quah's model, demand side shocks have no long run effect on output, due to the natural rate hypothesis, while productivity shocks have a permanent effect on output. Since there is no unique way to decompose the series in a univariate framework, Blanchard and Quah use output and unemployment in their VAR to decompose real GNP. Bayoumi (1992) develops a similar model but uses prices instead of unemployment. He argues that since unemployment would be expected to move in the same way in response to both demand and supply shocks, the implied over-identifying restrictions would have somewhat less power than if prices are used.

The basic framework is as follows.[19] Suppose the true model can be represented by an infinite moving average of a (vector) of variables X_t and an equal number of shocks ε_t (where L is the lag operator and A represents a matrix of impulse response functions of the shocks to the elements of X).

$$(1) \qquad X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + \ldots\ldots = \sum_{i=0}^{\infty} L^i A_i \varepsilon_t$$

Bayoumi (1992) uses output and prices in estimating supply and demand shocks. The framework implies that while supply shocks have permanent effects on the level of output, demand shocks have only temporary effects (both have permanent effects on the level of prices). Let X_t consist of a change in real output and a change in prices. Let ε_t represent the two shocks. The model can be written as:

$$(2) \qquad \begin{bmatrix} \Delta y_t \\ \Delta p_t \end{bmatrix} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \begin{bmatrix} \varepsilon_{st} \\ \varepsilon_{dt} \end{bmatrix}$$

where ε_{st} and ε_{dt} are independent supply and demand shocks. In theory, only supply shocks affect real output in the long run, while demand shocks have only a temporary effect. Since real output is written in first-difference form, the cumulative effect of demand shocks on the change in real output must be zero. This puts the following restriction on the model:

$$(3) \qquad \sum_{i=0}^{\infty} a_{12i} = 0$$

Since the elements of X are covariance stationary (represented by the infinite moving average process in 1), they can be represented by an autoregressive process by inverting the MA operator. Hence, this model can be estimated using a vector auto regression (VAR), where all the variables are potentially endogenous and hence are regressed on their lags. Let B represent the estimated coefficients, the VAR can be written as:

$$(4) \qquad \begin{aligned} X_t &= B_1 X_{t-1} + B_2 X_{t-2} + \ldots\ldots\ldots + B_n X_{t-n} + e_t = [I - B(L)]^{-1} e_t \\ &= [I + B(L) + B(L)^2 + \ldots\ldots]e_t = e_t + D_1 e_{t-1} + D_2 e_{t-2} + \ldots\ldots\ldots \end{aligned}$$

where e_t represents the residuals from the equations in the VAR.

[19] See Blanchard and Quah (1989), Bayoumi (1992) and Enders (1995) for details on this framework.

In order to transform equation (4) into the model defined by (2) and (3), we need to transform the residuals from VAR (e_t) into supply and demand (ε_t). Writing $e_t = C\,\varepsilon_t$, in this two by two case, we require four restrictions to define the four elements of the matrix C. Two restrictions come from normalization of the variance of supply and demand shocks. Another one comes from orthogonality of the two structural shocks.

The final restriction comes from the fact that demand shocks have only temporary effects on real output (3). In terms of the VAR:

$$(5) \qquad \sum \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \begin{bmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{bmatrix} = \begin{bmatrix} . & 0 \\ . & . \end{bmatrix}$$

This restriction allows the matrix C to be uniquely defined and the supply and demand shocks to be identified.

This econometric methodology is used to estimate supply and demand shocks. Then, a pair-wise correlation matrix is computed for each type of shock to examine their symmetry across countries, which is essential in determining the readiness of a country to enter the union. A positive correlation of supply shocks signals that countries would require a synchronous policy response, which is crucial as the countries entering the union have to accept a common monetary policy. Highly related demand shocks may be less important, as they may stem from divergent monetary policies, which would no longer occur after monetary union.

Appendix 2: Data Source for Estimating Structural Vector Autoregressions

Country	Source		Series	No. of Obs.	Estimation Prd
China,P.R.: Mainland	IFTS	92464...ZF...	CPI (UNPUBLISHED)	20	1981-2000
China,P.R.: Mainland	IFTS	92499B.PZF...	GDP AT 1995 PRICES		
India	IFTS	53464...ZF...	CPI:INDUST.WORKERS,50 CENTERS	42	1959-2000
India	IFTS	53499BVPZF...	GDP VOL. (1995=100)		
Indonesia	IFTS	53664...ZF...	CPI:17 CAPITAL CITIES	41	1961-2001
Indonesia	IFTS	53699BVPZF...	GDP VOL. (1995=100)		
Japan	WEO	W158NGDP_R	Gross domestic product, constant prices	47	1955-2001
Japan	IFTS	15864...ZF...	CPI:ALL JAPAN-485 ITEMS		
Korea	IFTS	54264...ZF...	CPI ALL CITIES	36	1966-2001
Korea	IFTS	54299BVPZF...	GDP VOL. (1995=100)		
Lao People's Dem.Rep	IFTS	54464...ZF...	CONSUMER PRICE INDEX	36	1966-2001
Lao People's Dem.Rep	WEO	W544NGDP_R	Gross domestic product, constant prices		
Malaysia	WEO	W548NGDP_R	Gross domestic product, constant prices	37	1965-2001
Malaysia	IFTS	54864...ZF...	CPI PENINSULAR MALAYSIA		
Myanmar	WEO	W518NGDP_R	Gross domestic product, constant prices	36	1966-2001
Myanmar	IFTS	51864...ZF...	CPI RANGOON ALL INCOME		
Philippines	IFTS	56664...ZF...	CPI:ALL INC H'HLDS-459 ITEMS	41	1961-2001
Philippines	IFTS	56699BVPZF...	GDP VOL. (1995=100)		
Singapore	IFTS	57664...ZF...	CPI	39	1963-2001
Singapore	IFTS	57699BVPZF...	GDP VOL. (1995=100)		
Thailand	IFTS	57864...ZF...	CPI: URBAN	46	1956-2001
Thailand	IFTS	57899BVPZF...	GDP VOL. (1995=100)		
Vietnam	IFTS	58264...ZF...	CONSUMER PRICES 1995=100	36	1966-2001
Vietnam	WEO	W582NGDP_R	Gross domestic product, constant prices		

Table 1: Economic Structure of ASEAN + 3 Countries: 1999

	China	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand	India
Growth and Economic Structure								
GDP growth rate	7.05	0.85	10.89	6.08	3.40	5.86	4.22	7.10
GDP per capita (PPP $)	3643	2892	15878	8107	3806	20874	6135	2258
Value Added: Agriculture (% of GDP)	17.63	19.54	5.07	11.91	17.15	0.15	11.20	26.23
Value Added: Manufacturing (% of GDP)	33.63	25.92	30.74	29.32	21.63	25.07	31.10	15.20
Value Added: Services (% of GDP)	32.95	36.71	52.41	45.47	52.25	65.21	49.51	47.75
Social Indicators								
Infant Mortality Rate	32.00	40.88	8.16	7.90	30.72	2.90	27.92	69.2
Life Expectancy at birth	70.26	66.03	73.15	72.54	69.27	77.65	68.82	62.80
Illiteracy rate (adult)	16.59	13.79	2.41	13.16	4.96	8.04	4.79	43.55
Immunization, DPT	90	71.5	74	93	79	94	97	55
Immunization, Measles	90	71	85	88	79	93	96	50
Population (0-14) (% of total)	25.10	31.25	21.29	34.46	37.85	21.73	27.07	33.87
Population (15-64) (% of total)	67.97	64.03	71.78	61.45	58.51	70.34	67.93	61.28
Rural population (% of total population)	68.44	60.16	18.84	43.34	42.32	0.00	78.72	71.92
Population density (per sq km)	134.40	114.28	474.61	69.12	248.83	6478.69	117.92	335.50
Internal and External Balance								
CPI inflation	-1.41	20.49	0.81	2.74	6.71	0.02	0.31	4.67
Budget balance (% of GDP)	-2.13	-1.14	-3.21	-1.76	-3.75	10.26	-3.34	-4.24
Current account (% of GDP)	2.13	4.09	6.03	15.95	10.39	25.94	10.18	-1.14
Trade (% of GDP)	41.19	62.36	77.82	218.26	102.78	313.59	104.30	27.01
Short-term debt (% of total external debt)	11.47	13.28	26.66	14.35	10.84	n.a.	24.20	4.01
PV of debt (% of exports)	45.52	181.78	60.56	37.87	102.78	n.a.	88.96	91.21
Aid (% of GNI)	0.24	1.69	-0.01	0.19	0.86	0.00	0.85	0.34
FDI, net inflows (% of GDP)	3.91	-1.94	2.30	1.96	0.75	8.58	5.09	0.49
Taxes on trade (% of current revenue)	9.51	2.54	6.39	12.66	18.27	1.32	9.22	20.76
International reserves (months of imports)	9.09	6.09	5.84	4.44	4.55	7.01	6.69	5.96

Source: World Development Indicators, World Bank, CD-Rom, except for budget deficits, which is from IMF IFS, 2002; Values for infant mortality, life expectancy and PV of debt are for the year 2000; shaded values are for 1997; n.a. represents non-availability of data; data for budget deficits is from IMF IFS 2002.

Table 2: Basic Statistics of ASEAN + 4 and other Geographic Regions

	Growth		Inflation	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Brunei	2.45	7.89		
Cambodia	5.13	3.10	5.39	5.91
Indonesia	5.72	4.30	62.69	183.70
Lao	5.63	3.73	36.50	38.28
Malaysia	6.89	3.54	3.43	3.35
Myanmar	3.89	5.19	12.88	13.69
Philippines	3.88	3.28	10.72	8.91
Singapore	8.53	4.01	2.96	4.68
Thailand	6.88	4.03	5.31	5.17
Vietnam	6.40	2.18	3.71	3.40
China	7.11	7.53	8.72	8.33
India	4.58	3.17	8.11	5.62
Japan	5.13	3.85	4.44	4.42
Korea	7.66	3.80	9.70	7.23
Averages				
ASEAN	5.54	4.12	15.95	29.68
ASEAN5	6.38	3.83	17.02	41.16
Chn, Ind, Jpn, Kor	6.12	4.59	7.74	6.98
ASEAN+4	5.71	4.26	13.43	22.51
European Union	3.44	2.55	7.17	5.22
NAFTA	3.86	2.67	12.02	12.80
SAARC	5.44	3.18	8.70	5.28
Latin America	3.36	4.58	206.33	595.91

Data is from 1961-2000 for all (with some exceptions)
Data Source: World Development Indicators CD-Rom, World Bank

Table 3a: Correlations of Growth Rates Among ASEAN5 + 4 Nations

	China	Indonesia	India	Japan	Korea	Malaysia	Phillippines	Singapore	Thailand
China	1								
Indonesia	0.036	1							
India	0.083	-0.037	1						
Japan	-0.217	0.512	-0.101	1					
Korea	0.115	0.538	-0.014	0.057	1				
Malaysia	-0.051	0.838	-0.071	0.293	0.517	1			
Phillippines	-0.554	0.260	0.106	0.188	0.106	0.425	1		
Singapore	-0.185	0.617	0.027	0.212	0.293	0.857	0.557	1	
Thailand	0.064	0.802	0.110	0.439	0.697	0.752	0.243	0.552	1

Table 3b: Correlations of Inflation Rates Among ASEAN5 + 4 Nations

	China	Indonesia	India	Japan	Korea	Malaysia	Phillippines	Singapore	Thailand
China	1								
Indonesia	-0.250	1							
India	0.073	0.167	1						
Japan	-0.349	0.169	0.304	1					
Korea	-0.288	0.221	0.149	0.645	1				
Malaysia	-0.070	-0.181	0.643	0.603	0.269	1			
Phillippines	-0.004	-0.210	0.327	0.377	0.156	0.489	1		
Singapore	-0.083	-0.030	0.678	0.678	0.307	0.876	0.487	1	
Thailand	-0.008	-0.098	0.567	0.594	0.398	0.870	0.373	0.845	1

Table 4a: COS Measure for India's Exports

Imports from		1996	1997	1998	1999	Average
Thailand	ALL	0.161	0.106	0.085	0.090	0.113
	Ind 0	0.604	0.648	0.620	0.619	0.655
	Ind 2	0.107	0.139	0.262	0.155	0.157
	Ind 5	0.369	0.454	0.360	0.450	0.421
	Ind 6	0.394	0.235	0.178	0.175	0.269
	Ind 7	0.600	0.462	0.208	0.322	0.436
	Ind 8	0.135	0.113	0.093	0.131	0.127
China	ALL	0.090	0.101	0.066	0.057	0.076
	Ind 0	0.678	0.576	0.359	0.500	0.579
	Ind 2	0.113	0.092	0.126	0.201	0.155
	Ind 5	0.107	0.110	0.106	0.178	0.148
	Ind 6	0.107	0.125	0.096	0.100	0.115
	Ind 7	0.423	0.424	0.320	0.347	0.409
	Ind 8	0.108	0.114	0.114	0.150	0.140
Singapore	ALL	0.086	0.070	0.039	0.043	0.055
	Ind 0	0.526	0.522	0.586	0.503	0.550
	Ind 2	0.496	0.476	0.476	0.291	0.338
	Ind 5	0.406	0.388	0.372	0.416	0.403
	Ind 6	0.548	0.493	0.296	0.455	0.480
	Ind 7	0.504	0.342	0.197	0.249	0.324
	Ind 8	0.374	0.426	0.314	0.368	0.401
Japan	ALL	0.252	0.208	0.177	0.162	0.183
	Ind 0	0.478	0.539	0.429	0.536	0.502
	Ind 2	0.294	0.251	0.333	0.291	0.306
	Ind 5	0.523	0.522	0.472	0.515	0.522
	Ind 6	0.478	0.346	0.322	0.370	0.370
	Ind 7	0.452	0.318	0.238	0.274	0.322
	Ind 8	0.444	0.410	0.439	0.459	0.450
Koea	ALL	0.058	0.040	0.019	0.020	0.032
	Ind 0	0.512	0.456	0.350	0.324	0.423
	Ind 2	0.071	0.067	0.040	0.042	0.058
	Ind 5	0.231	0.222	0.216	0.273	0.246
	Ind 6	0.116	0.113	0.071	0.082	0.101
	Ind 7	0.328	0.165	0.100	0.109	0.184
	Ind 8	0.144	0.159	0.110	0.161	0.155
Indonesia	ALL	0.292	0.166	0.485	0.375	0.332
	Ind 0	0.722	0.359	0.810	0.584	0.702
	Ind 2	0.383	0.507	0.182	0.301	0.355
	Ind 5	0.179	0.187	0.137	0.205	0.178
	Ind 6	0.132	0.163	0.211	0.276	0.210
	Ind 7	0.473	0.535	0.442	0.521	0.577
	Ind 8	0.136	0.123	0.094	0.079	0.117
Phillippines	ALL	0.090	0.071	0.093	0.053	0.072
	Ind 0	0.715	0.729	0.931	0.720	0.802
	Ind 2	0.293	0.468	0.212	0.326	0.333
	Ind 5	0.425	0.448	0.596	0.640	0.548
	Ind 6	0.155	0.184	0.225	0.219	0.200
	Ind 7	0.258	0.215	0.122	0.132	0.185
	Ind 8	0.121	0.106	0.093	0.112	0.110
Malaysia	ALL	0.046	0.041	0.023	0.017	0.028
	Ind 0	0.499	0.502	0.533	0.380	0.479
	Ind 2	0.335	0.363	0.327	0.224	0.295
	Ind 5	0.399	0.411	0.340	0.416	0.406
	Ind 6	0.164	0.123	0.083	0.082	0.117
	Ind 7	0.307	0.270	0.136	0.136	0.215
	Ind 8	0.106	0.076	0.071	0.092	0.083
Brunei	ALL	n.a.	0.185	0.075	n.a.	0.163
	Ind 0	n.a.	0.657	0.067	n.a.	0.520
	Ind 5	n.a.	0.435	0.677	n.a.	0.549
	Ind 6	n.a.	0.383	0.329	n.a.	0.386
	Ind 7	n.a.	0.236	0.268	n.a.	0.265
	Ind 8	n.a.	0.203	0.087	n.a.	0.172

Table 4b: COS Measure for India's Imports

Exports of		1996	1997	1998	1999	Average
Thailand	ALL	0.076	0.132	0.110	0.094	0.101
	Ind 0	0.014	0.147	0.147	0.127	0.146
	Ind 2	0.035	0.067	0.080	0.071	0.066
	Ind 5	0.364	0.452	0.527	0.524	0.529
	Ind 6	0.071	0.068	0.069	0.075	0.082
	Ind 7	0.344	0.467	0.549	0.655	0.542
	Ind 8	0.233	0.194	0.228	0.198	0.213
China	ALL	0.092	0.078	0.062	0.073	0.079
	Ind 0	0.101	0.149	0.110	0.088	0.140
	Ind 2	0.116	0.140	0.140	0.118	0.130
	Ind 5	0.232	0.235	0.190	0.188	0.221
	Ind 6	0.050	0.053	0.055	0.053	0.059
	Ind 7	0.430	0.542	0.629	0.663	0.603
	Ind 8	0.198	0.176	0.180	0.196	0.193
Singapore	ALL	0.099	0.105	0.136	0.091	0.099
	Ind 0	0.120	0.095	0.133	0.103	0.111
	Ind 2	0.208	0.292	0.354	0.283	0.300
	Ind 5	0.339	0.416	0.432	0.302	0.422
	Ind 6	0.168	0.127	0.097	0.078	0.112
	Ind 7	0.372	0.491	0.560	0.586	0.514
	Ind 8	0.525	0.548	0.524	0.723	0.669
Japan	ALL	0.262	0.166	0.117	0.147	0.158
	Ind 0	0.687	0.245	0.088	0.104	0.176
	Ind 2	0.457	0.427	0.413	0.433	0.452
	Ind 5	0.299	0.254	0.209	0.185	0.240
	Ind 6	0.298	0.306	0.260	0.230	0.300
	Ind 7	0.556	0.661	0.708	0.731	0.696
	Ind 8	0.184	0.136	0.175	0.125	0.138
Korea	ALL	0.309	0.386	0.395	0.230	0.314
	Ind 0	0.144	0.555	0.804	0.705	0.722
	Ind 2	0.140	0.148	0.126	0.086	0.129
	Ind 5	0.398	0.292	0.244	0.221	0.296
	Ind 6	0.117	0.145	0.184	0.160	0.172
	Ind 7	0.320	0.403	0.394	0.512	0.468
	Ind 8	0.186	0.159	0.142	0.100	0.177
Indonesia	ALL	0.123	0.154	0.224	0.240	0.197
	Ind 0	0.063	0.066	0.078	0.098	0.085
	Ind 2	0.044	0.074	0.080	0.072	0.075
	Ind 4	0.534	0.674	0.750	0.875	0.746
	Ind 5	0.677	0.627	0.342	0.297	0.545
	Ind 6	0.055	0.054	0.101	0.098	0.097
	Ind 7	0.262	0.414	0.567	0.685	0.537
	Ind 8	0.175	0.138	0.166	0.097	0.161
Philippines	ALL	0.140	0.087	0.040	0.041	0.058
	Ind 0	0.018	0.361	0.414	0.329	0.310
	Ind 2	0.388	0.511	0.560	0.546	0.534
	Ind 5	0.125	0.449	0.418	0.390	0.396
	Ind 6	0.690	0.600	0.232	0.191	0.463
	Ind 7	0.196	0.232	0.179	0.172	0.196
	Ind 8	0.171	0.146	0.136	0.133	0.147
Malaysia	ALL	0.119	0.115	0.122	0.116	0.119
	Ind 0	0.209	0.325	0.399	0.423	0.424
	Ind 2	0.220	0.395	0.341	0.512	0.379
	Ind 4	0.968	0.977	0.940	0.955	0.963
	Ind 5	0.376	0.212	0.128	0.121	0.213
	Ind 6	0.012	0.012	0.015	0.012	0.013
	Ind 7	0.230	0.375	0.458	0.619	0.486
	Ind 8	0.187	0.146	0.137	0.161	0.170
Brunei	ALL	n.a.	0.235	0.368	n.a.	0.282

Table 4c: COS Measure for Korea's Exports

Imports from		1996	1997	1998	1999	2000	Average
China	ALL	0.252	0.298	0.352	0.439	0.555	0.422
	Ind 0	0.111	0.070	0.111	0.204	0.233	0.151
	Ind 2	0.636	0.677	0.558	0.434	0.366	0.532
	Ind 3	0.218	0.236	0.884	0.763	0.068	0.766
	Ind 5	0.602	0.649	0.690	0.747	0.830	0.740
	Ind 6	0.609	0.626	0.635	0.671	0.643	0.660
	Ind 7	0.238	0.306	0.333	0.450	0.577	0.434
	Ind 8	0.270	0.298	0.312	0.357	0.420	0.377
Japan	ALL	0.627	0.616	0.591	0.702	0.808	0.707
	Ind 0	0.493	0.475	0.524	0.603	0.447	0.527
	Ind 2	0.095	0.097	0.101	0.122	0.116	0.106
	Ind 3	0.033	0.032	0.680	0.678	0.640	0.683
	Ind 5	0.222	0.235	0.249	0.231	0.222	0.236
	Ind 6	0.129	0.158	0.182	0.132	0.114	0.147
	Ind 7	0.799	0.792	0.726	0.823	0.911	0.848
	Ind 8	0.542	0.528	0.433	0.411	0.621	0.528
Thailand	ALL	0.180	0.162	0.122	0.481	0.588	0.352
	Ind 0	0.579	0.561	0.689	0.629	0.551	0.620
	Ind 2	0.184	0.186	0.254	0.222	0.205	0.209
	Ind 5	0.551	0.463	0.487	0.506	0.513	0.534
	Ind 6	0.293	0.298	0.256	0.287	0.363	0.326
	Ind 7	0.138	0.127	0.086	0.513	0.604	0.346
	Ind 8	0.295	0.309	0.216	0.164	0.423	0.287
Singapore	ALL	0.608	0.594	0.542	0.560	0.706	0.637
	Ind 0	0.560	0.595	0.510	0.532	0.572	0.584
	Ind 2	0.074	0.079	0.098	0.100	0.080	0.089
	Ind 5	0.370	0.366	0.315	0.296	0.317	0.350
	Ind 6	0.209	0.234	0.352	0.352	0.357	0.306
	Ind 7	0.657	0.630	0.586	0.575	0.719	0.664
	Ind 8	0.246	0.377	0.356	0.365	0.427	0.397
Philippines	ALL	0.164	0.164	0.079	0.084	0.237	0.153
	Ind 0	0.358	0.222	0.255	0.351	0.252	0.292
	Ind 2	0.773	0.766	0.711	0.733	0.746	0.768
	Ind 5	0.635	0.613	0.468	0.452	0.499	0.554
	Ind 6	0.395	0.461	0.560	0.550	0.574	0.534
	Ind 7	0.161	0.164	0.077	0.077	0.233	0.149
	Ind 8	0.269	0.364	0.317	0.403	0.453	0.367
Malaysia	ALL	0.235	0.360	0.337	0.422	0.497	0.400
	Ind 0	0.168	0.188	0.190	0.191	0.229	0.197
	Ind 2	0.366	0.255	0.269	0.354	0.252	0.320
	Ind 5	0.610	0.554	0.592	0.617	0.715	0.647
	Ind 6	0.299	0.364	0.450	0.404	0.383	0.402
	Ind 7	0.177	0.330	0.343	0.420	0.499	0.388
	Ind 8	0.293	0.228	0.178	0.142	0.295	0.228
Indonesia	ALL	0.140	0.142	0.130	0.142	0.160	0.164
	Ind 0	0.231	0.194	0.162	0.206	0.136	0.202
	Ind 2	0.325	0.318	0.389	0.420	0.462	0.397
	Ind 3	0.097	0.144	0.754	0.725	0.749	0.770
	Ind 5	0.537	0.524	0.463	0.491	0.533	0.544
	Ind 6	0.416	0.486	0.578	0.536	0.571	0.554
	Ind 7	0.121	0.121	0.087	0.122	0.119	0.134
	Ind 8	0.193	0.239	0.106	0.127	0.343	0.220
Brunei	ALL	n.a	0.296	0.371	n.a	n.a	0.283
	Ind 0	n.a	0.573	0.483	n.a	n.a	0.539
	Ind 5	n.a	0.330	0.388	n.a	n.a	0.390
	Ind 6	n.a	0.492	0.562	n.a	n.a	0.595
	Ind 7	n.a	0.257	0.356	n.a	n.a	0.263
	Ind 8	n.a	0.528	0.440	n.a	n.a	0.539

Table 4d: COS Measure for Korea's Imports

Exports of		1996	1997	1998	1999	2000	Average
China	ALL	0.169	0.153	0.128	0.172	0.242	0.181
	Ind 0	0.245	0.295	0.223	0.330	0.326	0.297
	Ind 2	0.119	0.124	0.097	0.100	0.089	0.107
	Ind 3	0.932	0.899	0.717	0.582	0.460	0.742
	Ind 4	0.686	0.172	0.175	0.069	0.076	0.268
	Ind 5	0.380	0.385	0.384	0.415	0.418	0.405
	Ind 6	0.402	0.444	0.351	0.352	0.386	0.396
	Ind 7	0.240	0.225	0.174	0.232	0.304	0.247
	Ind 8	0.176	0.196	0.156	0.179	0.188	0.187
Japan	ALL	0.673	0.634	0.588	0.681	0.764	0.702
	Ind 0	0.541	0.510	0.457	0.447	0.494	0.499
	Ind 2	0.345	0.393	0.466	0.484	0.465	0.432
	Ind 5	0.786	0.756	0.749	0.817	0.804	0.795
	Ind 6	0.421	0.391	0.358	0.440	0.512	0.438
	Ind 7	0.794	0.739	0.637	0.706	0.777	0.750
	Ind 8	0.726	0.714	0.688	0.707	0.840	0.767
Thailand	ALL	0.208	0.253	0.188	0.320	0.500	0.317
	Ind 0	0.509	0.424	0.292	0.263	0.272	0.363
	Ind 2	0.130	0.117	0.148	0.179	0.201	0.149
	Ind 5	0.273	0.334	0.277	0.305	0.300	0.323
	Ind 6	0.174	0.217	0.207	0.237	0.293	0.238
	Ind 7	0.284	0.262	0.181	0.341	0.537	0.350
	Ind 8	0.168	0.207	0.141	0.138	0.141	0.171
Singapore	ALL	0.489	0.467	0.471	0.495	0.579	0.530
	Ind 0	0.429	0.363	0.278	0.254	0.307	0.333
	Ind 2	0.282	0.351	0.424	0.349	0.406	0.358
	Ind 4	0.888	0.906	0.883	0.794	0.761	0.865
	Ind 5	0.503	0.510	0.502	0.435	0.499	0.522
	Ind 6	0.610	0.585	0.500	0.489	0.451	0.568
	Ind 7	0.573	0.529	0.479	0.509	0.594	0.557
	Ind 8	0.320	0.392	0.402	0.481	0.451	0.451
Philippines	ALL	0.322	0.292	0.184	0.180	0.304	0.250
	Ind 0	0.611	0.502	0.443	0.355	0.375	0.473
	Ind 2	0.511	0.561	0.531	0.471	0.474	0.518
	Ind 5	0.262	0.182	0.142	0.203	0.200	0.206
	Ind 6	0.574	0.556	0.629	0.527	0.453	0.577
	Ind 7	0.352	0.321	0.194	0.184	0.314	0.260
	Ind 8	0.144	0.163	0.113	0.111	0.118	0.138
Malaysia	ALL	0.159	0.271	0.214	0.448	0.573	0.376
	Ind 0	0.281	0.267	0.225	0.224	0.254	0.265
	Ind 2	0.254	0.215	0.176	0.206	0.177	0.212
	Ind 4	0.910	0.917	0.896	0.752	0.776	0.863
	Ind 5	0.410	0.365	0.389	0.487	0.443	0.442
	Ind 6	0.314	0.299	0.228	0.256	0.271	0.284
	Ind 7	0.184	0.329	0.249	0.482	0.594	0.419
	Ind 8	0.146	0.173	0.136	0.146	0.183	0.166
Indonesia	ALL	0.148	0.172	0.190	0.211	0.234	0.200
	Ind 0	0.290	0.318	0.262	0.270	0.186	0.277
	Ind 2	0.213	0.209	0.325	0.323	0.391	0.279
	Ind 4	0.885	0.904	0.860	0.764	0.771	0.883
	Ind 5	0.170	0.161	0.205	0.251	0.282	0.236
	Ind 6	0.305	0.275	0.214	0.286	0.335	0.298
	Ind 7	0.185	0.220	0.205	0.337	0.330	0.287
	Ind 8	0.173	0.195	0.060	0.120	0.137	0.154
Brunei	ALL	n.a	0.400	0.528	n.a	n.a	0.404

Table 4e: COS Measure for China's Exports

Imports of		1996	1997	1998	1999	2000	Average
Japan	ALL	0.387	0.389	0.439	0.452	0.458	0.437
	Ind 0	0.525	0.570	0.471	0.498	0.527	0.534
	Ind 2	0.333	0.335	0.317	0.296	0.283	0.317
	Ind 3	0.800	0.742	0.809	0.649	0.580	0.724
	Ind 4	0.558	0.175	0.182	0.055	0.104	0.267
	Ind 5	0.532	0.489	0.503	0.468	0.469	0.500
	Ind 6	0.276	0.316	0.365	0.317	0.301	0.324
	Ind 7	0.434	0.497	0.575	0.565	0.531	0.540
	Ind 8	0.627	0.613	0.603	0.617	0.629	0.626
Thailand	ALL	0.311	0.330	0.334	0.370	0.426	0.387
	Ind 0	0.167	0.170	0.177	0.228	0.295	0.209
	Ind 2	0.085	0.100	0.090	0.072	0.070	0.084
	Ind 3	0.888	0.847	0.694	0.775	0.537	0.835
	Ind 5	0.332	0.373	0.357	0.372	0.402	0.386
	Ind 6	0.356	0.380	0.342	0.353	0.433	0.389
	Ind 7	0.465	0.506	0.477	0.507	0.527	0.539
	Ind 8	0.317	0.338	0.324	0.336	0.402	0.352
Indonesia	ALL	0.211	0.216	0.207	0.170	0.175	0.223
	Ind 0	0.192	0.187	0.683	0.519	0.301	0.436
	Ind2	0.281	0.204	0.153	0.160	0.105	0.193
	Ind 3	0.248	0.345	0.320	0.494	0.364	0.347
	Ind 4	0.785	0.340	0.830	0.707	0.632	0.571
	Ind 5	0.328	0.344	0.319	0.253	0.248	0.324
	Ind 6	0.374	0.428	0.432	0.396	0.456	0.445
	Ind 7	0.253	0.243	0.174	0.187	0.163	0.238
	Ind 8	0.200	0.319	0.174	0.279	0.360	0.295
Philippines	ALL	0.168	0.172	0.210	0.181	0.245	0.203
	Ind 0	0.166	0.241	0.677	0.491	0.324	0.420
	Ind 2	0.210	0.191	0.180	0.176	0.191	0.198
	Ind 5	0.321	0.340	0.363	0.383	0.398	0.378
	Ind 6	0.462	0.508	0.528	0.441	0.511	0.508
	Ind 7	0.263	0.281	0.316	0.256	0.314	0.295
	Ind 8	0.278	0.344	0.290	0.360	0.350	0.334
Malaysia	ALL	0.199	0.218	0.208	0.223	0.268	0.239
	Ind 0	0.164	0.257	0.450	0.363	0.317	0.316
	Ind 2	0.242	0.219	0.208	0.196	0.138	0.211
	Ind 4	0.271	0.432	0.342	0.588	0.620	0.524
	Ind 5	0.447	0.452	0.406	0.399	0.401	0.438
	Ind 6	0.378	0.364	0.358	0.349	0.407	0.388
	Ind 7	0.344	0.380	0.326	0.326	0.348	0.361
	Ind 8	0.270	0.213	0.213	0.236	0.227	0.236
Singapore	ALL	0.289	0.316	0.351	0.386	0.409	0.371
	Ind 0	0.472	0.519	0.593	0.550	0.514	0.556
	Ind 2	0.189	0.184	0.151	0.164	0.106	0.165
	Ind 4	0.646	0.259	0.313	0.133	0.150	0.380
	Ind 5	0.344	0.328	0.332	0.354	0.368	0.361
	Ind 6	0.401	0.431	0.451	0.476	0.523	0.473
	Ind 7	0.506	0.567	0.575	0.582	0.549	0.579
	Ind 8	0.273	0.284	0.256	0.294	0.310	0.302
Brunei	ALL	n.a.	0.284	0.270	n.a.	n.a.	0.308
	Ind 0	n.a.	0.540	0.299	n.a.	n.a.	0.611
	Ind 5	n.a.	0.461	0.574	n.a.	n.a.	0.537
	Ind 6	n.a.	0.452	0.437	n.a.	n.a.	0.477
	Ind 7	n.a.	0.282	0.233	n.a.	n.a.	0.272
	Ind 8	n.a.	0.478	0.530	n.a.	n.a.	0.545

Table 4f: COS Measure for China's Imports

Exports of		1996	1997	1998	1999	2000	Average
Japan	ALL	0.475	0.545	0.578	0.615	0.657	0.614
	Ind 0	0.158	0.134	0.176	0.192	0.203	0.186
	Ind 2	0.609	0.585	0.602	0.463	0.440	0.537
	Ind 5	0.392	0.423	0.419	0.508	0.568	0.493
	Ind 6	0.452	0.452	0.482	0.543	0.547	0.520
	Ind 7	0.545	0.642	0.650	0.672	0.701	0.679
	Ind 8	0.502	0.458	0.541	0.548	0.615	0.561
Thailand	ALL	0.354	0.470	0.538	0.517	0.574	0.525
	Ind 0	0.440	0.275	0.389	0.300	0.312	0.352
	Ind 2	0.438	0.304	0.315	0.271	0.308	0.326
	Ind 5	0.418	0.594	0.705	0.737	0.755	0.733
	Ind 6	0.215	0.323	0.346	0.351	0.384	0.339
	Ind 7	0.499	0.643	0.660	0.606	0.645	0.644
	Ind 8	0.160	0.167	0.170	0.177	0.176	0.178
Indonesia	ALL	0.125	0.174	0.227	0.267	0.319	0.226
	Ind 0	0.097	0.087	0.163	0.131	0.166	0.136
	Ind 2	0.159	0.146	0.244	0.267	0.342	0.234
	Ind 4	0.360	0.534	0.595	0.764	0.737	0.614
	Ind 5	0.517	0.366	0.337	0.379	0.415	0.389
	Ind 6	0.132	0.144	0.225	0.231	0.273	0.192
	Ind 7	0.272	0.458	0.571	0.617	0.588	0.559
	Ind 8	0.068	0.069	0.048	0.075	0.088	0.077
Philippines	ALL	0.180	0.215	0.166	0.148	0.226	0.191
	Ind 0	0.648	0.585	0.597	0.386	0.511	0.584
	Ind 2	0.405	0.489	0.526	0.424	0.496	0.458
	Ind 5	0.223	0.303	0.262	0.248	0.211	0.268
	Ind 6	0.281	0.284	0.342	0.394	0.480	0.385
	Ind 7	0.199	0.248	0.185	0.161	0.239	0.209
	Ind 8	0.121	0.121	0.126	0.138	0.122	0.131
Malaysia	ALL	0.317	0.438	0.508	0.606	0.662	0.569
	Ind 0	0.102	0.063	0.105	0.221	0.258	0.164
	Ind 2	0.355	0.396	0.398	0.579	0.501	0.455
	Ind 4	0.472	0.513	0.689	0.829	0.956	0.693
	Ind 5	0.524	0.445	0.432	0.485	0.605	0.540
	Ind 6	0.155	0.214	0.268	0.238	0.271	0.227
	Ind 7	0.376	0.548	0.621	0.692	0.729	0.666
	Ind 8	0.157	0.160	0.144	0.162	0.211	0.174
Singapore	ALL	0.436	0.578	0.668	0.722	0.780	0.687
	Ind 0	0.128	0.069	0.068	0.172	0.191	0.136
	Ind 2	0.385	0.372	0.502	0.352	0.462	0.421
	Ind 4	0.475	0.549	0.661	0.801	0.846	0.676
	Ind 5	0.374	0.467	0.500	0.367	0.516	0.488
	Ind 6	0.371	0.339	0.378	0.432	0.485	0.438
	Ind 7	0.521	0.716	0.781	0.821	0.863	0.792
	Ind 8	0.311	0.304	0.331	0.485	0.534	0.423
Brunei	ALL	n.a.	0.145	0.170	n.a.	n.a.	0.138

Table 4g: COS Measure for Japan's Exports

Imports from		1996	1997	1998	1999	2000	Average
Thailand	ALL	0.523	0.518	0.430	0.598	0.620	0.580
	Ind 0	0.387	0.512	0.540	0.414	0.391	0.452
	Ind 2	0.491	0.452	0.417	0.539	0.472	0.502
	Ind 5	0.716	0.674	0.665	0.744	0.736	0.736
	Ind 6	0.512	0.509	0.388	0.454	0.615	0.520
	Ind 7	0.540	0.529	0.446	0.641	0.637	0.602
	Ind 8	0.401	0.377	0.321	0.284	0.268	0.334
Indonesia	ALL	0.346	0.361	0.241	0.203	0.282	0.339
	Ind 0	0.110	0.265	0.114	0.074	0.266	0.142
	Ind 2	0.680	0.678	0.572	0.475	0.465	0.602
	Ind 5	0.670	0.636	0.563	0.492	0.523	0.602
	Ind 6	0.509	0.523	0.562	0.506	0.562	0.565
	Ind 7	0.379	0.369	0.319	0.367	0.317	0.389
	Ind 8	0.487	0.487	0.417	0.334	0.281	0.452
Philippines	ALL	0.371	0.373	0.321	0.249	0.308	0.323
	Ind 0	0.164	0.266	0.161	0.299	0.398	0.234
	Ind 2	0.290	0.256	0.263	0.288	0.320	0.286
	Ind 5	0.497	0.537	0.559	0.637	0.630	0.589
	Ind 6	0.372	0.384	0.419	0.476	0.500	0.440
	Ind 7	0.372	0.376	0.325	0.248	0.309	0.324
	Ind 8	0.402	0.398	0.371	0.376	0.385	0.395
Malaysia	ALL	0.406	0.519	0.455	0.472	0.528	0.494
	Ind 0	0.342	0.325	0.293	0.373	0.414	0.355
	Ind 2	0.395	0.480	0.455	0.516	0.600	0.538
	Ind 5	0.670	0.652	0.669	0.725	0.757	0.722
	Ind 6	0.586	0.624	0.662	0.674	0.672	0.676
	Ind 7	0.410	0.525	0.457	0.477	0.535	0.497
	Ind 8	0.556	0.505	0.428	0.415	0.407	0.477
Singapore	ALL	0.782	0.759	0.719	0.678	0.710	0.738
	Ind 0	0.624	0.667	0.612	0.617	0.657	0.650
	Ind 2	0.243	0.278	0.258	0.350	0.380	0.309
	Ind 5	0.601	0.593	0.589	0.642	0.627	0.635
	Ind 6	0.496	0.478	0.537	0.512	0.499	0.522
	Ind 7	0.798	0.774	0.732	0.690	0.726	0.750
	Ind 8	0.411	0.450	0.451	0.483	0.483	0.473
Brunei	ALL	n.a.	0.256	0.247	n.a.	n.a.	0.271
	Ind 0	n.a.	0.391	0.497	n.a.	n.a.	0.499
	Ind 5	n.a.	0.487	0.601	n.a.	n.a.	0.571
	Ind 6	n.a.	0.434	0.469	n.a.	n.a.	0.490
	Ind 7	n.a.	0.271	0.266	n.a.	n.a.	0.290
	Ind 8	n.a.	0.249	0.351	n.a.	n.a.	0.317

Table 4h: COS Measure for Japan's Imports

Exports from		1996	1997	1998	1999	2000	Average
Thailand	ALL	0.519	0.573	0.607	0.636	0.704	0.625
	Ind 0	0.457	0.484	0.480	0.432	0.495	0.472
	Ind 2	0.347	0.305	0.235	0.241	0.257	0.279
	Ind 4	0.425	0.197	0.204	0.244	0.478	0.316
	Ind 5	0.330	0.317	0.301	0.279	0.221	0.297
	Ind 6	0.505	0.369	0.313	0.372	0.350	0.401
	Ind 7	0.611	0.654	0.685	0.708	0.761	0.701
	Ind 8	0.570	0.528	0.504	0.501	0.512	0.534
Indonesia	ALL	0.350	0.411	0.436	0.457	0.422	0.425
	Ind 0	0.634	0.718	0.718	0.632	0.649	0.676
	Ind 2	0.152	0.181	0.232	0.240	0.332	0.220
	Ind 4	0.553	0.670	0.780	0.868	0.688	0.754
	Ind 5	0.155	0.153	0.211	0.230	0.233	0.208
	Ind 6	0.579	0.552	0.420	0.513	0.489	0.527
	Ind 7	0.367	0.524	0.616	0.676	0.548	0.584
	Ind 8	0.386	0.404	0.354	0.373	0.390	0.421
Philippines	ALL	0.429	0.359	0.230	0.204	0.310	0.282
	Ind 0	0.557	0.548	0.589	0.592	0.648	0.593
	Ind 2	0.623	0.662	0.671	0.652	0.626	0.656
	Ind 5	0.382	0.297	0.252	0.330	0.278	0.321
	Ind 6	0.292	0.253	0.214	0.209	0.201	0.244
	Ind 7	0.474	0.408	0.256	0.225	0.337	0.311
	Ind 8	0.477	0.497	0.498	0.471	0.504	0.500
Malaysia	ALL	0.355	0.477	0.488	0.668	0.724	0.591
	Ind 0	0.411	0.454	0.512	0.492	0.552	0.502
	Ind 2	0.319	0.349	0.213	0.268	0.243	0.288
	Ind 4	0.929	0.919	0.938	0.934	0.909	0.932
	Ind 5	0.338	0.329	0.345	0.329	0.309	0.339
	Ind 6	0.489	0.486	0.363	0.479	0.423	0.457
	Ind 7	0.406	0.582	0.613	0.788	0.801	0.701
	Ind 8	0.365	0.374	0.346	0.375	0.443	0.388
Singapore	ALL	0.677	0.652	0.689	0.675	0.669	0.682
	Ind 0	0.516	0.446	0.415	0.350	0.375	0.431
	Ind 2	0.317	0.386	0.554	0.380	0.364	0.402
	Ind 3	0.517	0.042	0.414	0.387	0.406	0.432
	Ind 4	0.912	0.936	0.915	0.931	0.885	0.927
	Ind 5	0.443	0.429	0.464	0.418	0.465	0.487
	Ind 6	0.486	0.426	0.370	0.377	0.428	0.437
	Ind 7	0.821	0.808	0.821	0.785	0.740	0.795
	Ind 8	0.554	0.552	0.508	0.469	0.425	0.542
Brunei	ALL	n.a.	0.202	0.350	n.a.	n.a.	0.307

Table 5a: Correlation of Supply Shocks Among ASEAN + 4 Nations

	Thailand	Korea	Malaysia	Indonesia	Japan	Laos	Phillippines	Singapore	China	India	Vietnam	Myanmar
Thailand	1											
Korea	0.823	1										
Malaysia	0.724	0.643	1									
Indonesia	0.807	0.857	0.862	1								
Japan	0.374	0.536	0.276	0.436	1							
Laos	0.180	0.158	0.409	0.479	0.058	1						
Phillippines	0.403	0.419	0.339	0.359	0.242	-0.178	1					
Singapore	0.555	0.503	0.795	0.623	0.161	0.129	0.381	1				
China	0.094	0.055	0.093	0.120	0.155	0.118	-0.447	-0.158	1			
India	0.165	0.070	0.049	0.004	0.332	-0.298	0.467	0.131	-0.134	1		
Vietnam	-0.002	0.151	0.125	0.188	-0.172	0.052	0.056	-0.031	0.257	-0.100	1	
Myanmar	-0.291	-0.563	-0.150	-0.278	-0.568	0.333	-0.261	-0.326	0.111	-0.131	-0.126	1

Table 5b: Correlation of Demand Shocks for ASEAN + 4 Nations

	India	Indonesia	Korea	Malaysia	Myanmar	Vietnam	Thailand	Singapore	Phillippines	China	Japan	Laos
India	1											
Indonesia	0.603	1										
Korea	0.332	0.008	1									
Malaysia	0.333	-0.137	0.467	1								
Myanmar	0.439	0.429	0.019	-0.003	1							
Vietnam	0.112	-0.075	0.226	0.348	0.073	1						
Thailand	0.171	0.034	0.456	0.019	0.037	-0.216	1					
Singapore	-0.147	0.008	0.077	0.158	-0.312	0.042	-0.288	1				
Phillippines	-0.205	0.174	-0.161	-0.052	-0.167	0.142	-0.371	0.276	1			
China	-0.052	0.130	-0.021	-0.237	0.256	-0.204	0.436	-0.067	0.243	1		
Japan	-0.373	-0.140	-0.256	-0.661	-0.017	-0.320	-0.056	-0.091	0.375	0.282	1	
Laos	-0.263	-0.610	-0.180	0.191	-0.087	-0.088	-0.071	-0.419	-0.192	-0.188	-0.170	1

Table 6: Disturbances and Adjustments across Different Geographic Regions

	Supply Disturbance		Demand Disturbance	
	Size	**Adjustment**	**Size**	**Adjustment**
Myanmar	0.059	0.748	0.069	0.602
China	0.042	0.892	0.047	0.900
India	0.025	1.080	0.040	1.256
Indonesia	0.055	0.910	0.337	0.503
Japan	0.142	0.275	0.023	0.451
Korea	0.041	0.865	0.033	0.433
Laos	0.030	1.162	0.268	0.885
Malaysia	0.038	1.103	0.023	0.945
Phillippines	0.053	0.782	0.056	0.972
Singapore	0.057	0.862	0.039	1.263
Thailand	0.059	0.884	0.039	0.995
Vietnam	0.054	0.744	0.259	0.376
Averages for Different Geographic Regions				
ASEAN + 4	0.055	0.859	0.103	0.798
W. Europe 1/	0.030	0.684	0.022	0.417
Americas 1/	0.062	0.801	0.145	0.820
SAARC 2/	0.023	0.826	0.037	1.106

1/ Figures are from Bayoumi and Eichengreen (1994)
2/ Figures are from Saxena (2005)

Table 7: Dispersion of Unemployment Rate Across Regions

EU		**NAFTA**		**Asia**	
Austria	0.96	Mexico	0.99	China	0.72
Belgium	1.81	Canada	1.57	Indonesia	0.99
Denmark	1.72	United States	1.54	Japan	0.81
Finland	4.60	**Average**	**1.37**	Korea	1.36
France	1.75			Malaysia	1.97
Germany	1.24			Philippines	1.61
Iceland	1.73			Singapore	1.11
Ireland	3.65			Thailand	1.25
Italy	1.34			**Average**	**1.23**
Luxembourg	0.78				
Norway	1.39			**SAARC**	
Portugal	1.52			Pakistan	1.18
Spain	3.36			Sri Lanka	2.52
Sweden	3.06			**Average**	**1.85**
United Kingdom	2.02				
Average	**2.06**				

Data souce is World Development Indicators CD-Rom, World Bank, 2002.
Data for all countries is from 1980-2000, except for Germany (1991-2000), Sri Lanka (1990-2000), Mexico (1988-99) and Indonesia (1996-2000).

Figure 1: Intra-ASEAN Trade (as a % of total trade)
(Source: Direction of Trade Statistics)

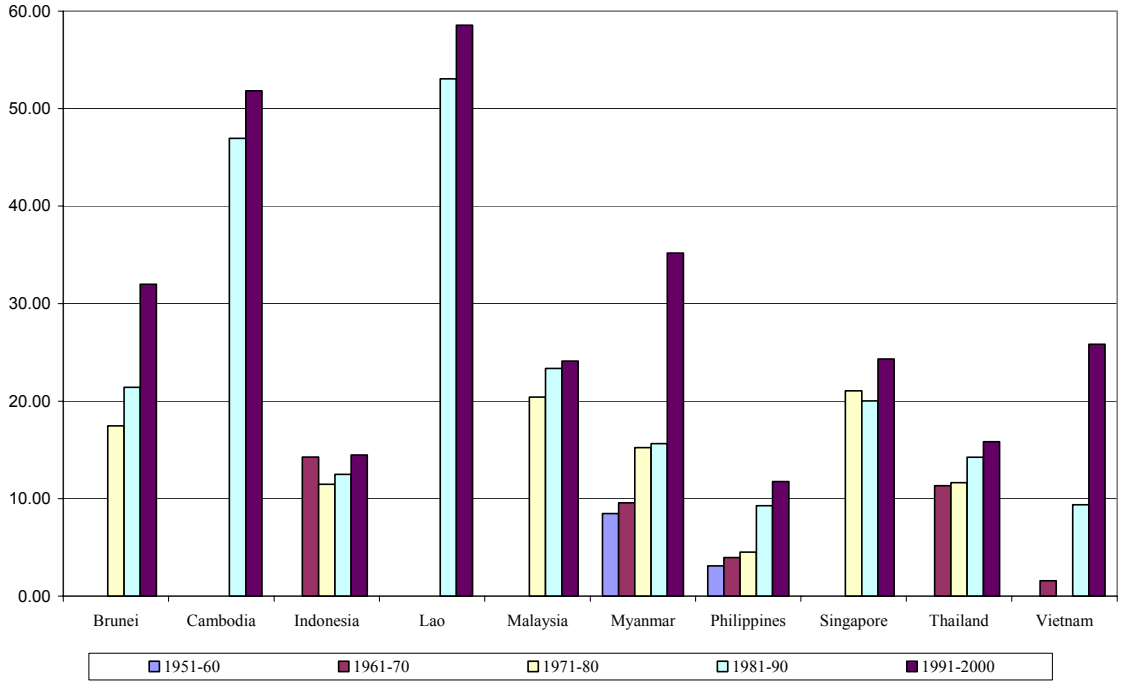

Figure 2: Share of Trade with ASEAN: China, Korea, Japan and India
(as a % of total trade; Source: Direction of Trade Statistics)