PROSPECTS FOR MONETARY INTEGRATION IN ASEAN

Submitted by Carlos José Ferreira Cortinhas, to the University of Exeter as a thesis for the degree of Doctor of Philosophy in Economics, March 2007.

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Abstract

In the past two decades, a new resolve for both increased economic integration and monetary and exchange rate cooperation has started to emerge in ASEAN, most notably since the 1997-1998 Asian financial crisis. This thesis addresses the question of whether there are sufficient economic reasons to justify such a move.

The first chapter presents an historical overview of the integration process in ASEAN to date and the main motivations for the study. The following two chapters present a review of the main theory (Chapter II) and empirical works (Chapter III) on optimum currency areas and present the basis for the remainder of the study.

The fourth chapter investigates whether structural shocks among ASEAN countries are becoming more symmetrical over time, thus verifying whether this region is becoming better prepared to introduce a common currency.

The fifth chapter studies the degree of relative price adjustment in ASEAN by providing a study on the degree of exchange rate pass-through into domestic prices, using the distribution chain of pricing. This study includes, for the first time, all five founding members of ASEAN (ASEAN5) and draws inferences on their suitability for further monetary cooperation.

The sixth chapter researches whether the recorded increase in intra-ASEAN trade is moving ASEAN members towards closer economic integration by applying a new panel data methodology.

The final chapter presents the main conclusions.

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Abbreviations

ADB	Asia Development Bank
ADF	Augmented Dickey-Fuller
AEC	ASEAN Economic Community
AFTA	ASEAN Free Trade Area
AMF	Asian Monetary Fund
APEC	Asia Pacific Economic Community
APMF	Asia Pacific Monetary Fund
ARIC	Asia Regional Information Centre
ASEAN	Association of Southeast Asian Nations
ASEM	Asia Europe Meeting
CEPT	Common Effective Preferential Tariff
CPI	Consumer Price Index
EIV	Error in Variable
EMU	Economic and Monetary Union
ERM	Exchange Rate Mechanism
EU	European Union
FEER	Fundamental Equilibrium Exchange Rate
FTAA	Free Trade Area of the Americas
GDP	Gross Domestic Product
HP	Hodrick-Prescott
HPA	Hanoi Plan of Action
IAI	Initiative for ASEAN Integration
IFS	International Financial Statistics
IIT	Intra-Industry Trade
IL	Inclusion List
IMF	International Monetary Fund
IMP	Import Unit Value Index
IRF	Impulse-Response Function
JSEPA	Japan-Singapore Economic Partnership Agreement
LCP	Local Currency Pricing
MFG	Manila Framework Group
NEER	Nominal Effective Exchange Rate
OCA	Optimum Currency Area
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCP	Producer Currency Pricing
PP	Phillips-Peron
PPI	Producer Price Index
PPP	Purchasing Power Parity
PTA	Preferential Trading Arrangements
REER	Real Effective Exchange Rate
REMU	Regional Economic Monitoring Unit

- RIA Roadmap for the Integration of ASEAN
- SITC Standard International Trade Commodity
- SVAR Structural VAR
- TSLS Two-Stage Least Squares
- USD US dollar
- VAR Vector Autoregressions

Chapter I

Introduction

1.1 The Genesis of ASEAN

The Association of Southeast Asian Nations or ASEAN was established in Bangkok in 1967 by the five original members (ASEAN5), namely, Indonesia, Malaysia, Philippines, Singapore and Thailand. The grouping has since been enlarged to include ten nations with Brunei Darussalam (1984), Vietnam (1995), Laos and Myanmar (1997) and Cambodia (1999).

Not unlike the origins of the European Union, the founding of ASEAN was essentially motivated to contain regional conflicts and the rise of communism¹. Apart from these motivations, the stated aims and purposes of ASEAN in the Bangkok declaration were twofold: (i) to pursue cooperation in a number of areas, most importantly in economic, cultural and social fields, and (ii) to promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries in the region and adherence to the principles of the United Nations Charter.

Even if it seems unquestionable that it has been successful in containing intra-ASEAN conflicts and in providing a forum for the discussion of regional matters, it also seems consensual that ASEAN has failed in asserting itself as a political force in the world stage and has been at best disappointing in terms of tangible economic benefits for its members.

This has led some authors to describe ASEAN as an enigma in Asia because of its longevity as a trading block which is 'always at the crossroads' in the sense that "it fails to deliver and periodically something always needs to be done to revitalize the integration process".² However, it can also be argued that this argument applies to all

¹ In fact, the idea of creating the ASEAN was broached during a banquet sponsored by Thailand brokering reconciliation among Indonesia, the Philippines and Malaysia. However, the creation of ASEAN did not by any means end intra-ASEAN disputes. In fact, just a year later, the Philippines and Malaysia broke diplomatic relations over the issue of sovereignty over Sabah. Many ASEAN disputes persist to this day. Nevertheless, it is undeniable that ASEAN was able to contain intra-ASEAN conflicts and even regional ones like disputes over territorial claims in the South China Sea.

² Wilson (2002), p. 6. Pomfret (1996) is the author of the 'always at the crossroads' argument.

multinational integration processes and that it is an obstacle that all economic and monetary union projects share and need to overcome in order to assert themselves³.

1.2 ASEAN Free Trade Area (AFTA)

Even though the first attempts to lower tariffs collectively through preferential trade arrangements date from 1977⁴, it was not until the implementation of the ASEAN Free Trade Area (AFTA) at the IV ASEAN Summit in Singapore on the 28 of January 1992 that a new resolve started to emerge⁵.

The strategic purpose of AFTA is to enhance ASEAN's position as a competitive production base to service the global market through increased intra-ASEAN trade, greater specialization, economies of scale, and increased foreign direct investments which should be attracted to a new single ASEAN market.

The stated objective of AFTA was to create a common market in ASEAN with the reduction of tariffs achieved by the implementation of the Common Effective Preferential Tariff (CEPT) Scheme as the main mechanism within a time frame of 15 years commencing on 1 January 1993 with the ultimate effective tariffs ranging from 0% to 5% for goods produced within ASEAN⁶. ASEAN members have also agreed to work on the elimination of non-tariff barriers. However, the level of tariffs with non-ASEAN countries is to continue to be determined individually.

The AFTA is now well under way. As of July of 2004, more than 99% of the products in the CEPT Inclusion List $(IL)^7$ of the ASEAN5 grouping plus Brunei Darussalam (or ASEAN6) have been brought down to the 0-5% tariff range. That number is down to 66% for ASEAN's newest members. Vietnam has until 2006 to bring down tariffs to the 0-5% range for the products in the IL, Laos and Myanmar must reach this by 2008 and Cambodia by 2010⁸.

The percentage of product groups moved into each country's CEPT Inclusion Lists varies from less than 80% for Cambodia, Laos, Myanmar, Vietnam and the

³ Even though the EU is the most successful example to date, "Europe's integration has always been characterised by a process of muddling-through, two steps forward and one step back, with deep and lingering divergences as to what the end objective is. But each integration step makes the next one more likely", Wyplosz (2001), p. 17.

⁴ The ASEAN Preferential Trading Arrangements (PTA) were signed in Manila on 24 February 1977

⁵ In fact, early preferential trade arrangements "were hampered by the voluntary listing of products for preferential treatment, and a cumbersome case-by-case approach", Wilson (2002), p.6.

⁶ According to the CEPT agreement for AFTA signed in January of 1992, a product is deemed to originate from ASEAN Member States if at least 40% of its contents originates from any member state. The CEPT scheme requires the reduction of tariffs for all products in the Inclusion List, the elimination of quantitative restrictions and the abolition of other non-tariff barriers.

⁷ The Inclusion Lists refer to the products agreed by each member state to be included in the CEPT-AFTA Scheme. Products can be excluded from the scheme under three categories: (i) General exclusions (products excluded on the grounds of national security, protection of public morals, protection of human, animal or plant life and health and the protection of articles of artistic, historic or archeological value), (ii) Temporary Exclusions (sensitive products which a member state is not ready to include in the scheme) and (iii) Unprocessed Agricultural Products.

⁸ Data provided by the ASEAN Secretariat.

Philippines, between 80 and 90% for Brunei Darussalam, Indonesia, Malaysia and Thailand and virtually all products (97%) for Singapore.

As a consequence of AFTA, the average tariff rates have been steadily declining over the years with the average tariff for ASEAN-6 declining to 1.51% from 12.76% when the tariff cuts started back in 1993.

The benefits of these achievements in terms of trade are not, however, clear cut, and are an area of contention. Even though there has been a large increase in intraregional trade in ASEAN since the beginning of the 90s it is not clear that this is a direct effect of the tariff reduction or a more general trend in the world markets⁹.

Figure A-1 of Appendix A shows that intra-ASEAN trade more than doubled in the decade after 1993 (from 88 to 208 billion dollars). However, it is also clear that ASEAN's trade with the rest of world has grown just as fast as amongst its members (from 359 to 691 billion dollars). Moreover, Table A-1 of Appendix A shows that trade with China (even if trade with Hong Kong is not taken into account) is growing at a faster rate than trade within ASEAN. Another feature worth noting is clearly demonstrated in Figure A-2 of Appendix A, namely that trade among ASEAN5 represented on average as much as 94% of all trade amongst ASEAN10 for the period between 1990 and 2003, meaning that for the time being at least, AFTA is essentially an ASEAN5 endeavour.

Table A-2 of Appendix A presents the trade patterns of ASEAN countries in three separate moments, 1990, 1997 and 2003, respectively. A comparison between those dates allows for the identification of some important trends. First, the percentage of imports coming from the ASEAN5 countries has increased for all of the ASEAN10 countries¹⁰. Also, with the exception of Malaysia, Cambodia, Laos and Vietnam, ASEAN's exports to the ASEAN5 grouping also experienced a large increase between 1990 and 2003. Finally, with some notable exceptions, ASEAN's trade (both exports and imports) with China, South Korea and Hong Kong has steadily increased in terms

⁹ Sharma and Chua (2000) found empirical evidence that the "ASEAN integration scheme did not increase intra-ASEAN trade" and that "increase in ASEAN countries trade occurred with members of a wider APEC group", p. 167. A more recent study by Elliot and Ikemoto (2004) reinforce these findings and even come to the conclusion that the degree of trade creation in the years immediately after the signing of the AFTA agreement in 1993 was actually lower than for the preceding period of 1988-1992. Elliot and Ikemoto (2004) follow a method originally developed by Endoh (1999) in measuring trade creation and trade diversion in a gravity model context and define trade creation in a Johnson (1962) sense. Endoh (1999) uses a modified version of the gravity model which included several regional institution variables but did not include the domestic price level as an explanatory variable. In this model, 'trade creation', 'import trade diversion' and 'export trade diversion' are determined by the sign of the estimated coefficients of three dummy variables, intra-institutional trade, exports from a country excluded from a regional institution to a member country of that institution and exports from a member of the regional institution to a country that does not belong to the institution, respectively.

¹⁰ Elliot and Ikemoto (2004), found that the Asian economic crisis generated a stronger desire to source imports from within the region. Hence the trend identified above might be the outcome of ASEAN governments' efforts to promote AFTA in the midst of the Asian Crisis.

of percentage of total trade with the opposite being true for the European Union, the United States of America and Japan.

Therefore, as a recent article by The Economist puts it, AFTA is not quite what it is cracked up to be, especially as several of its members refused to lower tariffs on certain critical products to meet last year's deadline¹¹. Moreover, "no one knows what proportion of trade within ASEAN takes advantage of the CEPT (...). Some estimates put the figure as low as 5%"¹². Also, because "AFTA's members do not trust one another to streamline the current system, nor to negotiate collective deals with outsiders (...), some countries are growing impatient"¹³. This is especially true for Singapore which is actively pursuing several multilateral trade agreements, even with countries with which ASEAN is supposedly negotiating collectively, like Japan and the United States¹⁴. This in turn has created the fear in some ASEAN members that Singapore could be used as a back door entry into the ASEAN market which could be seen as threatening AFTA (and even ASEAN) as a regional economic grouping¹⁵.

This growing impatience is directly concerned with the realization of the great difficulties inherent to creating a broad regional trade arrangement and a fear of being left behind in the trade liberalization race. A recent study by Hoa (2003a) found 'ample support' for the claim that the ASEAN countries would improve their welfare by forming an ASEAN+3 (ASEAN plus Japan, Korea and China) FTA. Hoa (2003a) goes even further by claiming that his findings are "sufficient to provide an empirical basis to Asian policy-makers to push for bilateral regional FTAs such as ASEAN+Japan, ASEAN+Korea and ASEAN+China" (p. 14). Furthermore, in another paper (Hoa 2003b) the author found evidence that whilst income convergence or similarity between ASEAN and its East Asia trading partners does help to increase bilateral trade, its impact is negligible in size and in statistical inference. Therefore, if the case for an ASEAN+3 FTA cannot, for political reasons, move forward quickly, the incentive to sign bilateral FTAs between ASEAN (or only some of its members even the least developed ones) and any of the three Northeast Asian countries is quite large.

These findings seem to find justification in another recent simulation by Kawasaki (2003), who shows that whilst simultaneous trade liberalization between

¹¹ The Economist (2004b). The article presents several examples of that refusal like Malaysia's continuing protection of its stateowned car industry and the Philippines reticence in lowering tariffs on petrochemicals. The deadline refers to the agreement of lowering tariffs of 20% and below, under the normal track program, to a 0-5% range by 2003.

¹² The Economist (2004b).

¹³ The Economist (2002).

¹⁴ As an example, the Japan-Singapore Economic Partnership Agreement (JSEPA) was signed in January 2002.

¹⁵ Tongzon (2002) argues, however, that "the fear that Singapore could be used as a backdoor entry into the ASEAN market has not been substantiated based on available evidence" (p. 14). One possible explanation might be that the local product content requirement (set under the CEPT scheme at 40 percent for both the single country and the cumulative ASEAN content) is limiting the 'back door' trade in ASEAN.

ASEAN, China and Japan would be beneficial to both parties, trade liberalization between any two of the three parties would be beneficial to all participants but would imply important welfare losses (mostly from trade diversion) for the non-participants. This implies that if say, Japan and China agree to pursue trade liberalization without ASEAN, both Japan and China would experience an increase in real GDP (0.45 and 3.06 percent, respectively) but all ASEAN members would experience a reduction (between a minimum of 0.26 percent for Indonesia to a maximum of 1.06 percent for Thailand). Furthermore, the study shows that both Japan and China have more to win from bilateral trade liberalization with each other than from that with ASEAN countries. Even though a Sino-Japanese FTA is not a real prospect for the time being as the "two economic giants are still too distrustful of one another to sit and discuss an FTA"¹⁶, the large potential (welfare) loss of being left out explains why Asian countries are racing to sign bilateral trade deals with each other¹⁷.

1.3 Cooperation or Integration for ASEAN?

Economic Integration was not an original goal in the Bangkok Declaration of 1967 but has since been clearly become a major objective for ASEAN.

In fact, ASEAN has adopted "ASEAN's Vision 2020" (at the Second Informal ASEAN Summit held in Kuala Lumpur on 14 - 16 December 1997) where a timetable was established to create a ASEAN Economic Region in which there is a "free flow of goods, services and investments, a freer flow of capital, equitable economic development and reduced poverty and socio-economic disparities"¹⁸. For that purpose a series of measures were agreed upon including the full implementation of AFTA by 2020 and the acceleration of liberalization of trade in services, the completion of the ASEAN Investment Area by 2010 and free flow of investments by 2020.

The Sixth ASEAN Summit held in Hanoi on 15-16 December 1998 adopted the Hanoi Plan of Action (HPA) which is the first in a series of plans of action building up

¹⁶ The Economist (2004a). The same can be said of the third largest economy in Asia: South Korea. In fact, for historical reasons China, Japan and South Korea deal uneasily with each other and are often viewed with suspicion by the ASEAN members. This largely explains the difficulty in implementing a broad regional free trade agreement.

¹⁷ Recent examples are South Korea and Chile FTA in February 2004 and Singapore's FTAs with Japan, Australia and America, all signed in the past two years. Furthermore, a number of talks are underway for the creation of additional bilateral FTAs. Examples are discussions between Japan and Mexico, Japan and several ASEAN countries and between South Korea and Mexico and even an ASEAN+5 FTA (ASEAN+3 plus Australia and New Zealand).

¹⁸ ASEAN Vision 2020, p.2. It is worth noting the apparent contradiction in this statement. Whilst the free flow of investments is clearly indicated in the Vision 2020 statement as a goal to be undertaken with concrete measures including the realisation of a ASEAN Investment Area by 2010 and free flow of investments by 2020, the objective of capital mobility it merely alluded to in terms of the promotion of "financial sector liberalisation and closer cooperation in money and capital market, tax, insurance and customs matters as well as closer consultations in macroeconomic and financial policies", (p.3). This is a clear indication of the reticence of at least some of its members in liberalising capital movements across borders especially for the main purpose of preventing speculative attacks to their currencies.

to the realisation of the goals of the Vision 2020^{19} . Under the HPA the ASEAN leaders agreed to study the feasibility of a common currency and exchange rate system. The HPA has a six-year timeframe covering the period from 1999 to 2004²⁰. The progress of its implementation is to be reviewed every three years to coincide with ASEAN Summit Meetings.

Next, in 2000 the leaders of ASEAN launched the Initiative for ASEAN Integration (IAI), whose aim "is to narrow the divide within ASEAN and enhance ASEAN's competitiveness as a region. Essentially, it provides a framework for regional cooperation through which the more developed ASEAN members could help those member countries that most need it"²¹.

Another plan of action is the Roadmap for the Integration of ASEAN (RIA) set up at 7th ASEAN Summit and the 5th ASEAN+3 Summit of November 5, 2001, in Bandar Seri Begawan (Brunei Darussalam). The RIA aims to chart "milestones along the way including specific steps and timetables"²² for economic integration so that ASEAN can compete with other regional economic powers. The ASEAN10 countries want to achieve integration before 2010 in 11 industry sectors - wood, rubber, automotive, textiles, electronics, agriculture, information technology, fisheries, health care, air travel and tourism²³.

More recently, the leaders of ASEAN in their 2003 Summit (7-8 October in Bali), emphasized that the ASEAN Economic Community would be the realization of the end-goal of the economic integration as stipulated in ASEAN Vision 2020 and further agreed on the creation of an ASEAN Economic Community (AEC) to achieve deeper economic integration of the region, as outlined in the RIA and Vision 2020. Furthermore, it was noted that "the AEC would be characterized by a single market and production base, with free flow of goods, services, investment and labor, and freer flow of capital"²⁴.

¹⁹ The Hanoi Plan of Action's objectives are not exclusively to foment greater economic integration. In fact that plan states a large number of objectives in a number of areas including to promote human resource development, protect the environment and promote sustainable development, amongst others. Nevertheless, the plan's introduction chapter clearly reaffirms "ASEAN commitments to closer regional integration and are directed at consolidating and strengthening the economic fundamentals of the Member

Countries". 20 The successor plan to the HPA to carry out the ASEAN vision 2020, the Vientiane Action Plan was signed at the 2004 Vientiane Summit to be implemented for the period 2004-2010. ²¹ Press Statement by Chairman, 4th ASEAN Informal Summit, Singapore, 25 Nov 2000. According to ASEAN's secretariat, as of

the first half of 2004, there were 85 projects in the IAI Work Plan at various stages of implementation. ²² Press Statement by the Chairman of the 7th ASEAN Summit and the 5th ASEAN + 3 Summit, November 5, 2001, Bandar Seri

Begawan. ²³ In January 2004, Indonesia's Trade Minister Rini Suwandi said ministers were hopeful that some sectors could achieve integration

before 2005 and all the others in 2008.

Press Statement by the Chairperson of the 9th ASEAN Summit and the 7th ASEAN+3 Summit, Bali, 7 October 2003. At that summit, the ASEAN leaders pledged to achieve an ASEAN community by the year 2020. The objective of an AEC was formalised in the Declaration of ASEAN Concord II.

Some members (Thailand and Singapore) pressured the group to be even more ambitious or to agree to let the members who want to move faster to do so. This discourse sounds very familiar and might point towards the emergence of a political will for a "two-speed" ASEAN integration process. In any event, it seems clear that ASEAN-wide cooperation in terms of economic integration is not yet a reality. In fact, the October 2003 Bali Summit clearly considered the possibility of adopting a so-called "2+x" approach to ASEAN economic integration, in which two countries that are ready to cooperate on specific sectors could work together first, instead of waiting for a consensus to be reached on the global level (or the so-called "ASEAN-x" formula)²⁵.

1.4 ASEAN Monetary Cooperation?

Even ardent supporters of financial integration in ASEAN are not expecting the rapid formation of a currency union in the region.

The economic costs and benefits of adopting a currency union (or other fixed or semi-fixed currency arrangements) are explored in the literature of optimum currency areas. The three most important criteria on the suitability of common currency are (i) the intensity of intra-regional trade, (ii) the correlation of shocks experienced by each member's economies and (iii) convergence of macroeconomic conditions²⁶. Despite some visible improvement in recent years, the fact is that ASEAN fares, as least at first sight, quite badly on all three counts.

The degree of trade integration is believed to be an important optimum currency area (OCA) argument since it reduces the likelihood of asymmetric shocks and enhances the transmission of any shocks. As discussed above, even though the level of intra-ASEAN trade is growing and is expected to continue to do so as a result of AFTA, the proportion is still relatively small. In fact, ASEAN trades much more with other countries (77%) than amongst its member countries $(23\%)^{27}$. Nevertheless, a recent study by Wyplosz (2001) finds that Asian countries appear to be at least as integrated in terms of trade as the European countries. Moreover, using a modified version of Rose (2000)'s gravity model, Wyplosz (2001) found quite unexpectedly that, on average, the European pairs seem less integrated than predicted, while the opposite is true for most Asian country pairs (p.10).

²⁵ Recently, however, the leaders of ASEAN in their last summit (12th ASEAN Summit, Cebu, 12-15 January 200/) agreed to hasten the establishment of the ASEAN Economic Community by 2015 and to transform ASEAN into a region with free movement of goods, services, investment, skilled labour, and freer flow of capital, thus suggesting a preference for a ASEAN-wide integration 26 T

The optimum currency area theory will be discussed in detail in chapter III below.

²⁷ In actual fact, ASEAN's total trade (Imports plus exports) in 2003, intra-ASEAN trade amounted to 208 billion US dollars whilst trade with the rest of the world amounted to 691 billion US dollars.

Concerning macroeconomic conditions, large differences of economic development, capacity and priorities can be found which in turn translate into different levels of readiness and willingness for economic and financial integration. Table A-3 of Appendix A presents some basic macroeconomic indicators for ASEAN and shows the existence of large differences in terms of GDP per capita (from a low of 1,364 US\$ for Myanmar to a maximum of almost 23,000 US\$ for Singapore), inflation rates (for example, while Singapore experienced a mere 0.5% inflation rate in 2003 it was more than 50% for Myanmar), trade openness of the economies (Total trade was 77% of GDP for Indonesia whilst that figure rose to 341% for Singapore) and composition of GDP by sector. Furthermore, a recent paper by Lim and McAleer (2004), using several different techniques did not find clear evidence of any income convergence and catching up in ASEAN, suggesting that the existing gaps are not closing with time²⁸.

Finally, the presence of country-specific (i.e., asymmetric) shocks hitting across different economies, without efficient adjustment mechanisms to restore equilibrium is thought to be a clear indication that a rigid or semi-rigid currency arrangement should not be attempted without an increase in the level of convergence among the countries. Even within the more homogeneous ASEAN5 subgroup, large differences in terms of the way shocks affect each country can be found²⁹, even if some studies suggest little difference between demand and supply shocks between Europe and Asia³⁰.

It is therefore not surprising that there seems to be a general consensus on ASEAN's unsuitability for a currency union for years to come³¹. The conclusion points towards the need to wait for increased economic integration among ASEAN members as economic integration is "not simply a necessary precondition for a currency union, it may also create favourable conditions for launching a currency union"³².

1.5 Asian Financial Crisis

Nevertheless, the political interest in increased monetary and exchange rate cooperation has greatly increased over the recent years, especially since the 1997-1998 Asian financial crisis. In fact, and paradoxically, the Asian financial crisis increased economic disparities within the region making monetary integration more difficult but

²⁸ In fact, whilst some tests found some evidence of some convergence in some pairs of ASEAN, the results were not robust when applying different techniques. It must be said, however, that since their data only covers the years from 1966 to 1992, that the opposite might be true after that period, especially since the introduction of AFTA.

²⁰ The study of the pattern, frequency and type of shocks affecting ASEAN will be developed in Chapter IV below.

³⁰ Bayoumi and Eichengreen (1994b) found little difference between demand and supply shocks between Europe and Asia for the period 1972-1989.

³¹ Wilson (2002) for example states that the "case for ASEAN monetary integration is much weaker than for other subsets of EA [East Asia]", p. 5.

³² Bayoumi and Mauro (2001), p. 953.

at the same time, by showing the flaws of unilateral exchange rate pegging, worked as a "wake up call for ASEAN"³³, which increased the interest of a common currency arrangement for the region.

In fact, in the aftermath of the 1997-1998 financial crisis, an important number of initiatives have been put forward to enhance monetary cooperation not just in ASEAN but in all of East Asia.

Firstly, the Manila Framework Group (MFG) was established in November 1997 with the purpose of improving regional surveillance on matters affecting financial stability in the region. The MFG meets semi-annually and brings together deputies from the finance ministries and central banks of 14 countries, not only from within the Asia-Pacific region³⁴. In these meetings, the Asia Development Bank (ADB), the Bank for International Settlements, the International Monetary Fund (IMF) and the World Bank provide surveillance reports.

The MFG was established when the proposal for an Asian Monetary Fund (AMF) did not materialise. The proposal for an AMF was introduced by Japan in September 1997 and called for the setting up of a \$100 billion fund (half of which was to be provided by Japan and the remainder by Hong Kong, Singapore and Taiwan) for quick disbursement to forestall speculative attacks on the region's currencies. The proposal was met with strong resistance from both the U.S. and the IMF on the grounds that an AMF would unnecessarily duplicate IMF's activities and create moral hazard problems. Even though the proposal was shelved at the time, the idea of a regional monetary fund or an equivalent structure continues to feature prominently in the current literature³⁵.

In October 1998 ASEAN's finance ministers agreed to undertake closer consultations on economic and monetary policies in what was called the ASEAN Surveillance Process and whose main purpose is to serve as an (IMF-style) early warning mechanism on future financial imbalances in the region³⁶.

In May 2000, the finance ministers of ASEAN, China, Japan and the Republic of Korea (or the ASEAN+3) agreed to establish a regional financing arrangement that came to be known as the 'Chiang Mai Initiative' whereby the ASEAN+3 agreed in

cooperation in Asia.

³³ Yong (2004), p2.

³⁴ The twelfth MFG meeting is scheduled for November 30th 2004. Members include Australia, Brunei Darussalam, Canada, China, Hong Kong SAR, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and the United States.
³⁵ On this subject see for example Mundell (2001), Rana (2002) or Wilson (2006). There also have been some calls for the creation

not of an AMF but an APMF (Asia Pacific Monetary Fund) modified to include the United States (Bergsten, 1998). ³⁶ Since then an ASEAN+3 Surveillance process has been set up with the first meeting occurring in May 2000 on the sidelines of ADB's Annual meeting. The ADB has since launched the Regional Economic Monitoring Unit (REMU) and the Asia Regional Information Centre (ARIC) to complement the Surveillance Process. REMU was established to support monetary and financial

²¹

principle to establish a regional network of bilateral currency swaps in order to supply short-term liquidity among ASEAN countries and between ASEAN countries and China, Japan and the Republic of Korea³⁷. In May 2001, at the Asian Development Bank Meeting in Honolulu, the ASEAN+3 decided to expand the Chiang Mai Initiative and to continue to work towards establishing a network of bilateral swap and repurchase agreement facilities among ASEAN+3 countries. The existence of this financial facility gives member countries good incentives to participate in regional financial surveillance. However, the lack of a permanent secretariat in place combined with the low frequency of meetings, together with the relatively small amounts involved raises questions about its efficiency in preventing future financial crises.

Finally, another recent initiative in terms of monetary cooperation is the Kobe Research Project. The Kobe Research project was endorsed by the IV ASEM (Asia Europe Meeting) Finance Ministers' Meeting held in Kobe, Japan in January 2001 and identifies a number of research projects dealing with regional economic integration. The Kobe Research Project seeks to facilitate inter-regional cooperation and research and to study activities on topics of mutual interest, such as regional and monetary cooperation, exchange rate regimes and public debt management³⁸.

1.6 Final Remarks and Motivation for the Study

Despite all the setbacks and reservations, the momentum for further financial and monetary cooperation seems to have gathered pace in recent years, especially in the aftermath of the 1997-1998 Asian Financial Crisis. The degree of political commitment (the lack of which has traditionally been pointed out as the main reason for the unfeasibility of closer cooperation in monetary matters until then) has been steadily increasing not only in ASEAN but in all East Asia, as the large number of recent regional initiatives described above seems to prove³⁹.

However, no one can deny that there is still a long way to go, especially in terms of collective institution-building. The more rigid the collective exchange rate regime chosen, the more loss of national sovereignty it implies. Without collective institutionalbuilding even the more ambitious Chiang Mai Initiative may fail to move to next stage

³⁷ As of August 2004, 16 bilateral swap arrangements have been concluded with a combined amount of about US\$ 36.5 billion (Yong, 2004, p.3).

³⁸ The European Central Bank on April 15-16 2002 held a seminar entitled "Regional Economic Cooperation: The European and Asian experiences" where contributions elaborated in the framework of the Kobe Research Project were presented. The seminar covered three broad areas, namely trade/real integration, financial integration and monetary and exchange rate cooperation. ³⁹ It should be emphasised, however, that a number of authors do not agree with this view. Bayoumi and Eichengreen (1996b),

³⁹ It should be emphasised, however, that a number of authors do not agree with this view. Bayoumi and Eichengreen (1996b), Williamson (1999) and Wyplosz (2001), for example, all doubt that there is enough political will in Asia to move far in the regional monetary cooperation direction.

and therefore "from the point of view of regional integration, the risk is that the [Chiang Mai] initiative will be both a beginning and an end"⁴⁰. One the other hand, as Huang, Mork and Yeung (2004) point out, a poor institutional environment may exacerbate the effects of an external shock to the region, such as the Free Trade Area of the Americas (FTAA)⁴¹ or the rise of China, especially in terms of trade and foreign direct investment diversion and thus constitute a threat to growth in the region and a source of future financial crisis⁴².

Nevertheless, a full currency union in ASEAN has become an inevitability for some of the most 'OCA-philes', at least in the long run⁴³. The recent popularity of the 'hollowing-out' hypothesis seems to leave no choice for ASEAN but to decide between fully flexible exchange rates or a common currency⁴⁴. The hollowing out hypothesis basically states that in a world of high capital mobility the (only credible and therefore viable) choice comes down to either monetary policy independence with freely flexible exchange rates or a complete loss of monetary policy independence by choosing a hard peg (either monetary unions, currency boards or dollarization)⁴⁵. Since the current climate in ASEAN seems to be totally hostile towards fully flexible exchange rates that would only leave the option for a common currency.

However, two arguments go against the deterministic view that the countries of ASEAN are 'condemned' to choose from one of these two extreme, opposing exchange rate arrangements. First is the idea of evolution in implementing a common regional exchange rate arrangement. In Europe, financial markets integration and the adoption of a common currency took more than 30 years to accomplish and were only achieved after a long preparation, deep integration and extensive institution-building⁴⁶. Therefore, "Europe's message to Asia is that the path towards monetary union is a long way down the path of gradually increasing cooperation"⁴⁷ and the decision to adopt a common currency cannot be made hastily. The other consideration has to do with the degree of capital mobility. The hollowing out hypothesis only applies when high capital mobility

⁴⁰ Wyplosz (2001), p. 29.

⁴¹ According to the declaration of the third Summit of the Americas in April 2001, The FTAA Agreement negotiations are to be concluded no later than January 2005 with entry into force to be sought as soon as possible thereafter, but no later than December 2005.

⁴² Even thought Huang, Mork and Yeung (2004) refer only to internal institutional weaknesses in ASEAN, the same argument can be extended to collective institutional frailty, especially as multinational institutions could discipline individual countries institutions and practices.

⁴³ Recently Mundell (2001), defended that Asia eventually needs a common currency even though he recognised that it cannot at present have a single currency, p.18.

⁴⁴ See Eichengreen (1999) and Wyplosz (2001).

⁴⁵ Wyplosz (2001). The author quotes Eichengreen (1999) and Fisher (2001) as saying a variation of this same argument. However, Wyplosz (2001) does not share this view. In fact, he finds some proof that "fixed-but-adjustable rates deliver exchange rate stability" which leads him to conclude that "they can be an efficient arrangement during a transition period", p. 5. However, as he uses the Hodrick-Prescott method which is not widely accepted as valid (see for example Meyers and Winker, 2005), these results are questionable.

⁴⁶ Wyplosz (2002) sets the date at least back to the end of World War I.

⁴⁷ Wyplosz (2001), p.28.

across borders is considered. Critics of the hollowing out hypothesis point out that the imposition of restrictions on capital mobility can help intermediary exchange rate regimes by restricting speculative attacks and only have, at most, limited effects on the allocation of resources⁴⁸. This view claims that some restriction on capital movements may, when coupled with disciplined monetary and fiscal policies, "be an acceptable way of increasing the odds that exchange rate pegs will withstand moderate market pressure"⁴⁹.

As pointed out by Wyplosz (2001), it is essential to clarify if a region indeed sets monetary union as its long-run goal since even "exchange rate regimes that seem suboptimal under current conditions may become desirable when viewed as a step towards monetary union (p. 1)". In that case, as indeed seems to be the case for ASEAN, a myriad of intermediary fixed or semi-fixed exchange rate regional arrangements should be considered, not only the two extremes in the exchange rate spectrum⁵⁰. Recent proposals for the region include (soft) pegging Asian currencies to the dollar, euro or yen, "going the full distance and dollarizing (or 'euroizing' or 'yenizing')"⁵¹, common basket pegs (composed by dollars, euros and yens or IMF's Special Drawing Rights) and the creation of an EU-style, Asian Exchange Rate Mechanism.

No matter which common exchange rate system (or systems) is eventually chosen for ASEAN there must be sufficient meeting of OCA criteria for the system to be stable. Therefore, this study is relevant not only to the study of full monetary integration (i.e., a common currency for ASEAN) but also for all possible types of fixed or semi-fixed exchange rate arrangements.

In this way, this study will be divided as follows. In order to fully understand the concepts and possibilities of monetary cooperation, an Overview of Exchange Rate Regimes will be conducted in Chapter II and a Survey of Recent OCA Empirical Studies is undertaken in Chapter III where the framework for the empirical research of the remainder of the study is established.

An in-depth study of the type, size and frequency of asymmetric disturbances across the ASEAN countries is conducted in Chapter IV. In addition, this chapter expands the existing literature by applying a dynamic analysis of the symmetry of the

⁴⁸ Wyplosz (2001) includes himself and Eichengreen, Tobin and Wyplosz (1995) and Rodrik (1998) in a group of 'reasonable supporters' for restricting capital mobility that suggest that restrictions on capital mobility do not seriously affect the allocation of resources and growth and can "make all the difference between a stable arrangement and one that withers away when markets, as they occasionally do, over-react", Wyplosz (2001), p. 23.

⁴⁹ Wyplosz (2001), p. 23.

⁵⁰ In a recent speech, ASEAN's Secretary General Mr. Ong Keng Yong, clearly states that "ASEAN is undertaking certain policies and projects that are expected to achieve some of the objectives of a single currency arrangement. In the process, this would also contribute to the necessary conditions for adopting a common regional currency", Yong (2004), p.1. ⁵¹ Mundell (2001), p. 303.

shocks in ASEAN in the context of a state-space model that complements the SVAR analytic framework. This analysis allows for the study of the evolution of the degree of symmetry of shocks over time, distinguishing a country's convergence with a regional partner from a more general trend of convergence with the rest of the world. The results yielded a number of important results that complement the Structural VAR analysis of previous studies. First, it showed that in the majority of cases there has been an increase in the degree of convergence of demand shocks in recent years. More importantly, it also showed an increase in divergence in supply shocks for most cases since the beginning of the 90's even when taking into account the Asian Financial Crisis. This is especially true for the periphery countries suggesting that the Philippines and Thailand are not only not converging but actually diverging from the core group comprising Indonesia, Malaysia and Singapore. Considering that supply shocks are more relevant than both monetary and demand shocks when assessing the feasibility of a monetary union, these results imply that an ASEAN5 wide monetary union should not be attempted without further economic integration. Nevertheless, the evidence also suggests the existence of a core that is in a better position to move faster towards the constitution of a monetary union in the future than the periphery, in what can be perceived as a 'two-speed' monetary integration process.

The purpose of Chapter V is to provide a study on the degree of relative price adjustment in ASEAN5 in order to draw inferences on their suitability for further monetary cooperation. The main contribution of this chapter is to provide, for the first time, a study on the degree of exchange rate pass-through to domestic prices in all five founding members of ASEAN by applying a three variable recursive VAR model which uses the Choleski decomposition method along the distribution chain of pricing, using data for the period 1968 to 2001. The results show that a strong case for entering a currency union can only be made for Singapore and Malaysia as in these countries there appears to be a case of exchange rate disconnect. A case for a common currency can also be made for Indonesia but for entirely different reasons. For this country, an independent monetary policy is a clear source of shocks to the economy and therefore a currency union would tend to eliminate then. A weaker case for a common currency can be made for the Philippines as evidence of some exchange rate pass-through to inflation was found but not to import prices. Finally, Thailand exhibits a clear case of exchange rate pass-through to import prices (but not to inflation) and thus evidence that a flexible exchange rate might be preferable as it provides the means to improve the country's price competitiveness.

Chapter VI investigates whether the increase in intra-ASEAN trade in recent years, measured at the highly disaggregated 4-digit industry level, is leading the ASEAN members to closer economic integration and thus creating better preconditions for policy integration and the creation of a common currency area. Two separate models are estimated for that purpose. First, a variation of the model of Frankel and Rose (1997) was estimated for the ASEAN members. Next, a new panel data methodology was conducted. The results with the new model were very significant and robust when four of the ASEAN5 countries were considered, and showed a clear positive correlation between intra-industry trade and business cycle synchronization in ASEAN. These results have important implications for the prospects of the creation of a common currency in ASEAN. As intra-industry trade leads to business cycle synchronization for Malaysia, the Philippines, Singapore and Thailand the costs of joining a currency union in ASEAN will diminish when intra-industry trade is dominant. Therefore, even if we accept the endogenous OCA criteria hypothesis as valid, i.e. that a monetary union creates *ex-post* an OCA, the traditional OCA theory is still relevant since observing the initial conditions for a potential monetary union will give us an idea of how costly it would be for each member and how the economic policy can decrease the adjustment costs. This chapter with a few minor changes has been accepted for publication in Applied Economics.

Finally, the main conclusions of the study are presented in chapter VII⁵².

⁵² The raw data used in the estimations carried out in Chapters IV, V and VI is presented in Appendix I.

Prospects for Monetary Cooperation in ASEAN

Chapter II

Overview of Exchange Rate Regimes

2.1 Introduction

The common approach to OCA theory is to compare the desirability of joining an OCA (and thus a fixed exchange rate system) to the other extreme of having a more or less liberal monetary policy, i.e., free floating exchange rates. The main reason for this is the widely held belief that, given the present state of unregulated, international financial flows, these are the only two regimes with a minimum level of credibility, being less prone to speculative attacks and therefore the only sustainable exchange rate arrangements⁵³. This belief has recently been reinforced by the financial crises of 1997-98, during which "pegged exchange rates crashed from Bangkok to Brasilia"⁵⁴.

There are, however, other possible monetary arrangements for any country to have and we should, therefore, consider not only the extremes but several intermediate possibilities. Frankel (1999) argues that there is no single rule for the best solution for any given country (nor at all times), but instead an array of different possibilities that should be considered in order to obtain the best solution for that particular country, at a particular time. Therefore, the aim of this chapter is to assess the various possibilities, attempting to equate each of the advantages and disadvantages with those of the OCA theory in order to determine in which cases a currency union would be the best solution.

2.2 The Exchange Rate Spectrum

One major difficulty in defining the exchange rate spectrum is that there is not a commonly agreed classification. Even the most widely used 'official' classification, compiled by the IMF in its Annual Report on Exchange Rate Arrangements and Exchange Restrictions is not exempt of criticism. As the IMF classification system until

⁵³ Friedman (1953) while presenting "The Case for Flexible Exchange Rates" asserted that an adjustable peg invites speculative attacks. "In short, the system of occasional changes in rigid exchange rates seems to me the worst of two worlds: it provides neither the stability of expectations that a genuinely rigid and stable exchange rate could provide in a world of unrestricted trade and willingness and ability to adjust the internal price structure to external conditions nor the continuous sensitivity of a flexible exchange rate". (p. 164). ⁵⁴ The Economist (2000a), p. 96.

1997 divided the exchange rate spectrum into a mere four categories (fixed, limited flexibility, managed floating and independently floating) is was criticised for not being sufficiently disaggregated. In light of increasing criticism, the IMF classification system was significantly revised and upgraded in 1997 (to an eight categories system) but it did not re-evaluate its past classification, which makes the two systems all but incompatible. A further problem is the fact that most classifications rely on official information that countries self-declare (as was the case for the pre-1997 IMF system) and the exchange rate data is almost always based on official exchange rate series. However, the declared official classification does not always correspond with the actual country practice. Reinhart and Rogoff (2004) for example, show that during the supposedly pegged exchanged rates period under the Bretton Woods system, *de facto* floating was not at all uncommon⁵⁵.

This is an important issue as most empirical studies on the costs and benefits of different exchange rate arrangements are based on the empirical differences in growth, business cycles, inflation and trade across different types of exchange rate arrangements. It is therefore evident that different classifications may lead to completely different results and conclusions⁵⁶. Table 1 presents four recent alternative exchange rate classifications.

Source			
IMF (Post 1997 system)	Frankel(1999)	Reinhart&Rogoff(2004)	Stone&Bundia(2004)
(8 categories)	(9 catogories)	(14 categories)	(7 categories)
Exchange arrangements with	Currency union	No separate legal	Monetary nonautonomy
no separate legal tender		tender	
Currency board arrangements	Currency board	Pre announced peg or	Exchange rate peg
		currency board arrangement	
Other conventional fixed	'Truly fixed' exchange	Pre announced horizontal band	Full-fledged inflation
peg arrangements	rates	that is narrower or equal to +/- 2%	targeting
Pegged exchange rates	Adjustable peg	Pre announced crawling peg	Implicit price stability
within horinzontal bands			anchor
Crawling pegs	Crawling peg	Three separate de facto crawling	Inflation targeting lite
		bands ($\le 2\%$, $\ge 2\%$ and $\ge 5\%$)	
Exchange rates within	Basket peg	Moving band that is narrower than or	Weak anchor
crawling bands		equal to +/- 2%	
Managed floating with no preannounced	Target zone or band	Managed floating	Money anchor
path for exchange rate			
Independent floating	Managed float	Freely floating	
·			
	Free float	Freely falling	

Table 1: Alternative Exchange Rate Arrangement Classifications

⁵⁵ In fact, they do not find any difference for many countries in the exchange rate behaviour during and after the Bretton Woods system. Notable exceptions are the case of the U.S., Japan and Germany. They also show that dual or multiple exchange rates were very common in the past. In a sample of 153 countries, about 45% of the countries had dual rates in 1950 and even though that number has been steadily decreasing over time, it still stood at about 20% in the 1990s.
⁵⁶ Reinhart and Rogoff (2004) conjecture that the "surprising and provocative results in Baxter and Stockman (1989) and Flood and

⁵⁶ Reinhart and Rogoff (2004) conjecture that the "surprising and provocative results in Baxter and Stockman (1989) and Flood and Rose (1995), namely that there are no significant differences in business cycles across exchange arrangements, may owe to the fact that the official historical groupings of exchange rates are misleading", p.6.

Even though it is possible to find some equivalence among the different categories in each study as they represent slightly different names in most cases, there are also obvious and irreconcilable differences in the chosen methods between studies, which make comparisons between different classification systems difficult in practice⁵⁷. In fact, the differences in methods include differences in the number of classifications (and therefore the level of aggregation of the categories), and the source of the data in which the classifications are made⁵⁸.

Since the general purpose of this section is to provide an overview of alternative exchange rate arrangements from a theoretical point of view (as opposed to an operational point of view), Frankel (1999)'s classification will be used as it is the most straight forward one.

In this way, nine separate exchange rate arrangements with varying characteristics can be distinguished:

Figure 1: The Exchange Rate Arrangement Spectrum



As the diagram above illustrates, the usual distinction between flexible and fixed exchange rate systems is an oversimplification and often leads to confusion. There are at least three 'fixed' exchange rate arrangements: Currency Union, Currency Board and "Truly Fixed" exchange rate; at least two 'flexible' exchange rate arrangements: Managed float or "Dirty Float" and Free Float or "Clean Float" and four intermediate exchange rate systems: Adjustable Peg, Crawling Peg, Basket Peg and Target Zone or Band.

A country has a Currency Union when "the currency that circulates domestically is literally the same as that circulating in one or more major neighbours or partners"⁵⁹. This very general definition can include two very different situations: The first being a "simple" Currency Union, when a (usually small) country adopts the currency of its

⁵⁷ There are other studies presenting alternative exchange rate arrangement classifications (e.g. Gosh, Gulde, Ostry and Wolf (1997), Masson (2000), Nitithanprapas and Willett (2002) and Levy-Yeyati and Sturzenegger (2005)). However, as pointed out by Reinhart and Rogoff (2004), they either consisted in extending the IMF pre-1997 system into a more informative listing or relied on purely statistical methods to regroup country declared practices. Therefore the examples shown here can be seen as representative of the existing alternative exchange rate classification systems.
⁵⁸ Unlike the others, Reinhart and Rogoff (2004) use not only the official rate but also the market-determined rate, which includes

⁵⁸ Unlike the others, Reinhart and Rogoff (2004) use not only the official rate but also the market-determined rate, which includes black market-determined rates.

⁵⁹ Frankel (1999), p. 3.

neighbour or major trading partner and recognises its legal tender⁶⁰; examples are Monaco (the Euro) for the first case and Panama (the US dollar) for the second. In this case, a domestic currency may or may not exist but even when it exists, it retains only a subsidiary role. In either case, there is no currency risk and therefore, no credibility problems. The second situation would be a "full" Monetary Union, when a group of countries agree not only to adopt a (new) joint currency but also have common Monetary and Economic Policies and a collective Central Bank; the best example is the European Monetary Union.

A "true" Currency Board is "a monetary authority that issues notes and coins convertible into a foreign anchor currency or commodity (also called the reserve currency) at a truly fixed rate and on demand"⁶¹. In this case, the currency board holds no discretionary powers and is obliged by law to hold a 100 percent (often more) ratio of foreign reserves (traditionally low-risk, interest bearing bonds and other assets denominated in the anchor currency) as a guarantee to full and unlimited conversion between its notes and coins and the anchor currency at the fixed rate of exchange. In this system, the government cannot borrow from the monetary authorities and cannot finance its spending by printing money. Hong Kong is the most famous and closest example of a "true" currency board.

A Currency Board-like system (or unorthodox currency board) differs from the previous in that the country's Central Bank retains many of its traditional powers but is constrained by currency board rules regarding the exchange rate and reserves. In this case, the legal foreign reserve ratio is normally relaxed and falls below the 100 percent mark⁶². Unlike the "true" Currency Board, an "unorthodox" Currency Board can suffer from lack of credibility, especially when the foreign reserve ratio is kept low and suffer speculative attacks on the domestic currency.

Exchange rates are said to be "truly fixed" when a country fixes its domestic currency to a foreign currency. In some cases both currencies circulate domestically and both have legal tender. An example is the case of some members of francophone Africa who used to fix their currencies to the late French Franc and now fix it to the Euro.

Most countries that declare themselves as having a "truly fixed" exchange rate have in fact, a "fixed but adjustable" exchange rate peg, that is, the currency is fixed but can undergo realignments in the presence of persistent imbalances in the economy. The former Bretton Woods system was characterised by this arrangement.

⁶⁰ Some authors like for example Bogetic (1999), call this arrangement "official or full dollarization".

⁶¹ Schuler (1998), p. 1.

 $^{^{62}}$ As an example, Argentina's legal foreign reserve ratio is only 66 percent. In Brunei, the monetary authorities are only required to hold foreign reserves (in this case the Singapore dollar) of at least 70 percent.

With Crawling Pegs, the exchange rate peg is regularly reset in a series of (sometimes pre-announced) mini-devaluations according to a nominal anchor which is normally the inflation rate. Inflation targeting tries to "combine the flexibility of a floating currency, allied to a rigorous monetary framework to conquer inflation"⁶³. Recent examples of crawling peg are Bolivia and Costa Rica⁶⁴.

A Basket Peg fixes the exchange rate in terms of a basket of different currencies of its main trading partners, each with a different weight, instead of just one major currency. The purpose is to diminish the exposure to large (negative) swings in the value of an individual currency. Morocco and Kuwait are current examples of Basket Pegs.

A Target Zone or Band is an exchange rate system whereby a country's monetary authorities intervene only when the exchange rate either actually threatens to fall out of a pre-determined margin on either side of a central parity. In the EU's late Exchange Rate Mechanism (ERM) the band was established on a range of plus-or-minus 2,25 percent (the narrow band) and after the 1993 currency crises some countries were allowed a wider plus-or-minus 15 percent range (wide band). Even though the first case resembles a fixed exchange rate arrangement, the second case is, in all but name, a Managed Float system.

When a currency is under Managed Float, the Central Bank intervenes regularly in the exchange rate market without defending any particular parity. This system, also know as "Dirty Float", normally but not exclusively means that the authorities intervene to increase its country's competitiveness by "strategically" devaluating its currency against its main trading partners. In 2001, with 42 currencies, this exchange rate arrangement was the most popular choice worldwide.

Finally, in Free Floating or "Clean Floating currencies, the Central Bank simply does not intervene in the Exchange Market, letting the market forces determine the exchange rate on their own. The USA is the closest example of Free Floating exchange rates.

Table 2 summarizes the main characteristics of each exchange rate arrangements and presents some examples of nations that adopt them.

⁶³ The Economist (2000a), pg. 96.

⁶⁴ According to IMF's International Financial Statistics, as of December 31, 2001.

Table 2:	Exchange	Rate Arrangeme	nts: Examples	and Main	Characteristics
	0	0	1		

Exch. Rate Arrangement	Where ? (examples)	Main Characteristics	
Curency Union	Panama and European Union.	Domestic currency is the same as the currency circulating in one or more main trading partners.	
Currency Board	Hong Kong, Argentina, Brunei Darussalam	Domestic currency is (by law) fully convertible to a foreign currency (reserve currency). Monetary authority has no discretionary power (in "true" Currency Board)	
"Truly fixed" Exch. Rate	West and Central francophone Africa.	Domestic currency is fixed to a foreign denominated currency.	
Adjustable Peg	Former Bretton Woods system.	Fixed but adjustable pegs. Periodical realignments of currency peg when fundamental misalignments arise.	
Crawling Peg	Bolivia, Paraguai	National currency is pegged to a foreign currency but the country's Central Bank allows the exchange rate to 'crawl' upward over time so that the peg is regularly reset in a series of mini-devaluations according to a nominal anchor.	
Basket Peg	Malta, Morocco, Kuwait	Exchange rate is pegged to a weighted basket of currencies (normally a country's main trading partners), reducing the risk of large (negative) swings in the values of individual currencies in the basket.	
Target Zone or Band	Former ERM system, Denmark under EU's ERM II cooperative arrangement.	Exchange rate is maintained within a pre-determined range of a pre-determined central parity.	
Managed Float	Most countries with "flexible exchange rates" eg. Brasil.	The Central Bank intervenes in the Exchange market without defending any particular parity.	
Free Float	The United States is the closest example.	The Central Bank does not intervene in the Exchange Market. The Exchange rate is determined freely according to demand and supply.	

Note: Examples taken from International Financial Statistics Yearbook 2002, as of December 31, 2001

Whilst the European Union is the main reference of a modern full Currency Union, the other extreme of the spectrum is harder to identify as even in the example presented, the USA, intervention is not a rare occurrence⁶⁵.

Even though the classification of some exchange rate arrangements is, in practice, difficult in some cases as the clear distinction between systems is not always obvious and because some countries do not always follow their declared *de jure* regime, it seems nevertheless clear that a number of countries do not always maintain the chosen exchange rate arrangement for long. Using the data compiled by the IMF published in its International Financial Statistics Yearbooks, the number of countries adopting Free Floating exchange rates declined from 49 in March 2000 to 41 in December 2001 whilst the number of countries under Managed Floating exchange rates increased from 27 to an impressive 42 in the same period.

The apparent lack of stability in exchange rate arrangements is also evident when analysing the special case of ASEAN. Table 3 shows the exchange rate regimes in ASEAN5 immediately before and after the 1997 Asian Financial Crisis, using not only the declared official exchange rate system but also the *de facto* practices based on dual or parallel market rates.

⁶⁵ According to Coppel, Durand and Visco (2000), the Federal Reserve has intervened 125 times on the dollar/yen market between 1985 and 1995.

Exch. Rate Arrangement	Pre- 1997 Financial Crisis period	Intermediate period (if different)	Situation in Dec 2001
Free Floating		Malaysia (from Aug 1997 - Sep 1998) Phillipines (from Jul 1997 - Dec 1997) Thailand (Jul 1997 - Jan 1998)	Indonesia (from Aug 1997)
Managed Float			Philippines (from Dec 1997) Singapore (from Dec 1998) Thailand (from Jan 1998)
De facto Moving Band around US dollar	Singapore (from Jun 1973 - Nov 1998) Malaysia (from Sep 1975-Jul 1997)		
De facto Peg to US dollar	Indonesia (from Nov 1978 - Jul 1997) Phillipines (from Sep 1995 - Jun 1997) Thailand (from Mar 1978 - Jul 1997)		
Peg to US dollar			Malaysia (from Sep 1998)

Table 3: Exchange Rate Arrangements in ASEAN5

Source: After Reinhart and Rogoff (2004)

One immediate conclusion is that the speculative attacks on the national currencies during the 1997-1998 Asian Financial Crisis forced all ASEAN5 countries (although at different times) to stop pegging their currencies to the US dollar and move towards a more flexible regime. It is also evident that the timing of the switch to a more flexible exchange rate regime varied considerably amongst these countries indicating a lack of a concerted response to the crisis.

The same pattern of instability and variability in exchange rate arrangements can be found in terms of ASEAN10. Table 4 shows the exchange rate regimes for the ASEAN10 countries in 2000 and 2001 based on the 'official' IMF classification system⁶⁶.

Exch. Rate System	March 2000	December 2001	
	Indonesia	Philippines	
Free Floating	Philippines		
	Thailand		
	Cambodia	Indonesia	
	Singapore	Cambodia	
		Laos	
Managed Floating		Myanmar	
		Singapore	
		Thailand	
		Vietnam	
Currency Board	Brunei	Brunei	
Target Targe	Malaysia	Malaysia	
Target zone	Vietnam		
Basket Peg	Mvanmar		

Table 4: Exchange Rate Arrangements in ASEAN10

Source: IMF's International Financial Statistics 2001, 2002.

⁶⁶ As stated above, because Table 3 and Table 4 rely on different classification methods, some apparent contradictions in a particular country's exchange rate regime can occur. This the case for example of the Philippines, which appear as having a system of Managed Floating in Table 3 in December 2001 whilst simultaneously appearing as Free Floating in Table 4.

Once again this shows that despite being a regional grouping with a stated goal of increased economic and monetary cooperation, ASEAN10 encompasses several very different monetary systems, from a Currency Board to Free Floating exchange rates. It also demonstrates that no less than half of the ASEAN10 countries changed their chosen exchange rate regime between those two years (Indonesia, Laos, Myanmar, Thailand and Vietnam).

These examples seem to suggest that either the chosen exchange rate regime is not credible and therefore not sustainable in the long run or that countries change their views on their ideal exchange rate regime, or both. The next section will look further at these questions and provide a brief overview of the on-going discussion on whether fixed or flexible exchange rates yield better results.

2.3 Flexible Vs Rigid Exchange Rates: A Reminder

One desirable characteristic of any exchange rate system is credibility. Without it a country's currency can become the target of harsh speculative attacks that can completely undermine its ability to pursue its objectives, and furthermore introduce prohibitive costs which will in the end force the country to abandon its monetary policy. As we have seen in the previous analysis, the only exchange rate arrangements which have no lack of credibility (and thus are less prone to speculative attacks) are both extremes in the exchange rate spectrum: Fixed exchange rates (in its various formats) and Free Floating exchange rates⁶⁷. Even assuming that intermediate regimes are not tenable (which is not yet clear, even if the majority of authors seem to agree on it⁶⁸) another question has to be asked: if both extremes guarantee credibility which one is the best solution for a particular country?

2.3.1 Flexible Exchange Rates Systems

The main advantage of a flexible exchange rate system can be summarised in one factor: a country's ability to pursue an independent monetary policy. This system has been viewed as able to perform two vital functions: adjustment of eventual balanceof-payments disequilibriums and insulation.

In theory, any balance-of-payments deficit implies a corresponding excess demand of the foreign currency against the national currency. Under the (fully) flexible exchange rate system will make the price of the foreign currency go up (as is the case

⁶⁷ This is known as the 'bipolar view' or 'two-corner' solution view.

⁶⁸ This view seems to find justification in recent history. As suggested above, independently of whether or not the country is open to international capital markets, recent history has been characterized by a "hollowing out of the middle of the distribution of exchange rate regimes, with the share of both hard pegs and floating gaining at the expense of soft pegs" (Fisher (2001), p. 22).

for any other good in a free market situation) causing a depreciation of the national currency, stimulating exports and penalising imports until equilibrium is restored, with the opposite being true for a balance-of-payments surplus. Flexible exchange rates, again in theory, enable countries to insulate themselves from outside disturbances and to pursue national economic objectives with a degree of autonomy. This autonomy is achieved because external imbalances caused by the pursuit of internal macroeconomic goals are corrected almost automatically in the exchange rate market.

On the other hand, this insulation makes it less painful to the economy to adjust to external shocks, (especially demand shocks) as a relatively quick adjustment of exchange rates (depreciation) is less costly than a prolonged adjustment of relative nominal price levels that is going to affect the competitiveness of its exports. Also, exchange rate flexibility is "said to 'bottle up' inflation in the country where it arises"⁶⁹, and thus makes it possible to avoid 'importing' inflation from other less inflationconscious countries. Finally an independent currency (as opposed to a currency union) provides the government with seigniorage profits (which are especially important in less developed countries with high inflation).

In practice, Free Floating exchange rate systems are quite rare. The dominant Managed Floating exchange rates are perceived to provoke excess volatility of exchange rates (excessive in terms of what would be expected in theoretic terms considering economic conditions and inflation differentials between countries)⁷⁰, increasing uncertainty and thus discouraging investment and trade. And finally, another disadvantage of this system is the higher transaction costs it implies. In fact, floating exchange rates are thought to (negatively) affect policymaking for two main reasons. First, because if market forces are left alone, the exchange rate may deviate in large and consistent terms from its long-term 'equilibrium level' and thus not be consistent with economic fundamentals. This will in turn endanger the 'automatic' stabilisation function of the exchange market. Secondly, and especially in the short term, because exchange rates seem to be excessively volatile, it will create uncertainty and discourage trade and investment.

2.3.1.1. Are Exchange Rates Excessively Volatile?

Nowadays, economists tend to downplay the effect of excess volatility on trade and investment flows as being the main disadvantage of Floating exchange

⁶⁹ Ypersele (1985), p. 21.

⁷⁰ Even though some authors question whether Floating exchange rates are excessively volatile (e.g. Frankel and Rose (1996) conclude they cannot explain the large swings in exchange rates, especially on a short-term basis), this still seems to be the prevailing view. For estimates on exchange rate volatility see for example Sapir, A. and Sekkat, K. (1990).

arrangements, as there is little empirical evidence that this effect exists in reality, especially as regards trade⁷¹. A possible reason for this is the existence of a forward exchange market which makes it relatively cost efficient to hedge against unforeseen exchange rate fluctuations. However, possible negative effects of exchange rate uncertainty on trade and investment continue to occupy the minds of policy makers and business people (this is undoubtedly true in the case of European politicians), especially as its effects were considered valid in the recent past⁷². Also, other possible effects of exchange rate excess volatility such as the creation of inflationary pressures for example, and the undermining of credibility in the currency and in the country's monetary policy (this assumes particular importance in the Euro zone), cannot be disregarded.

2.3.1.2. What is the Equilibrium Exchange Rate?

The 'theoretical' or equilibrium exchange rate was traditionally seen as dependent on trade in goods and services. This is the approach of both the purchasing power parity theory (PPP) and the fundamental equilibrium exchange rate theory (FEER)⁷³. This view was consistent when capital movements were fairly restricted and thus tended to be linked to trade. Nowadays, however, since as little as 1% of all foreign exchange transactions are trade related⁷⁴, these measures are seen to be systematically out-of-tune with spot exchange rates.

As a consequence, a second approach emerged, which seems to be gaining in influence. This approach defends that the relative price of financial assets is more important than the prices of goods and services in explaining exchange rate movements. The argument is that international investors will shift large amounts of funds in response to differences in expected returns in financial markets until equilibrium is met and expected returns are equal in all financial markets. Initially, differences in bond yields in international markets were seen as the main reason for international capital movements and thus the main cause of exchange rate movements. According to this view, changing expectations about growth rates and inflation affect exchange rates

⁷¹ Bacchetta and Van Wincoop (1998), for example, find no evidence that trade is higher in a fixed exchange rate regime and some (but little) evidence that investment flows are affected by floating exchange rates. Conversely, Ghosh, Gulde, Ostry and Wolf (1997) found that investment rates were higher under pegged exchange rates but only for the middle to high-income IMF members. Also, and contrary to what the theory suggests, these authors found some evidence that trade growth was in fact higher under floating

⁷² Frankel and Wei (1995) found significant effects of bilateral exchange rate variability on bilateral trade in the 1960's and 1970's,

The first is based on the so-called 'law of one price' or the notion that in the long run, a basket of tradable goods and services cost the same in any two countries. The second states that the equilibrium (real) exchange rate is one that produces a sustainable current account (or macroeconomic) balance. ⁷⁴ According to The Economist (2000b), p. 81.
because they change expectations about interest rates and bond yields. More recently, some economists have argued that equity markets are a better measure since they now represent most of the cross-border investment.

In either case, and although one can argue what the right long-term equilibrium level of any exchange rate is, the general opinion seems to point towards the existence of large differences between the spot exchange rate and its 'theoretic' value.

This argument is particularly relevant as regards the Euro and its performance since its birth at the beginning of 1999. Before the introduction of the Euro, most economists predicted that the new currency was set to appreciate according to some of the main economic fundamentals "(...) which *a-priori* appeared in line with an appreciating currency; a positive economic outlook for the euro area, a continued current account surplus and expectations of narrowing differentials in euro short and long-term interest rates *vis-à-vis* those in the United States"⁷⁵. In this light, recent studies⁷⁶ put the (FEER) Euro/dollar equilibrium exchange rates in a range of \$1.07 and \$1.43. However, the opposite, in fact occurred. Since the launch of the Euro at the beginning of 1999 and for about three years, the Euro steadily lost value against the US dollar, losing about 24 percent of its original value by January 2002⁷⁷. This happened during a period in which the economic outlook improved for the Euro zone and some economists testified to the US's worsening current account deficit as chaotic and the best reassurance that the US dollar 'had to' depreciate. The market forces seemed (at least for a while) to continue 'stubbornly' ignoring it.

One of the main explanations advanced at the time relied on the fact that the level of trade in goods and services may no longer be the main reason behind exchange rate movements, and that different performances in financial markets are now the key behind exchange rate fluctuations. In fact, for most of 1999 and 2000, there had been "a strong correlation between the dollar and the American stockmarket, and between the yen and the Japanese stockmarket. A net inflow of equity capital into both countries has supported their currencies. In contrast, the net outflow from the euro zone has more than offset its current-account surplus, depressing the euro".⁷⁸

However, the declaration of death of the traditional exchange rate equilibrium theories by the most ardent supporters of the 'new' approach proved premature. Since January 2002, the Euro has gained more than 50 percent against the U.S. dollar reaching

⁷⁵ Coppel, Durand and Visco (2000), p. 7.

⁷⁶ CAE (1999) and Alberola *et al.* (1999) quoted in Coppel, Durand and Visco (2000), p. 8.

⁷⁷ In effective terms, however, the depreciation of the Euro was less accentuated (Coppel, Durand and Visco (2000), p. 6.)

⁷⁸ The Economist (2000b), p. 81.

its all time highest value by the end of 2004^{79} . Even though it is still too early to fully understand these large swings in the exchange rate, it seems more likely that the main reason the Euro was under its predicted equilibrium levels had to do with the European Central Bank's perceived lack of credibility. Macroeconomic conditions alone are not able explain the large swings in the Euro/dollar exchange rate to date, especially as the large balance-of-payments and current account imbalances persist in the United States.

This and other examples reinforce the belief that floating exchange rates are excessively volatile with speculative bubbles being the major reason behind the unexplainable movements of exchange rates, especially in the short term. On the other hand, floating exchange rates do not seem to solve the balance-of-payments or current account equilibrium that the theory advocates. This has led some authors to defend a more interventionist role for Central Banks in the exchange market and others to defend the introduction of target zones for the value of the dollar vis-à-vis the euro and the yen, that is, a move toward more rigid exchange rate systems.

2.3.2 Rigid Exchange Rates Systems

When discussing fixed exchange rate regimes, a particular exchange rate agreement immediately comes to mind: The 1944 Bretton Woods agreement. This agreement established the foundations for a new International Monetary System that lasted until 1971 and under which the currencies were pegged by an official parity to the US dollar and assured the full convertibility (at a fixed price) with gold. Even though no one nowadays argues for a reintroduction of a Bretton Woods-like system⁸⁰, more-orless rigid exchange systems continue to attract admirers. This nostalgia is partially caused by the fact that under the Bretton Woods regime both nominal and real exchange rates were very stable which together with low levels of inflation is seen as the main reason for the unprecedented and generalised growth both in income and international trade for about 25 years⁸¹.

A first obvious advantage of a rigid exchange rate arrangement is the reduction of transaction costs and the exchange rate risk (which is supposed to promote trade and investment but this, as we have seen, does not seem to be very significant in what concerns trade). The advantage most authors tend to focus on is the fact that a fixed

⁷⁹ Once again, the movement in the euro's trade-weighted value was, however, much smaller. According to The Economist (2004c), the euro's trade-weighted value was by the end of November at its original value at the launch in January 1999. This is due to the fact that the U.S. represents only 16% of the Euro area's exports compared with almost 50 percent to the rest of Europe.

For one thing, the relatively low and widely restricted capital mobility that characterised the Bretton Woods system cannot be duplicated in an age of ever-growing market globalisation, deregulation and increased capital mobility.⁸¹ It is worth noting however, that when analysing not only the official exchange rates but also dual or parallel market exchange

rates de facto floating was not uncommon during this period. (see Reinhart and Rogoff (2004)).

exchange rate creates a nominal anchor for monetary policy, which will provide credibility for the monetary authorities' commitment to low inflation targets. This is particularly attractive to countries with poor records in inflation and economic discipline and thus suffering from a severe lack of credibility.

The anti-inflationary property of a pegged exchange rate is based on two main factors: Discipline and Credibility. A pegged exchange rate is a clear indication of a country's commitment to low inflation targets, this makes them have lower rates of growth in money supply and thus raises the political costs of abandoning a peg. On the other hand, "pegged exchange rates by enhancing confidence, can engender a greater demand for the domestic currency. This will be reflected in a lower velocity of circulation and a faster decline of domestic interest rates"⁸², which will help lower inflation. Ghosh, Gulde, Ostry and Wolf (1997), for example, found that for the IMF members in the period between 1960 and 1990, the growth of broad money averaged 17 percent a year under pegged exchange rates compared with almost 30 percent a year under floating regimes, regardless of the income level of the country. Also for the same period, and although there was a general tendency for nominal rates to increase, the rate of increase in nominal interest rates was 2 percent for countries with pegged exchange rates, 6 percent for countries with floating exchange rates and 9 percent for countries in intermediate regimes. In real terms, the results were similar, with a 0.2 percent, 2.3 percent and 1.8 percent real interest rate increase, for pegged, floating and intermediate regimes, accordingly.

Also, fixed exchange rate regimes in the presence of capital controls present some extra tools in fighting speculative attacks, i.e., by constraining capital movements, it can guarantee its peg without having to increase interest rates to prohibitive levels. This, however, will discourage investment and trade, as foreign investors will stay out of the country⁸³. On the other hand, it is generally believed that controls on capital tend to lose their effectiveness and efficiency over time⁸⁴.

From the brief analysis above, the conclusion that rigid exchange rate regimes are ideal could be drawn: They are credible and thus less prone to speculative attacks, they guarantee some degree of exchange rate stability and are anti-inflationary in nature. Why then, don't more countries adhere to this kind of system? The answer to this

⁸² Ghosh, Gulde, Ostry and Wolf (1997), p. 6.

⁸³ Fischer (2001) argues that each of the major international capital market-related crises since the Mexican crisis in 1994, including the Asian Financial crisis in 1997 and the financial crisis in Russia and Brazil in 1998 and Argentina and Turkey in 2000 have involved a fixed or pegged exchange rate regime in countries open to international capital flows, and thus not implementing capital controls. ⁸⁴ See Fisher (2001), pp. 8-12.

question lies with the main liability of the rigid exchange rate systems: the loss of an independent monetary policy.

This, as we have seen, makes insulation impossible and can greatly damage a country's external competitiveness if one or several of its main trading partners choose to devalue their currencies⁸⁵. As a result, pegged exchange rates are associated with larger growth and employment volatility and there is some evidence that they result in lower productivity and GDP growth rates⁸⁶.

The conclusion we can make at this point is that a particular exchange rate regime is not likely to serve equally well all countries or a given country at all times. As Table 5 summarizes, countries facing mostly internal problems (namely inflation, and lack of credibility which provokes massive capital flights in times of crises, etc.) might find the costs of pegging its exchange rate, especially in terms of the loss of independent monetary policy, to be fewer than its advantages. But for countries facing mostly external disturbances (real exchange rate misalignments, sluggish growth created by an external shock, etc.) it might be advantageous to adopt a more flexible exchange rate system as the ability to pursue an independent monetary policy will help the economy to adjust to real disturbances.

	Advantages	Costs
Fixed	 Reduces transactions costs 	 Loss of independent monetary policy
	- Reduces exchange rate risk	 Loss of seigniorage profits (in Currency Union)
	- Provides a credible nominal anchor	
	for monetary policy	
	- When combined with capital controls	- Discourages trade and investment (when in
	helps fighting speculation.	presence of capital controls)
Floating	 Provides the ability to pursue an 	- Uncertainty
	independent monetary policy	- Excess volatility
	- Seigniorage profits	- Transaction Costs
	 Allows smoother adjustment to real 	 Discourages trade and investment
	shocks (especially demand shocks)	

Table 5: Fixed vs. Floating: Main Advantages and Costs

The ideal solution seems, then, to be one whereby a country has a rigid exchange rate with its main trade and investment partners and a flexible exchange rate with the rest of the world. But this seems unfeasible; can a country simultaneously have a fixed and a flexible exchange rate mechanism? The Optimum Currency Area theory provides clues to a possible solution for this apparent contradiction; a country belonging to a

⁸⁵ The credibility of Argentina's currency board has been greatly affected by Brazil's devaluation of the Real against the US dollar of about 30 percent, as some analysts predict that under the present terms, Argentina competitiveness (and therefore its balance-of-payments) will be unsustainable.

⁸⁶ See Ghosh, Gulde, Ostry and Wolf (1997), pp. 10.

currency union has rigid exchange rates with its co-members but the currency area as a whole can have a floating exchange rate with the rest of the world.

2.4. A Brief Survey of OCA Theory

The Optimal Currency Area theory was first introduced by the recent Nobel Prize winner Robert Mundell back in 1961. Since then, the original framework has experienced a large number of transformations and improvements.

The basic concern of the OCA theory is to know when a country should have an independent currency (and independent monetary policy) and when a country should have a common currency with other countries. It is widely accepted that very large countries (like the USA or China) would have more to loose than to gain in adopting a foreign currency as its own or fixing the value of its currency in terms of another. On the other hand, in very small countries (like Andorra, Liechtenstein, etc.) an independent currency wouldn't make sense as the costs would largely outweigh the benefits. Therefore, the OCA concept is only relevant to the "middle-of-the-range" countries or economies, which constitute the largest overall number.

The OCA theory states, in simplistic terms, that the more similar and the more closely tied two ("middle of the range") countries or economies are, the more benefits they aim to reap from having a joint currency as opposed to having separate currencies. The next question is how similar and in what aspects.

The main challenge when addressing optimum currency areas is the difficulty in 'operationalising' this theory in a way to make it possible to use in an empirical study. Despite some important developments in this area in recent years it is still extremely difficult to implement quantitative analysis on the criteria used to measure the desirability to join an OCA⁸⁷.

The earlier literature on the subject, the so-called 'traditional approach', tried to identify a single characteristic on which a country's readiness to join a common currency could be assessed. This was done with reference to the achievement of "the standard objectives of economic policy"⁸⁸: the maintenance of full employment, internal price stability and balance of payments equilibrium. Later, a cost-benefit analysis (as suggested by Ishiyama (1975)) was seen as a better method for evaluating the

⁸⁷ For example, McCallum (1999) considers that the OCA "concept is, in practice, non-operational" since "each of the criteria is extremely difficult to implement quantitatively" (pg. 5). Notable exceptions are Bayoumi and Eichengreen (1996b, 1997) who tried to "operationalise" OCA theory (in a reduced-form approach) and apply it to data for European Countries (1997) and Japan and its 19 leading trading partners (including 8 of the 9 East Asian countries (1996b). This was done by relating exchange rate variability to 4 country characteristics (Asymmetric output disturbances, Dissimilarity of the composition exports of a pair of trade partners, Importance of commercial links between each pair of countries and Economic size) that "according to the OCA theory affect a country's desirability of stable exchange rates and monetary unification". For a more detailed analysis see Chapter III. ⁸⁸ Ishiyama (1975), p. 346.

desirability to join an OCA, taking into account the self-interest of a particular region or country, as was done, in much in the same way, in the previous section. However, even the so-called 'new' theory of OCA uses the 'traditional' approach as a starting point in their cost-benefit (or welfare) analysis. Therefore, a brief review of the main criteria put forward by the 'traditional' approach is still relevant.

2.4.1 Mundell's Contribution: Labour (and Capital) Mobility

Mundell's main argument is that high mobility of labour (and capital) across countries functions as an automatic balance of payments stabiliser, making exchange rate policies unnecessary in performing that vital function. In his own words: "If factors are mobile across national boundaries then a flexible exchange system becomes unnecessary, and may even be positively harmful"⁸⁹.

In this way, factor mobility and especially labour mobility between regions and industries are seen to be good substitutes for exchange rate adjustment in the presence of asymmetric output disturbances.

Furthermore, Mundell emphasised that "what matters for the Optimum Currency Area approach is the difference between inter-regional and inter-national labour mobility and not the level of the latter"⁹⁰. In this way, Mundell's argument not only applies in determining whether a country should join an OCA but also whether or not that country should have more than one currency (if inter-regional labour mobility is very low).

On the other hand, as regards capital mobility, Mundell's original argument was that high capital mobility among countries called for (irrevocably) fixed exchange rates. However, when in the presence of adjustable pegs (or an exchange rate system seen as revocable), other authors defend that fixed exchange rates are costly to uphold if capital mobility is perfect (e.g. Obstfeld and Rogoff (1995)). This implies that the effect of capital mobility on the choice of the exchange rate system is not straightforward and depends on the degree of rigidity of the exchange rate arrangement and its credibility. This seems to be sustained by some empirical works where the relationship between capital mobility and the probability of a country adopting flexible exchange rates has mixed results⁹¹.

⁸⁹ Mundell (1961), p. 669.

⁹⁰ Gros (1996), p. 108.

⁹¹ See for example Bratberg, Legernes and Vardal (1999). This paper includes a survey of several empirical works with opposite results in what concerns this relationship.

2.4.2 Why Does the Size and Openness of an Economy Matter?

In very open economies (when the ratio of tradable to non-tradable goods or, in other words, the ratio of trade to output is large), the two functions of insulation and 'automatic' stabilisation of balance-of-payments imbalances of a flexible exchange rate are greatly limited since this type of economy is greatly dependent on its main trading partners. In this instance, and to use the words of Mckinnon (1963), who first put forward this idea, "(...) flexible exchange rates become both less effective as a control device for external balance and more damaging to internal price-level stability"⁹² and therefore have less advantages in having such a exchange rate arrangement.

Furthermore, given that the smaller the economy, the more open it is likely to be (being unable to efficiently produce internally all the goods and services it requires it is therefore more dependent on trade), smaller countries would reap more benefits (or have less costs) in joining a currency union. The main reason being that in a small country the use of exchange rate policy as a means to improve its terms of trade is not an option because it cannot affect foreign prices. Also, "being small it is less stable and more prone to speculation (Mundell (1960))"⁹³.

2.4.3. Professor Kenen's Contribution: Production Diversity (and Economic **Development), Symmetry of Shocks and Fiscal Transfers**

Kenen (1969) argued that diversity in a country's product mix is more relevant than factor mobility in that country's choice of exchange rate arrangement. He suggested that well-diversified economies (which tend to be fairly developed economies) should adopt a fixed exchange rate and that specialisation in the production structure (less-developed economies) calls for a flexible exchange rate. The argument is that "(product) diversification serves to average out external shocks and, incidentally, to stabilize domestic capital formation" and also serves "to minimize the damage done when averaging is incomplete"⁹⁴.

The implication is that the more similar the industrial structures across countries, the more symmetric shocks tend to be (especially demand shocks since there "is relatively little that monetary policy changes can do to counteract supply shocks⁹⁵), reducing the need for flexible exchange rates to provide the necessary adjustment to accommodate differences among them. Furthermore, countries with fixed exchange rate regimes "must be armed with a wide array of budgetary policies to deal with the

⁹² Mckinnon (1963), p. 719.

 ⁹³ Bratberg, Legernes and Vardal (1999), p.2.
 ⁹⁴ Kenen (1969), p. 54.

⁹⁵ Frankel (1999), p. 31.

stubborn 'pockets of unemployment' that are certain to arise from export fluctuations combined with imperfect mobility of labour"⁹⁶, suggesting that in the absence of labour mobility and sufficient wage and price flexibility to compensate for the loss of an independent monetary policy, a system of fiscal transfers between regions and countries could help smooth asymmetric shocks.

Although Kenen's arguments carry a lot of weight among economists, they are not without contention. Firstly, because fiscal integration is a criterion that can only be verified *ex post* not *ex ante*, that is, fiscal integration is a result of a high political integration within the area and can only be considered after the decision to adopt a common currency has been taken. Also, some authors argue that specialisation means unstable export earnings and thus calls for a fixed exchange rate for developing countries (Heller (1977)), while others argue that the lower the degree of economic development, the stronger the need for a fixed exchange rate (Holden, Holden and Suss (1979)). Finally, Frankel and Rose (1996) argue the diversification criteria cannot work in practice as this does not provide an equilibrium solution, that is, either countries are well diversified to start with and by adding more regions a larger, more diversified region will always be formed (and this process will continue until the whole world has only one currency), or countries do not pass this criterion and thus they should break up into smaller currency units that float against each other (and in this case the world would have several million currency units).

2.4.4 Price and Wage Flexibility

Another criterion normally quoted in relevant literature can be traced, perhaps paradoxically, to a strong defender of flexible exchange rates even before the birth of the OCA theory. In fact, Friedman (1953) argued that in the presence of price and wage rigidities a country should adopt flexible exchange rates in order to maintain both internal and external balance. From this, we can infer that when "prices and (real) wages are flexible throughout the area in response to the changed conditions of demand and supply, the regions should be tied together by fixed exchange rates. Complete flexibility of prices and wages would achieve market clearance and facilitate instantaneous real adjustments to disturbances affecting inter-regional payments without causing unemployment"⁹⁷.

⁹⁶ Kenen (1969), p. 54.

⁹⁷ Kawai (1987), p. 740.

These criteria are also somewhat downplayed in the literature because prices, but particularly wages, are thought to be quite 'sticky' in the short run, and therefore their ability to function as a stabiliser is questionable. In fact, the previous criteria were proposed as substitutes for exchange rate flexibility in the adjustment to real disturbances in the presence of price and wage rigidities.

2.4.5 Financial Market Integration

Although Mundell already suggested the need for capital mobility in his seminal work, he did so with the goods market in mind, considering both labour and capital as production factors and thus international adjustment was achieved on the current account. It was Ingram (1962) who first noted that tightly integrated financial markets (not only of short-term but especially of long-term securities) could make adjustment via exchange rates unnecessary as capital movements can finance inter-regional external imbalances.

In this way, in the presence of a high degree of financial integration (and in the absence of capital controls), a small differential in interest rates would provoke large capital movements across borders until equilibrium was achieved, making adjustment of terms of trade via exchange rates unnecessary. Also, financial integration was seen to help create a real long-term adjustment through a wealth effect, that is, "the surplus region accumulating net claims raises expenditures and the deficit region decumulating net claims lowers them, thereby contributing to real adjustment"⁹⁸.

Ingram's arguments were strongly criticised on the grounds that capital flows between countries would primarily be financing, rather than adjusting, payments imbalances and thus the wealth effect adjustment would not occur as "residents of payment surplus countries are basically not willing to lend extensively to deficit countries"⁹⁹. A further criticism was that there was no large stock of internationally accepted financial assets. Finally, not all capital flows are a response to 'fundamental' differences between countries, that is, there may be large speculative capital flows.

Nevertheless, the view that the relative price of financial assets is one of the main factors behind (especially short-term) exchange rate movements is widely held and thus Ingram's original approach seems to be as important as ever.

⁹⁸ Kawai (1987), p. 740.

⁹⁹ Ishiyama (1975), p. 356.

2.4.6 Other Criteria

A number of other criteria have been proposed to infer the desirability of a certain country forming an OCA with other countries, some as a variation of some of the criteria previously presented or as proxies used mainly in empirical tests. Of those, it is worth mentioning the Degree of Policy Integration criterion, which in brief states that more important than the similarity of some microeconomic variables in assessing the question of whether to form an OCA is the similarity in policy attitudes among different countries. This idea was first suggested by Haberler (1970) and implicitly suggests the need for the countries of a currency union to have similar policies (and tastes) on inflation and unemployment (and their trade-off, usually presented in the form of the Philips curve); similar fiscal policies (and eventually a unified fiscal policy) and similar (unified) monetary policies. Therefore, when different countries have similar (macro) economic priorities there will be less need for flexible exchange rates as they will tend to have similar responses to common shocks.

This seems to be the view of the EU, which imposed a set of 'convergence criteria' on its members as a condition for acceptance in its currency union¹⁰⁰. In this way, the EU requires that members of its currency union should have a high degree of formal policy integration (both prior to entry and after) in order to ensure the stability (and credibility) of the new currency area.

Another criterion worth mentioning is the Geographical Concentration in Trade, first presented by Heller (1978). According to this author, more concentration in trade calls for a system of rigid exchange rates. Assuming that countries trade more heavily with their neighbours, this argument somehow suggests that an OCA should be regional in nature.

Finally, a new set of criteria related to credibility has emerged in the context of the decision to adopt an institutional commitment to a fixed rate (particularly in the case of Currency Boards and 'Simple' Currency Unions). In this field, factors such as political credibility, the need to import monetary stability, an adequate level of reserves, the rule of law and the existence of a well-supervised and regulated financial system are seen as necessary conditions for pegging a country's currency¹⁰¹.

¹⁰⁰ As is widely known, the convergence criteria imposed by the EU on its members in order to be allowed entry into the union are on: (1) inflation rates, (2) long-term interest rates, (3) government budget deficits, (4) government debts and (5) exchange rates stability (in the two years prior to entry).¹⁰¹ As presented by Frankel (1999), p. 20.

2.5 The OCA Theory: What Have We Learned?

In the initial stages, the so-called 'traditional' approach tried to single out a single characteristic based on which a country's suitability to join a currency union could be assessed. Later, a new approach emerged defending that a cost-benefit analysis was a better method for evaluating a country's readiness to join an OCA. The new approach is inscribed in the more general discussion on deciding which exchange rate system is better for each country. In both cases, we seem no closer today to achieving a definite solution than we were about 40 years ago.

In practice, the existence of an Optimum Currency Area is not something easily measurable. The existence of a large amount of criteria makes it very hard to make the theory operational in practice. The criteria are extremely difficult to implement quantitatively as in many cases there is no clear (or unique) method to measure each criteria or establish the exact relationship of each criteria with the others and with the desirability of forming (or joining) a currency area, especially in terms of factor mobility and diversification. This can be seen in Table 6 which presents the optimum currency area theory criteria and the expected relationship with the desirability of forming a currency union.

Criteria	Introduced by	Expected Relationship			
Labour Mobility	Mundell (1961)	+			
Capital Mobility	Mundell (1961)	+/-			
Size of the Economy	Mckinnon (1963)	-			
Degree of Openness of the Economy	Mckinnon (1963)	+			
Production Structure Diversity	Kenen (1969)	+/-			
Degree of Economic Development	Kenen (1969)	+/-			
Symmetry of Shocks to the Economy	Mundell (1961)	+			
Fiscal Transfers	Kenen (1969)	+			
Price Flexibility	Friedman (1953)	+			
Wage Flexibility	Friedman (1953)	+			
Financial Market Integration	Ingram (1962)	+			
Inflation Rate Differentials	Haberler (1970)	-			
Unemployment Rate Differentials	Haberler (1970)	-			
Similarity of Fiscal Policies	Haberler (1970)	+			
Similarity of Monetary Policies	Haberler (1970)	+			
Geographical concentration in Trade	Heller (1978)	+			

Table 6: Main Optimum Currency Area Criteria

Table 6 shows that the expected (theoretical) relationship of some of the OCA criteria is not yet clear. Furthermore, no less that sixteen separate criteria can be identified, but there seems to be little agreement on the relative importance of each criterion or on the relationship amongst them.

Also, as argued by Frankel and Rose (1996,1997,1998) a country is more likely to satisfy the OCA criteria for entry into a currency union *ex post* rather than *ex ante* in which case an examination of historical data may give a misleading picture of a country's suitability for entry into a currency union, since the OCA criteria are jointly *endogenous*¹⁰².

Several conclusions can be made at this point. Even though some of the criteria proposed have been all but dismissed over the years (as for example, Labour Mobility) others seem to be widely accepted as being of great importance (notably the case of Openness and the Size of the Economies) in determining a country's readiness to join a currency union¹⁰³. However, even in this case, there seems to be no agreement on the framework to adopt in the study of OCA theory, especially in deciding which criteria are the most important and how it can be measured in practice. In fact, the OCA theory has known very few advances in recent years. Most recent contributions have been done in empirical, rather than theoretical works. The following chapter presents a survey of the main empirical contributions on this area.

¹⁰² This is widely known as the endogeneity of OCA criteria argument.

¹⁰³ As will be discussed in the next chapter, the apparent dismissal of some of the criteria as an important factor, like for example labour mobility is not made on theoretical grounds but on the highly questionable grounds that it did not seem to respond to shocks in earlier empirical studies.

Prospects for Monetary Cooperation in ASEAN

Chapter III

Optimum Currency Areas: A Survey of Recent Empirical Works

3.1 Introduction

The existence of an Optimum Currency Area is not something easily measured. The main problem is that it is extremely difficult to implement a quantitative analysis on the criteria used, that is, the OCA concept is seen, in practice, as being "non-operational"¹⁰⁴. Another difficulty is that the OCA criteria are thought to evolve over time and therefore "countries are more likely to satisfy the criteria for entry into a currency union after taking steps toward economic integration than before"¹⁰⁵.

Therefore what is usually done is to study its absence, i.e. find clues that a particular group of countries (or regions) is not an OCA or that it performs worse than existing currency areas. Furthermore, each of the numerous criteria advocated by the theory is "extremely difficult to implement quantitatively" or more precisely, the theory "lacks operational indicators for factor mobility, openness and diversification"¹⁰⁶, while the exact relation (and relative importance) to each other remains unclear.

Since the beginning of the 1990's, the number of studies on Optimum Currency Areas has been quite spectacular, which makes the task of compiling a survey a challenging task¹⁰⁷.

3.2 A Survey of Selected OCA Empirical Studies

The present chapter is divided into four sections: (1) Empirical papers using OCA criteria to explain the actual choice of the exchange rate regimes; (2) Empirical papers measuring asymmetric disturbances; (3) Empirical studies on adjustment mechanisms to asymmetric shocks and (4) Studies that use an "OCA index".

¹⁰⁴ McCallum (1999), p. 5.

¹⁰⁵ Frankel and Rose (1997), p. 753.

¹⁰⁶ Patterson and Amati (1998), p. 31.

¹⁰⁷ For surveys of empirical studies on OCA's also see Bayoumi and Eichengreen (1996a) or Lafrance and St-Amant (1999).

3.2.1 Empirical Studies on the Choice of Exchange Rate Systems

This category includes studies using the main OCA criteria to explain the actual choice of exchange rate regimes. Although some of the studies included here cannot be termed as 'pure' OCA empirical studies they represent a (initial) attempt to investigate the relative importance of some the OCA criteria in the decision of deciding about an exchange rate system¹⁰⁸.

The rationale behind this approach is the basic premise that authorities make rational choices and are therefore expected to choose the best exchange rate system according to its economic characteristics. These "economic characteristics" are mostly found in the OCA theory.

There have been quite a few studies using some selected OCA criteria (but not exclusively), to explain the actual choice of exchange rate regimes. Table 7 summarises the main studies in this area¹⁰⁹.

Table 7: The Relationship between Some Selected (OCA) Variables and the Probability
of Adoption of Flexible Exchange Rates ¹¹⁰

Variable	Theory	Empirical findings of some selected studies							
		1978a	1978b	1979	1985	1987	1990	1992	1999
Capital mobility	+/_	+		-		+**	_**	-	_
Openness	-	-	_*	-**	+	-*	-	+	_**
Economic Size	+	+	+		+**	+**		+	+***
Production Structure Concentration	+/_		_*	_**			_*	_**	-
Geographical Concentration	-	-	_*	_*	_**	_**	+	+	+
Inflation Differential	+	+		+**	+*	+**			+**
Economic Development	+			+**			+*	-**	
Countries		73	88	75	64	92	39	140	56
Developing (D)/Industrial (I)		D&I	D	D&I	D&I	D	D	D&I	D&I

Note: One, two or three asterisks indicate that the coefficient(s) is (are) significant at the 90, 95 and 99 percent probability level respectively, except for 1978a (significance levels not reported). '+' indicates a positive relationship. '-' indicates a negative relationship. Column 'Theory' presents the expected relationship (according to the theory) of the variable. Source: After Bratberg, Legernes and Vardal (1999).

All the studies in Table 7 reported the predicted signs for Economic Size, Production Structure Concentration and Inflation Differentials and were found to be significant at the 5% level in several studies, with only one criterion (Economic Size) found to be significant at the 1 percent level in one study.

¹⁰⁸ Most of the mentioned studies are concerned primarily with exchange rate practices in general, especially the choice between fixed and flexible exchange rates.

 ¹⁰⁹ Even though some studies include some non-OCA criteria, the results presented in this table are a summary of the main results of these studies on some selected criteria. Furthermore, when a study reports several estimated models only the one that is the most comparable with the other studies is presented.
 ¹¹⁰ The empirical studies included in this table are from left to right, Heller (1978), Dreyer (1978), Holden, Holden and Suss (1979),

¹¹⁰ The empirical studies included in this table are from left to right, Heller (1978), Dreyer (1978), Holden, Holden and Suss (1979), Melvin (1985), Bosco (1987), Savvides (1990), Honkapohja and Pikkarainen (1992) and Bratberg, Legernes and Vardal (1999).

Some criteria, however, yielded mixed results. Economic Development and Capital Mobility were found to be significant at the 5% level of confidence in different studies but with opposite signs. The degree of Openness and Geographical Concentration also had mixed results with the 'wrong' sign showing up in some studies. However, when significant, the coefficients had the predicted sign.

The implications of these results for the OCA theory are, however, not straightforward. These studies were only interested in the past choice of an exchange rate system and were therefore were not concerned with the more modern approach of deciding which exchange rate system is better for each country based on a cost-benefit analysis. The latter will be explored in the following sections.

3.2.2 Empirical Studies on Asymmetry of Shocks

Mundell (1961)'s original argument was that if the impact of output disturbances on particular areas (and not just countries) was similar, a common currency or a fixed exchange rate system was appropriate. If, however, disturbances were asymmetric, the necessary adjustment in relative prices to restore equilibrium could be achieved either through exchange rates (which would not be, however, totally effective if the affected regions did not coincide with a currency area) or through high labour mobility and/or wage flexibility. It is therefore not surprising that a large number of empirical studies on OCA are dedicated to measuring the extent of asymmetries between regions in order to assess their advantages in having a common currency.

Early studies¹¹¹ on this matter focused on the correlation across countries of relative prices (as measured by the variability of real exchange rates or real share prices) or on output movements¹¹² (as measured by their nominal or real GDP's) and argued that countries which tended to move together on those variables had faced relatively symmetrical shocks.

These approaches have, however, encountered criticism (Bayoumi and Eichengreen (1993)) since correlation of relative prices or output movements reflect the influence of both disturbances and responses, that is, if relative prices or output move together in two regions it may reflect either symmetric disturbances or rapid symmetric responses¹¹³.

¹¹¹ For a survey of the early empirical papers see for example Bayoumi and Eichengreen (1993).

¹¹² This was the view of the famous European Commission (1990)'s "One Market, One Money".

¹¹³ The same criticism was also made of early studies that focused on the responsiveness of labour markets as a "high degree of observed labor mobility may reflect either an exceptionally responsive labor market or exceptionally asymmetric regional labor market shocks", p. 10.

Since then, several empirical studies have attempted to isolate disturbances from other components of output (and/or relative price) movements.

3.2.2.1 Asymmetry of Output Movements

Caporale (1993) regressed nominal and real GDP for EU countries on three own lags and examined the correlation of the residuals across countries in an attempt to determine to what extent Europe was affected by symmetric as opposed to asymmetric disturbances. The results for nominal and real GDP were similar and seemed to suggest that asymmetric shocks account for a large part of GDP fluctuations in the EU. However, the results for real GDP were "somewhat peculiar: the correlation of 'shocks' to the Dutch and German economies are if anything negative; only in Denmark and Portugal do shocks follow those of Germany"¹¹⁴.

According to Bayoumi and Eichengreen (1996a) the peculiarity of Caporale's results may be explained by the lack of distinction between supply and demand disturbances in his estimated residuals. Therefore, they set out to distinguish between these two types of disturbances using a structural vector autoregression (SVAR) model of output and prices (Bayoumi and Eichengreen, 1993, 1994). Using a decomposition method first used by Blanchard and Quah (1989), they identify permanent and transitory shocks which they associate with aggregate supply and aggregate demand shocks, respectively. Using data from 1968 to 1988, they estimated bivariate autoregressions for real GDP and prices, restricting demand disturbances to have permanent effects only on prices ("since a demand disturbance has no permanent effect on output"¹¹⁵) while allowing supply shocks to have long-run effects on both prices and output. The results 'clearly' suggested the existence of a hardcore and a periphery in the European monetary integration. Supply disturbances to the core countries (Germany, Denmark and the Benelux countries) were both smaller and more correlated than for the periphery (Ireland, Greece, Italy, Portugal, Spain, UK and Finland). When comparing to the U.S. (a currency union that appears to function relatively well) they find that supply shocks are larger in magnitude and less correlated across regions in Europe than within the U.S. However, the results are similar if compared with just the EU-core. Therefore, Bayoumi and Eichengreen (1993, 1994) conclude that this group of countries are much closer than the community as a whole to representing a workable monetary union along American lines and thus defend the view of a two-speed Europe.

¹¹⁴ Bayoumi and Eichengreen (1996a), p. 3.

¹¹⁵ For proof see Bayoumi and Eichengreen (1993).

Funke (1995)¹¹⁶ and Bayoumi and Eichengreen (1996a) later repeated this framework by extending the data range to 1992 and 1994, respectively, as to include the 'highly asymmetric German unification shock". The results were consistent with the core-periphery distinction previously found, with somewhat lower correlations with Germany in the first study and the approach of Italy to the EU-core in the second case.

Later studies tried to distinguish a larger number of disturbances. Chamie, DeSerres and Lalonde (1994) use a VAR system that includes measures of industrial production, consumer price index and M1 monetary aggregate¹¹⁷. Then, extending the Blanchard-Quah method, they use long-run restrictions to decompose the VAR reducedform residuals into three structural innovations: supply shocks, monetary and nonmonetary (or real) demand shocks. In a clear demarcation from Bayoumi and Eichengreen's approach, they argue that on the demand side, only monetary shocks have no permanent effect on real balances, while a real demand shock (like fiscal or consumer preference shocks) may have an important impact on the evaluation of the costs of losing exchange rate flexibility and therefore should be analysed separately. Their results showed that supply shocks account for a much larger proportion of output variance in Europe than in U.S. regions. Furthermore, instead of two, they identified three groups of countries. The only group to show highly correlated supply and real demand shocks was Germany and Switzerland. A second, intermediate group was comprised by Austria, Belgium, France, the Netherlands, Spain and the UK, while Greece, Italy, Norway, Portugal and Sweden formed the European periphery. Studies using the same approach found that both supply and demand shocks affecting Canada had little correlation with those in the U.S. with the same occurring in the case of Mexico and the U.S. correlations across regions of a country were found to be higher than across these neighbouring countries¹¹⁸.

Artis and Zhang (1997) try to evaluate the cyclical components of industrial production, exchange rate variability, correlations of real interest rates and trade correlations in a technique known as cluster analysis¹¹⁹. The countries chosen for the study include the G-7, the European Community members (except Luxembourg) plus

¹¹⁶ Quoted in Bayoumi and Eichengreen (1996a).

¹¹⁷ Clarida and Gali (1994) using a similar methodology distinguish between supply, demand (or IS) and monetary (or LM) shocks to output growth level, inflation and real effective exchange rates, by incorporating monetary neutrality, and thus the assumption that in the long run the real exchange rate (as well as the real GDP) is invariant to monetary shocks. A number of other studies have since expanded Bayoumi and Eichengreen (1993)'s framework to three-variable VAR models that distinguish between a larger number of disturbances. Examples include Ng (2002) and Chow and Kim (2003).

¹¹⁸ As quoted in Lafrance and St-Amant (1999). See Lalonde and St-Amant (1993) for the case of the correlation of shocks between the US and Mexico, and DeSerres and Lalonde (1994) for the case of Canada and the US.

¹¹⁹ According to Lafrance and S-Amant (1999), the basis of cluster analysis is a measurement of similarity or, conversely, of dissimilarity or distance between countries. The five core variables are treated as being of equal importance in defining the clusters. This implies that the conclusions might be different if different weights of the selected criteria are chosen.

Norway and Switzerland. The results suggest an EU-core formed by Germany, Belgium, France, the Netherlands and Austria and an EU-periphery group formed by Italy, Ireland, the UK, Denmark, Portugal, Norway, Greece and Spain. Furthermore, their analysis identified three other clusters: a U.S. group (the U.S., Canada, Sweden and Finland) with Japan and Switzerland each forming a group of their own.

Another approach aims to distinguish between shocks and their transmission mechanisms. The argument is that even if two economies have highly correlated shocks, the transmission mechanisms might be sufficiently different to warrant an exchange rate adjustment. On the other hand, even if two economies have low correlation of shocks, they could still be in similar positions in the business cycle and thus do not need asymmetric monetary policies or an exchange rate adjustment. This is an important issue since "as the degree of asymmetries (in the shocks and transmission processes of symmetric shocks) increases, the effectiveness of stabilisation of output and unemployment is reduced"¹²⁰. Mélitz and Weber (1996) and Dupasquier, Lalonde and St-Amant (1997) examine the correlations of the structural components of output (defined as the cumulative effect of shocks plus their propagation dynamics). The former find more symmetry between the French and German economies for structural components than for structural shocks. The latter find similar results for Canada and the United States.

Barran, Coudert and Mojon (1997) focus on differences in the transmission mechanism of monetary policy. Differences were found in terms of responses of prices and output changes to monetary instruments for a group of European Countries (although it is not known if these differences are statistically significant). Germany stood out as the country where the transmission mechanism takes longer and is most pronounced in terms of its impact on real output. "These results suggest that imposing a single currency policy on Europe may be a source of asymmetry among the various economies"¹²¹.

3.2.2.2 Regional/Industrial Specialisation

Kenen (1969) suggested that the more similar the patterns of industrial structures across countries the more symmetrical shocks will tend to be and therefore the less the need for exchange rate flexibility to provide adjustment. Similarly, when a region is well diversified in terms of industrial sectors, sector-specific shocks will tend to be

¹²⁰ De Grauwe (2000), p. 22.

¹²¹ Lafrance and St-Amant (1999), p. 9.

cancelled out since shocks to one industry will affect only a small portion of the total economy¹²² and "these shocks cannot be dealt with by exchange rate changes"¹²³. If that region is, however, overwhelmingly dependent on the industry in question the sector-specific shock will be "identical to a regional shock, and opens up the question of whether the region should create its own currency; or, alternatively whether it should reduce its degree of specialisation"¹²⁴.

De Grauwe (1997) refers to several studies which have found that a large part of the asymmetric shocks in the EU occur not so much at the national level but at the sectoral level, suggesting that the EU-core could encompass more countries that originally thought.

Bayoumi and Prassad (1996) distinguish between output and employment aggregate (or global), industry-specific and country- or region-specific disturbances, comparing eight U.S. regions with eight European countries. In terms of explaining output growth variation, the relative importance of the different sources of shocks were found to be roughly similar, with the share of variance in output explained by regionspecific shocks slightly higher in Europe than in the U.S. In terms of employment variation, region-specific shocks dominate in Europe and industry-specific shocks in the U.S. Their results suggest that the U.S. has a more integrated labour market and that large wage differentials could remain after EMU.

There are two opposing views on what would be the effect of closer integration on regional specialisation (and thus on the costs and benefits of joining an OCA). De Grauwe (1997) distinguishes these opposing views as 'The European Commission View' and 'The Krugman View'¹²⁵. The European Commission view states that closer integration will lead to a situation whereby asymmetric shocks will occur less frequently. The reasoning is that since most trade between European countries is intraindustry trade, the more integrated they are, the more similarly they'll be affected by disturbances. Conversely, Krugman's view, taking the U.S. as an example, is that increased integration leads to increased regional concentration of industries (in order to profit from economies of scale) and thus to more economic divergence between countries.

¹²² This might also imply that since some large regions are likely to be more diversified than small ones, large regions are well qualified to become even larger whereas small ones are not. The implication is that there may be a pessimum rather than an optimum currency area.

²³ De Grauwe (1997), p. 75.

¹²⁴ Patterson and Amati (1998), p. 16.

¹²⁵ The first accrues from European Commission (1990) and the second from Krugman (1991). Patterson and Amati (1998) quote Peters (1995) as dividing the same opposite approaches as the 'Convergence School' and the 'Divergence School'.

If we take Krugman's view as the correct one, we can argue that the fact that Europe appears to be more diversified and have a greater overlap of regional industrial structures than the U.S. is a result of the lower degree of integration in the EU. If, however, we accept the European Commission's view, as seems to be the case with most authors¹²⁶, then the conclusion to be drawn seems to be that increased economic integration will create more strongly correlated business cycles and thus be less affected by (country-specific) asymmetric disturbances and that "countries that undergo a gradual rise in trade integration will come gradually over time to satisfy better and better the criteria for a common currency"¹²⁷.

Empirical Studies on Mechanisms of Adjustment to Asymmetric shocks 3.2.3

3.2.3.1 Empirical Studies on Labour Mobility

According to Mundell, high labour mobility between regions of nations can substitute exchange rate adjustments in the presence of asymmetric shocks. Most empirical studies on this matter compare labour mobility in the U.S. with that of Europe under the assumption that the U.S. is an optimum currency area that functions relatively well.

Barro and Sala-i-Martin (1991) find that net migration rates respond to differences in per capita state income, contributing to economic convergence in the U.S. Similarly, Blanchard and Katz (1992) find that inter-state migration in the U.S. contributes more to internal adjustment than changes in either relative wages or labourforce participation rates.

By contrast, several studies suggest that in Europe the case is quite different. Decressin and Fatas (1995) find that in Europe a decline in regional labour demand is met mostly by lower labour-force participation: migration is only important four years after a shock. Similarly, Eichengreen (1993) found that the elasticity of interregional migratory flows with respect to internal wages and employment differentials is significantly smaller in the UK and Italy than in the United States. De Grauwe and Vanhaverbeke (1993) find that labour mobility within European countries is higher than between them.

¹²⁶ De Grauwe (1997), for example, argues that the theoretical presumption is not in favour of Krugman's view and that recent empirical evidence seems to suggest this theoretical evidence. Bayoumi and Eichengreen (1996a) also share the view that Krugman's view is unlikely to be prevalent. Also, on the empirical side, Frankel and Rose (1996) show that closer trade linkage between two countries is strongly associated with a tighter correlated economic activity between the two. In addition, Frankel (1999) shows that trade links do in practice raise income correlations.

It is worth noting, however, that a recent paper by Kalemli-Ozcan, Yosha and Sorensen (2003) show that risk sharing, facilitated by a favourable legal environment and a developed financial system, is a direct causal determinant of industrial specialisation.¹²⁷ Frankel (1999), p. 36.

Pelagidis (1996) shows that "since 1992 net migration within the EU has actually been falling, and that migration within the EU as a percentage of total population in 1995 was less than 1% on average. By comparison, some 3% of the U.S. population change their state of residence each year"¹²⁸.

More recently, Obstfeld and Peri (1998), using a VAR approach developed by Blanchard and Katz (1992) try to identify regional shocks and their dynamics in labour markets. As expected, they find that labour market adjustment in North America is much faster than in Europe.

It is worth mentioning that "neither team of authors [Blanchard and Katz nor Decressin and Fatas] finds much evidence that regional shocks result in persistent unemployment differentials. Their combined results support the notion that Europe is less well suited to monetary unification only if the social costs of migration are less than the social costs of reduced labor force participation, which is less than clear *a priori*"¹²⁹. Belke and Gros (1999) show that "the data from the past 30 years in Europe does not show any strong link between external shocks and unemployment" (p. 38), leading them to conclude that EMU is unlikely to lead to the serious unemployment problems that have often been predicted.

That is not to say, however, that the lower labour mobility in Europe, when compared to the U.S. is not important in terms of its "optimality" for a currency union¹³⁰. Most authors seem to agree that the EU as a whole is not an optimum currency area. A more relevant question would be whether the EU (or other regions of the world) is a viable currency union. What the existing literature seems to point out is that "it is unlikely that greater mobility of labour, either within or between Member States, can ever become a major instrument of adjustment within the EU"¹³¹, therefore suggesting that the adjustment to disturbances has to come from elsewhere¹³². The fact that labour mobility has "not played a significant role in responding to shocks that are felt asymmetrically across countries"¹³³ has led some major authors to leave labour mobility out of their empirical studies on optimum currency areas (see 3.2.4. below) and focus on other criteria instead.

¹²⁸ Quoted by Patterson and Amati (1998), p. 23.

¹²⁹ Bayoumi and Eichengreen (1996a), p. 11.

¹³⁰ In this light, some authors have changed their focus from "optimality" to "viability" of currency unions. According to Patterson and Amati (1998) we can trace the term 'viable' as applied to currency areas to Cesarano (1985, 1992).

¹³¹ Patterson and Amati (1998), p. 64.

¹³² It also seems worth mentioning Patterson and Amati (1998)'s point on whether the 'Lucas critique' might not also be relevant: "If the absence of labour mobility in the EU disqualifies it as an OCA, to what extent does the existence of a single currency facilitate labour mobility in the US?", p. 24.

¹³³ Bayoumi and Eichengreen (1997), p. 2. Dismissing labour mobility as an important factor because on earlier empirical studies it did not seem to respond to shocks is highly questionable and the implication that it is not relevant is far from straightforward.

3.2.3.2 Empirical Studies on Fiscal Federalism

Another possible adjustment mechanism for a region that experiences an adverse shock is through net transfers from other regions (or other countries) within the same country (or within the same monetary union).

Sala-i-Martin and Sachs (1992) estimated that a \$1 fall in income in a particular state brought about a 34 cent decline in federal taxes by residents of that state and a 6 cent increase in federal fiscal transfers, i.e. they found that 40% of state income changes were automatically offset through the Federal Budget. Bayoumi and Masson (1995) criticised the previous study on the grounds that their estimation method does not distinguish between stabilisation and long-run income redistribution effects of fiscal policy (which is a response to cyclical or temporary shocks). Taking this distinction into account, Bayoumi and Masson estimated the stabilisation offset at around 30%. Von Hagen (1992) found that the U.S. Federal budget absorbed only 10% of state income changes.

It is worth mentioning that according to Patterson and Amati (1998) any comparison between the situation in the U.S. and Europe can be misleading since "whatever the true level of mutual insurance provided by the U.S. federal budget, however, it is clear that the EU budget cannot provide any similar adjustment mechanism. Whereas the U.S. federal budget amounts to 33% of GDP, that of the EU is below 1.5%" (p. 29). In Europe, the main fiscal mechanisms for adjustment are national budgets which "range from 42% of GDP in the UK to around 65% of GDP in Sweden" (p.29), which collectively provide a high degree of 'insurance' between regions within the same member state (but not between member states). Therefore, whereas the U.S. has a relatively high federal budget, but relatively small state budgets, the situation in Europe is the reverse.

This has led some authors to suggest that fiscal stabilisation can be carried out at the national government level of the countries that compose a monetary union instead of fiscal centralisation. In as much that the inter-regional transfers can be replicated at the national level, the need for a centralised fiscal transfer system can be avoided. Bayoumi and Eichengreen (1996a) foresee several problems in achieving this; (1) local jurisdictions may be inhibited by credit constraints from borrowing on the requisite scale, i.e. the smaller the region and the more mobile its tax base, the less scope for rising taxes relative to those in neighbouring regions to service and repay debts incurred in recessionary periods and (2) fiscal stabilisation by local jurisdictions may be less effective than stabilisation at a federal level, i.e. higher debts by the local jurisdiction in order to offset a negative shock will generate an expectation of higher future taxation which will lower the impact of fiscal transfers on aggregate demand. This may not happen at a federal level since "the deficit in one region generated by a negative disturbance will on average be offset by fiscal surpluses in other regions with positive disturbances. To the extent that these cancel out, and hence there is no net impact on federal debt, there will be no expectation of future tax increases and hence no diminution of the impact on aggregate demand" (p. 16).

A recent empirical study seems to provide some evidence for this argument. Arreaza, Sorensen and Yosha (1998), set to identify the amount of smoothing achieved through various components of the government deficit in EU and OECD countries. They show that for EU countries (at the 1-year frequency) 18 percent of shocks to GDP are smoothed via transfers, 13 percent via government consumption and 5 percent via subsidies, with similar results for OECD while tax-transfers provided no consumption smoothing¹³⁴. They also find no evidence of a trade-off between high government deficits in a country and the ability to smooth consumption. Furthermore, for countries where the budgetary process is governed by explicit fiscal targets negotiated effectively by coalition members and in countries where power regarding fiscal matters is delegated to a strong party or person (e.g., a strong finance minister), consumption smoothing via government consumption and government transfers is considerably higher. They conclude that effective budgetary institutions can accomplish efficient consumption smoothing via government deficit spending (in recession periods) and, at the same time, lower average deficits (in the long-run).

Most authors seem to agree that for the European Monetary Union to function properly, a centralised system of fiscal transfers is needed. The existence of asymmetric shocks, together with low factor mobility and stickiness of wages and prices, "make indispensable the existence of mechanisms or institutions to take care of balanced growth within the EU"¹³⁵. On the other hand, Fatás (1998) argues that "the benefits associated with the creation of a European fiscal federation are much smaller than previously thought" and although the purpose of the system would be interregional risk sharing, it might result in permanent transfers "which might go in any direction (for example, from poor to rich regions)..."¹³⁶.

¹³⁴ A tax transfer is a reduction in federal income tax in concert with an offsetting increase in provincial/territorial income tax and no net financial impact on the taxpayer.

¹³⁵ Pelagidis (1996), quoted in Patterson and Amati (1998), p. 54.

¹³⁶ Quoted in Patterson and Amati (1998), p. 54.

3.2.3.3 Regional and International Risk-Sharing and Consumption Smoothing¹³⁷

According to Sorensen and Yosha (1998), "mechanisms for achieving income insurance and consumption smoothing are essential for the stability of a monetary union. Without such mechanisms, countries in recession will have an incentive to leave the union" (p. 211). As we have seen, both labour mobility and fiscal federalism can provide some income insurance.

Market institutions can also provide important risk-sharing mechanisms. Members of a currency union can also share risk via cross-ownership of productive markets and smooth their consumption by lending and borrowing on international credit markets (to adjust the composition and size of their asset portfolio). In fully integrated financial markets risk sharing would be perfect and individuals of a currency union would smooth consumption with respect to movements in aggregate income.

Although the opposite would be expected in the presence of consumption smoothing, recent empirical work shows that what we face is a 'quantity anomaly'¹³⁸, i.e. cross-country correlations of output are consistently higher than those of consumption¹³⁹. Also, capital markets data seem to indicate that there is very little consumption smoothing via financial markets at the international level.

Bayoumi and Klein (1995) develop a method of testing for zones of financial integration based on the idea that individuals in a financially integrated geographical area smooth their consumption with respect to movements in aggregate income. Consumption in a region follows income of that region if individuals use regional capital markets only. If, however, individuals have access to and use national or global capital markets, their consumption follows movements in national and world income, respectively. In this way, they develop a method of looking at differences in capital mobility between groups of countries and then apply it to data on trade balances across Canadian provinces. They conclude that capital is fully mobile within Canada but it is only partially mobile between Canada and the rest of the world.

Asdrubali, Sorensen and Yosha's (1996) approach constitutes an important innovation in this area. They identify three mechanisms of risk sharing in the U.S.: first, member states can share risk (or get insurance) via cross-ownership of productive assets. Second, income smoothing can be provided by the tax-transfer system of the central government and thirdly individuals can smooth their consumption through

 ¹³⁷ A recent survey on this subject is provided by Antia, Djoudad and St-Amant (1999).
 ¹³⁸ Also known as 'the international consumption correlation puzzle'. A possible explanation for this puzzle is provided by Stockman and Tesar (1995), who argue that low consumption correlations are due to country specific taste shocks. These are consistent with perfect risk sharing. ¹³⁹ Sorensen and Yosha (1998) provide a detailed discussion and survey of the literature on the subject.

lending and borrowing in the credit markets. These mechanisms are called capital market, federal government and credit market smoothing, respectively. Their idea was to decompose the cross-sectional variance in per capita gross U.S. State product so as to determine how much insurance and credit smoothing regions get as opposed to the central budget. Using a sample of annual data from 1963 to 1990, they found that market forces play a much higher role in smoothing regional shocks than fiscal transfers from the federal government. In fact, they found that shocks to the per capita gross product of individual states is smoothed first through the capital market (39%), secondly through the credit market (23%) with only 13 percent being smoothed by the central government net transfers. These results imply that there is considerable risk sharing within the U.S. with most of it coming through market mechanisms. Furthermore, having decomposed federal government smoothing into taxes, transfers and grants to states, they found, that compared to the tax-transfer system, the magnitude of smoothing through the grant system is rather small (2.7% of a shock), and that the unemployment insurance system only smoothes 1.8% of a shock.

Sorensen and Yosha (1998) explore income and consumption smoothing patterns between EU countries and between OECD countries during the period 1966-90. Using a similar method to that of Asdrubali, Sorensen and Yosha (ASY), they find that in both the EU and OECD, about 40 percent of shocks to GDP are smoothed at the one year frequency¹⁴⁰ (25 percent at the 3 year frequency), with about half of the smoothing achieved through national government budget deficits and half by corporate saving. They also find that smoothing via international transfers in the EU (including structural funds) are substantially lower (3 to 7%) than the 13% percent smoothing by the U.S. federal government found in the ASY study. They conclude that in the absence of further income and consumption smoothing mechanisms, the restrictions on budget deficits imposed in the EU should be relaxed to allow governments to run large temporary deficits in response to output shocks and that further integration of European capital markets should be a high priority in Europe.

Antia, Djoudad and St-Amant (1999), also using the ASY framework, show that regional risk sharing in Canada is much higher than risk sharing between Canada and the United States. For Canada, they find that capital markets, credit markets and federal net transfers account for 37 percent, 27 percent and 27 percent of the smoothing, respectively. Federal transfers (especially through the unemployment insurance system)

¹⁴⁰ Average correlations for OECD countries as well as for U.S. states with the corresponding U.S. aggregate series, calculated for the logarithm of each series, differenced at the 1-year frequency.

play a more important role in Canada than in the United States (27 percent versus 13 percent). Not surprisingly, they conclude that a U.S. - Canada monetary union would encounter more difficulties than would the existing Canadian monetary union.

Mélitz and Zumer (1999) set a modified version of ASY and applied it on the same U.S. data, but also on the OECD and the European Union members. At the regional level, their results were similar to those of ASY's for the U.S., with market mechanisms smoothing (insurance and credit) having a much lower combined weight in smoothing shocks. Then they apply the model to three other individual countries. The model had similar results for Canada but "perform[ed] badly" for the U.K. and Italy. At the international level, they found the idiosyncratic shocks to be larger and the smoothing to be lower than within a country. Also, credit plays a "much smaller role relative to claims on property (to labor income as well as wealth) in risk sharing between countries, especially in the long run" (p. 30). Finally, both regional and international data support the hypothesis that openness promotes risk sharing via insurance as opposed to credit. Based on these results, they conclude that while monetary union possibly reduces smoothing via public action (macroeconomic policy), it will increase smoothing through market channels thus appearing to give "the European Commission's view" more justification¹⁴¹.

These recent contributions indicate that there appears to be a significant level of risk sharing at the interregional level (especially in the United States and Canada). At the international level, however, risk sharing seems to be extremely limited. Furthermore, and perhaps more importantly, although fiscal mechanisms play a significant role, market mechanisms appear to be even more important in smoothing shocks.

3.2.3.4 Empirical Studies on Relative Prices

Another possible substitute for exchange rate flexibility in adjusting to an asymmetric shock is through changes in relative prices.

Vaubel (1978) was the first to compare movements in relative prices (measured in a common currency) between countries and between regions within a country. He found that relative variability of CPI's (measured in a common currency) across European countries was several times that of three separate measures of variability within countries. Similar results obtained by Eichengreen (1991), De Grauwe and

¹⁴¹ Lafrance and St-Aman (1999) state that their results may be questioned since, for example, they underestimate the role of federal transfers as a smoothing mechanism given that their measure of federal transfers excludes transfers to (Canadian) provincial governments.

Vanhavebeke (1993) and Von Hagen and Neuman (1994) seem to indicate that "real wage and price levels tend to fluctuate less between regions within a currency area than between currency areas" (Patterson and Amati (1998) p. 22).

In contrast, a study by Poloz (1990), who compared the variability of real exchange rates among four European countries and across Canadian regions, found that the relative price variability (using GDP deflators) between Canadian regions was higher than that between European countries. This led him to conclude that EMU should be viable since the variability of real exchange rates in Europe is similar to that between Canadian Regions.

Bayoumi and Thomas (1995) using GDP regional deflators find variances across U.S. regions to be much lower than those across European countries. Also, when relating real exchange rates to output movements, they found that "the much higher relative price movements within Europe compared to the United States reflected lower levels of integration on the demand and (particularly) the supply side across these economies"¹⁴². This led them to conclude that in the absence of greater integration, large relative price movements are an important adjustment mechanism for countryspecific shocks within Europe.

As some authors point out, a serious limitation of this line of research is that it is not clear that real exchange volatility reflects beneficial responses to underlying real shock asymmetry¹⁴³. The prevailing view seems to be that exchange rates are excessively volatile and do not always reflect economic fundamentals even if we agree that "real exchange rates show mean-reverting tendencies over the medium to long term"¹⁴⁴. It then seems reasonable to conclude that "the exact relationship [of relative price volatility] to optimum currency area considerations remains unclear¹⁴⁵.

3.2.4 Empirical Studies using an "OCA index".

This approach was first developed by Bayoumi and Eichengreen (1996a, 1996b, and 1997). These authors set to 'operationalise' the OCA theory by analysing the determinants of nominal exchange rate variability and not the choice of exchange rate regime as in earlier studies since they used "relatively judgmental categorizations of

¹⁴² Quoted in Bayoumi and Eichengreen (1996a), P. 18.

¹⁴³ Frankel and Rose (1996) for example, conclude they cannot explain the large swings in exchange rates, especially on a short-term basis, this still seems to be the prevailing view. For estimates on exchange rate volatility see for example Sapir, A. and Sekkat, K. (1990). ¹⁴⁴ Bayoumi and MacDonald (1998), p. 10. In this paper the authors confirm that relative prices vary less within countries than

across countries. They also find, however, that relative prices within countries appear nonstationary and therefore relative price movements within a country seem dominated by real factors in the long run. ¹⁴⁵ Bayoumi and Eichengreen (1996a), p. 19.

exchange rate arrangements¹⁴⁶ (i.e., the exchange rate arrangements used in IMF's Exchange and Trade Restrictions). In this way, they identified the five most important characteristics on which OCA theory focuses: asymmetric disturbances to output, trade linkages, economic size, the mobility of labour, and the extent of automatic stabilisers. Since the last two characteristics "have not played a significant role in responding to shocks that are felt asymmetrically across countries"¹⁴⁷, their empirical work focuses on the first three factors.

In this way, they used two proxies to measure asymmetric shocks: output disturbances and the dissimilarity of the commodity composition of the exports of the two countries. Trade linkages were measured as the average value of the ratio of bilateral exports to domestic GDP for the two countries. Finally, they measured economic size (a cost-benefit analysis in which smaller countries have higher benefits) as the arithmetic average of the log of real GDP in U.S. dollars of the two countries.

They then applied this framework to data for European Countries (1997) over the period 1971-1995 (with some of the data after 1987 being predicted or forecasted) and Japan and its 19 leading trading partners (1996b) over the period 1976-1995. The results were highly significant (except for the dissimilarity coefficient which was only significant at the 10% level in the second study (1996b)) and had the predicted signs, that is, countries that trade more heavily have more stable exchange rates, as do smaller economies, countries whose GDP's generally fluctuate together, and countries with a more similar composition of exports. Next, they used the estimated coefficients and values of the independent variables to predict the dependent variable. The result is what the authors call an "OCA index", with smaller values suggesting that countries better approximate an OCA.

In the first study, the OCA index was calculated for each European country visà-vis Germany¹⁴⁸, and the results show European countries falling into three groups: prime candidates for EMU, those converging to EMU, and those for which the index shows little convergence. The makeup of each of the groups coincided with "popular handicapping of the Maastricht states with one notable exception: France", which "supports the view that the desire for monetary unification in France is driven by political rather than economic considerations" (p. 8). Next, the authors used the OCA index for some other bilateral relationships. The results suggested that important interdependencies exist in some cases, that is, the participation of some countries in the

¹⁴⁶ Bayoumi and Eichengreen (1997), p. 2.

¹⁴⁷ Bayoumi and Eichengreen (1997), p. 2.

¹⁴⁸ Because "that country is widely viewed as the core member of EMU to which all the other potential participants need to converge", Bayoumi and Eichengreen (1997), footnote 10.

EMU may depend on the participation of some of its partners.¹⁴⁹ Finally, based on the results, the authors concluded that economic integration has increased the countries' readiness for monetary integration and vice-versa.

Bayoumi and Eichengreen's second study also produced the predicted results using the same model with very small, very open economies (Hong Kong and Singapore) with the best results in terms of the OCA index and some country pairs (Singapore-Malaysia, Singapore-Thailand, Singapore-Hong Kong, Singapore-Taiwan and Hong Kong-Taiwan) approaching the OCA index values of Western Europe. In contrast, the case for Indonesia, South Korea and the Philippines was found to be weaker. Furthermore, they constructed an OCA index for each Asian country vis-à-vis Japan, the United States and Germany and a basket peg with weights of 0.3, 0.4, and 0.3 for each country's currency, accordingly. The results suggest that although some countries might prefer the dollar, whilst others the yen, a common basket peg with these weights works nearly as well for all the considered countries.

Benassy-Quere (1997) adapted the basic Bayoumi-Eichengreen model and carried out cross-country estimations for 40 countries (including 9 Asian countries, 15 West-European countries, 4 other OECD countries and 12 non-OECD, non-Asia countries) over the period 1986-1995. The main difference was the introduction of a second equation where the dependent variable was the standard deviation of the logvariation of the year *real* exchange rate between two countries. Also, Bayoumi and Eichengreen's "dissimilarity of the commodity composition of the exports of the two countries" was replaced by a Finger index of export structure similarity between two countries¹⁵⁰. Moreover, the author did not include the economic size variable in his equations since "this measure [bilateral trade] catches both the country distribution of trade, and an openness effect (i.e. the fact that small, open countries have more incentive to peg their currencies than large countries)" (p. 6). Finally, labour mobility and fiscal federalism were left aside for the same reasons, and real wage flexibility as well since "in developing Asian countries, shocks on the labour market can be adjusted by sector migrations (between the traditional and the modern sector), which avoids both international migrations and real wage adjustment" (footnote 4)¹⁵¹. When significant, the coefficients always had the expected signs. However, the results were substantially

¹⁴⁹ For example, they found that Italy and Spain interests in belonging to an EMU might be dependent on the participation of France. ¹⁵⁰ This index was written as $FING_{ij} = 100 \sum Min \left[\frac{X_k^i}{X_{\bullet}^i}, \frac{X_k^j}{X_{\bullet}^j} \right]$, where X_k^j stands for country i exports of product k, and X_{\bullet}^i is the

total of country I exports. This index catches whether industry-specific shocks may have asymmetric effects in the two countries. ¹⁵¹ The decision to exclude wage flexibility and labour mobility is, once again, highly questionable and seems to be based on convenience rather than strong theoretic arguments.

different for OECD and non-OECD countries. For the first group of countries, the results for nominal and real exchange rates equations were similar and the exchange rate volatility depends on asymmetry of output shocks and intensity of trade but not on the similarity of trade. For non-OECD countries, the trade intensity index is never significant and the results for nominal and real exchange rate volatility were quite different; that is, asymmetry of output shocks partly explains the volatility of nominal exchange rates but not real exchange rates and the Finger index was significant for real (but not nominal) volatility of exchange rates.

In order to investigate whether the "good" results obtained for OECD countries were dominated by a European integration effect and if the non-OECD "bad" results were explained by an atypical behaviour in Asian countries, the author included two dummies in his equations¹⁵². The results showed that European currencies showed an especially low volatility against the DM and the Asian currencies showed an especially low volatility against the USD. However, while the European exchange rates were found to be consistent with the OCA theory, Asian countries "seem to peg the USD (\ldots) , with little OCA rationale" (p.10).

3.3 Empirical Studies on OCA: What Have We Learned?

Instead of asking if a certain geographical area encompassing several regions and/or countries is or can be an "optimum" currency area, it might be more useful to inquire if it is a "viable" currency area. This seems especially relevant since recent works seem to indicate that a country's suitability for an OCA grows as economic integration with its trading partners increases, i.e. the famous 'Lucas Critique' seems to be more relevant than ever.

Despite all the recent contributions and a considerable difference in the statistical data and economic and econometric techniques, the basic framework for empirical research on Optimum Currency Areas seems to continue to be as follows¹⁵³: (1) Study the type, size and frequency of asymmetric disturbances across different economies and (2) examine the efficiency and availability of adjustment mechanisms available to restore equilibrium.

If (1) is small or is mostly industry or sector-specific then (2) is not necessary to guarantee the existence of a workable OCA since flexible exchange rates cannot provide

¹⁵² In their study, "good" and "bad" refer to the level of significance of the regressors included in the estimations (highly significant and not significant, respectively). ¹⁵³ Bayoumi and Eichengreen (1993) already suggested the following agenda for empirical research: (i) Identify the magnitude and

incidence of disturbances, (ii) isolate their underlying determinants and (iii) analyse the market and policy response.

adjustment to such shocks and in this case the benefits of an OCA should clearly outweigh its losses.

If, however, (1) exists and shocks are large, frequent and country-specific, then either (2) must function well or an increase the level of convergence between the two countries is needed (by increasing flexibility in the goods, services, capital and labour markets). When this is not possible, exchange rate flexibility will always be preferable.

Of course, if (2) were to function perfectly, (1) would not occur. However, asymmetric disturbances occur even among regions of existing and apparently well functioning monetary unions. Therefore, it is important not only to learn about (1) but study the evolution of (2) over time.

Because OCA theory is difficult to *operationalise*, a popular technique in assessing whether a particular group of countries (or regions) are suitable for a common currency is to compare that country's (1) and/or (2) with that of a existing OCA, for example the U.S. or Canada. The assumption being that the existing monetary unions are efficient (because they have existed for many years) and constitute the minimum level of performance for any of the candidates. This method, however, is certainly not above criticism¹⁵⁴.

¹⁵⁴ Rockoff (2000), for example, points out that the survival of the U.S. monetary union (since its birth in 1788), is at best weak evidence that the net effects have been positive. He argues that it took the US 150 years to become an OCA, i.e. the US was not an OCA until the 1930's when a system of inter-regional federal fiscal transfers and bank deposit insurance, addressed the problem of regional banking shocks.

Prospects for Monetary Cooperation in ASEAN

Chapter IV

Asymmetry of Shocks and Convergence in Selected Asean Countries: A Dynamic Analysis

4.1 Introduction

The political desire for closer economic and monetary cooperation in the Association of Southeast Asian Nations, has increased in recent years, especially since the 1997-1998 Asian financial crisis and the successful launch of the Euro in 1999¹⁵⁵. A considerable number of studies have since emerged to study the feasibility of a common currency arrangement not only for ASEAN but also for the whole of East Asia using the Structural VAR (SVAR) approach pioneered by Bayoumi and Eichengreen (1993), which has since become the standard approach to study the asymmetry of shocks amongst any group of countries¹⁵⁶.

Bayoumi and Eichengreen (1994b) were the first to apply this method in a study that included a number of Asian countries. Using a two variable SVAR, they identified both a Northeast Asian bloc comprising Japan, Taiwan and Korea and a Southeast Asian bloc comprising Hong Kong, Singapore, Malaysia, Indonesia, and possibly Thailand as having highly correlated shocks. Bayoumi, Eichengreen and Mauro (2000), Yuen (2000) and Bayoumi and Mauro (2001) have updated the analysis in Bayoumi and Eichengreen (1994b) and focusing on supply shocks, once again found evidence of the existence of a core, comprising Malaysia, Indonesia and Singapore and a periphery composed of the Philippines and Thailand¹⁵⁷.

Recently, the empirical analysis has moved to the estimation of three-variable SVARs. Ng (2002) developed a three-variable structural VAR, which allows for the

¹⁵⁵ Notable initiatives to promote regional financial stability and monetary policy cooperation include the establishment of 'Manila Framework Group' in 1997, the 'ASEAN Surveillance Process' in 1998 and the "Chiang Mai Initiative' in 2000. Recent initiatives to promote economic integration include the ASEAN Free Trade Area (1992) and the adoption of the so-called "ASEAN's Vision 2020" in 1997 where a timetable was established to create an ASEAN Economic Region.
¹⁵⁶ A number of studies have since expanded Bayoumi and Eichengreen (1993)'s framework allowing for the distinction between a

¹⁵⁶ A number of studies have since expanded Bayoumi and Eichengreen (1993)'s framework allowing for the distinction between a larger number of disturbances. Examples include models that distinguish between supply, monetary and non-monetary shocks (Chamie, DeSerres and Lalonde, 1994), supply, demand (or IS) and monetary (or LM) shocks (Clarida and Gali, 1994), external, demand and supply shocks (Ng, 2002) and global, regional and country-specific shocks (Chow and Kim, 2003).

¹⁵⁷ In Yuen (2000)'s case study, only the pairs Singapore and Malaysia and Malaysia and Indonesia were found to display significant positive correlations of supply shocks. Evidence of a core comprising Indonesia, Malaysia and Singapore was also found in Bayoumi and Eichengreen (1996a), who developed an alternative method based on an "OCA index".

determination of external, demand and supply shocks and found evidence of the existence of the same core and periphery countries as those found in the two-variable SVAR models. Zhang, Sato and McAleer (2004) apply the three variable VAR model developed by Clarida and Gali (1994), which allows for the distinction of supply, monetary and real (or demand) shocks. Their results are in line with those of Yuen (2000) and show that for the period of 1980-1997 only Malaysia and Singapore, and Malaysia and Indonesia experience significant positive correlation of supply shocks.

At this point several conclusions can be made. The existing empirical literature seems to agree that if not all of ASEAN5 (or East Asia), at least a sub-group appears to be a feasible monetary union even if it does not fare as well when comparing with the EU countries before the introduction of the euro¹⁵⁸. Several studies point to the existence of a core and periphery but do not seem to agree on which ASEAN countries comprise each group. Furthermore, the Structural VAR analysis used in most of the previous studies, even if very informative is static in nature and therefore, does not allow for the assessment of the possibility of changing relationships in the symmetry of shocks over the years¹⁵⁹. This is especially relevant in the recent past, as some studies suggest that the Asian financial crisis seems to have improved the symmetry of shocks in the ASEAN economies.

The main purpose of this chapter is to fill this gap by applying a dynamic analysis of the symmetry of the shocks in ASEAN in the context of a state-space model that complements the SVAR analytic framework. This analysis, based on a model first applied by Boone (1997), allows for the study of the evolution of the degree of symmetry of shocks over time, distinguishing a country's convergence with a regional partner from a more general trend of convergence with the rest of the world.

This chapter is organised as follows. The next section explains the empirical methodology. Section 3 presents the data and empirical results, and the last section concludes the chapter.

¹⁵⁸ Most studies seem to agree that the whole of East Asia is not well positioned for a monetary union, especially when comparing with the European countries before the launch of the euro (e.g., Bayoumi, Eichengreen and Mauro, 2000, Bayoumi and Mauro, 2001, Chow and Kim, 2003). However, there are also those who support the opposite view (e.g. Brito, 2004).
¹⁵⁹ Some dynamics could be created by dividing the sample into sub-periods. Even then, however, the study of temporal

¹⁵⁹ Some dynamics could be created by dividing the sample into sub-periods. Even then, however, the study of temporal relationships in shocks would be very limited.

4.2 Empirical Methodology

In order to assess whether or not ASEAN countries are converging and therefore better fulfilling the optimum currency area criteria, a state-space model developed by Boone (1997) is applied¹⁶⁰.

The estimated (measurement or signal) equation is defined as:

$$\left(\varepsilon_{t}^{i}-\varepsilon_{t}^{j}\right)=\alpha_{t}+\beta_{t}\left(\varepsilon_{t}^{i}-\varepsilon_{t}^{k}\right)+\omega_{t},$$
(1)

where ε represents the structural shocks, estimated by applying the trivariate SVAR model developed by Clarida and Gali (1994), which allows for estimation of the series of supply, demand (or IS) and monetary (or LM) shocks. The model, which is a stochastic version of the Mundell-Fleming-Dornbush model, is formally presented in Appendix A¹⁶¹. Superscripts i and j denote ASEAN country i and j, and k denotes the rest of the world, here proxied by the USA, and ω_t is an independent, normally distributed error term with zero mean and a constant variance H. α_t and β_t are time-varying coefficients defined in matrix form as (state or transition equations):

$$A_t = T_t \cdot A_{t-1} + \eta_t, \tag{2}$$

where $A_t = (\alpha_t, \beta_t)$, $T_t = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, and $\eta_t = (\eta_{1t}, \eta_{2t})$ are random error terms with zero

mean and variance-covariance matrix Q.

The time-varying coefficients in (2) are estimated by using the Kalman filter and describe the dynamics of the system¹⁶². α_t is expected to tend towards zero in the long-run as the variables considered here are expected to be white noise¹⁶³. β_t is the important coefficient and measures the temporal relationship in structural shocks among countries

¹⁶⁰ This is also known as the structural time-series approach. Ramos, Clar and Surinach (2003), Babestkii, Boone and Maurel (2004), Zhang and Sato (2005) are recent examples of studies applying this type of method. Haldane and Hall (1991) were the first to use this kind of model to measure to the dynamic linkages of the British pound with the US dollar and the Deutschmark for the period between 1976 and 1989.
¹⁶¹ Nikolakaki (1997) and more recently Brito (2004) extended Clarida and Gali (1994)'s analysis. The latter, extends the model to

¹⁶¹ Nikolakaki (1997) and more recently Brito (2004) extended Clarida and Gali (1994)'s analysis. The latter, extends the model to encompass the Balassa-Samuelson-effect that contradicts Clarida and Gali (1994)'s predictions that positive supply shocks induce disinflation and real depreciation.

¹⁶² The Kalman Filter is a tool that enables the estimation of the state variables and the parameters in a time-varying parameter model using maximum likelihood. For an explanation of the Kalman filter applied to the estimation of time-varying parameters, see for example Boone (1997, 2000). A short description of the Kalman Filter is provided in Appendix C. ¹⁶³ The time-varying parameter α is not crucial to this model. Ramos, Car and Surinach (2003) apply a version of this model where α

The time-varying parameter α is not crucial to this model. Ramos, Car and Surinach (2003) apply a version of this model where α is dropped from (2). In this paper, parameter α is included as it provides information on the robustness of the results, given that in a well constructed model α should quickly tend towards zero.

i, j and k. Countries i and j will be converging if β tends toward zero, with the opposite being true when β tends towards one¹⁶⁴.

When employing the Kalman filter, two key variables assume great importance as they may affect the estimated results. Firstly, the starting values of the state equations have to be guessed and, if too far from their true value, they could significantly alter the results, especially in small samples. Following Zhang and Sato (2005), constant parameter estimation by OLS is performed, and then the OLS estimates are used as the starting values of the state coefficients. Similarly, the variance-covariance matrix obtained by OLS is used in the specification of the variance-covariance matrix of the state equations. Another key variable for the estimation of these variables is the ratio of the variance of the transition to the measurement equation residuals, known as the "signal-to-noise ratio" (Q/H). The higher the signal-to-noise ratio, the more explanatory power is given to the unobserved variables, and the better the fit of the measurement equation. As pointed out by Gordon (1997) and Boone (2000), if no limit is placed on the value of Q (i.e., if it is very large), the unobserved variable will soak up all the residual variation in the measurement equation. Alternatively, if Q is zero (or very small), then the time-varying coefficient will be estimated as a constant.

There appears to be no set rule in fixing the signal-to-noise ratio and the common practice seems to be that the Q/H ratio is fixed "so that the estimated unobserved variable is relatively smooth, with fluctuations which are judged to be reasonable from one period to another¹⁶⁵. For the purposes of this study the value of O was set at a relatively small level (0.1), as large variations of the unobserved variable from one year to the next seem unlikely. Furthermore, the size of the variance of the residuals of the measurement equation was set at a larger value (1) so that the Q/H is fixed at about 0.1, which allows for some dynamics to emerge but avoids sharp periodto-period zigzags¹⁶⁶.

4.3 Data and Results

The data on both real Gross Domestic Product (GDP) and Consumer Price Index (CPI) comes from IMF's International Financial Statistics and consists of annual real

¹⁶⁴ Babestskii, Boone and Maurel (2004) define 'weak' convergence if either α is constant but not necessarily zero and β declines towards zero, or if β shows no tendency to decline in the most recent observations and is defined as 'unclear' if either α or β show an erratic pattern even if β is trending downwards. ¹⁶⁵ Boone (2000), p. 6. Most studies do not indicate their choice for this ratio which makes it virtually impossible to compare

results. ¹⁶⁶ This is within the range (0.1 to 0.4) of typical values for the signal-to-noise ratio suggested by Boone (2000).

GDP and annual CPI series for all countries which have 1995 as the base year¹⁶⁷. Data on the Real Effective Exchange Rates (REER) had to be generated, as the IFS database does not provide data for all countries under analysis¹⁶⁸. The source of the data and methodology used in generating the REER time series are presented in Appendix B.

To identify supply, monetary (or LM) and demand (or IS) disturbances using the model described in Appendix A, trivariate VARs were estimated for each of the five countries under analysis plus the USA which is included as a proxy for the global economy¹⁶⁹. The period of analysis is 1968-1996 and 1999-2004, leaving out the data on the three variables for the 1997-1998 Asian Financial crisis period as it was likely to distort the results¹⁷⁰. Since this method requires all variables to be stationary, the first difference of the log functions of real GDP, REER and CPI were used. The results for both the Augmented Dickey-Fuller test and the Phillips-Peron test on the first difference of the log of all three variables are presented in Table E-1 of Appendix E and show all time series to be stationary in at least one of the tests at the 5% level of significance¹⁷¹. As all individual VARs proved to be stable we can reasonably assume all time series to be stationary¹⁷². A lag of one was chosen for all VARs as the Likelihood Ratio test clearly indicated that this was the ideal lag length in all of the five models.

4.3.1. Correlation of Shocks

The trivariate Structural VAR model allows for the determination of the correlation of the three separate types of shocks. The correlation coefficients of Monetary (or LM), Demand (or IS) and Supply shocks among ASEAN5 members and the USA, used as a proxy for global shocks, are presented in Table 8.

¹⁶⁷ The original purpose of this study was to include all ten ASEAN members. A closer look at the available data, however, indicated that such a task was extremely difficult as the data available for some of the smaller members of the ASEAN countries proved to be quite limited. Therefore, the analysis shall be reduced to the five founding members (ASEAN5): Philippines, Malaysia, Indonesia, Singapore and Thailand.

¹⁶⁸ The REER time series were not available for all countries in the analysis. In fact, and perhaps surprisingly, the IMF's International Financial Statistics do not provide data for Indonesia and Thailand.

⁹ As the main objective of the estimation of this model is to generate the structural shocks, a cointegration analysis of the VARs

was not conducted here. ¹⁷⁰ Even though this strategy can be seen as questionable, the inclusion of this period is known to inflate the results (see for example Zhang, Sato and McAleer, 2004). When the Structural VAR was estimated for the whole sample period (1968-2004), the Jarque-Bera normality tests on the residuals clearly suggested the presence of a structural break in the data.

The exception was the data on the USA consumer price index which was only found to be stationary at the 10% level. However, even in this case the VAR system proved to be stable.¹⁷² The VARs proved to be stable as the inverse roots of the characteristic AR polynomial test showed that all roots lay inside the

unit circle.
<u>Table 8</u>: Correlation of Structural Shocks in ASEAN – 1968-2004 (excluding 1997 and 1998

	Ind.	Mal.	Phil.	Sing.	Thail.	USA	
Monetary Shocks (LM)							
Indonesia	1.00						
Malaysia	0.09	1.00					
Philippines	-0.04	0.39*	1.00				
Singapore	0.09	0.61*	0.34	1.00			
Thailand	0.16	0.54*	0.18	0.62*	1.00		
USA	0.05	-0.10	0.23	0.16	0.21	1.00	
Demand Shocks (IS)							
Indonesia	1.00						
Malaysia	0.34*	1.00					
Philippines	0.57*	0.26	1.00				
Singapore	0.42*	0.39*	0.44*	1.00			
Thailand	0.53*	0.31	0.63*	0.50*	1.00		
USA	0.46*	0.53*	0.52*	0.36*	0.56*	1.00	
Supply Shocks (S)							
Indonesia	1.00						
Malaysia	0.47*	1.00					
Philippines	0.20	0.22	1.00				
Singapore	0.36*	0.44*	0.35*	1.00			
Thailand	0.31	0.18	0.14	0.39*	1.00		
USA	0.22	0.34*	0.11	0.24	0.22	1.00	

Notes: Significance levels are assessed using Fisher's variance stabilizing transformation. For an explanation see for example Zhang, Sato and McAleer (2004). * = Positive correlation coefficient at the 5% level.

An analysis of Table 8 allows for several conclusions. First, with two exceptions, all coefficients yield a positive sign which can be seen as an encouraging sign for the existence of preconditions for a common currency area in the region. Also, all pairs that include Malaysia, and the pair Singapore-Thailand yield significant monetary shocks coefficients. Demand shocks are highly correlated among ASEAN members (and the USA) with two exceptions, Malaysia and the Philippines, and Malaysia and Thailand. These results might suggest a high degree of macroeconomic policy coordination not only among ASEAN countries but also between the ASEAN countries and the USA¹⁷³. Among ASEAN countries, all four pairs that include Singapore, and the pair Malaysia and Indonesia yielded significant supply shock correlation coefficients. Finally, only Malaysia presents a significant correlation coefficient of supply shocks with the USA.

Using a similar methodology, Zhang, Sato and McAleer (2004) found only three significant supply shock correlation coefficients for the period 1980-1997: only two pairs that include Singapore; Singapore-Malaysia and Singapore-Philippines, and the

¹⁷³ This is a probable outcome. Demertzis, Hallet and Rummel (2000) show that for the case of the EU, policy actions were responsible for about one-half to one-third of the structural shocks correlations reported for the period 1970-1995. Even though the same degree of policy coordination is not expected to exist in ASEAN, a large number of initiatives have been implemented recently in the region to further policy coordination. See footnote 155 for further details.

pair Malaysia-Indonesia. When extending the data range to include the financial crisis (1980-2000), they found that two more coefficients became significant: Malaysia-Thailand and Malaysia-Philippines, suggesting that the 1997-1998 Asian financial crisis has increased the degree of shock correlation in ASEAN. Similarly, in this study, Table E-2 of Appendix E presents the correlation of structural shocks in ASEAN for the period 1968-2004 and shows that when including the period of the financial crisis, the number of significant coefficients of the correlation of supply shocks does indeed increase.

The difference in the results presented here with those of Zhang, Sato and McAleer (2004) is likely to be due to the different frequency and range of the data (they use quarterly data from 1980 to 2000).

4.3.2 Size and Speed of Adjustment of Shocks

Countries are better candidates for a currency union if their disturbances are correlated and small, and adjustment to them is rapid. This is especially true concerning aggregate supply shocks as they are more relevant than both demand and monetary shocks when assessing the feasibility of a monetary union. As pointed out by Bayoumi and Mauro (2001), supply shocks are closely linked to underlying private sector behaviour and therefore are not likely to affected by to macroeconomic policies. Conversely, Monetary and Demand shocks are easier to tame through the implementation of common demand policies which are likely to be implemented if further monetary cooperation in ASEAN is attempted.

Since the estimated structural shocks are assumed to have unit variances, their size and adjustment speed cannot be inferred by analysing the identified disturbances recovered from the VAR estimation. They can, however, be determined by analysing the associated impulse response functions. Since supply shocks are the only ones with permanent effects on output, the size of supply shocks is measured as the long-run effect (12-year horizon) of a unit shock on changes in real GDP. The size of demand shocks is measured as the sum of its 1-year impact on the changes of real GDP and price level (Bayoumi and Eichengreen, 1994b), and the size of monetary shocks is measured as its 1-year impact on the changes of the real effective exchange rates¹⁷⁴.

¹⁷⁴ Following Brito (2004), monetary shocks are here defined to emcompass changes in the relative demand and supply of money, home and abroad, so that its contemporaneous impact on the real exchange rate can be picked to gauge the size of monetary structural disturbances.

The speed of adjustment to shocks is defined in this study as the proportion of the long run adjustment accomplished in the first two years after the occurrence of a structural shock¹⁷⁵. Both the size and the speed of adjustment to disturbances are crucial to the assessment of the feasibility of a currency union. The smaller the size of underlying shocks the easier it will be to maintain a fixed exchange rate, and therefore the stronger the case for a monetary union. Also, as pointed out by Brito (2004), if the deviations that follow a shock are quickly eliminated, the costs of forsaking policy independence are bound to be smaller even in situations where countries experience asymmetric shocks and divergent responses to those shocks. Table 9 presents the size of shocks and the speed of adjustment to disturbances.

	Monetary	Shocks	Demand	l Shocks	Supply	Shocks	
	Size	Speed	Size	Speed	Size	Speed	
Indonesia	0.0355	0.935	0.0151	0.872	0.0285	0.955	
Malaysia	-0.0120	0.966	0.0091	0.985	0.0335	0.731	
Philippines	0.0117	0.999	0.0188	0.938	0.0508	0.700	
Singapore	0.0195	0.969	0.0097	0.843	0.0558	0.736	
Thailand	-0.0283	0.877	0.0168	0.912	0.0323	0.869	
USA	-0.0268	0.787	0.0049	0.964	0.0153	0.659	

Table 9: Size and Speed of Adjustment of Structural Shocks

Brito (2004) using the same method, estimated the Euro-zone average speed of adjustment to Monetary, Demand and Supply shocks to be 0.919, 0.669 and 0.502 and the average size to be 0.0078, 0.0059 and 0.0213, respectively for the period 1979-1998¹⁷⁶. Thus, the average size of the three underlying shocks is much larger in ASEAN than in both the Euro-zone countries and the USA. In contrast, the speed of adjustment to shocks is much faster in ASEAN than both the EU and the USA. The explanation seems to point to the fact that the labour market and wage rates are more flexible in ASEAN which makes it easier for these countries to adjust internally to shocks (Bayoumi and Mauro, 2001).

The combination of the results from Tables 8 and 9 allows for the clear distinction of a core (formed by Indonesia, Malaysia and Singapore) as they experience smaller and more correlated supply disturbances, and a periphery (formed by Thailand and the

¹⁷⁵ Following Brito (2004), the speed of adjustment is measured as the average across the endogeneous variables of one minus the adjustment remaining. The adjustment remaining is calculated as the absolute value of one minus the ratio of the response after two years to the long run effect of any particular shock. For the responses to which the theoretical identifying restrictions impose convergence toward zero, the measure of the speed of adjustment is computed as one minus the impulse-response after two years.
¹⁷⁶ Bayoumi and Mauro (2001) found the average size of supply shocks in the Euro-zone for the period 1969-1989 to be 0.031. Since they apply a bivariate analysis, the other results are not comparable.

Philippines) in ASEAN. This pattern can be better seen in graphic form. Figure 2 presents the size and the correlation of supply shocks between ASEAN countries and an anchor country (Malaysia)¹⁷⁷.



Figure 2: Correlation and Size of Structural Supply Shocks with Malaysia.

Due to the construction of the figure, the more to the right and the lower the coefficients are in the figure, the better prepared are the countries to form a currency union as they experience smaller and more correlated disturbances. Malaysia, Indonesia and Singapore emerge as forming a group of countries better prepared for currency union whilst the Philippines and Thailand can be seen as a periphery. These results are in line with most of the previous studies.

4.3.3 Constant Parameter Estimation Results

As mentioned above, the initial values of the parameters in the state equations are provided by OLS estimation of (1). The results for the full sample period (1968-2004) are presented in Table E-3 of Appendix E, and Table E-4 presents the results for the periods 1968-1996 and 1999-2004. One immediate conclusion we can make from these two tables is that, in the great majority of cases, the Asian Financial Crisis seems to have increased convergence among ASEAN members, as the β estimates in Table E-3 are lower than those in Table E-4. Furthermore, it is clear in both cases, that the degree of convergence of supply shocks among the ASEAN5 is much higher that the convergence achieved for both monetary and demand shocks. Finally, all the estimated

¹⁷⁷ As pointed out by Bayoumi and Mauro (2001), ASEAN does not have a country that can obviously be considered the focal point, unlike the EU. In this study, Malaysia was chosen as the anchor as of the two most developed countries in ASEAN5, Singapore is too small for this role.

 β coefficients measuring the convergence of Singapore with its ASEAN partners (fourth column in Tables E-3 and E-4) are somewhat atypical. In fact, only one out of twelve of the OLS estimated coefficients were found to be significant at the 1% level in Table E-3 with one of them (Singapore-Malaysia) found to be negative. Nevertheless, the overall pattern found in both those tables is broadly consistent with the pattern found for shock correlation in the previous section.

4.3.4 Time-Varying Parameter Estimation Results

In this section, the state-space model described in (1) and (2) is estimated by the use of the Kalman filtering procedure. This model allows for the estimation of the timevarying parameters α_t and β_t . All estimates presented in this section are smoothed estimates (which use the full information set) rather than filtered estimates (which only use the information available at the time that the forecast was made)¹⁷⁸. The estimated time-varying β coefficients showing the monetary (or LM), demand (or IS), and supply shock convergence path of Indonesia, Malaysia, the Philippines, Singapore and Thailand with each of its ASEAN5 partners against the rest of the world, here proxied by the U.S., for the period 1968-2004, excluding the years 1997 and 1998, are presented in Figures E-1 to E-5, respectively, of Appendix E¹⁷⁹. As expected, the shape over the whole sample period of the estimated β coefficients paths is broadly similar both for the convergence path from country i to country j and from country j to country i, as opposed to the rest of the world. In some cases, however, the trend in some periods is quite different in each case, with the β coefficients attaining values well out of the expected range. The likely reason for this outcome is that the model might not be well specified in some cases and therefore the time-varying constant α is capturing the fact that the difference between country i's shocks and those of the USA vary greatly from the difference between those of country j and the USA¹⁸⁰. This would suggest that the signal-to-noise ratio should not be set at the same level for all cases, or that the data should be normalised between 0 and 1. That would, however, make comparisons very

¹⁷⁸ As pointed out by Boone (2000), the Kalman filtering procedure comprises two stages: first a filtering procedure, second a smoothing procedure. The smoothing procedure allows for the smoothing of the first stage estimate, taking the information available from the whole sample of observation which provides more robust estimates. It should be noted, however, that the use of smooth estimates makes it less likely for the estimates of α_t to be stationary as should be expected in a well constructed model. ¹⁷⁹ Estimations of the time-varying model for the whole sample period 1968-2004 were also conducted and the results were found to

¹⁷⁹ Estimations of the time-varying model for the whole sample period 1968-2004 were also conducted and the results were found to be very similar to the reported ones but much more volatile.

¹⁸⁰ This is quite clear, for example, in terms of the monetary shocks convergence path of Indonesia-Malaysia and Malaysia-Indonesia (blue line in left-hand graphs in figures E-1 and E-2, respectively). In both cases, the highest values are reached in 1979. But whilst in the first case the period of convergence after that ends in 1986, in the second case it continues until 2004, with is final value being around an unexpected -0.5. An analysis of the data on the difference of Indonesian and Malaysian monetary shocks with those of the USA shows that the mean value for the years 1986-2004 is close to zero in the first case (0.000419) but far from zero in the second (0.104576) which might explain the different results. At the same time, the α estimates (not reported) tend towards zero in the case of Indonesia-Malaysia but not in the case of Malaysia-Indonesia.

difficult and therefore, the same constraints are applied in all cases. For the purposes of this paper, the existence of a clear trend is defined only when the same trend can be identified both ways, that is, when the same trend can be found in the convergence (divergence) of country i with country j and simultaneously from country j to country i.

Following this definition of convergence, a visual analysis of Figures E-1 to E-5 shows very few clear trends over the whole sample period. The only exceptions are a clear diverging trend in the cases of the β estimates of monetary shocks of the Philippines with Malaysia and the Philippines with Singapore.

In order to facilitate the analysis, the mean values and standard deviations of the β estimates of monetary, demand and supply shocks for five alternative time spans are presented in Tables E-5 to E-7 respectively, of Appendix E. The first three columns show the mean values and standard deviations of three similar spaced sub-periods, 1968-1979, 1980-1991 and 1992-2004, the fourth column shows the results for the whole sample period excluding the 1997-1998 Asian Financial Crisis data, and the last column shows the results for the whole sample (1968-2004), thus including the data for 1997 and 1998. In addition, information on whether the α time-varying estimates were found to be stationary was included in the last two columns.

One immediate conclusion that can be made is that in the unit root tests on the α time-varying coefficient estimates the hypothesis of a unit root could not be rejected at the 5% level in a large number of cases, especially in the case of monetary shocks. As discussed above, the choice for smooth estimates makes this outcome more likely. Furthermore, an analysis of Tables E-5 to E-7 of Appendix E, shows that in terms of monetary shocks, convergence over the whole sample period was found in the pair Indonesia-Malaysia and in Indonesia-Thailand whilst divergence occurred in the pairs Philippines-Indonesia and Philippines-Singapore. In terms of demand shocks, the only case of convergence was found in the pair Indonesia-Philippines whilst in the case of supply shocks, no clear trend was found.

When concentrating on the last period (1992-2004), however, a clearer picture emerges. The evolution of the time-varying estimates of β for this period in comparison with the one that precedes it (1980-1991) for the three types of shocks is presented in Table 10 below.

<u>Table 10</u>: Convergence of ASEAN5 Countries with their Partners as Opposed to the USA (assembled from Tables E-5 to E-7 from Appendix E)^{π}.

	Ind.	Mal.	Phil.	Sing.	Thail.
Monetary Shocks (LM)					
Indonesia	-				
Malaysia	▼ ▼	-			
Philippines			-		
Singapore	$\mathbf{\nabla} \mathbf{A}$			-	
Thailand	••		▲ ▼		-
Demand Shocks (IS)					
Indonesia	-				
Malaysia	▼ ▼	-			
Philippines	▼ ▼	▼ ▼	-		
Singapore	▼ ▼	$\mathbf{\nabla}$	▼ ▼	-	
Thailand	• •	• •	••	▲ ▼	-
Supply Shocks (S)					
Indonesia	-				
Malaysia	$\mathbf{\nabla} \mathbf{A}$	-			
Philippines	$\mathbf{\nabla} \mathbf{A}$		-		
Singapore		$\mathbf{\nabla} \mathbf{A}$		-	
Thailand	▼ ▲				-

Notes: ▲ = increase from previous period (divergence). ▼ = decrease from previous period (convergence)

First symbol indicates the increase or decrease in the convergence of country i to country j while the second indicates the convergence of country j to country i as opposed to the USA. According to the definitions set in this paper, convergence or divergence only occurs in the cases where the symbols are black.

 $\mathcal{K} =$ excluding the years 1997 and 1998.

An analysis of Table 10 allows for some important conclusions¹⁸¹. First, the only clear trends in terms of monetary shocks are the same trends that were found for the whole sample period analysis, that is, convergence for the pairs Indonesia-Malaysia and Indonesia-Thailand, and divergence for the pairs Philippines-Indonesia and Philippines-Singapore. Next, in terms of demand shocks, with two exceptions (Singapore-Malaysia, and Singapore-Thailand), all country pairs present a clear converging trend. Finally, in terms of supply shocks, the majority of cases yield a clear diverging trend. This being particularly true for the case of Thailand (Thailand-Malaysia, Thailand-Philippines-Singapore and Philippines-Thailand). Considering that supply shocks are more relevant than both demand and monetary shocks when assessing the feasibility of a monetary union, these results imply that the countries forming the periphery are increasingly less suited to embark on further monetary cooperation with their ASEAN partners.

¹⁸¹ When including the critical years of the Asian Financial Crisis, the results were found to be exactly the same with the exception of the trend in convergence of Monetary Shocks. In this case, four diverging relationships were found: Philippines-Indonesia, Philippines-Malaysia, Philippines-Singapore and Singapore-Malaysia. And no convergence was found.

4.4 Concluding Remarks

The present study expands the existing literature by applying a dynamic analysis of the symmetry of shocks in ASEAN. The results yielded a number of important findings that complement the Structural VAR analysis of previous studies. First, it showed that in the majority of cases there has been an increase in the degree of convergence of demand shocks in recent years. More importantly, it also showed an increase in divergence in supply shocks for most cases since the beginning of the 90's even when taking into account the Asian Financial Crisis. This is especially true for the periphery countries suggesting that the Philippines and Thailand are not only not converging but actually diverging from the core group comprising Indonesia, Malaysia and Singapore. Considering that supply shocks are more relevant than both monetary and demand shocks when assessing the feasibility of a monetary union, these results imply that an ASEAN5 wide monetary union should not be attempted without further economic integration. Nevertheless, the evidence also suggests the existence of a core that is in a better position to move faster towards the constitution of a monetary union in the future than the periphery, in what can be perceived as a 'two-speed' monetary integration process¹⁸².

In this way, several areas of further research can be identified. First, the inclusion of a larger number of ASEAN economies in the analysis would certainly allow us to refine the conclusions on the desirability (and the extent) of ASEAN becoming a currency union. Second, the state-space model and the Kalman filtering method applied in the dynamic analysis require several key assumptions which can significantly alter the results and for which there seems to be no consensus in the current literature about the right procedures. Finally, the study of the causes of the degree of convergence in structural shocks such as the degree of factor mobility across countries or the effect of trade or macroeconomic policy coordination, would almost certainly help explain the reasons behind the fact that some countries appear to have more synchronised business cycles than others, and thus complement the results presented in this study.

 $^{^{182}}$ A two-speed integration process has already been considered in ASEAN but in terms of economic integration. In fact, the October 2003 Bali summit clearly considered the possibility of adopting a so-called "2+x" approach to ASEAN economic integration, in which two countries which are ready to cooperate on specific sectors could work together first, instead of waiting for a consensus to be reached on the global level (or the so-called "ASEAN-x" formula).

Prospects for Monetary Cooperation in ASEAN

Chapter V

Exchange Rate Pass-Through in ASEAN

5.1 Introduction

The majority of studies to date on the suitability for a currency union amongst the five largest ASEAN economies (ASEAN5) focused on the asymmetry of shocks affecting those countries and points towards the existence of a core group comprising Indonesia, Malaysia and Singapore that is in better position to move faster towards the constitution of a monetary union than a periphery composed of the Philippines and Thailand¹⁸³. Furthermore, most studies found that the average size of demand, monetary and supply shocks is much larger in ASEAN than in both the Euro-zone countries and the USA. Conversely, the speed of adjustment to shocks is much faster in ASEAN than both the EU and the USA. In this way, the existing empirical literature seems to agree that, if not all of ASEAN5, at least the core group appears to be a viable monetary union even if it does not fare as well when comparing with the EU countries before the introduction of the euro (or the USA).

The faster speed of adjustment to shocks in ASEAN raises the question of whether the necessary adjustment to restore equilibrium is coming from changes in nominal exchange rate or from other sources. If it is the nominal exchange rate that is providing most of the adjustment, the region's prospects for further monetary integration are limited. Conversely, if the adjustment is coming from other sources, most notably labour and wage changes, a currency union can be seen as a feasible endeavour. The latter, however, cannot easily be tested empirically as no systematic data is available for this group of countries¹⁸⁴.

¹⁸³ Examples include Bayoumi and Eichengreen (1994b), Bayoumi and Eichengreen (1996a), Bayoumi, Eichengreen and Mauro (2000), Yuen (2000), Bayoumi and Mauro (2001) and Zhang, Sato and MacAleer (2004).
¹⁸⁴ These, however, are expected to play an important role in the region. Bayoumi and Mauro (2001), for example, suggest that the

¹⁶⁴ These, however, are expected to play an important role in the region. Bayoumi and Mauro (2001), for example, suggest that the reason for a faster speed of adjustment to shocks in ASEAN is due to the fact that the labour market and wage rates are more flexible in ASEAN which makes it easier for these countries to adjust internally to shocks.

The purpose of this paper is to provide a study on the degree of relative price adjustment in ASEAN5 in order to draw inferences to their suitability for further monetary cooperation.

The existing optimum currency area theory suggests that in the presence of large asymmetric (country-specific) shocks without the appropriate adjustment mechanisms, countries should not attempt to join or create a common currency as the costs of having a fixed exchange rate would greatly outweigh the benefits of such policy¹⁸⁵. Under the traditional assumptions that factors of production are not as mobile externally as they are internally and are of limited price and wage flexibility, the necessary adjustment of the real exchange to an asymmetric shock can be quickly achieved by adjustment of the nominal exchange rate. Under a monetary union (or other fixed exchange rate regime) any adjustment in the real exchange rate can only come from adjustment in the relative inflation levels. If wages and prices are slow to adjust, this could lead to prolonged periods of real exchange rate misalignments which would bring large and prolonged costs to the economy.

Therefore, when accessing whether any two countries fulfil the pre-conditions to form a currency union, it is not only important to study the degree of real relative price level adjustment to an asymmetric shock, but especially to determine whether the flexibility accrues from nominal exchange rate changes or changes in the relative consumer price levels¹⁸⁶. As pointed out by Artis and Ehrmann (2006), exchange rates can work both as a shock-absorber and a source of shocks and therefore, the determination of the effective role played by the exchange rate is a critical issue for countries where a monetary union (or other quasi-union arrangements) is a open policy option¹⁸⁷.

For the nominal exchange rate to work as an adjustment mechanism, changes in the nominal exchange rate must increase the consumer price of imported goods relative to domestic goods, thereby leading to a strong expenditure-switching effect, i.e, encouraging consumers to buy domestic rather than foreign produced goods. For macroeconomic policy purposes it is essential to distinguish between the impact of changes in the nominal exchange rate on import prices and on consumer prices.

¹⁸⁵ Frankel and Rose (1997, 1998) offer a conflicting view with their now famous endogeneity of OCA criteria argument, suggesting that a country is more likely to satisfy the criteria for entry into a monetary union *ex post* than *ex ante* due to lowered asymmetrical shocks.

¹⁸⁶ In this way, the evidence found in several studies, like Rogers and Jenkins (1995), Engel, Hendrickson and Rogers (1997) and Rose and Engel (2002), of the existence of no difference between intra-national and international speeds of convergence of aggregate real exchange rates cannot be seen as proof that (for the countries under analysis) a rigid exchange rate system would be preferable. In fact, evidence of the opposite result has also been found (see for example Bayoumi and Thomas (1995)).

¹⁸⁷ Buitter (2000) pointed out that flexible exchange rates are unlikely to provide adjustment to imbalances caused by long-term real rigidities in the economy and concludes that in a setting of high degree of international financial integration (but also in case of closed economies), fully flexible exchange rates are primarily a source of shocks and instability.

A popular way to investigate these matters is provided by the literature of exchange rate pass-through¹⁸⁸. The theory of the determination of exchange rate passthrough goes back to the debate over the (failure of the) law of one price and has since moved to industrial organization models where the role that different market structures and the price discrimination of exporting firms plays in determining import prices. In more recent years, the debate has enlarged to include discussions over appropriate monetary policies and the optimal choice of exchange rate regimes¹⁸⁹.

The main motivation for most of the ongoing debate is the substantial empirical evidence on the limited pass-through of nominal exchange rate movements and the fact that there appears to be a declining trend in the pass-through rates over time in a large number of countries¹⁹⁰. Most recent theoretical works in this area try to explain these phenomena and essentially do so by discussing either (i) the prevalence of local currency pricing (LCP) over producer-currency pricing (PCP) or (ii) whether exchange rate pass-through rates are endogeneous to a country's inflation performance.

The former, of which Devereux and Engel (2003) is a recent prominent example, argue that if PCP dominates, the exchange rate pass-through to domestic prices is immediate and exchange rate flexibility plays a central part of an optimal monetary policy. If, however, LCP dominates, the exporters keep their prices fixed in the foreign currency and accept the resulting domestic price at the prevailing exchange rate. The exporting firm's willingness to reduce its profit margin in case of a nominal exchange rate appreciation prevents any pass-through from nominal exchange rates into import and ultimately consumer prices, implying that the optimal monetary policy would be a fixed exchange rate.

The latter, originally put forward by Taylor (2000), argues that a low inflationary environment leads to a low exchange rate pass-through to domestic prices. Using a model of firm behaviour based on staggered price setting and monopolistic competition, he shows that the degree of exchange rate pass-through is regime specific and that in low inflation scenarios the effectiveness of monetary policy could be severely impaired¹⁹¹.

¹⁸⁸ For the key terms "law of one price", "purchasing power parity", "exchange rate pass-through" and "pricing to market" Goldberg and Knetter (1997) reported that EconLit gives approximately 700 entries published from the 1970s. Restricting the search to "exchange rate pass-through", Econlit returns a total of 255 entries at the end of 2006. ¹⁸⁹ For extended surveys on the theory of exchange rate pass-through, see for example Menon (1995) or Goldberg and Knetter

^{(1997).} ¹⁹⁰ Gagnon and Ihrig (2004) for example, present a brief survey of empirical papers that identified a reduction in exchange rate pass-

thorugh in various countries. For a survey of empirical works that found evidence of partial pass-through see for example Menon (1995). ¹⁹¹ Recently, Choudri and Hakura (2006), using data from 71 countries, found strong evidence supporting Taylor's hypothesis.

The general conclusion that most of the existing literature seems to reach is that flexible exchange rates have, at best, very limited power in functioning as an adjustment mechanism to asymmetric shocks and therefore there appears to be a strong case for fixed exchange rate regimes¹⁹².

As with theory studies, there are a great number of empirical studies on exchange rate pass-through to domestic prices. They vary considerably in terms of types of data, econometric methods and countries under analysis.

The data included in the empirical studies has reflected the problems under study. Early studies tended to concentrate on the study of the degree of exchange rate pass-through to import prices and have since extended to include a larger number of domestic price variables, including export prices, producer price index (PPI) and consumer price index (CPI). Similarly, depending on the scope of the study, the level of aggregation of the data used varies from micro data to industry level data and more recently aggregated level data.

Concerning the estimation techniques, a large number of alternatives can be identified, which can be roughly collated into two main categories¹⁹³: Single equation models, estimated either by OLS techniques e.g., Campa and Goldberg (2005), twostage least squares, e.g., Mihailov (2005), panel data estimation, e.g., Barhoumi (2006); the other widely used type is based on vector autoregressions (VAR), mostly by interpreting impulse-response functions (IRF). These include recursive VAR models, e.g., McCarthy (2000), Structural (or restricted) VAR models, e.g., Choudhri, Faruquee and Hakura (2005), VARs in levels with sign restrictions, e.g., An (2006), Generalized VAR impulse response models, e.g., Mihailov (2005) and Cointegration Analysis and Vector Error Correction Models, e.g., Toh and Ho (2001).

As all methods necessarily have shortcomings, there seems to be no consensus on the best econometric technique to use. The major problem of single equation based methods is the underlying assumption of the exogeneity of the regressors. This does not allow for the possibility of dual causality between variables which is of essential importance when the analysis is macroeconomic in nature. Similarly, the VAR based methods also have drawbacks which are largely related to the underlying assumptions on the IRFs. The recursive VAR models typically study exchange rate pass-through to prices at different stages of the distribution chain of pricing, most commonly import prices, PPI and CPI, using a Cholesky decomposition to identify the structural shocks.

¹⁹² It is worth noting that there also are those who defend the opposite view. Duarte (2004), Duarte and Obstfield (2004) and Obstfield (2006) show that the inclusion of non-traded goods in the model is enough to restore the need for exchange rate flexibility, even when shocks are real and prices are set in local currency and there is complete absence of expenditure-switching effects. ¹⁹³ For a recent survey of empirical papers on exchange rate pass-through, see for example An (2006).

The well-known drawback of this method is that of the IRFs being sensitive to the ordering of the variables. The major problem of IRFs with imposed structural restrictions (which also applies to IRFs with sign restrictions), "has been argued to be some degree of arbitrariness of such assumptions"¹⁹⁴. The main virtue of the generalised impulse response method is that of not requiring the orthogonalisation of shocks and thus being invariable to the ordering of the variables but at the cost of needing an assumption for the distribution of shocks (Mihailov (2005, p.15)).

All these VAR based techniques also share the problem of estimating the VAR system with stationary variables (namely by first differencing the variables) which creates estimates that are "systematically biased downwards"¹⁹⁵. This could in theory, be avoided by the use of cointegration analysis and (vector) error correction models¹⁹⁶. In practice, however, "an econometrician using standard tests for cointegration rank and for testing restrictions on the cointegration space would in general not be able to infer the correct rank or identify the true cointegration relations"¹⁹⁷.

Most empirical studies on exchange rate pass-through have been conducted in terms of developed countries, most notably the United States. In recent years, however, greater attention has been given to studies that include developing economies. Despite their reduced number, studies on Asia in general and South East Asia in particular have followed this trend.

The first paper to study the exchange rate pass-through to import prices for a group of Asian countries was Weber (1999), who used cointegration techniques and error correction modelling to provide estimates of the long run and short run pass-through for nine Asia-Pacific countries, including four ASEAN members: Thailand, the Philippines, Malaysia and Singapore. Using quarterly data for the period 1978:1 to 1994:2 (1978:1 to 1987:3 for Thailand and Malaysia), he found evidence of partial, long-run pass-through into import prices in the case of the Philippines (90%) and Singapore (77%), but not in the case of Thailand and Malaysia.

Recently, Ito, Sasaki and Sato (2005) and Ito and Sato (2006) studied 5 East Asian countries, including four ASEAN countries, Indonesia, Thailand, Malaysia and Singapore, employing a recursive VAR model that uses monthly data for the period January 1995 to August 2005. Using a five variable VAR (later extended to a seven

¹⁹⁴ Michailov (2006), p. 6.

¹⁹⁵ Bache (2006), p. 22. He generated data from a dynamic stochastic general equilibrium model and used Monte Carlo techniques to compare the results with the performance of different VARs. He found that a low order vector cointegration model is a good approximation to the data generating process but casts doubts on whether in practice an econometrician would be able to infer the cointegration properties implied by the DSGE model.

¹⁹⁶ VAR models with sign restrictions also use information on the variables in levels. However, the assumptions on the sign restrictions can also be seen as arbitrary.

¹⁹⁷ Bache (2006), p. 22.

variable VAR) to study the degree of exchange rate pass-through along the distribution chain of pricing, they showed the pass-through of exchange rate shocks to be largest on import prices, then on the PPI, with the smallest on CPI. They found that Indonesia exhibited a very large and significant response of both the CPI and the import prices to an exchange rate shock. Thailand also yielded a positive and significant response of CPI and import prices to exchange rate shocks but of much smaller magnitude than that in Indonesia. Finally, for both Malaysia and Singapore no significant response was found (for Malaysia only the pass-through to CPI was investigated, as no data on import prices was available).

A number of studies have also focused on the exchange rate pass-through to export prices. Toh and Ho (2001) used cointegration techniques and error correction modelling to provide estimates of the long run and short run pass-through of exchange rates to export prices in four Asian countries, namely, Malaysia, Thailand, Taiwan and Singapore, using quarterly data for the period between 1975:1 and 1996:2 both at the aggregate and disaggregate levels. They showed the degree of pass-through to export prices to be 0.127, 0.633, 0.807 and 0.997, for Taiwan, Malaysia, Singapore and Thailand, respectively. Conversely, Parsons and Sato (2005) found little evidence of pass-through to export prices in their study of four ASEAN countries: Indonesia, Malaysia, the Philippines and Thailand. Applying a single equation model they estimate the exchange rate pass-through coefficients for the exports at the 6-digit industry level and found little evidence of pass-through in these countries attributing this to the fact that the ASEAN countries are price-takers in a relatively integrated market rather than evidence of pricing-to-market¹⁹⁸.

At this point several conclusions can be made. The number of empirical studies on the exchange pass-through to domestic prices in ASEAN is still meagre and does not seem to agree on the results. Also, mostly due to the unavailability of data, no study has included the five largest, founding members of ASEAN. Finally, there seems to be no agreement on the best econometric method to apply in order to investigate these matters.

The main contribution of this chapter is, for the first time, to provide a study on the degree of exchange rate pass-through into domestic prices, using the distribution chain of pricing, which simultaneously includes all five founding members of ASEAN (ASEAN5) so to draw inferences on their suitability for further monetary cooperation.

¹⁹⁸ However, as stated by the authors, their results are dependent on certain modelling assumptions which are not tested (they get opposite results depending on whether the underlying assumption is imperfect or perfect competition).

The empirical method and the data are explained in the following section. Section 3 presents the results and section 4 provides a sensitivity analysis. Finally, the last section concludes the chapter.

5.2 Data and Empirical Methodology

The five founding members of ASEAN, Indonesia, Malaysia, the Philippines, Singapore and Thailand, constitute the sample countries of this study. The primary objective of this chapter is to estimate the impacts of exchange rate changes on domestic price variables so to estimate the expenditure-switching effect of exchange rate changes. As mentioned above, it is essential to extract the effects of exchange rate changes not only on inflation but also along the different stages of the pricing chain most importantly on import prices and producer prices.

For this purpose, a recursive VAR model is applied which uses the Choleski decomposition method along the distribution chain of pricing¹⁹⁹. This choice can be justified for several reasons. The so-called distribution chain of pricing is now well established in the existing literature and appears to be the most widely used method, thus providing a means of comparison of the results with those of other studies²⁰⁰. Furthermore, when the results are not very sensitive to the ordering of the variables, the Choleski decomposition method can be interpreted as providing robust results.

Accordingly, a VAR model including three endogenous variables - the nominal effective exchange rate (*neer*), the import price level (*imp*) and the consumer price index (*cpi*) - is estimated for each possible pairing in ASEAN5. Therefore, the data is presented in bilateral terms and not in US dollars, which is more commonly used in the literature²⁰¹. In order to retrieve the structural disturbances, ε_t , from the reduced-form VAR residuals, u_t , a Choleski decomposition of the variance-covariance matrix of the reduced form residuals is used as follows:

$$\begin{bmatrix} u_t^{neer} \\ u_t^{imp} \\ u_t^{cpi} \end{bmatrix} = \begin{bmatrix} S_{11} & 0 & 0 \\ S_{21} & S_{22} & 0 \\ S_{31} & S_{32} & S_{33} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{neer} \\ \varepsilon_t^{imp} \\ \varepsilon_t^{cpi} \end{bmatrix}$$
(3)

¹⁹⁹ This chapter aims to investigate only the degree of exchange rate pass-through along the distribution chain of pricing and not its determinants. Accordingly, other variables normally included in previous studies are dropped here, namely variables to measure demand, monetary and supply shocks.

²⁰⁰ See for example McCarthy (2000), Hahn (2003) and Ito and Sato (2006).

²⁰¹ The reason is that one of the purposes of this study is to explain the correlation and adjustment speeds of shocks found among these countries in previous studies. Nevertheless, an analysis which includes all variables in terms of US dollars is also included in the Appendix for completeness.

The ordering of the variables follows the distribution chain of pricing and reflects the belief that exchange rates do not respond contemporaneously to both import price and domestic price shocks and that import prices do not respond contemporaneously to domestic price shocks.

The data on consumer price index (2000=100) and nominal exchange rates was collected from IMF International Financial Statistics (IFS) database. Data on the nominal effective exchange rate was not available for all countries and therefore had to be generated by applying the IMF trade weights and is constructed so that an increase in the index denotes an appreciation of the currency $(2000=100)^{202}$.

The data on import prices proved to be quite a challenge. The original intent of this study was to use high frequency data as low frequency data might fail to capture most of the pass-through dynamics. A closer analysis on the IFS database, however, showed this to be impossible as no data at any frequency on import prices was available for Indonesia²⁰³. For Malaysia only annual data for the period 1967-1987 was available, and quarterly data for the Philippines was only available for the period 1996 to 2004. Therefore, annual data from the United Nation's COMTRADE database was compiled for all industries at the Standard International Trade Commodity (SITC) 3-digit level (about 177 industries, depending on the year and country). Next, the import unit values were calculated for all industries on which data was available for all countries simultaneously during the whole sample period. This limited the sample to 46 industries for the period 1967 to 2001 as data for Malaysia in 2002 was not available for any industry²⁰⁴. Finally, a weighted average index (2000=100) was generated²⁰⁵.

Consequently, all VAR estimations in the next section use annual data for the period between 1967 and 2001. The results are presented in the following section.

5.3 Results

Following the standard practice, impulse response functions are employed to assess the degree of exchange rate pass-through to domestic prices in ASEAN5. Impulse response functions trace the effects of a shock emanating from an endogenous variable to other variables of the system through the dynamic structure of the VAR.

²⁰² The method is formally described in Zanuello and Desruelle (1997). The trade weights used on the computations were kindly provided by IMF's Dominique Desruelle.

²⁰³ Ito and Sato (2006) report using monthly data for Indonesia from the CEIC Asia Database. Even this alternative source does not, however, provide data for Malaysia.

²⁰⁴ The list of the SITC codes of the industries included in the index is presented in Table F-1 of Appendix F.

²⁰⁵ The quality of this index was established by estimating its correlation with the available IMF datasets. The correlation coefficients were found to be 0.77 for Singapore (period: 1974-2001, 28 observations), 0.90 for Thailand (period: 1967-2001, 35 observations) and 0.92 for Malaysia (period: 1967-1987, 21 observations). The correlation was not estimated for the Philippines as the sample available was only 12 observations.

All endogeneous variables included in the reduced-form VARs are in first differences of logs and were found to be stationary using the common unit root tests²⁰⁶. A lag order of either one or two was selected based on the Sequential Modified Likelihood Ratio test for all specifications²⁰⁷. The absence of serial autocorrelation in the residuals was confirmed by the Multivariate Lagrange Multiplier test (by failing to reject the null of no serial correlation at the 5% level of significance).

Figures G-1 and G-2 of Appendix G present the accumulated response of relative import prices and relative CPI to the nominal effective exchange rate shocks, respectively. The IRFs reported in this study are the accumulated response to Cholesky one standard deviation innovations with a plus and minus 2 standard error confidence intervals using a small sample degrees of freedom correction. The results show evidence of significant but very incomplete exchange rate pass-through to inflation (less than 0.1 of standard deviation of innovations) in all pairs involving Indonesia and the Philippines. For the remaining pairs, the exchange rate pass-through was either insignificant (Thailand-Singapore) or significant but very close to zero (Malaysia-Thailand and Malaysia-Singapore). The degree of exchange rate pass-through to import prices was found to be insignificant in all cases with the exception of the pair Thailand-Singapore where pass-through was found to be significant but very small (about 0.1 standard deviation of innovations).

The accumulated responses of nominal effective exchange rates to import prices and relative inflation shocks are presented in Figures G-3 and G-4 of Appendix G, respectively, and show that no significant response to import prices shocks was found whilst a significant (albeit very small, with less than 0.125 standard deviation of innovations) response of exchange rates to relative inflation shocks was only found in the case of the pairs Indonesia-Malaysia and Indonesia-Singapore.

The accumulated response of import prices to inflation shocks and the accumulated response of relative inflation to import prices shocks are presented in Figure G-5 and G-6 of Appendix G, respectively, and show the only significant response to be the case of Malaysia-Singapore in both cases.

Next, the statistically significant accumulated responses of each variable in percentage of the standard deviation of each innovation after 2 periods are summarised in Table 11.

²⁰⁶ All VARs were estimated with a constant. As the VAR is to be estimated in first differences, a cointegration analysis was not conducted here.

²⁰⁷ A VAR with a lag order of one was estimated for the pairs Indonesia-Philippines, Malaysia-Thailand, Philippines-Singapore and Philippines-Thailand. The VARs of all remaining pairs were estimated with two lags.

Country Response of:	IMP	CPI	NEER	NEER	IMP	CPI
Pairs: to shocks from	NEER	NEER	IMP	CPI	CPI	IMP
Indonesia-Malaysia	Х	0.084	Х	-0.062	Х	Х
Indonesia-Philippines	Х	0.104	Х	Х	-0.060	Х
Indonesia-Singapore	Х	0.092	Х	-0.124	Х	Х
Indonesia-Thailand	Х	0.075	Х	Х	Х	Х
Malaysia-Philippines	Х	0.080	Х	Х	Х	Х
Malaysia-Singapore	Х	0.014	Х	Х	-0.044	-0.015
Malaysia-Thailand	Х	0.017	Х	Х	Х	Х
Philippines-Singapore	Х	0.075	Х	Х	Х	Х
Philippines-Thailand	Х	0.099	Х	Х	Х	Х
Thailand-Singapore	0.164	х	Х	Х	Х	х

Table 11: Accumulated Responses after 2 periods in ASEAN5

Note: x = no significant response

These results show that with one exception (Thailand-Singapore), there is not expenditure-switching effect in ASEAN5. Also, two cases of a significant response of nominal exchange rates to inflation shocks and one case of a significant response of import prices to an inflation shock exists only in country pairs involving Indonesia. Additionally, dual causality between variables can be identified in several cases (CPI \leftrightarrow NEER in the pairs Indonesia-Malaysia and Indonesia-Singapore and IMP \leftrightarrow CPI in the case of Malaysia-Singapore), therefore reinforcing the need for a VAR estimation procedure. Finally, for the pair Malaysia-Singapore, a simultaneous significant response of import prices to an inflation shock and of inflation to import prices shocks was found, suggesting that adjustments in the real exchange rate arise from changes in the domestic price levels as opposed to the nominal exchange rate.

The similarity of the degree of bilateral exchange rate pass-through to relative inflation in the case of Indonesia and the Philippines with their ASEAN partners raises the question of whether this is due to the well-known fact that the US dollar has a large weight in the exchange rate policy of these countries.

Table 12 presents the accumulated response in percentage of the standard deviation of innovations after 2 periods of the same VARs now estimated with variables in US dollar terms²⁰⁸.

²⁰⁸ The lag order set according to the Sequential Modified Likelihood Ratio test was one for Malaysia, Philippines and Thailand, two for Indonesia and three for Singapore.

Response of:	IMP	CPI	NEER	NEER	IMP	CPI
Country: to shocks from	NEER	NEER	IMP	CPI	CPI	IMP
Indonesia	Х	0.088	Х	-0.089	-0.072	Х
Malaysia	х	х	х	х	х	0.022
Philippines	Х	0.050	Х	Х	Х	Х
Singapore	х	х	х	х	х	Х
Thailand	0.057	Х	Х	Х	Х	Х

Table 12: Accumulated Responses after 2 periods in ASEAN5 (variables in US dollars)

Note: x = no significant response

The results of Table 12 are broadly consistent with those of Table 11 and confirm Indonesia, followed closely by the Philippines, as being the country with the largest degree of exchange rate pass-through to inflation. Also, exchange rate pass-through to import prices is inexistent with the exception of Thailand. Additionally, both nominal exchange rates and import prices respond significantly to inflation shocks in Indonesia suggesting that the nominal exchange rate plays an important role in relative price adjustment. Finally, a significant response of inflation to import prices shocks was only found in Malaysia.

These results are mostly consistent with those of Ito and Sato (2006). In both studies, Indonesia exhibited the largest degree of exchange rate pass-through to inflation of the sample and Malaysia and Singapore revealed no exchange rate pass-through to both import prices and inflation. However, some differences also emerge. Ito and Sato (2006) found evidence that Thailand experienced a small degree of exchange rate pass-through to inflation and that Indonesia yielded a significant and large exchange rate pass-through to import prices. These differences are likely to be due to the fact that they use a different time span (they concentrated on the years immediately before and after the 1997-1998 Asian financial crisis) and a different frequency of data (monthly data).

These collective results have several implications for these countries' prospects of monetary union. A strong case for a rigid exchange rate regime can be made either when there is a total absence of exchange rate pass-through to both import prices and inflation (exchange rate disconnect) as the nominal exchange rate has no adjustment properties and thus a high degree of labour market and wage flexibility must be responsible for the necessary adjustment to shocks, or when there is one-to-one passthrough to domestic inflation (full pass-through) as the nominal exchange rate does not improve the country's competitiveness and destabilizes the inflation rate. In turn, in the case of incomplete pass-through it is difficult to establish any set policy rules. Incomplete pass-through can provide strong support for flexible exchange rates in the cases where the degree of pass-through to import prices is larger than the degree of pass-through to inflation as in this case the nominal exchange rate has some expenditure switching properties. Conversely, when the degree of pass-through to inflation is larger than to import prices, exchange rate flexibility does not help adjusting to asymmetric shocks and may be a source of inflation instability.

Accordingly, a strong case for a common currency can be made for Singapore and Malaysia, as they exhibit a case of exchange rate disconnect. For these countries, the necessary adjustment to asymmetric shocks must be coming from nominal wage changes and thus nominal exchange rate is not needed to provide further adjustment.

A case for a rigid exchange rate can also be made for Indonesia but for very different reasons. For this country, the nominal depreciation results in domestic inflation, which in turn affects import prices in a similar way thus offsetting any price competitiveness that could arise from the depreciation. Additionally, the increased inflation results in further depreciation of the currency magnifying the impact of the shocks. In this case, flexible exchange rates are a clear source of shocks to the economy²⁰⁹.

The case for the Philippines is less clear-cut, as the only significant response found was an incomplete response of inflation to nominal exchange rate shocks. This suggests that nominal exchange rates destabilise inflation and do not improve the country's competitiveness in the event of a shock which strengthens the case for a fixed currency but also implies a high degree of real wage flexibility which would increase the advantages of not joining a currency union.

Finally, for Thailand, a case for flexible exchange rates can be made as import prices respond to exchange rate shocks but inflation rates does not. In this case, a flexible exchange rate is affecting the price faced by domestic consumers of imported goods but not the price of domestic goods and therefore provides a certain degree of expenditure-switching effect.

The results included in this section partially explain the pattern of structural shocks found in previous studies²¹⁰. The fact that in those studies, Indonesia was found to have the largest monetary shocks in the grouping and at the same time yielded the lowest correlation coefficients of monetary shocks with its ASEAN partners is explained by Indonesia's central bank monetary policy reaction to shocks to the economy. Also, the very incomplete exchange rate pass-through to domestic prices

²⁰⁹ Ito and Sato (2006) show that Indonesia was the only country in their study that responded to the exchange rate shock resulting from the Asian financial crisis by increasing the base money significantly in order to keep commercial banks alive who experienced a serious nonperforming loans problem and in an attempt to maintain financial stability.
²¹⁰ See chapter IV for the estimates on the size, speed of adjustment and correlation coefficients of monetary, demand and supply

²¹⁰ See chapter IV for the estimates on the size, speed of adjustment and correlation coefficients of monetary, demand and supply shocks in the ASEAN5 countries.

found in ASEAN5, even in the case of Indonesia and the Philippines, suggests a high degree of labour market and wage rates flexibility which is likely to explain why ASEAN adjusts much faster to structural shocks than either the Euro-zone countries or the USA.

5.4 Sensitivity Analysis

In this section, a series of tests is conducted to assess the robustness of the results presented in the previous section, focusing on whether the results are sensitive to the ordering of the variables, to the de-trending method and to the frequency of the data.

The major drawback normally attributed to the recursive VAR method is that the results are sensitive to the chosen ordering of the variables as the variables that appear first in the ordering are assumed to have no contemporaneous response to the shocks emanating from the variables that follow. In order to investigate this, several alternative ordering of the variables were tested, with the results being identical in all cases. Furthermore, generalised IRFs were also computed and once again the results were identical. An example of the response of inflation to exchange rate shocks estimated with different Choleski ordering of the variables and generalised IRFs (for the pair Indonesia-Malaysia) is presented in Figure G-7 of Appendix G.

In order to assess the sensitivity of the results to the de-trending method used, the same VAR systems were re-estimated using HP filtering instead of first differencing of the variables. Figure G-8 of Appendix G presents a representative example (again for the pair Indonesia-Malaysia) of the results using the two alternatives methods. Overall, the results proved to be quite insensitive to the de-trending method used.

The disadvantage of using annual data for conducting the estimations on the degree of pass-through is that it might underestimate the degree of exchange rate pass-through as low frequency data is likely to miss important short-run dynamics. In order to investigate this matter, the same three-variable VAR was estimated for the two countries for which IFS data was available on import unit price indexes on a quarterly basis. Table G-1 of Appendix G, compares the results of the accumulated response in percentage of the standard deviation of innovations after 2 periods for Singapore and Thailand, using annual and quarterly data in US dollars²¹¹. The data for the import prices comes, in this case, from the IFS database (import unit value index), as quarterly data could not be generated for this frequency using the method employed in the

²¹¹ Data on the nominal effective exchange rate was once again generated using the IMF weights. The sample for Singapore is 1975 to 2001 and for Thailand is 1968 to 2001. Quarterly VARs were estimated with quarterly dummies as exogenous variables and with 4 lags for Singapore and 8 for Thailand.

previous section. Table G-1 of Appendix G shows that, as expected, the use of annual data implies missing some of the shorter term dynamics²¹². For both Singapore and Thailand, the use of quarterly data allows for the identification of some significant (but very small in size) responses that are not captured by the annual data estimations. However, overall the results from the quarterly data estimations are in line with those from the annual data estimations and therefore, support the validity of the results presented in the previous section.

5.5 Final Remarks

The main contribution of this chapter is, for the first time, to investigate the degree of exchange rate pass-through to domestic prices in all five founding members of ASEAN. For this purpose, a three variable recursive VAR model was applied which uses the Choleski decomposition method along the distribution chain of pricing, using data for the period 1968 to 2001.

Based on the evidence of the empirical analysis, a strong case for entering a currency union can only be made for Singapore and Malaysia as in these countries there appears to be a case of exchange rate disconnect. A case for a common currency can also be made for Indonesia but for entirely different reasons. For this country, an independent monetary policy is a clear source of shocks to the economy and therefore a currency union would tend to eliminate them. However, the costs of entering a currency union would be much larger for Indonesia than for Singapore and Malaysia without the prior strengthening of financial system in that country, as domestic commercial banks could not be bailed out by the central bank in the event of a currency crisis. A weaker case for a common currency can be made for the Philippines as evidence of some exchange rate pass-through to inflation was found but not to import prices. Finally, Thailand exhibits a clear case of exchange rate pass-through to import prices (but not to inflation) and thus evidence that a flexible exchange rate might be preferable as it provides the means to improve the country's price competitiveness. The sensitivity analysis showed the results to be very similar independently of the ordering of the variables and the de-trending method used. Also, it showed that although the use of quarterly data allows for the identification of a larger number of significant responses, the results are consistent with the results from annual data estimations.

 $^{^{212}}$ It is worth noting, however, that the data for *imp* is not the same for both frequencies. Despite the reasonably high correlation found between the import data generated with COMTRADE data and from the IFS database, it is possible that some of the differences in the results arise from the use of slightly different datasets.

In this way, this study provides further evidence of the existence of a core group of countries, comprised of mainly Malaysia and Singapore and to some extend by Indonesia, which is better prepared for monetary union than a periphery comprising the Philippines and Thailand. Chapter VI

Intra-Industry Trade and Business Cycles in ASEAN²¹³

6.1 Introduction

The Association of Southeast Asian Nations or ASEAN was established in Bangkok in 1967 and even if it seems unquestionable that it has been successful in containing intra-ASEAN conflicts and in providing a forum for the discussion of regional matters, it also seems consensual that ASEAN has failed in asserting itself as a political force on the world stage and has been disappointing in terms of tangible economic benefits for its members²¹⁴. This has led some authors to describe ASEAN as an enigma in Asia because of its longevity as a trading block which is always at the crossroads in the sense that "it fails to deliver and periodically something always needs to be done to revitalize the integration process".²¹⁵

Recently, however, a new resolve for both increased economic integration and monetary and exchange rate cooperation has started to emerge, especially since the 1997-1998 Asian financial crisis. In fact, and paradoxically, the Asian financial crisis increased economic disparities within the region making monetary integration more difficult while at the same time, by showing the flaws of unilateral exchange rate pegging, worked as a "wake up call for ASEAN"²¹⁶ which increased the interest in a common currency arrangement for the region²¹⁷. In fact, a full currency union in ASEAN has become an inevitability for some of the most 'OCA-philes', at least in the long run²¹⁸. The recent popularity of the 'hollowing-out' hypothesis seems to leave no

²¹³ 'This chapter has been accepted for publication in *Applied Economics*.

²¹⁴ A recent paper by Lim and McAleer (2004), for example, using several different techniques did not find clear evidence of any income convergence and catching up in ASEAN suggesting that the existing gaps are not closing with time. It must be said, however, that since their data only covers the years from 1966 to 1992, that the opposite might be true after that period, especially since the introduction of AFTA.

²¹⁵ Wilson (2002), p. 6. Pomfret (1996) is the author of the 'always at the crossroads' argument. The original five members of ASEAN or ASEAN5, Indonesia, Malaysia, Philippines, Singapore and Thailand have since been joined by Brunei Darussalam (1984), Vietnam (1995), Laos and Myanmar (1997) and Cambodia (1999). ²¹⁶ Yong (2004), p2.

²¹⁷ Notable initiatives to promote regional financial stability and monetary policy cooperation include the establishment of 'Manila Framework Group' in 1997, the 'ASEAN Surveilance Process' in 1998 and the "Chiang Mai Initiative' in 2000. Recent initiatives to promote economic integration include the ASEAN Free Trade Area (1992) and the adoption of the so-called "ASEAN's Vision 2020" in 1997 where a timetable was established to create an ASEAN Economic Region.

²¹⁸ Recently Mundell (2001), defended that Asia eventually needs a common currency even though it recognised that it cannot at present have a single currency, p.18.

choice for ASEAN but to decide between fully flexible exchange rates or a common currency²¹⁹.

Even though there has been a large increase in intra-regional trade in ASEAN since the beginning of the 90s it is not clear that it occurred as a direct effect of the tariff reduction or a more general trend in the world markets²²⁰. It does, nevertheless, raise the question of whether the large increased Intra-Asean Trade in recent years is creating more harmonized business cycles amongst its members since in light of the existing literature on optimum currency areas these are two of the most important criteria on the suitability of adopting a currency union (or other fixed or semi-fixed currency arrangements).

The degree of trade integration is believed to be an important OCA argument since it affects the likelihood of asymmetric shocks and their transmission between countries. The effect of more trade between two countries on the harmonization of business cycles is not, however, clear cut in the existing economic theory. Kenen (1969) was the first to suggest that well diversified economies, having a large share of intraindustry trade (IIT) in their total trade, will experience less asymmetric shocks. Conversely, Krugman (1991, 1993) warned that the potential for asymmetric shocks increases with greater integration among countries (and regions) since it increases their specialisation. These two opposing views on what would be the effect of closer integration on regional specialisation (and thus on the costs and benefits of joining an OCA) are what came to be known as 'The European Commission View' and 'The Krugman View'²²¹.

The European Commission view states that closer integration will lead to a situation whereby asymmetric shocks will occur less frequently. The reasoning is that since most trade between European countries is intra-industry trade, the more integrated they are, the more similarly they will be affected by disturbances and therefore the more synchronised their business cycles will be. Conversely, Krugman's view, taking the United States as an example, is that increased integration leads to increased regional concentration of industries (in order to profit from economies of scale) and thus more trade will lead to more divergence between countries.

²¹⁹ See Eichengreen (1999) and Wyplosz (2001).

²²⁰ Sharma and Chua (2000) found empirical evidence that the "ASEAN integration scheme did not increase intra-ASEAN trade" and that "increase in ASEAN countries trade occurred with members of a wider APEC group", p. 167. A more recent study by Elliot and Ikemoto (2004) reinforce these findings and even come to the conclusion that the degree of trade creation in the years immediately after the signing of the AFTA agreement in 1993 was actually lower than for the preceding period of 1988-1992.
²²¹ De Grauwe (1997) was the first to use these denominations. The first accrues from European Commission (1990) and the second from Krugman (1991, 1993). Patterson and Amati (1998) quote Peters (1995) as dividing the same opposite approaches as the 'Convergence School' and the 'Divergence School'.

The ambiguity in the economic theory on this matter has made this an essentially empirical matter. In two seminal papers, Frankel and Rose (1997, 1998) argue that closer trade relations result in a convergence of business cycles, i.e., that both international trade patterns and international business cycles correlations are jointly endogenous and thus that any monetary union creates *ex-post* an optimum currency area²²². Frankel and Rose report a significant and positive correlation between trade intensity and the correlation of business cycles as measured by four separate indicators of economic activity in a cross-section of OECD countries between 1959 and 1993. Kenen (2000) argues that Frankel and Rose's results should be interpreted cautiously. He shows in a framework of the Keynesian model that the correlation between two countries' output changes increases unambiguously with the intensity of trade links between these countries but this does not necessarily mean that asymmetric shocks are reduced as well.

A number of recent empirical studies seem to confirm a positive correlation between intra-industry trade and business cycles synchronisation, and that increased trade itself does not necessarily lead to business cycle harmonisation. Firdmuc (2004) found that when Frankel and Rose's model was augmented to include intra-industry trade there was no relation between business cycles and trade intensity. Intra-industry trade, however, was found to have a positive and significant relationship with business cycles for the OECD countries between 1990 and 1999. Shin and Wang (2003), applying a model which included a larger set of explanatory variables found that intraindustry trade is the major channel through which the business cycles of 12 East Asian economies become synchronised and that increasing trade itself does not necessarily lead to greater synchronisation of business cycles. Gruben, Koo and Millis (2002) show the instrumental variables used by Frankel and Rose in their study to be inappropriate and to result in inflated results. They develop an OLS-based procedure adding structureof-trade variables to the model to separate the effects of intra- and inter-industry trade and to include a number of omitted variables for the countries. Their findings are consistent with Frankel and Rose's and conclude that specialisation does not asynchronise business cycles between the OECD countries.

These recent empirical contributions suggest that the effect of more trade between two countries on the harmonization of business cycles depends not only on the intensity of trade links but on the structure of that trade. If more trade means more intra-

²²² They conclude that "a naïve examination of historical data gives a misleading picture of a country's suitability for entry into a currency union, since the OCA criteria are *endogenous*", (1998, p. 1010).

industry trade, we should expect more common shocks and thus, more business cycle harmonization. If, however, more trade means more specialization, we should expect more idiosyncratic shocks.

The contribution of this paper is to test this hypothesis in the special case of ASEAN, that is, to investigate whether the recorded increase in intra-ASEAN trade in recent years, measured at the highly disaggregated 4-digit industry level, is leading the ASEAN members to closer economic integration and thus creating better preconditions for policy integration and the creation of a common currency area. As will be discussed below, there is a lack of consensus on the correct methodology to use for this purpose and therefore several methods are employed.

The chapter is structured as follows: The next section will explain the data and empirical methodology and present the empirical results. Finally, the last section concludes the chapter.

6.2 Data, Empirical Methodology and Results

To measure output co-movements, annual data on real GDP was collected for the ASEAN5 countries over the period 1962-1996 from the IMF International Financial Statistics CD-ROM. The period after 1997 is excluded because the data is likely to be distorted by the 1997-1998 Asian Financial Crisis²²³. Data on the other ASEAN countries was not available and therefore these countries were excluded from this study.

Intra-Industry Trade in ASEAN was measured using the traditional Grubel-Lloyd (1975) Index. The IIT indexes were computed for all industries over the period 1962-1996 using the 'World Trade Flows, 1962-2000' data compiled by Feenstra, Lipsey, Deng and Ma (2005) at the four-digit industry classifications following the Standard International Trade Classification, revision 2²²⁴.

Since there is no consensus on the correct methodology to apply, several models will be tested. Firstly, the variation of Frankel and Rose's (1997) model first applied by Firdmuc (2004) will be estimated:

$$Corr(Q_i, Q_j) = \alpha + \beta IIT_{ij} + \varepsilon$$
(4)

²²³ In any case, a recent study by Zhang, Sato and McAleer (2004) found evidence that the Asian Financial crisis has increased the degree of supply, demand and monetary shock correlation among ASEAN countries. Therefore, the exclusion of this period from the analysis should not overstate the results.
²²⁴ Originally, this study intended to include not only the Grubel and Lloyd (1975) intra-industry trade index but also the measures

²²⁴ Originally, this study intended to include not only the Grubel and Lloyd (1975) intra-industry trade index but also the measures developed by Abd-el-Rahman (1991) and Fontagné and Freudenberg (1997) for vertical and horizontal intra-industry trade. That was not possible; however, as the sample included a significant number of zero observations which would greatly limit the analysis.

where $Corr(Q_i,Q_j)$ stands for the correlation of de-trended real GDP and IIT_{ij} denotes the average four-digit level of intra-industry trade index between ASEAN5 countries i and j in each period and ε is the error term²²⁵. The sign of the coefficient β if negative will indicate that the specialisation effect dominates in ASEAN ('Krugman View') and if positive will mean that more intra-industry trade leads to more output synchronisation in that region (European Commission View). As stated above, most empirical evidence to date seems to be consistent with the latter possibility so that we expect a positive coefficient for IIT^{226} .

Frankel and Rose (1997) note that countries are likely to orient their monetary policy and fix exchange rates towards their most important trade partners. In the case of ASEAN it is well known that the US dollar has a large weight in the exchange rate policies leading them to pursue broadly similar monetary policies. As noted by Firdmuc (2004), it is quite possible that bilateral trade reflects the adoption of a common exchange rate policy and not vice-versa. This suggests the need to instrument the regressions by exogenous determinants of intra-industry trade. The instruments normally chosen for the two-stage least squares (TSLS) are the ones provided by the gravity models and include the log of distance between countries and a dummy for geographic adjacency²²⁷. However, Gruben, Koo and Millies (2002) suggested that these instruments might be inappropriate and result in inflated results. However, the authors also find when using an alternative OLS-based approach, that their results are consistent with those of Frankel and Rose's model. Accordingly, the results for both OLS and TSLS are presented for (4).

Following Frankel and Rose (1997), the whole sample period is divided into four sub-sample periods: 1962-70, 1971-79, 1980-88 and 1989-96 in order to access time-series changes in intra-industry trade patterns and business cycles correlations. As there is no consensus on the proper de-trending method to apply, the four alternative methods of de-trending real GDP first applied by Frankel and Rose (1997) namely, first-differencing, HP-filtering, quadratic de-trending and HP-filtering on the residual of a regression of the real GDP on a constant and 5-year period dummies, were used²²⁸.

²²⁵ Originally, Frankel and Rose (1997) used the model $Corr(Q_i, Q_j) = \alpha + \beta TI_{ij} + \epsilon$, where TI_{ij} stands for trade intensity between countries i and j. They used four de-trending methods for real GDP and three other measures of economic activity and three measures of trade intensity, defined in relation to exports, imports and trade turnover.

²²⁶ This is especially true as the specialisation effect is more likely to exist in terms of inter-industry trade than intra-industry trade.
²²⁷ These two variables are known to be highly correlated with intra-industry trade (see for example Loertscher and Wolter (1980) and Hummels and Levinsohn(1995)). Both shorter distance and common border are expected to increase intra-industry trade for three main reasons, lower transportation costs, cultural similarities and similar resource bases which increases the likeliness of

²²⁸ Unlike Frankel and Rose (1997) the data frequency in the present study is annual. Therefore, some adjustments needed to be made, namely, first differencing instead of fourth-differencing and the use of 5-year period dummies instead of quarterly dummies for the quadratic de-trending and HP-filtering of a regression of real GDP on a constant and period dummies.

Since the sample includes 5 countries, the number of observations will be 40 (10 country pairs each with four period observations).

Table 13 reports the results of eight separate specifications, corresponding to the four de-trending methods discussed above, applied to both OLS and TSLS estimations²²⁹.

		1		2)		2)	,	
	(`	1)	(2	2)	(.	3)	(4	4)
	OLS	TSLS	OLS	TSLS	OLS	TSLS	OLS	TSLS
Contant	0.28553	0.231486	0.496143	0.4719848	0.411791	0.2604285	0.868709	0.829763
	(4.09)	(2.37)	(5.82)	(4.01)	(3.88)	(1.68)	(21.90)	(14.76)
IIT	0.003537	0.0100578	0.006479	0.0093942	0.013026	0.031288	0.003376	0.0080749
	(0.64)	(1.02)	(0.96)	(0.79)	(1.55)	(2.00)	(1.08)	(1.42)
R-squared	0.0107		0.0238		0.0597		0.029626	
no. Obs.	40	40	40	40	40	40	40	40

Table 13: Intra-Industry Trade and Business Cycles in ASEAN – Model (4)

Notes: Model: Corr(Q_{it}, Q_{jt}) = $\alpha + \beta IIT_{itj} + \varepsilon_{ijt}$

(1) to (4) correspond to regressions of alternative data de-trending techniques, namely, first-differencing, HP-filtering, quadratic detrending and HP-filtering on the residual of a regression of the real GDP on a constant and 5-year period dummies. Instrumental variables for Intra-Industry Trade (TSLS results) are log of distance and dummy variable for common border.

Absolute value of t-values with robust standard errors in parenthesis.

Bilateral annual data from ASEAN5 countries, from 1962 to 1996 split into four sub-periods. IITij is the bilateral average fourth SITC IIT in each sub-period.

The results are very weak. Even though IIT yielded the expected sign in all specifications, it was found to be significant (and only marginally so) in only one case. Also, as expected, the TSLS versions of (4) generate more robust results than the OLS estimates. However, the question of whether the variables used as instruments are valid instruments, i.e., uncorrelated with the error term, might cast some doubt on the results.

In order to investigate this matter, a procedure developed by Baum, Schaffer and Stillman (2003) is applied that allows for the determination of the Hansen test of overidentifying restrictions in $TSLS^{230}$. The results are presented in Table 14.

Table 14: Hansen Tests to the	Validity of the	Instruments of Model (4)
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	(1)	(2)	(3)	(4)
	TSLS	TSLS	TSLS	TSLS
Contant	0.231486	0.4719848	0.2604285	0.829763
	(3.78)	(4.95)	(1.46)	(16.49)
ΙΙΤ	0.0100578	0.0093942	0.0312887	0.0080749
	(2.34)	(1.21)	(1.68)	(1.51)
Hansen J Statistic	1.467	1.036	2.492	2.221
Chi-Square(1) P-Val	0.226	0.308	0.114	0.136
no. Obs.	40	40	40	40

Model: Corr(Q_{it}, Q_{jt}) = $\alpha + \beta IIT_{itj} + \varepsilon_{ijt}$

(1) to (4) and IIT assume the same meaning as in Table 13.

Instrumental variables for Intra-Industry Trade (TSLS results) are log of distance and dummy variable for common border. Absolute value of t-values with robust standard errors to both heteroskedasticity and arbitrary intra-group correlation in parenthesis.

²²⁹ All estimations were conducted with Stata version 8.2.

²³⁰ Baum, Schaffer and Stillman (2003) developed a STATA module called ivreg2 for extended TSLS estimation and instrument validity testing.

The Hansen test included a specification that takes into account the possibility that observations might not necessarily be independent within the group of countries under analysis. As the null hypothesis of the Hansen test is that the instruments are valid, i.e., that the instruments are uncorrelated with the error term, the instruments can reasonably be accepted as being valid in all four specifications. Once again only one specification was found to be significant but in this case corresponds to the estimation of (4) using first-differenced de-trended data (specification (1)) instead of the estimation using quadratic de-trending data (specification (3)) in Table 13. To all effects, the size of the estimated coefficient β (0.01) is much smaller than the results reported by Firdmuc (2004) for the OECD countries (0.175)²³¹ using a similar methodology. The extremely low values of the R-squares suggest that there are other factors beyond intraindustry trade – like demand shocks - producing business cycle harmonisation, generating a problem of omitted variables.

The division of the sample period into sub-periods in (4) raises a number of important issues. First, by creating sub-periods, we are in fact using small period averages of the variables which greatly reduces the number of observations in the estimations and its explanatory power which creates an error in variable (EIV) problem, especially when using annual data. Second, the division of the whole sample period into four more or less arbitrary periods raises the question of whether these smaller periods are able to capture the business cycles. Finally, as the analysis below will demonstrate, the explanatory variable is non-stationary and since this issue is not addressed in (4) the results may in fact be spurious.

In order to try to overcome these problems, the following model is estimated:

$$(\Delta Q_i - \Delta Q_i)^2 = \alpha + \beta \Delta IIT_{ii} + \varepsilon$$
⁽⁵⁾

where Q_i , Q_j , IIT_{ij} and ε assume the same meaning as in (4). This alternative model has the great advantage of using yearly data and therefore of greatly increasing the number of observations. Since (5) is to be estimated using panel data, for the results to be valid both the dependent variable and the regressor need to be stationary. For that purpose, several alternative unit root tests were conducted for both variables. The results are presented in Appendix H.

²³¹ Firdmuc (2004) however, uses quarterly instead of annual data which might account for some of the difference. Also, in his study the IIT indexes were computed for three-digit SITC commodity groups. Immediate conclusions should, therefore, be avoided.

First, a Fisher type unit root test for panel data, developed by Madalla and Shaowen (1999) was conducted for the variable IIT using both an augmented Dickey-Fuller (ADF) test and a Phillips-Peron (PP) test. This test assumes that all series are non-stationary under the null hypothesis against the alternative that at least one series in the panel is stationary. Table H-1 of Appendix H reports the results. The results show that we cannot reject the hypothesis that all 10 individual time series contain unit roots.

As there seems to be no agreement on the validity of panel unit root tests, ADF and PP tests were also conducted for all individual IIT time-series in first-differences. The tests were conducted with one lag and a constant and a trend in the test regressions for the cases where a trend was found to be significant and only a constant for the remainder cases. Table H-2 of Appendix H presents a summary of the results and shows all series to be integrated of order 1 at the 1% level of confidence in at least one of the tests. The results presented in Tables H-1 and H-2 show that we can reasonably assume the first-difference of the variable IIT to be stationary.

Next, we look at the dependent variable. Once again both the ADF test and the PP test were regressed for all individual series of the dependent variable, using three alternative data de-trending methods, namely, HP-filtering, quadratic-de-trending and HP-filtering on the residual of a regression of the real GDP on a constant and 5-year period dummies²³². The results are presented in Table H-3 of Appendix H. The dependent variable was found to be stationary in two data de-trending methods, namely quadratic de-trending and HP-filtering on the residual of a regression of the real GDP and 5-year period dummies. However, the dependent variable de-trended by HP-filtering was found to be non-stationary in both tests in at least three individual time series. Accordingly, regressions of (5) will only be conducted using the two series found to be stationary.

Due to the construction of the model, the sign of β now assumes the opposite significance of the previous models, that is, a negative sign implies that an increase in intra-industry trade will reduce differences in the growth rate of business cycles across ASEAN countries.

As stated before, OLS estimations of (5) may be inappropriate in this case. Therefore, the regressions of (5) will be estimated by TSLS using the same instruments used in (4) as they proved to be valid in that case. Table 15 shows the results for the TSLS estimates of (5) which also included a specification that takes into account the

²³² First-differencing of the data was excluded as it did not, in this case, remove the trend in the data.

possibility that observations might not necessarily be independent within the group of countries under analysis.

	(1)	(2)
Contant	13.83819	37.08033
	(2.64)	(2.23)
ΔΙΙΤ	-16.03203	-45.78226
	(1.92)	(1.75)
Hansen J Statistic	0.165	0.218
Chi-Square(1) P-Val	0.68	0.64
no. Obs.	340	340

Table 15: Intra-Industry Trade and Business Cycles in ASEAN – Model (5)

Model: $(\Delta Q_{it} - \Delta Q_{jt})^2 = \alpha + \beta \Delta IIT_{itj} + \epsilon_{ijt}$

(1) and (2) correspond to regressions of two alternative data de-trending techniques, namely, quadratic-de-trending and HP-filtering on the residual of a regression of the real GDP on a constant and 5-year period dummies.

Instrumental variables for Intra-Industry Trade are log of distance and a dummy for common border.

Absolute value of t-values in parenthesis with robust standard errors to both heteroskedasticity and arbitrary intra-group correlation.

The coefficient of IIT yielded the expected sign in both specifications suggesting that the increase in intra-ASEAN trade has led to more synchronised business cycles amongst its members. The coefficients for IIT were not, however, found to be very significant with only one (specification 1) being significant at the 10% level.

As before, the Hansen test was estimated and included a specification that takes into account the possibility that observations might not necessarily be independent within the group of countries under analysis. The results show that once again the instruments used can be considered valid as we cannot reject the null hypothesis that the instruments are uncorrelated with the error term.

In order to further test the robustness of the results, the same two specifications of (5) were estimated using as instruments not only the log of distance and a dummy for common border but also dummies for each period (minus one) of the whole sample period. Table 16 presents the results.

	(1)	(2)
	TSLS	TSLS
Contant	9.212954	25.49597
	(0.38)	(0.37)
ΔΙΙΤ	-16.03203	-45.78226
	(1.82)	(1.66)
no. Obs.	340	340

Table 16: Estimations for Model (5) with Year Dummies as Instruments

Model: $(\Delta Q_{it} - \Delta Q_{jt})^2 = \alpha + \beta \Delta IIT_{itj} + \varepsilon_{ijt}$

(1) and (2) assume the same meaning as in Table 15.

Instrumental variables for Intra-Industry Trade are log of distance, a dummy for common border and dummies for each year (minus one) of the sample data.

Absolute value of t-values with robust standard errors in parenthesis.

The results are identical with those of Table 15. Once again, the coefficients for IIT were not found to be significant.

Finally, in order to access the possible influence of one individual country in the results of the whole group, (5) was estimated excluding all the data involving each of the countries with the remaining pairs, that is, instead of including all of the 5 countries (10 pairs) in the sample, 5 separate regressions using the data of four countries (6 pairs) were computed. In these TSLS estimations, apart from the log of distance and a dummy for land border, dummies for each year (minus one) of the data sample were also included. The results are presented in Table 17.

	(1)	(2)
without Indonesia		
ΔIIT	-14.97145	-45.85273
	(3.43)	(3.67)
without Malaysia		
ΔIIT	-21.60093	-67.11973
	(0.64)	(0.64)
without Phillipines		
ΔIIT	-4.97638	-4.750257
	(0.97)	(1.04)
without Singapore		
ΔIIT	-16.21151	-48.45178
	(0.73)	(0.75)
without Thailand		
ΔIIT	-6.1948	-17.46528
	(0.79)	(0.75)
no. Obs.	204	204

Table 17: Estimations for (5) using Alternative Combinations of 4 of the ASEAN5.

Model: $(\Delta Q_{it} - \Delta Q_{jt})^2 = \alpha + \beta \Delta IIT_{itj} + \varepsilon_{ijt}$

(1) and (2) assume the same meaning as in Table 15. Constants not reported.

Excluding one country from the sample does not significantly change the previous outcome with one notable exception. When Indonesia is excluded from the sample, the coefficient of IIT becomes significant at the 1% level in both specifications. The explanation for this result might be that because Indonesia is the largest and relatively more closed economy of the group it is less integrated with the rest of ASEAN than its smaller and more open partners.

Furthermore, these results also show that the recorded increase of intra-industry trade amongst Malaysia, the Philippines, Singapore and Thailand has led to the

Instrumental variables for Intra-Industry Trade are log of distance and a dummy for common border and dummy variables for each year (minus one) of the sample data.

Absolute value of t-values in parenthesis with robust standard errors to both heteroskedasticity and arbitrary intra-group correlation.

synchronisation of business cycles among its members. This result is consistent with previous empirical studies in confirming the 'European Commission View'²³³.

6.3 Final Remarks

Frankel and Rose (1997, 1998) found that business cycles synchronisation increases with trade intensities leading them to conclude that these two important OCA criteria – trade links and similarity of business cycles - are jointly endogenous. This argument is a source of contention and can be interpreted as an invitation to disregard the 'static' OCA theory and encourage the early introduction of a monetary union since a country is more likely to satisfy the [OCA] criteria for entry into a currency union *ex post* than *ex ante* due to lowered asymmetrical shocks.

Recent empirical studies have shown, however, that increasing trade itself does not necessarily lead to more synchronisation of business cycles. The effect of more trade between two countries on the harmonization of business cycles depends not only on the intensity of trade links but on the structure of that trade. More trade will mean more synchronised business cycles only if it is of the intra-industry type, as we should expect more common shocks across countries. Otherwise, more trade might mean more specialization, and we should expect more idiosyncratic shocks.

This paper sets to test whether the recorded increase in intra-ASEAN trade is leading the ASEAN members to closer economic integration and thus to better satisfy the criteria for a common currency. Two separate models are estimated for that purpose. Firstly, a variation of the model of Frankel and Rose (1997) first used by Firdmuc (2004) was estimated for the ASEAN members. Following Frankel and Rose (1997) four alternative data de-trending techniques were applied in both OLS and TSLS regressions. The results were very weak, with only one specification out of eight being statistically significant even if all the results yielded the expected positive relation between intra-industry trade and the synchronization of business cycles. Furthermore, this methodology has some flaws which may invalidate the results.

Therefore, a new methodology was implemented. Unlike previous studies, our own panel data model uses the whole sample data instead of dividing it into sub-groups which greatly increases the number of observations in the regressions. The results with our own model for ASEAN5, using two alternative data de-trending techniques suggested a positive correlation between intra-industry trade and business cycle

²³³ It should be noted that this is not necessarily a rejection of 'Krugman's View'. The specialisation effect is more likely to exist as regards to inter-industry trade than for intra-industry trade.

synchronization in ASEAN but were not very significant. However, when excluding Indonesia from the sample, the result becomes highly significant for both data detrending methods. The results are very robust even when using the highly disaggregated SITC fourth-digit industry data for all reported trade unlike most previous studies that either use the three-digit level of data aggregation (Frankel and Rose (1997,1998), Gruben, Koo and Millis (2002), Firdmuc (2004)) or a limited number of industries (Shin and Wang (2003)). Also, it was shown that the instruments used in the two-stage least squares of both models included in this paper $-\log$ of distance and a dummy for a geographic adjacency - to be valid, which further strengthens our conclusions. This outcome contrasts with Gruben, Koo and Millies (2002) which report the instrumental variables used by Frankel and Rose in their study to be inappropriate and to result in inflated results.

These results have important implications for the prospects of the creation of a common currency in ASEAN. As intra-industry trade leads to business cycle synchronization with respect to Malaysia, the Philippines, Singapore and Thailand, the costs of joining a currency union in ASEAN will diminish when intra-industry trade is dominant. Therefore, even if we take the endogenous OCA criteria hypothesis as valid - that a monetary union creates *ex-post* an OCA - the 'static' OCA theory is still relevant since observing the initial conditions for a potential monetary union will give us an idea of how costly it would be for each member and how the economic policy can decrease the adjustment costs.

Prospects for Monetary Cooperation in ASEAN

Chapter VII

Conclusions

The momentum for further economic, financial and monetary cooperation in ASEAN has undeniably gathered pace in recent years. The degree of political commitment has been steadily increasing not only in ASEAN but in all East Asia, especially in the aftermath of the 1997-1998 Asian Financial Crisis. In fact, ASEAN leaders have now agreed not only to establish a full economic community by 2020 (since brought forward to 2015) but also to explicitly study the feasibility of a common currency and exchange rate system.

Based on the region's history there seems to be a general consensus that ASEAN will not be ready for a common currency for many years to come. The main problem lies with the inexistence of a strong collective institution-building record which in turn may be seen as a lack of political will to support the necessary loss of national sovereignty that closer economic and monetary integration implies. The decision to adopt a new monetary arrangement will always be largely political in nature, as indeed it can be argued was the case with the only real example of a new monetary union to date: the introduction of the Euro in 1999.

Nevertheless, the question of whether ASEAN is a viable monetary union remains. Therefore, the main question motivating this study is whether there are sufficient economic reasons to justify a common currency for ASEAN.

A review of the main theory (chapter II) and empirical works (chapter III) on optimum currency areas showed that it is (still) much easier to identify a *pessimum* currency area than an optimum currency area. The OCA concept is hard to *operationalise* as it involves a large number of sometimes conflicting criteria and there is not yet a consensus on which criteria are more important or on the right methodology to apply.

Most recent contributions on optimum currency areas have been empirical rather than theoretical. Most of the theoretical foundations have been around for decades and
are now well established. This study continues this trend by further developing the empirical research and expands the existing literature in some important ways.

First, a study on the type, size and frequency of asymmetric disturbances affecting ASEAN countries suggested, in line with most of the existing literature, the existence of a core group of countries, comprising Singapore, Malaysia and Indonesia, which experienced smaller and more correlated shocks than a periphery comprising the Philippines and Thailand. Furthermore, this study expanded the existing literature by applying a dynamic analysis of the shock asymmetry in ASEAN in the context of a state-space model which allows for the identification of the evolution of the degree of the symmetry of shocks with a regional partner over time. The results indicated that the periphery countries are not only not catching up with the core group but have actually been diverging since the beginning of the 90's, thus suggesting that the economic foundations for an ASEAN5-wide monetary union are not getting stronger.

The analysis carried out in the following chapter, which for the first time applied a three variable recursive VAR model using the Choleski decomposition method along the distribution chain of pricing for all ASEAN5 members, reinforced these results. In fact, the study on the degree of exchange rate pass-through to domestic prices in all five founding members of ASEAN showed that a strong case for entering a currency union could only be made for Singapore and Malaysia as these countries appear to exhibit a case of exchange rate disconnect. For the Philippines some evidence of exchange rate pass-through to inflation but not to import prices was found, making it a weaker case for a common currency. Conversely, the evidence for Thailand provided a strong case for flexible exchange rates; here the exchange rate was found to provide a strong expenditure-switching effect, thus providing the means to absorb shocks to the economy. Finally, for Indonesia a case for a common currency could also be made, as in this case an independent monetary policy is a clear source of shocks and therefore a currency union would tend to eliminate them.

In the last empirical chapter (Chapter VI), with the exception of Indonesia, the results showed that intra-industry trade is leading the founding members of ASEAN to closer business cycle synchronization thus reducing the costs of joining a currency union. The proposed establishment of a ASEAN Economic Community in 2015 with the corresponding elimination of the restrictions on the movement of goods, services, investment, skilled labour and the establishment of freer flow of capital is likely, as a result, to enhance the region's prospects for monetary integration.

To conclude, the combined evidence of this study suggests that three of ASEAN5 countries are better prepared for a currency union: Malaysia, Singapore and Indonesia. The Philippines, and especially Thailand, should not embark on this project without further economic integration with the core.

Malaysia and Singapore would possibly make a viable currency union because they are already well integrated with each other and therefore an independent monetary policy is not needed to help their economies accommodate to asymmetric shocks. The case for Indonesia, however, resides on very different grounds. Here, the monetary authorities have in the past actively pursued independent monetary policies but these have not been effective. In fact, instead of allowing the economy to absorb shocks, Indonesia's monetary policies were found to be a clear source of shocks. The move to a currency union would provide the discipline and credibility needed to improve its poor inflation record which in turn would encourage further investment and trade. That is not to say that the transition to a common currency would be painless. As shown by Ito and Sato (2006), the main reason for the country's poor performance during and immediately after the 1997-1998 Asian Financial Crisis, was the Central Bank's massive liquidity support to commercial banks, which resulted in an expansion of bank loans and M2 to prevent both corporations and banks from failing and in an attempt to maintain financial stability. However, Indonesia's financial system was already very fragile before the crisis "as most banks had [a] negative equity position before the massive capital injection by the government in 1998" (p. 25). Therefore, a move to a fixed exchange rate regime should not be attempted in Indonesia without a prior strengthening of its financial system.

The view that an ASEAN5 currency area should be implemented sooner rather than later on the basis that a monetary union always creates *ex-post* an optimum currency area is, in my view, questionable: this study shows that the costs of such a move would not be spread evenly amongst its members. The plausible step would be for ASEAN5 to implement a two-speed monetary integration process or delay the project until the conditions are favourable for all ASEAN5 members to join in by implementing the appropriate economic policies that can lower the adjustment costs of such a move.

My opinion, however, coincides entirely with that of Mundell (2001) in that the formation of a currency union is inevitable for ASEAN5 in the long run, especially after the introduction of the planned ASEAN Economic Community, as closer economic integration will, through increases in intra-ASEAN trade, lead to more synchronised business cycles and therefore to smaller and more correlated asymmetric shocks.

The main shortcomings of this study were almost all related to the great difficulties encountered in accessing high quality data for the ASEAN countries for the matters under study, which greatly limited the original intended scope of this thesis. This is fairly common when dealing with developing countries but ASEAN rates particularly badly in this respect.

Some of the problems encountered were overcome with some effort but others were unsurpassable. This was the case of the data for the real effective exchange rates in Chapter IV. In this case, not even annual data was available for all ASEAN5 countries (much less for the ASEAN10). In fact, IMF's International Financial Statistic database does not have any entries for Malaysia or Indonesia. With some assistance, it was possible to compute these values on an annual basis but not on higher frequencies as would obviously be desirable.

Similarly, data on import prices used in the estimations in Chapter V was not available for all ASEAN5 countries, even on an annual basis. A proxy for import prices based on UN's COMTRADE database was produced, but even in this case serious problems were found. For example, trade data for the year 2002 for Malaysia was not available for any industry which restricted the time range of the estimations. Clearly, the use of quarterly or even monthly data would be highly advantageous for the study of exchange rate pass-through as the use of annual data is likely to miss some of the short run dynamics.

Finally, data on some important adjustment mechanisms to asymmetric shocks such as labour mobility and wage flexibility was simply not available and thus no analysis on these matters could be conducted, even though these are likely to play an import role in the region.

As the process of economic integration in ASEAN develops, the interest of the research community is likely to continue and is greatly dependent on ASEAN members (or the ASEAN Secretariat) compiling better datasets on economic and financial statistics. Given this, several areas of further research can be identified.

First, the inclusion of a larger number of ASEAN economies in the analysis would certainly refine the conclusions on the desirability (and extent) of ASEAN becoming a currency union. Also due to lack of appropriate data, most of the estimations in this study were conducted with annual data which implied using fairly small samples. The use of higher frequency data would undoubtedly be more informative and strengthen the results. Second, the Clarida and Gali (1994) model used to identify the structural shocks employs nine exactly identifying restrictions which are central to the results. Even though this is a widely used model, testing for alternative identifying restrictions could provide an interesting sensitivity analysis that could reinforce the results.

Third, the state-space model and the Kalman filtering method applied in the dynamic analysis require several key assumptions which can significantly alter the results and for which there seems to be no consensus in the current literature on the right procedures. An interesting new field of study would be to implement Monte Carlo simulations to provide further guidance on those key assumptions and to study alternative methods to measure convergence in a dynamic context.

Finally, the study of the causes of the patterns of structural shocks found in ASEAN as well as their evolution in time, such as the degree of factor mobility across countries, the effect of increased trade integration or macroeconomic policy coordination, would certainly help to explain the reasons behind the results found here and thus complement the conclusions presented in this study.

Appendix A: ASEAN Statistics



Figure A-1: Total Trade (Exports plus Imports) of ASEAN countries 1990-2003

Source: International Monetary Fund's Direction of Trade Statistics



Figure A-2: Total Trade of ASEAN5 Versus ASEAN10 countries 1990-2003

Source: International Monetary Fund's Direction of Trade Statistics

					-	ASEAN10				
			ASEAN5							
	Indonesia	Malaysia	Philippines	Singapore	Thailand	Brunei D.	Cambodia	Laos	Myanmar	Vietnam
Imports from:										
ASEAN5	14.7%	17.9%	17.6%	9.6%	9.4%	10.6%	240.5%	18.1%	22.4%	21.1%
China	15.7%	22.6%	32.9%	14.5%	16.6%	18.5%	72.8%	42.5%	21.8%	79.9%
Hong Kong	0.1%	12.8%	12.3%	5.1%	10.7%	28.9%	77.6%	23.1%	23.8%	20.0%
European Union	-0.2%	8.4%	11.1%	5.9%	4.5%	31.9%	45.8%	77.9%	-0.3%	21.2%
USA	2.6%	8.0%	10.5%	5.4%	2.6%	10.0%	29.4%	77.9%	16.4%	146.1%
Japan	2.2%	6.7%	12.2%	3.4%	6.6%	36.1%	269.4%	10.5%	8.1%	27.1%
Korea	6.3%	18.5%	16.8%	10.5%	10.2%	26.0%	8.0%	15.4%	21.1%	43.8%
Rest of World	12.3%	15.4%	19.6%	7.9%	12.7%	22.3%	51.4%	66.2%	12.5%	15.4%
Exports to:										
ASEAN5	12.3%	10.0%	23.6%	10.5%	15.4%	20.4%	43.7%	15.0%	24.6%	18.9%
China	14.3%	30.5%	53.2%	23.2%	30.4%	6721.2%	144.5%	228.6%	21.6%	70.2%
Hong Kong	6.8%	15.9%	20.9%	12.8%	12.4%	73.2%	69.3%	74.9%	3.0%	4.2%
European Union	8.2%	10.3%	12.2%	7.5%	6.8%	67.8%	106.0%	43.5%	23.7%	34.0%
USA	6.7%	13.6%	9.2%	5.4%	8.0%	26.6%	261.0%	194.0%	37.6%	12702.5%
Japan	2.8%	8.7%	11.6%	7.0%	9.2%	5.3%	104.3%	32.0%	14.0%	20.5%
Korea	10.7%	10.5%	19.7%	16.5%	13.9%	10.4%	252.2%	-6.4%	26.4%	39.5%
Rest of World	5.7%	10.3%	8.4%	6.9%	9.9%	9.1%	52.4%	49.0%	17.9%	14.9%

Table A-1: ASEAN Trade Flows (1990-2003): Average Growth Rates

Source: Compiled from data from the International Monetary Fund's Direction of Trade Statistics Notes:

(1) Trade data for Laos, Cambodia and Myanmar presented a large number of zero values, especially prior to 1997. (e.g. Cambodia had no trade with Korea prior to 1998 and no exports to the Philippines prior to 1997). In the cases presented in bold, the average growth rate refers to a shorter period than the 14 years of the sample.

(2) Singapore trade statistics exclude data on trade with Indonesia, the Direction of Trade Statistics do not have the data of Singapore's trade with Indonesia. In this case, trade with ASEAN5 refers to Singapore's trade with Malaysia, the Philippines and Thailand only.

(3) 'Rest of World' was calculated by subtracting the trade flows from and to each of the countries and groupings presented above to the World trade value for each country.

															ASEA	AN10														
							1	ASEAN5	;																					
		Indonesia			Malaysia			Philippines			Singapore			Thailand			Brunei D.			Cambodia			Laos			Myanmar			Vietnam	
Year:	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003	1990	1997	2003
Imports from:																														
ASEAN5	8.2	12.6	22.1	18.8	20.1	35.3	8.8	12.6	16.1	16.8	21.7	23.4	11.7	12.1	14.4	41.9	45.4	50.5	25.4	19.7	43.1	49.1	82.7	62.9	26.0	47.3	45.6	18.6	26.7	21.5
China	3.0	3.6	9.1	1.9	2.8	6.8	1.4	2.5	6.7	3.4	4.3	8.7	3.3	3.6	8.0	2.7	2.5	2.0	5.9	5.1	11.1	10.7	1.2	12.9	20.6	21.9	29.0	0.2	3.4	13.6
long Kong	1.2	0.8	0.7	1.9	2.4	2.2	4.4	4.2	4.8	3.1	2.9	2.4	1.2	1.3	1.4	1.6	3.6	3.2	3.2	6.0	14.0	0.9	2.3	1.0	1.3	2.7	1.4	6.9	5.0	4.2
European Union	20.4	20.0	10.9	15.9	14.2	10.4	11.7	12.9	8.3	13.8	13.9	12.5	16.2	14.1	10.0	18.1	17.9	30.3	25.7	12.0	3.9	9.0	0.6	5.0	15.5	6.9	1.9	9.4	11.2	9.6
JSA	11.4	13.1	8.3	17.0	16.8	12.1	19.5	19.5	17.9	16.1	16.9	14.1	10.8	13.8	9.5	15.3	10.0	2.1	0.0	2.4	2.2	0.7	0.1	0.6	2.9	0.8	0.2	0.0	2.1	5.7
apan	24.8	19.8	13.0	24.2	22.0	12.5	18.4	20.3	20.0	20.1	17.6	12.0	30.4	25.7	24.1	14.6	11.2	5.7	9.0	7.5	2.0	14.5	2.5	1.8	16.6	8.1	4.0	5.9	12.7	11.2
Korea	4.5	5.6	4.7	2.5	5.1	5.2	3.8	5.9	6.8	2.9	3.1	3.9	3.1	3.6	3.9	0.6	1.8	1.9	0.0	10.3	5.2	0.0	0.8	0.7	3.5	5.3	5.5	1.9	13.2	10.8
Total	73.6	75.5	68.7	82.2	83.4	84.6	68.2	77.9	80.6	76.2	80.4	76.9	76.7	74.2	71.3	94.7	92.4	95.8	69.2	63.0	81.5	84.9	90.4	84.8	86.5	93.0	87.6	42.9	74.3	76.6
Exports to:	0.8	15.9	16.6	20.0	26.8	21.6	7.1	12.2	14.2	20.0	24.4	22.2	11.2	10.0	17.0	20.0	20.8	14.5	57.0	24.9	5.0	62.0	18.0	21.5	28.1	20.4	26.0	12.8	10.8	11.4
Thina	3.2	4.2	6.2	21.0	20.0	10.4	0.8	10.2	11.8	1.5	3.2	7.0	12	3.0	7.1	0.1	0.0	7.0	0.4	73	1.1	9.1	0.1	21.5	81	5.9	5.6	0.3	5.0	6.2
Iong Kong	2.4	3.3	1.9	3.2	5.5	4 3	4.0	4.6	77	6.5	9.6	10.0	4.5	5.9	5.4	0.0	0.0	0.0	0.4	2.0	0.3	0.0	0.0	0.0	5.6	41	0.9	9.6	4.5	1.5
European Union	12.0	15.2	13.1	15.4	14.4	12.3	18.5	18.0	14.2	15.0	13.9	13.4	22.7	16.0	14.7	0.2	1.2	2.2	5.0	11.2	23.5	9.4	41.5	26.2	6.9	12.5	13.9	6.8	17.0	21.5
JSA	13.1	13.4	12.1	16.9	18.4	19.5	37.9	35.1	20.4	21.3	18.4	14.3	22.7	19.4	17.0	3.4	2.5	10.0	0.0	13.7	57.6	0.1	3.6	0.9	2.3	9.9	9.8	0.0	3.0	20.9
apan	42.5	23.4	22.3	15.3	12.7	9.4	19.8	16.6	14.4	8.8	7.1	6.7	17.2	15.2	14.2	58.1	53.1	40.8	7.6	1.0	3.8	7.1	3.5	1.5	6.9	7.9	4.6	13.5	17.7	13.2
Lorea	5.3	6.5	7.1	4.6	3.2	3.3	2.8	1.7	3.6	2.2	3.0	4.2	1.7	1.8	2.0	12.4	18.1	13.1	0.0	0.2	0.2	0.0	0.4	0.0	2.2	1.3	2.4	1.1	4.4	2.8
Total	88.4	81.7	79.3	86.5	83.3	80.9	90.9	90.3	86.2	76.2	79.6	78.0	81.2	80.3	77.3	95.2	95.7	87.6	71.6	70.2	91.5	88.6	67.1	52.4	60.1	62.0	74.1	44.1	71.4	77.4

Table A-2: ASEAN Trade Pattern: Percentage of Total (world) Trade 1990, 1997, 2003

Source: Compiled from data from the International Monetary Fund's Direction of Trade Statistics

Variable	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Growth of Real GDP (annual %) (2000-2003 average)¤	2.98	5.80	4.04	5.79	4.55	8.58	4.46	2.86	4.77	6.99
GDP per capita, US dollars (2003)¤	12,971	310	972	362	4,175	179	987	20,987	2,291	481
GDP per capita, PPP (US\$) (2003)¤	15,051	1,658.0	3,405.0	1,799.0	9,579.0	1,364.0	4,387.0	22,962.0	7,253.0	2,477.0
Inflation rate, y-o-y average (%) (2000-2003 average)	-4.29	0.95	8.45	14.75	1.43	25.8ø	4.15	0.60	1.40	0.53ø
GDP composition by sector:#										
-Agriculture (% of total) (2003)	5§	30.0	15.9*	53§	8.4*	60*	15.0	0§	9*	24§
-Industry (% ot total) (2003)	45§	40.0	42.1*	23§	45.3*	9*	35.0	30§	42*	37§
-Services (% of total) (2003)	50§	30.0	42*	24§	46.3*	31*	50.0	70§	49*	39§
Trade (% of GDP) (2001)	n.a.	114.5	77.1	n.a.	214.3	n.a.	95.5	341.59ж	125.7	111.5

Table A-3: Basic Macroeconomic Indicators for ASEAN

Source: Compiled from data from Word Development Indicators 2003. Data on Brunei not available. Year of last available data in brackets.

Notes:

¤ = Data Compiled from the ASEAN Secretariat

* = 2002

 $\S = 2001$

= Data Compiled from the Central Intelligence Agency's The World Factbook 2004

 κ = Data Compiled from Penn World Tables, version 6.1 σ = 2000-2002 period

Appendix B: Description of the Clarida and Gali (1994) Methodology

Clarida and Gali (1994)'s methodology can be explained briefly as follows. Consider a system where 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 . Using the lag operator L, this can be written as:

$$X_t = A_0 \varepsilon_t + A_1 \varepsilon_{t-1} + A_2 \varepsilon_{t-2} + A_3 \varepsilon_{t-3} + \dots$$
(1)

$$=\sum_{i=0}^{\infty}L^{i}A_{i}\varepsilon_{t_{i}}$$
(2)

where the matrices A_i represent the impulse response functions to the shocks of the elements of X. Let vector X be made up of the change in output, Δy , changes in the real effective exchange rate, Δq and changes in the price level, Δp . The reduced form, moving average representation is given by

$$\begin{bmatrix} \Delta y_t \\ \Delta q_t \\ \Delta p_t \end{bmatrix} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} a_{11i} & a_{12i} & a_{13i} \\ a_{21i} & a_{22i} & a_{23i} \\ a_{31i} & a_{32i} & a_{33i} \end{bmatrix} \begin{bmatrix} \varepsilon_{lmt} \\ \varepsilon_{ISt} \\ \varepsilon_{St} \end{bmatrix},$$
(3)

where y_t , p_t and q_t represent the logarithm of output, real effective exchange rates and prices, ε_{LMt} , ε_{ISt} and ε st independent (LM) monetary, (IS) demand and (S) supply disturbances, and a_{11i} represents element a_{11} in matrix A_i .

Since the vector of structural disturbances ε_t is unobservable, the system of equations in (3) cannot be estimated directly. Following the Blanchard and Quah (1989) decomposition method, we assume that the estimated residuals of a VAR on the elements of X, e_t , are linear representations of the unobservable structural shocks, ε_t , so that $e_t = C\varepsilon_t$.

Estimating this model using a Vector Autoregression (VAR), and letting B represent these estimated coefficients, the estimating equation becomes

$$X_{t} = B_{1}X_{t-1} + B_{2}X_{t-2} + \dots + B_{n}X_{t-n} + e_{t}$$

$$= \left[\left(I - B(L) \right) \right]^{-1} e_{t}$$
(4)

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$$= \left[I + B(L) + B(L)^{2} + B(L)^{3} + \dots\right]e_{t}$$
$$= e_{t} + D_{1}e_{t-1} + D_{2}e_{t-2} + D_{3}e_{t-3} + \dots,$$

or alternatively:

$$\begin{bmatrix} \Delta y_t \\ \Delta q_t \\ \Delta p_t \end{bmatrix} = \sum_{i=1}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} & d_{13i} \\ d_{21i} & d_{22i} & d_{23i} \\ d_{31i} & d_{32i} & d_{33i} \end{bmatrix} \begin{bmatrix} e_{yt} \\ e_{qt} \\ e_{pt} \end{bmatrix},$$
(5)

where e_t represents the residuals of a regression of lagged values of Δy_t , Δq_t and Δp_t on current values of each in turn, that is, the residuals of the output, exchange rates and price equations, e_{yt} , e_{qt} and e_{pt} , respectively.

To convert this reduced form equation into the structural model, the residuals from the VAR, e_t , must be transformed into monetary, demand and supply shocks, ε_t . Following the Blanchard and Quah (1989) decomposition method, it is assumed that the estimated residuals of a VAR on the elements of X, e_t , are linear representations of the unobservable structural shocks, ε_t , so that (3) and (5) can be combined as

$$\begin{bmatrix} e_{yt} \\ e_{qt} \\ e_{pt} \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} & d_{13i} \\ d_{21i} & d_{22i} & d_{23i} \\ d_{31i} & d_{32i} & d_{33i} \end{bmatrix}^{-1} \cdot \sum_{i=0}^{\infty} L^{i} \begin{bmatrix} a_{11i} & a_{12i} & a_{13i} \\ a_{21i} & a_{22i} & a_{23i} \\ a_{31i} & a_{32i} & a_{33i} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{LMt} \\ \varepsilon_{ISt} \\ \varepsilon_{St} \end{bmatrix} = C \cdot \begin{bmatrix} \varepsilon_{LMt} \\ \varepsilon_{ISt} \\ \varepsilon_{St} \end{bmatrix}$$
(6)

To uniquely identify matrix C in the three by three case described above, nine restrictions have to be imposed to reduce the number of unknown structural parameters to be less than or equal to the number of estimated parameters of the variance-covariance matrix Σ of the innovations $e_y e_q$, and e_p . It is assumed that the three structural shocks are serially uncorrelated and have a variance-covariance matrix normalized to the identity matrix. In this manner, the orthogonality condition CC'= Σ imposes six non-linear restrictions on the elements of C.

The remaining three (theoretical) necessary restrictions stem from the condition that only supply shocks have permanent effects on output (and therefore the cumulative effect of both ϵ_{IS} and ϵ_{LM} shocks on output growth is zero) and that monetary shocks (ϵ_{LM}) do not have long-run effects on real effective exchange rates. These conditions, given the ordering of the variables, imply the restrictions:

$$\sum_{i=0}^{\infty} a_{11i} = \sum_{i=0}^{\infty} a_{12i} = \sum_{i=0}^{\infty} a_{21i} = 0,$$
(7)

which in terms of the SVAR model implies:

$$\sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} & d_{13i} \\ d_{21i} & d_{22i} & d_{23i} \\ d_{31i} & d_{32i} & d_{33i} \end{bmatrix} \begin{bmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{bmatrix} = \begin{bmatrix} 0 & 0 & . \\ 0 & . & . \\ . & . & . \end{bmatrix},$$
(8)

and allows the matrix C to be uniquely defined, and the monetary, demand and supply shocks to be (just) identified.

Appendix C: Derivation of the Kalman Filter

The Kalman Filter is a recursive procedure for computing the optimal estimator of the state vector at time t, based on information available at time t. The system includes a measurement equation and a transition equation, which can be defined as (in matrix form):

Measurement (or signal) Equation (matrix form):

$$Y_t = A_t Z_t + \mu_t \tag{1}$$

<u>Transition (or state) Equation (matrix form):</u>

$$A_t = T \cdot A_{t-1} + \eta_t \tag{2}$$

where
$$Y_t = \left(\varepsilon_t^i - \varepsilon_t^j\right), Z_t = \begin{pmatrix} 1 \\ \varepsilon_t^i - \varepsilon_t^k \end{pmatrix}, A_t = \left(\alpha_t, \beta_t\right), T = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$
 and $\eta_t = \left(\eta_{1t}, \eta_{2t}\right)$.

 μ_t is assumed to be an independent, normally distributed error term with zero mean and a constant variance H and η_t are assumed to be random error terms with zero mean and variance/covariance matrix Q. It is further assumed that ε_t and η_t are uncorrelated for all t and that A_{t-1} is uncorrelated with ε_t and independent of the error term η_t .

The Kalman filter prediction is an algorithm for estimating forecasts of the state vector given the initial values and data observed up to date t. The Kalman filter prediction equations are given by defining \hat{A}_t as the best (or optimal) estimate of A_t based on information up to t, and P_t as the covariance matrix of the estimate of \hat{A}_t :

Prediction Equations²³⁴:

$$\hat{A}_{t|t-1} = T.\hat{A}_{t-1} \tag{3}$$

$$P_{t|t-1} = T \cdot P_{t-1} \cdot T' + Q_t \tag{4}$$

where the notation t|t-1 denotes the optimal estimator of a parameter at time t based on all information available at time t-1. Once the information becomes available at time t, it is possible to update these estimates using the following equations:

 $^{^{234}}$ It is, therefore, necessary to 'guess' the correct values of $\hat{A}_{t\text{-}1}$ and $P_{t\text{-}1}$ to start the estimation

Updating Equations:

$$\hat{A}_{t} = \hat{A}_{t|t-1} + P_{t|t-1} \cdot Z_{t} \left(\frac{e_{t}}{f_{t}}\right)$$
(5)

$$P_{t} = P_{t|t-1} - P_{t|t-1} Z_{t} Z_{t} \left(\frac{P_{t|t-1}}{f_{t}} \right)$$
(6)

 e_t is the one step ahead predictor error and f_t its variance. These are defined as:

$$\boldsymbol{e}_t = \boldsymbol{Y}_t - \hat{\boldsymbol{A}}_{t|t-1} \boldsymbol{Z}_t \tag{7}$$

$$f_{t} = Z_{t}^{'} P_{t|t-1} Z_{t} + H$$
(8)

Once predictions are updated, one can use the updated estimate to work out predictions for t+1 and so on until the end of the sample.

The likelihood function is a function of the prediction errors given in (7) and can be defined as (Haldane and Hall (1991)):

$$Log(l) = \sum \log(f_t) + N \log\left(\sum e_t^2 / Nf_t\right)$$
(9)

When estimating the model described above, the matrix of the transition equation, T_t is reduced to an identity matrix. Therefore, (3) and (4) will be reduced to:

$$\hat{A}_{t|t-1} = \hat{A}_{t-1} \tag{10}$$

$$P_{t|t-1} = P_{t-1} + Q_t \tag{11}$$

The reason why both α_t and β_t despite being defined as random walk processes exhibit a clear trend after estimation by the Kalman Filter is because of the way that the updating equations [equations (5) and (6)] are defined.

Let
$$K_t = P_{t|t-1} Z_t F_t^{-1}$$
 (12)

Then the updating equations can be simplified to:

$$\hat{A}_{t} = \hat{A}_{t|t-1} + K v_{t}$$
(5')

$$P_t = P_{t|t-1} - K_t Z_t' P_{t|t-1}$$
(6')

Equation (5') is the key to workings of the model. If we consider that e_t is the one step ahead predictor error and f_t its variance and are defined as (7) and (8), then we can see that the various $\hat{A}_{t|t-1}$ (optimal estimator of A at time t based on all information available at time t-1) and consequently \hat{A}_t will change over time, even if T is the identity matrix and will exhibit a trend because of K_t and e_t .

A clearer way to see this is an example given by Chatfield (1989, p. 189) who quotes Abraham and Ledolter (1986), as showing that in the simple case of A_t consisting of only one variable, the current level of β_t , the Kalman Filter becomes a simple recurrence relation (as t $\rightarrow\infty$ and $P_t \rightarrow$ constant)

$$\hat{\beta}_t = \hat{\beta}_{t-1} + \phi v_t \tag{13}$$

where the smoothing constant ϕ is a function of the signal-to-noise ratio Q/H. Denoting this ratio as *c*, Abraham and Ledolter (1986, p. 58) show that smoothing constant ϕ is given by:

$$\phi = \frac{1}{2} \left[\left(c^2 + 4c \right)^{\frac{1}{2}} - c \right]$$
(14)

When the signal-to-noise ratio tends to zero, so that β_t is a constant, we find that ϕ tends to zero as would be intuitively expected, while as *c* becomes large, then ϕ approaches unity.

Appendix D: Description of the Real Effective Exchange Rate Methodology

The Real Effective Exchange Rate time series (REER) were calculated for the five countries under analysis for the period 1968-2001. According to the IMF's definition, the REER is computed as the weighted geometric average of the price of the domestic country relative to the prices of its trade partners. Following Zanello and Desruelle (1997), the REER (based on consumer price indices) can be expressed as²³⁵:

$$REER = \prod_{j \neq i} \left[\frac{P_i R_i}{P_j R_j} \right]^{w_{ij}},$$

where *j* is an index that runs over country *i*'s partners, W_{ij} is the competitiveness weight of country *i* on country *j*, P*i* and P*j* are consumer price indices in countries *i* and *j*, and R*i* and R*j* represent the nominal exchange rates of countries *i* and *j*'s currencies in US dollars. An increase in the index denotes an appreciation of country *i*'s currency.

In this computation, the IMF weights were calculated by using trade flows from 1988-1990 and were based on (a weighted average of) trade in manufactures, primary commodities and tourism services. The CPI based REER index uses the IMF weights for 23 countries including Australia, Belgium, Brazil, Canada, China, Hong Kong, Germany, Indonesia, Italy, Japan, Korea, Malaysia, the Netherlands, the Philippines, Singapore, Spain, Sweden, Switzerland, Thailand, the United Kingdom, the United States and Taiwan.

Data for the competitiveness weights W_{ij} , was kindly provided by IMF's Dominique Desruelle. Both price index and nominal exchange rates source of data was mostly IMF's International Financial Statistics. Exceptions are the CPI data for China and Taiwan with the first taken from the World Bank's World Development Indicators

²³⁵ Zanello and Desruelle (1997) also present a method of computation of REER based on unit labour costs. However, in this paper the CPI based REER was chosen since as a rule it should provide the same information and its data is more readily available.

and the latter provided by the Directorate -General of Budget, Accounting and Statistics of the Republic of China.

The indices were calculated at a yearly frequency for the period 1968-2004 and have 1995 as the base year unless stated otherwise.

Appendix E: Additional Data and Results

Table E-1: Unit Root Test Results for the First Difference of the Log of Real GDP, CPI

	Al	OF Test Statisti	c]	PP Test Statistic	2
Country	СРІ	Real GDP	REER	CPI	Real GDP	REER
Indonesia	-8.7813*	-3.5306**	-5.4242*	-5.0262*	-4.4092*	-8.9110*
Malaysia	-3.8090*	-3.3468**	-3.8206*	-3.3011**	-4.3349*	-4.8976*
Philippines	-4.9005*	-4.2440*	-5.0077*	-4.6151*	-4.2422*	-7.0707*
Singapore	-4.6896*	-3.2948**	-4.4119*	-3.2806**	-3.5562**	-3.4025**
Thailand	-3.6084**	-3.2823**	-4.2688*	-3.1065**	-3.3801**	-4.9591*
USA	-2.8490***	-5.4467*	-3.5783**	-2.0458	-4.8806*	-3.5240**

and REER Time Series. Data Range: 1968-2004

Where: *, ** and *** = rejection of hypothesis of unit root at 1%, 5% and 10% level, respectively. ADF = Augmented Dickey-Fuller PP = Phillips-Peron

Table E-2: Correlation of Structural Shocks in ASEAN - 1968-2004

	Ind.	Mal.	Phil.	Sing.	Thail.	USA
Monoton, Shocks (I M)						
	1 00					
Indonesia	1.00	4.00				
Malaysia	0.37*	1.00				
Philippines	0.06	0.25	1.00			
Singapore	0.25	0.68*	0.28	1.00		
Thailand	0.43*	0.64*	0.12	0.61*	1.00	
USA	0.24	-0.12	0.15	0.08	0.18	1.00
Demand Shocks (IS)						
Indonesia	1.00					
Malaysia	0.42*	1.00				
Philippines	0.53*	0.21	1.00			
Singapore	0.44*	0.36*	0.45*	1.00		
Thailand	0.54*	0.39*	0.63*	0.49*	1.00	
USA	0.32	0.37*	0.44*	0.33*	0.51*	1.00
Supply Shocks (S)						
Indonesia	1 00					
Malavsia	0.56*	1 00				
Philippines	0.57*	0.42*	1 00			
Singapore	0.51*	0.53*	0.50*	1 00		
Theiland	0.01	0.00	0.00	0.40*	1 00	
	0.09	0.34	0.49	0.40	0.11	1 00
USA	0.10	0.31	0.08	0.21	0.11	1.00

Notes:

Significance levels are assessed using Fisher's variance stabilizing transformation. For an explanation see for example Zhang, Sato and McAleer (2004).

* = Positive correlation coefficient at the 5% level.

Convergence of ASEAN5 countries with their Partners as Opposed to the Table E-3: USA - Constant Parameter Estimation of β (OLS) – Period: 1968-2004

Convergence of:					
3	Ind.	Mal.	Phil.	Sina.	Thail.
With:	-	-		- 5	-
Monetary Shocks (LM)					
Indonesia	-	0.468*	0.780*	0.443**	0.361***
Malaysia	0.476*	-	0.447*	-0.119	0.016
Philippines	0.810*	0.516*	-	0.342***	0.581*
Singapore	0.686*	0.360*	0.570*	-	0.286*
Thailand	0.585*	0.351*	0.684*	0.177	-
Demand Shocks (IS)					
Indonesia	-	0.398**	0.482*	0.235	0.145
Malaysia	0.508*	-	0.808*	0.329**	0.366*
Philippines	0.439*	0.746*	-	0.410**	0.185
Singapore	0.502*	0.467*	0.646*	-	0.247***
Thailand	0.521*	0.566*	0.578*	0.351*	-
Supply Shocks (S)					
Indonesia	-	0.150	0.195**	0.119	0.057
Malaysia	0.242**	-	0.321*	0.201***	0.259**
Philippines	0.120	0.168	-	0.072	0.067
Singapore	0.225**	0.212**	0.253*	-	0.149***
Thailand	0.151**	0.253**	0.232*	0.129	-

Notes: Regressions also included a constant (not reported)

* = Significant at the 1% level.

** = Significant at the 5% level.

*** = Significant at the 10% level.

Table E-4: Convergence of ASEAN5 Countries with their Partners as Opposed to the USA - Constant Parameter Estimation of β (OLS) - Period: 1968-2004 (excluding 1997-1998)

Convergence of:	Ind	Mal	Dhil	Cing	Theil
With:	ina.	iviai.	PIIII.	Sing.	Than.
Manatary Charles (IM)					
Monetary Shocks (LIM)					
Indonesia	-	0.649*	0.893*	0.509***	0.505**
Malaysia	0.739*	-	0.427**	-0.087	0.061
Philippines	0.933*	0.516*	-	0.423**	0.647*
Singapore	0.820*	0.462*	0.662*	-	0.320*
Thailand	0.796*	0.478*	0.767*	0.235**	-
Demand Shocks (IS)					
Indonesia	-	0.665*	0.640*	0.401**	0.390**
Malavsia	0.693*	-	0.962*	0.503*	0.724*
Philippines	0.430**	0.935*	-	0.570**	0.303
Singapore	0.479*	0.528*	0.764*	-	0.353**
Thailand	0.537*	0.771*	0.665*	0.434*	-
Supply Shocks (S)					
Indonesia	-	0.261**	0.324*	0.232**	0.289*
Malaysia	0 182	-	0.318*	0 201***	0.327**
Philippines	0.135	0 211	-	0.001	0.193
Singanore	0.154	0.204**	0 212**	0.001	0.187**
Theiland	0.104	0.204	0.212	0 126	0.107
malianu	0.105	0.200	0.201	0.130	-

Notes: Regressions also included a constant (not reported)

* = Significant at the 1% level.

** = Significant at the 5% level. *** = Significant at the 10% level.

<u>Figure E-1</u>: Convergence of Indonesia to ASEAN as Opposed to the USA: β Coefficients: (1968-2004, excluding 1997-1998)



<u>Figure E-2</u>: Convergence of Malaysia to ASEAN4 as Opposed to the USA: β Coefficients (1968-2004, excluding 1997-1998)



<u>Figure E-3</u>: Convergence of Philippines to ASEAN4 as Opposed to the USA: β Coefficients (1968-2004, excluding 1997-1998)



<u>Figure E-4</u>: Convergence of Singapore to ASEAN4 as Opposed to the USA: β Coefficients (1968-2004, excluding 1997-1998)







<u>Table E-5:</u> Convergence of ASEAN5 countries with their Partners as Opposed to the USA - Time Varying Parameter Estimation of β (OLS) – Period: 1968-2004

	1968-1979	1980-1991	1992-2004 ^φ	<u>1968-2004[¢]</u>	full sample ^{π}	
				βα	βά	
Convergence of Indonesia on:						
Malaysia	0.647 (0.194)	0.639▼ (0.213)	0.624 ▼ (0.095)	0.637 y (0.172)	0.387 n (0.126)	
Philippines	0.643 (0.126)	0.983▲ (0.110)	1.035 ▲ (0.086)	0.883 n (0.207)	0.668 n (0.250)	
Singapore	0.782 (0.087)	0.718▼ (0.087)	0.650 ▲ (0.059)	0.719 n (0.094)	0.535 n (0.133)	
Thailand	0.811 (0.055)	0.694 ▼ (0.093)	0.638▼ (0.027)	0.716 y (0.097)	0.518 n (0.084)	
Convergence of Malaysia on:						
Indonesia	0.815 (0.154)	0.546▼ (0.370)	-0.318▼ (0.229)	0.367 n (0.549)	0.241 n (0.442)	
Philippines	0.440 (0.148)	0.784 ▲ (0.110)	0.723▼ (0.091)	0.647 n (0.192)	0.620 n (0.257)	
Singapore	0.454 (0.032)	0.470▲ (0.032)	0.298 ▼ (0.054)	0.410 n (0.087)	0.367 y (0.095)	
	0.561 (0.079)	0.367 ▼ (0.043)	-0.022▼ (0.154)	0.312 y (0.262)	0.298 n (0.139)	
Philippines on:						
Indonesia	0.660 (0.149)	1.022▲ (0.200)	1.395▲ (0.193)	1.015 n (0.350)	0.842 n (0.275)	
Malaysia	0.340 (0.118)	0.670▲ (0.075)	0.776▲ (0.100)	0.590 y (0.216)	0.591 y (0.325)	
Singapore	0.535 (0.107)	0.766 ▲ (0.081)	0.969▲ (0.114)	0.750 y (0.204)	0.575 n (0.119)	
Thailand	0.722 (0.071)	0.835▲ (0.070)	0.807▼ (0.020)	0.788 y (0.076)	0.650 y (0.099)	
Convergence of Singapore on:						
Indonesia	0.661 (0.022)	0.082▼ (0.274)	-0.445▼ (0.108)	0.115 n (0.485)	0.167 n (0.380)	
Malaysia	-0.013 (0.191)	-0.250▼ (0.087)	-0.014▲ (0.084)	-0.095 n (0.137)	-0.087 y (0.053)	
Philippines	0.383 (0.094)	0.665▲ (0.074)	0.849▲ (0.142)	0.627 n (0.219)	0.455 n (0.183)	
Thailand	0.336 (0.088)	-0.011▼ (0.072)	-0.079▼ (0.035)	0.087 n (0.197)	0.101 n (0.125)	
Convergence of Thailand on:						
Indonesia	0.612	0.392▼ (0.154)	0.235▼ (0.075)	0.418 n (0.184)	0.327 n (0.170)	
Malaysia	-0.028 (0.068)	-0.009 (0.066)	0.363▲ (0.121)	0.101 y (0.200)	0.051 n (0.180)	
Philippines	0.510 (0.052)	0.785 ▲ (0.097)	0.840 ▲ (0.067)	0.708 n (0.163)	0.593 n (0.205)	
Singapore	0.206 (0.066)	0.314▲ (0.067)	0.505 ▲ (0.050)	0.337 n (0.138)	0.284 ́ n (0.206)	
no of obs:	12	12	11	35	37	

Monetary Shocks (LM)

Notes: Figures in the table represent mean values for five alternative time spans. Values in parenthesis represent standard deviations. $\phi = excluding$ the years of 1997 and 1998.

 \mathcal{K} = including the years of 1997 and 1998.

 θ = Result of Dickey-Fuller Unit Root tests on the α time-varying coefficient estimates, where y = rejection of hypothesis of a unit root at 5% critical level and n = failure to reject the presence of a unit root at the 5% critical level. The estimations included a trend when a trend was found to be significant at the 5% level.

 \blacktriangle = increase from previous period (divergence).

 $\mathbf{\nabla}$ = decrease from previous period (convergence).

<u>Table E-6:</u> Convergence of ASEAN5 Countries with their Partners as Opposed to the USA - Time Varying Parameter Estimation of β (OLS) – Period: 1968-2004

	1968-1979	1980-1991	1992-2004 ^φ	<u>1968-2004</u> ^φ β α ^θ	full sample ^ж β α ^θ	
Convergence of						
Indonesia on:						
Malaysia	0.734	0.686▼	0.531▼	0.654 v	0.508 v	
	(0.100)	(0.186)	(0.135)	(0.165)	(0.191)	
Philippines	0.525	0.282 ▼	-0.062 🔻	0.257 y	0.310 y	
	(0.133)	(0.167)	(0.055)	(0.273)	(0.155)	
Singapore	0.429	0.649	0.440▼	0.508 n	0.508 n	
	(0.173)	(0.097)	(0.053)	(0.156)	(0.167)	
Thailand	0.612	0.665 🛦	0.083▼	0.464 y	0.535 n	
	(0.081)	(0.179)	(0.118)	(0.292)	(0.195)	
Convergence of						
Malaysia on:						
Indonesia	0.656	0.718	0.607▼	0.662 y	0.446 y	
	(0.057)	(0.049)	(0.101)	(0.085)	(0.265)	
Philippines	0.992	1.047 🛦	0.590▼	0.885 y	0.707 y	
	(0.059)	(0.221)	(0.035)	(0.242)	(0.247)	
Singapore	0.274	0.569 🛦	0.688 🛦	0.505 y	0.461 y	
	(0.123)	(0.109)	(0.028)	(0.200)	(0.184)	
Thailand	0.666	0.734 🛦	0.668▼	0.690 y	0.570 n	
	(0.056)	(0.126)	(0.114)	(0.105)	(0.158)	
Convergence of						
Philippines on:						
Indonesia	0.718	0.530▼	0.410▼	0.557 y	0.386 y	
	(0.036)	(0.092)	(0.121)	(0.154)	(0.259)	
Malaysia	0.962	0.995 🛦	0.693▼	0.889 y	0.685 y	
	(0.039)	(0.191)	(0.076)	(0.180)	(0.325)	
Singapore	0.725	0.927 🛦	0.687▼	0.782 y	0.660 n	
	(0.046)	(0.082)	(0.043)	(0.122)	(0.122)	
Thailand	0.629	0.948	0.325▼	0.643 y	0.568 n	
	(0.088)	(0.136)	(0.243)	(0.302)	(0.276)	
Convergence of						
Singapore on:						
Indonesia	0.471	0.548	0.070▼	0.371 y	0.116 y	
	(0.067)	(0.076)	(0.187)	(0.240)	(0.462)	
Malaysia	0.471	0.548	0.070▼	0.371 y	0.139 y	
	(0.067)	(0.076)	(0.187)	(0.240)	(0.210)	
Philippines	0.579	0.765	-0.051 V	0.445 y	0.241 y	
The still are st	(0.133)	(0.140)	(0.026)	(0.392)	(0.449)	
Inaliand	0.493	0.273	-0.138	0.219 n	0.144 n	
Conversion of	(0.042)	(0.037)	(0.237)	(0.294)	(0.327)	
Convergence of						
	0.445	0 507 4	0.000	0.426	0.065 m	
indonesia	0.415	0.597	0.283 ▼	0.430 y	0.200 []	
Malavaia	(0.083)	(0.159)	(0.035)	(0.100)	(U.200) 0.277 V	
ivialaysia	0.001	U.121 ▲ (0.049)	0.722 ▼ (0.075)	0.003 y	0.377 y	
Dhilippingo	(0.000)	(U.U40) 0.755 A	(0.075) 0.111 T	(0.000)	0.201)	
Fillippines	0.239	0.700▲ (0.221)	0.111▼ (0.071)	0.370 y	0.200 y (0.201)	
Singanara	(0.170)	(U.ZZI)	(0.071) 0.475 A	(0.327)	(U.291) 0.200 p	
Singapore	0.201		0.4/3 A	0.300 y	0.299 11	
	(0.104)	(0.030)	(0.099)	(0.124)	(0.229)	
		10				
no. of obs:	12	12	11	35	37	

Demand Shocks (IS)

Notes: Figures in the table represent mean values for five alternative time spans. Values in parenthesis represent standard deviations. $\varphi = \text{excluding the years of 1997 and 1998.}$

 \mathcal{K} = including the years of 1997 and 1998.

 θ = Result of Dickey-Fuller Unit Root tests on the α time-varying coefficient estimates, where y = rejection of hypothesis of a unit root at 5% critical level and n = failure to reject the presence of a unit root at the 5% critical level. The estimations included a trend when a trend was found to be significant at the 5% level.

 \blacktriangle = increase from previous period (divergence).

 $\mathbf{\nabla}$ = decrease from previous period (convergence).

Table E-7: Convergence of ASEAN5 Countries with their Partners as Opposed to the

USA - Time Varying Parameter Estimation of β (OLS) – Period: 1968-2004

		Cuppiy	onoons			
	1968-1979	1980-1991	1992-2004 ^φ	<u>1968-2004^φ β α^θ</u>	full sample ^ж β α ^θ	
				P	P	
Convergence of						
Moleveie	0.076	0.015 -	0.249 4	0.246	0.170	
ivialaysia	0.270	0.215 ▼	0.240	0.240 y	0.1/0 y (0.147)	
Dhilippipoo	(0.003)	(0.109)	(0.090)	(0.092)	(0.147)	
Philippines	0.072	-0.001 V	0.497	0.201 11	0.004 11	
Singanara	(0.132)	(0.235)	(0.035)	(0.255)	(0.230)	
Singapore	0.004	0.003	(0.040	0.249 y	0.190 11	
Theiland	(0.067)	(0.092) 0.152 ¥	(0.247)	(0.307)	(0.309)	
Indianu	0.102	0.155 V	(0.070)	0.220 11	0.130 y	
Convergence of	(0.103)	(0.079)	(0.076)	(0.127)	(0.096)	
Convergence of						
ivididySid UII.	0 303	0.200 -	0 212 🕊	0.267 5	0.118	
indonesia	0.303	0.200 V	0.∠13 ▼ (0.045)	0.20/ 11	U. I IO Y (0.232)	
Dhilippings	(0.043)	(U.UO3)	(0.045)	(0.003)	(0.232)	
Finippines	0.174	(0.220	(0.070)	0.347 11	0.210 11	
Singanara	(0.037)	(U.Z/9) 0.160▼	(U.U/U)	(0.202)	(0.141)	
Singapore	0.100	0.100 V	0.309	0.303 y	0.200 11	
Theilerd	(0.063)	(0.082)	(0.193)	(0.228)	(0.168)	
Thailand	0.424	0.222	0.364	0.330 1	0.237 11	
Company of	(0.065)	(0.058)	(0.059)	(0.105)	(0.122)	
Convergence of						
Philippines on.	0.004	0.000 -	0.004	0.400 -	0.007 -	
Indonesia	0.231	0.220 V	0.001 V	0.102 11	0.007 11	
Malavaia	(0.045)	(0.164)	(0.052)	(0.123)	(0.207)	
ivialaysia	0.325	0.012	0.313	0.214 y	0.240 y	
Cinconoro	(0.106)	(0.042)	(0.096)	(0.177)	(0.000)	
Singapore	0.055	0.207	0.443 ▲ (0.145)	0.220 y	0.220 y	
Theiland	(0.067)	(0.070)	(0.145)	(0.100)	(0.149)	
Thailand	0.210	0.201	0.353	0.209 y	0.171 y (0.000)	
Conversiones of	(0.051)	(0.004)	(0.065)	(0.097)	(0.090)	
Convergence of						
Singapore on:	0.001	0.015 -	0.650 4	0.256	0.000	
Indonesia	0.221	0.215 V	0.059	0.350 y	0.096 y	
Malavaia	(0.057)	(0.049)	(0.215)	(0.242)	(0.146)	
walaysia	0.459	0.069 V	0.005 V	0.190 y	0.102 y	
Dhilippipoo	(0.140)	(0.061)	(0.033)	(0.221)	(0.100)	
Fillippines	0.113	0.046 V	0.003	0.239 y	0.003 y	
Theiland	(0.076)	(0.230) 0.120▼	(0.041)	(0.270)	(0.144) 0.157 yr	
Indiditu	(0.176)	0.139 V	0.455▲ (0.122)	0.201 11	0.137 y	
Convergence of	(0.120)	(0.040)	(0.123)	(0.173)	(0.034)	
Theiland on:						
	0.240	0.262 1	0 164 🛡	0.227 5	0.037 p	
indonesia	0.249	0.203	0.104 ▼	0.227 11	0.037 (1)	
Malavaia	(0.121)	(0.064)	(0.030)	(0.091)	(0.139)	
ivialaysia	0.290	0.017 ▼		0.123 []	0.194 y (0.170)	
Dhiling in a -	(0.070)	(0.110)	(0.063)	(0.153)	(0.179)	
Philippines	0.102		0.529	0.245 N	U.U64 Y	
Cineran	(0.193)	(0.262)	(0.037)	(U.273)	(0.190)	
Singapore	0.098	0.13/	0.456	0.224 n	U.1// N	
	(0.026)	(0.075)	(0.180)	(0.211)	(0.229)	
no. of obs:	12	12	11	35	37	

Supply Shocks

Notes: Figures in the table represent mean values for five alternative time spans. Values in parenthesis represent standard deviations.

 φ = excluding the years of 1997 and 1998. \mathcal{K} = including the years of 1997 and 1998.

 θ = Result of Dickey-Fuller Unit Root tests on the α time-varying coefficient estimates, where y = rejection of hypothesis of a unit root at 5% critical level and n = failure to reject the presence of a unit root at the 5% critical level. The estimations included a trend when a trend was found to be significant at the 5% level.

 \blacktriangle = increase from previous period (divergence).

 $\mathbf{\nabla}$ = decrease from previous period (convergence).

Appendix F: Description of the Industries Included in the Import Unit Value Index

Commodity Class	No. of	SITC Codes
	industries	
0 - Food and live animals	19	11, 12, 13, 23, 44, 46, 47, 48, 51, 52, 54,
		55, 61, 62, 72, 73, 74, 75, 81
2 - Crude materials, inedible,	4	231, 251, 273, 276
except fuels		
3 - Mineral fuels, lubricants and	2	321, 332
related materials		
4 - Animal and vegetable oils and	3	411, 421, 422
fats		
5 - Chemicals	5	514, 531, 532, 551, 561
6 - Manufactured goods classified	13	611, 641, 661, 673, 674, 676, 677, 682,
chiefly by material		683, 684, 685, 686, 693

Table F-1: Description of the Industries included in the Import Unit Value Index (*imp*)

Appendix G: Impulse Response Functions

<u>Figure G-1:</u> Accumulated Impulse Response of Import Prices to the Exchange Rates Shock



<u>Figure G-2:</u> Accumulated Impulse Response of Relative CPI to the Exchange Rate Shock



<u>Figure G-3:</u> Accumulated Impulse Response of Exchange Rates to the Import Prices Shock



<u>Figure G-4:</u> Accumulated Impulse Response of Exchange Rates to the Relative CPI Shock





Figure G-5: Accumulated Impulse Response of Import Prices to the Relative CPI Shock





Figure G-7: Accumulated IRFs using Different Choleski Orderings and Impulse Definitions



Figure G-8: Accumulated IRFs using Different De-Trending Methods



<u>Table G-1</u>: Accumulated Responses after 2 periods in ASEAN5 – Annual and Quarterly Data

Response of:	IMP	CPI	NEER	NEER	IMP	CPI
Country: 📃 to shocks from	NEER	NEER	IMP	CPI	CPI	IMP
Singapore (annual data)	Х	Х	Х	Х	Х	Х
Singapore (quarterly data)	Х	Х	-0.008	Х	Х	0.002
Thailand (annual data)	0.057	Х	Х	Х	Х	х
Thailand (quarterly data)	0.016	Х	Х	Х	0.012	0.005

Notes: x = no significant response. Data Range is 1975 to 2001 for Singapore and 1968 to 2001 for Thailand.

Appendix H: Unit Root Tests

Table H-1: Fisher Test for Panel Unit Root on variable IIT in Levels

	ADF	PP			
Chi-square(20) 4.9758 10.7516					
Prob>Chi-square 0.9997 0.9524					
Note: ADF = Augmented Dickey-Fuller test.					

PP = Phillips-Peron test.

The number of lags set at one in both cases.

H₀: Unit Root in all series

Table H-2: Unit Root Tests for all Individual IIT Series in First-Differences

	ADF test statistic	PP test statistic
Pair:		
Indonesia-Singapore	-6.334*	-11.325*
Indonesia-Malaysia	-7.292*	-6.970*
Indonesia-Phillipines	-3.975*	-5.564*
Indonesia_Thailand	-2.736	-5.530*
Malaysia-Phillipines	5.495*	-8.532*
Singapore-Malaysia	-6.144*	-7.472*
Thailand-Malaysia	-3.860	-4.709*
Thailand-Phillipines	-4.101*	-7.626*
Thailand-Singapore	-2.343	-4.635*
Singapore-Phillipines	-3.899*	-8.374*

The estimations included a trend in the cases when a trend was found to be significant at the 5% level.

* = rejection of hypothesis of unit root at 1% critical level

<u>14010 11-5</u> . Onit Root 10sts for an individual Series of Depended Variable of (5)
--

	(1)		(2)		(3)	
	ADF test statistic	PP test statistic	ADF test statistic	PP test statistic	ADF test statistic	PP test statistic
Pair:						
Indonesia-Singapore	-1.207	-1.641	-5.057*	-3.636**	-3.827**	-3.900*
Indonesia-Malaysia	-3.515**	-4.336*	-3.732*	-4.176*	-3.899*	-5.584*
Indonesia-Phillipines	-1.207	-1.641	-3.487**	-4.627*	-3.519**	-5.501*
Indonesia_Thailand	-3.332**	-4.202*	-3.729*	-5.717*	-5.083*	-6.541*
Malaysia-Phillipines	-3.062	-4.985*	-3.547**	-5.556*	-3.760*	-5.234*
Singapore-Malaysia	0.212	-1.643	-2.336	-4.180*	-2.961***	-3.183**
Thailand-Malaysia	-3.674**	-3.674**	-2.845***	-4.506*	-2.992**	-4.743*
Thailand-Phillipines	-3.162**	-3.419**	-3.986*	-5.176*	-4.588*	-6.071*
Thailand-Singapore	4.005**	-6.660*	-2.823***	-5.446*	-3.724**	-6.595*
Singapore-Phillipines	-3.237**	-5.194*	-3.811*	-5.454*	-3.650**	-5.051*

The estimations included trend in the cases where a trend was found to be significant at the 5% level.

(1) to (3) correspond to regressions of the dependent variable using alternative data de-trending tecniques, namely, HP-filtering, quadratic de-trending and HP filtering on the residual of a regression of the real GDP on a constant and 5-year period dummies. * = rejection of hypothesis of unit root at 1% critical level

*** = rejection of hypothesis of unit root at 5% critical level
*** = rejection of hypothesis of unit root at 10% critical level

Appendix I: Raw Data

	Indonesia	Malaysia	Philippines	Singapore	Thailand	USA
1966	14,8683	13,9640	35,6367	8,3382	11,6182	42,4500
1967	15,2086	14,5027	37,5340	9,3251	12,5232	43,5100
1968	16,8985	15,6597	39,3902	10,6197	13,5852	45,5800
1969	17,9135	16,4252	41,2244	12,0742	14,6608	47,0100
1970	19,2631	16,7362	42,7763	13,7305	16,1952	47,0900
1971	20,6127	18,4157	45,0985	15,4484	16,9992	48,5600
1972	22,5551	20,1447	47,5549	17,5231	17,6920	51,1400
1973	25,1061	22,5018	51,7971	19,5437	19,4365	54,0400
1974	27,0228	24,3737	53,6401	20,7841	20,2822	53,8900
1975	28,3678	24,5689	56,6251	21,6331	21,2652	53,7400
1976	30,3214	27,4099	61,6118	23,2501	23,2582	56,5500
1977	32,9779	29,5350	65,0634	25,0536	25,5613	59,1200
1978	35,5639	31,5003	68,4285	27,2068	28,2294	62,4900
1979	37,7884	34,4453	72,2877	29,7401	29,7294	64,6200
1980	41,5220	37,0086	76,0097	32,6230	31,1514	64,6400
1981	44,8135	39,5770	78,6117	35,7571	32,9915	66,2600
1982	45,8202	41,9433	81,4569	38,2112	34,7573	65,0200
1983	47,7414	44,5523	82,9839	41,3397	36,6982	67,7400
1984	51,0713	48,0103	76,9065	44,7747	38,8093	72,6700
1985	52,3290	47,4699	71,2872	44,0491	40,6128	75,4900
1986	55,4036	48,0162	73,7229	45,0623	42,8603	78,0900
1987	58,1326	50,6045	76,9016	48,4137	46,9401	80,8300
1988	61,4925	55,0569	82,0944	54,0460	53,1776	84,2400
1989	66,0783	60,1112	87,1886	59,2479	59,6602	87,1500
1990	70,8633	65,9580	89,8365	64,5645	66,3225	88,6700
1991	75,7886	71,6285	89,3294	69,1176	71,9986	88,4900
1992	80,6843	77,2133	89,6185	73,6531	77,8185	91,4300
1993	85,9257	83,6579	91,5151	83,0409	84,5936	93,5900
1994	92,4045	91,4394	95,5304	92,5337	91,8826	97,3600
1995	100,0000	100,0000	100,0000	100,0000	100,0000	100,0000
1996	107,8838	105,8333	110,1138	108,0381	105,9305	103,6675
1997	112,9668	111,3095	118,0784	117,3025	104,3967	108,4352
1998	98,1328	110,7143	109,4817	116,2125	93,4560	112,9584
1999	98,8589	114,4048	116,1820	124,2507	97,6483	117,9707
2000	103,7344	119,0476	126,4223	136,2398	102,2495	122,2494
2001	107,3651	123,0952	126,8015	133,6512	104,4990	123,2274
2002	111,2033	129,8810	132,1113	136,5123	110,0204	125,4279
2003	116,1826	136,3095	139,0645	138,0109	117,5869	129,2176
2004	119,3983	143,0952	148,9254	151,6349	124,7444	134,9633

Table I-1: Annual Real Gross Domestic Product

Source: Compiled from data in IMF's International Financial Statistics.

IndonesiaMalaysiaPhilippinesSingaporeThailandUSA19660.972731,39693,688036,176118,674021,311619672.003832,83353,996037,630419,827522,827019684,585532,78153,976737,630419,827522,827019695,297232,64744,029237,527720,313424,063019705,951333,24944,645037,701520,295525,481619716,615234,87756,101839,163821,380527,444219738,668438,56067,113546,854324,696529,1513197412,187945,24289,543757,334830,701132,3620197514,510247,273210,189058,789132,337553,3240197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,4550654,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3871198443,464773,7307	1				· · · · · · · · · · · · · · · · · · ·		
1966 0,9727 31,3969 3,6880 36,1761 18,6740 21,3116 1967 2,0038 32,8335 3,8980 37,3854 19,4788 21,9032 1968 4,5855 32,7815 3,9767 37,6304 19,8275 22,8270 1969 5,2972 32,6474 4,0292 37,5277 20,3134 24,0630 1970 5,9513 33,2494 4,6450 37,7015 20,2952 52,8416 1971 6,6152 34,8775 6,1018 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6966 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3682 1975 14,5102 47,2721 10,1890 58,7891 32,3375 35,3240 1976 17,3918 48,5182 11,1263 57,7063 33,6793 37,5506 1977 19,3113 50,8414 12,2277 59,52321 36,23		Indonesia	Malaysia	Philippines	Singapore	Thailand	USA
1967 2,0038 32,8335 3,8980 37,3854 19,4788 21,9032 1968 4,5855 32,7815 3,9767 37,6304 19,8275 22,8270 1969 5,2972 32,6474 4,0292 37,5277 20,3134 24,6630 1970 5,9513 33,2494 4,6450 37,7015 20,2955 25,4816 1971 6,6152 34,8775 6,1018 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6965 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3682 1975 14,5102 47,2732 10,1890 58,7891 33,6793 37,3506 1977 19,3113 50,8414 12,2277 59,5321 36,2393 39,7733 1978 20,8773 53,3123 13,1245 62,4328 39,1110 42,8149 1979 24,2720 55,2606 15,4257 64,9779 42,9	1966	0,9727	31,3969	3,6880	36,1761	18,6740	21,3116
1968 4,5855 32,7815 3,9767 37,6304 19,8275 22,8270 1969 5,2972 32,6474 4,0292 37,5277 20,3134 24,0630 1970 5,9513 33,2494 4,6450 37,7015 20,2955 25,8416 1971 6,6152 34,8775 6,0108 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6965 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3682 1975 14,5102 47,2732 10,1890 58,7891 32,3375 35,3240 1976 17,3918 48,5182 11,1263 57,7063 33,6793 37,5506 1977 19,3113 50,8414 12,2277 59,5321 36,2393 39,7733 1978 24,6427 53,2133 13,1245 62,4328 39,110 42,8149 1979 24,2720 55,2606 15,4257 64,9779 42,	1967	2,0038	32,8335	3,8980	37,3854	19,4788	21,9032
1969 5,2972 32,6474 4,0292 37,5277 20,3134 24,0630 1970 5,9513 33,2494 4,6450 37,7015 20,2955 25,4816 1971 6,2107 33,7857 5,6392 38,3655 20,3939 26,5660 1972 6,6152 34,8775 6,1018 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6965 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3682 1975 14,5102 47,2732 10,1890 58,7891 32,3375 35,3240 1976 17,3918 48,5182 11,1263 57,7063 33,6793 37,3506 1977 19,3113 50,8414 12,2277 59,5321 36,2393 39,7733 1978 20,8773 53,3123 13,1245 62,4328 39,1110 42,8149 1979 24,2720 55,2606 15,4257 64,9779 42	1968	4,5855	32,7815	3,9767	37,6304	19,8275	22,8270
1970 5,9513 33,2494 4,6450 37,7015 20,2955 25,4816 1971 6,2107 33,7857 5,6392 38,3655 20,3939 26,5660 1972 6,6152 34,8775 6,1018 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6965 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3682 1975 14,5102 47,2732 10,1890 58,7891 32,3375 53,5240 1977 19,3113 50,8414 12,2277 59,5321 36,2393 39,7733 1978 20,8773 53,3123 13,1245 62,4328 39,1110 42,8149 1979 24,2720 55,2606 15,4257 64,9779 42,9819 47,6385 1980 28,6452 58,9492 18,2333 70,5185 51,4508 54,0742 1981 32,1526 64,6672 20,6186 76,2883	1969	5,2972	32,6474	4,0292	37,5277	20,3134	24,0630
1971 6,2107 33,7857 5,6392 38,3655 20,3939 26,5660 1972 6,6152 34,8775 6,1018 39,1638 21,3805 27,4442 1973 8,6684 38,5606 7,1135 46,8543 24,6965 29,1513 1974 12,1879 45,2428 9,5437 57,3348 30,7011 32,3662 1975 14,5102 47,2732 10,1890 58,7891 32,3375 35,3240 1976 17,3918 48,5182 11,1263 57,7063 33,6793 37,3506 1977 19,3113 50,8414 12,2277 59,5321 36,2393 39,7733 1978 20,8773 53,3123 13,1245 62,4328 39,1110 42,8149 1979 24,2720 55,2606 15,4257 64,9779 42,9819 47,6385 1980 28,6452 58,9492 18,2333 70,5185 51,4508 54,0742 1981 32,1526 64,6672 20,6186 76,2883 <t< td=""><td>1970</td><td>5,9513</td><td>33,2494</td><td>4,6450</td><td>37,7015</td><td>20,2955</td><td>25,4816</td></t<>	1970	5,9513	33,2494	4,6450	37,7015	20,2955	25,4816
19726,615234,87756,101839,163821,380527,444219738,668438,56067,113546,854324,696529,1513197412,187945,24289,543757,334830,701132,3682197514,510247,273210,189058,789132,337535,3240197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,366839,744199276,771488,42697	1971	6,2107	33,7857	5,6392	38,3655	20,3939	26,5660
19738,668438,56067,113546,854324,696529,1513197412,187945,24289,543757,334830,701132,3682197514,510247,273210,189058,789132,337535,3240197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,328070,6114198648,172874,631442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,658198960,525278,815054,867385,188174,649981,3519199065,2538 <td< td=""><td>1972</td><td>6,6152</td><td>34,8775</td><td>6,1018</td><td>39,1638</td><td>21,3805</td><td>27,4442</td></td<>	1972	6,6152	34,8775	6,1018	39,1638	21,3805	27,4442
197412,187945,24289,543757,334830,701132,3682197514,510247,273210,189058,789132,337535,3240197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3261198339,350470,965023,650180,224563,288365,3615198443,64773,730734,688482,311163,85768,1833198545,520373,986142,741482,706366,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,7714 <t< td=""><td>1973</td><td>8,6684</td><td>38,5606</td><td>7,1135</td><td>46,8543</td><td>24,6965</td><td>29,1513</td></t<>	1973	8,6684	38,5606	7,1135	46,8543	24,6965	29,1513
197514,510247,273210,189058,789132,337535,340197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,186174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,64489,3744199276,7714<	1974	12,1879	45,2428	9,5437	57,3348	30,7011	32,3682
197617,391848,518211,126357,706333,679337,3506197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,258880,878362,110588,136379,111585,7432199171,394684,403273,596191,155589,981194,7933199276,771488,426979,921393,218587,051092,0814199210,0000 <td>1975</td> <td>14,5102</td> <td>47,2732</td> <td>10,1890</td> <td>58,7891</td> <td>32,3375</td> <td>35,3240</td>	1975	14,5102	47,2732	10,1890	58,7891	32,3375	35,3240
197719,311350,841412,227759,532136,239339,7733197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,3798 <td>1976</td> <td>17,3918</td> <td>48,5182</td> <td>11,1263</td> <td>57,7063</td> <td>33,6793</td> <td>37,3506</td>	1976	17,3918	48,5182	11,1263	57,7063	33,6793	37,3506
197820,877353,312313,124562,432839,111042,8149197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000 <td>1977</td> <td>19,3113</td> <td>50,8414</td> <td>12,2277</td> <td>59,5321</td> <td>36,2393</td> <td>39,7733</td>	1977	19,3113	50,8414	12,2277	59,5321	36,2393	39,7733
197924,272055,260615,425764,977942,981947,6385198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7933199491,379894,964692,564098,308694,518097,27111995100,000100,0000100,0000100,0000100,0000100,0000199918,657	1978	20,8773	53,3123	13,1245	62,4328	39,1110	42,8149
198028,645258,949218,233370,518551,450854,0742198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997	1979	24,2720	55,2606	15,4257	64,9779	42,9819	47,6385
198132,152664,667220,618676,288357,966159,6522198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998 </td <td>1980</td> <td>28,6452</td> <td>58,9492</td> <td>18,2333</td> <td>70,5185</td> <td>51,4508</td> <td>54,0742</td>	1980	28,6452	58,9492	18,2333	70,5185	51,4508	54,0742
198235,201168,430222,469979,276061,014563,3271198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,0056	1981	32,1526	64,6672	20,6186	76,2883	57,9661	59,6522
198339,350470,965023,650180,224563,288365,3615198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,05661999218,8649114,9358131,4208103,2427121,1562109,2655 <t< td=""><td>1982</td><td>35,2011</td><td>68,4302</td><td>22,4699</td><td>79,2760</td><td>61,0145</td><td>63,3271</td></t<>	1982	35,2011	68,4302	22,4699	79,2760	61,0145	63,3271
198443,464773,730734,688482,311163,835768,1833198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,05661999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,9944<	1983	39,3504	70,9650	23,6501	80,2245	63,2883	65,3615
198545,520373,986142,741482,706365,388070,6114198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,1582	1984	43,4647	73,7307	34,6884	82,3111	63,8357	68,1833
198648,172874,531442,602681,560266,592271,9239198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,830311	1985	45,5203	73,9861	42,7414	82,7063	65,3880	70,6114
198752,641174,747543,898581,987068,257074,6145198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,0561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443<	1986	48,1728	74,5314	42,6026	81,5602	66,5922	71,9239
198856,875176,658549,267283,235970,854177,6058198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,611	1987	52,6411	74,7475	43,8985	81,9870	68,2570	74,6145
198960,525278,815054,867385,188174,649981,3519199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,2435124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1988	56,8751	76,6585	49,2672	83,2359	70,8541	77,6058
199065,253880,878362,110588,136379,111585,7432199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1989	60,5252	78,8150	54,8673	85,1881	74,6499	81,3519
199171,394684,403273,596191,155583,648489,3744199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1990	65,2538	80,8783	62,1105	88,1363	79,1115	85,7432
199276,771488,426979,921393,218587,051092,0814199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1991	71,3946	84,4032	73,5961	91,1555	83,6484	89,3744
199384,205091,554285,421295,352589,981194,7993199491,379894,964692,564098,308694,518097,27111995100,0000100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1992	76,7714	88,4269	79,9213	93,2185	87,0510	92,0814
199491,379894,964692,564098,308694,518097,27111995100,000100,000100,000100,000100,000100,0001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1993	84,2050	91,5542	85,4212	95,3525	89,9811	94,7993
1995100,0000100,0000100,0000100,0000100,00001996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1994	91,3798	94,9646	92,5640	98,3086	94,5180	97,2711
1996107,9682103,5006107,5137101,4644105,7811102,93791997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1995	100,0000	100,0000	100,0000	100,0000	100,0000	100,0000
1997114,6879106,3011113,5246103,4519111,6851105,31071998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1996	107,9682	103,5006	107,5137	101,4644	105,7811	102,9379
1998181,6572111,9020124,0437103,1381120,7872107,00561999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1997	114,6879	106,3011	113,5246	103,4519	111,6851	105,3107
1999218,8649114,9358131,4208103,2427121,1562109,26552000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1998	181,6572	111,9020	124,0437	103,1381	120,7872	107,0056
2000227,0148116,6861136,6120104,6025123,0012112,99442001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	1999	218,8649	114,9358	131,4208	103,2427	121,1562	109,2655
2001253,1215118,3197145,9016105,6485124,9692116,15822002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	2000	227,0148	116,6861	136,6120	104,6025	123,0012	112,9944
2002283,2009120,4201150,2732105,2301125,8303118,07912003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	2001	253,1215	118,3197	145,9016	105,6485	124,9692	116,1582
2003301,8615121,7036155,4645105,7531128,0443120,67802004320,7037123,5706164,7541107,5314131,6113123,9548	2002	283,2009	120,4201	150,2732	105,2301	125,8303	118,0791
2004 320,7037 123,5706 164,7541 107,5314 131,6113 123,9548	2003	301,8615	121,7036	155,4645	105,7531	128,0443	120,6780
	2004	320,7037	123,5706	164,7541	107,5314	131,6113	123,9548

Table I-2: Annual Consumer Price Index (1995=100)

Source: Compiled from data in IMF's International Financial Statistics.

[Indonesia	Malaysia	Philippines	Singapore	Thailand	USA
1966	71,9384	162,6639	161,6161	103,9561	167,3002	145,4498
1967	223,3976	164,7379	164,3373	103,2639	169,0474	144,4190
1968	250,2110	160,7188	162,3538	100,9877	166,5300	146,5222
1969	251,7443	154,7373	157,3685	96,7565	163,0263	148,0109
1970	239,7600	149,3068	114,1875	91,6536	153,5726	147,3778
1971	216,2287	145,3817	119,2658	89,3588	144,8829	142,8330
1972	193,0014	145,2635	111,9442	88,4248	133,8553	131,1501
1973	212,3109	153,4841	110,5027	102,9378	131,8099	119,1772
1974	262,6386	159,1733	130,1944	111,5192	146,4770	117,1757
1975	280,7177	152,0767	117,3361	106,4979	138,3974	114,4936
1976	322,8477	143,8549	119,6007	96,6125	138,4296	115,6342
1977	321,5036	141,7767	119,4278	91,1224	133,5948	111,7559
1978	274,2052	135,7537	110,1540	87,5100	121,4838	102,7000
1979	206,5804	135,5600	117,3821	86,9909	121,5617	103,7079
1980	222,0421	137,6052	128,5599	94,1763	134,8778	110,2633
1981	243,1405	137,4905	134,2262	100,0630	139,6614	120,4642
1982	260,9258	144,9045	137,0931	104,0034	143,3025	130,8105
1983	211,1402	149,6064	110,2595	104,6436	147,4739	134,9633
1984	209,0382	154,2327	108,2499	106,4585	145,7805	143,7741
1985	202,2343	146,2656	119,2556	104,0355	129,3808	149,0310
1986	149,3995	123,1426	91,4663	88,1744	110,4425	124,0109
1987	112,1407	114,1172	83,1392	82,2259	102,2000	112,2614
1988	108,2276	104,1257	83,8729	80,9812	99,0733	106,1589
1989	107,9916	101,0378	88,5624	84,4659	101,5818	108,7963
1990	103,4967	97,3431	83,8010	89,3196	100,4863	105,5738
1991	102,1706	94,8945	83,9162	92,3474	101,3573	104,9254
1992	99,2515	100,8803	92,7441	93,9488	99,5695	102,8723
1993	103,6574	101,3141	91,4667	94,3796	101,0058	106,3393
1994	103,5913	98,1686	97,2688	98,5757	101,7571	105,4593
1995	100,0000	100,0000	100,0000	100,0000	100,0000	100,0000
1996	106,1722	104,1025	107,0124	103,5239	106,7013	104,7568
1997	96,2250	99,8164	105,2640	105,4910	96,1668	113,2228
1998	46,8370	80,1736	86,8972	100,0300	82,9105	121,2491
1999	71,8700	84,9544	96,3176	96,7967	90,5586	125,0892
2000	65,4855	82,2935	83,8178	92,1224	81,9957	121,9769
2001	62,0421	85,4291	79,4811	91,7670	77,5454	129,1746
2002	77,2984	87,5308	81,4696	91,6705	81,5265	132,3531
2003	88,9477	87,4773	79,6458	93,3901	85,1377	132,7151
2004	88,0909	86,0784	79,3614	94,9836	87,6205	131,6258

Table I-3: Annual Real Effective Exchange Rates

Source: See Appendix D for details.

	Indonesia	Malaysia	Philippines	Singapore	Thailand
1967	4358,4370	98,0289	699,9057	55,2194	169,3509
1968	2235,7520	100,4679	709,6556	56,5670	171,0831
1969	2042,1690	101,0792	713,0479	56,7731	171,0738
1970	1835,9110	100,6639	475,4445	56,5722	170,8200
1971	1682,7110	101,5379	433,2072	57,1237	169,7638
1972	1487,6250	103,2191	395,6779	58,1960	157,4659
1973	1367,0110	109,7428	364,9376	61,8739	146,9896
1974	1398,8200	113,3201	370,3873	63,5014	152,7245
1975	1400,8510	113,7907	348,0152	65,3160	152,3498
1976	1460,7020	111,6207	352,1051	64,7948	158,4897
1977	1421,5100	113,1551	347,0268	63,6878	154,0904
1978	1203,2940	110,9598	321,1489	62,4100	139,1125
1979	906,7242	124,4199	357,1155	69,6156	145,9434
1980	922,1494	126,6239	358,9617	71,3703	148,1870
1981	996,8893	127,6368	369,3348	77,2163	150,3277
1982	1047,3190	136,3088	372,2990	81,9916	156,6594
1983	800,2428	143,4746	301,3969	85,6815	163,7208
1984	757,7171	150,2379	213,9914	88,5491	169,1631
1985	737,6285	148,5803	202,3256	89,0025	153,9643
1986	548,9729	127,7493	163,3971	79,3450	135,9834
1987	392,2206	122,5472	151,0612	75,7804	127,2855
1988	371,8567	114,6099	145,4567	76,0257	125,3586
1989	377,6990	115,9928	151,2242	80,8192	131,0923
1990	370,0804	116,8227	140,1197	85,8205	133,2308
1991	356,1808	115,7866	127,3706	89,7218	134,9929
1992	344,1985	124,9376	140,0817	92,6137	135,2580
1993	352,8888	129,5048	140,9092	93,8612	141,5917
1994	350,2955	128,9889	150,8800	98,2868	144,8629
1995	319,4561	128,9832	148,8605	101,2737	138,7278
1996	321,5788	132,7522	152,0047	106,0278	143,0392
1997	280,3212	127,1123	144,8453	108,8077	124,6993
1998	87,4477	99,1671	111,2568	108,0628	100,7929
1999	112,1852	102,8067	117,4356	104,8173	110,5528
2000	100,0000	100,000	100,0000	100,000	100,000
2001	86,2490	104,5556	90,2692	100,3417	94,3866

Table I-4: Annual Nominal Effective Exchange Rates

Source: Constructed from IMF's International Financial Statistics.
	Indonesia Malaysia		Philippines	Singapore	Thailand
1967	0,8826	28,6443	2,7311	35,7551	15,8274
1968	2,0198	28,5990	2,7955	35,9894	16,1107
1969	2,3333	28,4820	2,8502	35,8911	16,5055
1970	2,6214	29,0072	3,2601	36,0575	16,4910
1971	2,7357	29,4751	3,9578	36,6924	16,5709
1972	2,9139	30,4276	4,2825	37,4559	17,3726
1973	3,8182	33,6408	4,9926	44,8110	20,0670
1974	5,3685	39,4704	6,6982	54,8345	24,9460
1975	6,3915	41,2417	7,1511	56,2254	26,2756
1976	7,6608	42,3279	7,8089	55,1898	27,3659
1977	8,5062	44,3546	8,5819	56,9360	29,4460
1978	9,1961	46,510348,210051,4280	9,2113	59,7102	31,7794
1979	10,6914		10,8264	62,1443	34,9247
1980	12,6176		12,7969	67,4433	41,8061
1981	14,1626	56,4165	14,4710	72,9615	47,0999
1982	15,5054	59,6993 61,9107	15,9502	75,8189	49,5770
1983	17,3331		17,5499	76,7260	51,4245
1984	19,1453	64,3235	26,3843	78,7217	51,8692
1985	20,0508	64,5464	32,4800	79,0996	53,1306
1986	21,2192	65,0221	32,7241	78,0035	54,1091
1987	23,1874	65,2107	33,9645	78,4117	55,4618
1988	25,0524	66,8778	36,9405	79,6061	57,5720
1989	26,6602	68,7592	40,8508	81,4732	60,6563
1990	28,7430	70,5592	46,0306	84,2928	64,2649
1991	31,4479	73,6344	54,5427	87,1804	67,9504
1992	33,8163	77,1447	59,2304	89,1534	70,7144
1993	37,0907	79,8730	63,3064	91,1944	73,0946
1994	40,2510	82,8482	68,6000	94,0215	76,8116
1995	44,0480	85,7070	73,2000	95,6392	81,2702
1996	47,5587	88,6969	78,7000	96,9620	86,0102
1997	50,5216	91,0585	83,1000	98,9048	90,8269
1998	80,0196	95,8576	90,8000	98,6402	98,1586
1999	96,4149	98,4885	96,2000	98,6567	98,4569
2000	100,000	100,0000	100,0000	100,0000	100,000
2001	111,5040	101,4170	106,8000	100,9970	101,6370

Source: Compiled from data in IMF's International Financial Statistics.

	Indonesia Malaysia		Philippines	Singapore	Thailand	
1967	35,8493	26,1351	29,4872	128,7153	24,5372	
1968	29,8097	28,3911	30,9078	29,8501	21,2539	
1969	30,4693	28,2537	42,6171	37,8532	23,9095	
1970	68,5364	23,8808	36,7829	49,7341	26,8869	
1971	45,9031	25,3298	38,9130	208,1341	31,0964	
1972	93,4153	28,5489	41,6660	38,4256	37,0707	
1973	65,3988	40,5546	85,5694	55,4450	43,8304	
1974	58,3969	46,8334	66,8565	66,1281	47,3339	
1975	80,7969	44,6761	81,1045	54,0050	51,7290	
1976	78,1199	47,2702	76,8546	56,8443	45,5965	
1977	78,3266	50,8011	81,8783	79,6752	50,9972	
1978	89,2278	60,0537	84,6879	85,2119	50,7077	
1979	1979 102,9396 1980 102,8773	63,1075	77,3860	96,6454	59,1342	
1980		68,9935	77,4901	96,3038	60,2810	
1981	109,8087	58,8053	96,6916	97,2259	61,9706	
1982	1982 78,7879	55,5325	91,2248	74,6615	62,1921	
1983	61,5100	55,5392	73,0273	75,3896	59,0010	
1984	67,3474	56,9826	85,6509	85,5092	52,2208	
1985	90,7559	52,3050	73,8709	76,0131	48,2633	
1986	108,6682	55,8242	73,1696	89,2399	65,5920	
1987	113,9056	63,3342	77,1471	95,3568	69,5378	
1988	115,1696	83,2011	80,6456	141,5655	81,2121	
1989	143,1402	74,8295	77,1428	129,6024	79,5066	
1990	169,3620	79,2262	97,0013	118,9910	86,1740	
1991	202,5219	80,2071	126,3670	121,8163	73,3469	
1992	218,2887	94,2768	101,8166	124,2795	95,9275	
1993	216,9305	95,4946	113,6393	126,6417	95,7520	
1994	204,9413	94,7732	104,5285	135,5169	103,1138	
1995	180,0965	119,2678	118,6133	181,4427	112,9745	
1996	161,2898	103,1130	114,4270	129,2028	104,2066	
1997	133,7376	99,3033	131,0588	117,7366	108,9904	
1998	138,1138	94,3476	114,6029	109,3036	124,3120	
1999	106,8984	63,2842	102,3583	102,1033	117,0548	
2000	100,000	100,000	100,0000	100,000	100,000	
2001	98,9816	66,5387	95,2977	98,8687	103,1678	

Table I-6: Annual Import Unit Values Index

Source: Constructed from UN's COMTRADE database.

	Singapore			Thailand			
	NEER	IMP	CPI	NEER	IMP	CPI	
1968q01				110,8675	14,1621	15,9557	
1968q02				110,2600	14,3347	16,1834	
1968q03				110,4390	14,7111	16,1350	
1968q04				110,6547	14,4288	16,1689	
1969q01				111,0746	14,2092	16,2609	
1969q02				111,2545	14,1308	16,4789	
1969q03				110,5512	14,6640	16,5854	
1969q04				110,6901	14,5542	16,6968	
1970q01				110,8525	14,3033	16,5661	
1970q02				110,4540	14,5385	16,4886	
1970q03				110,3992	14,8836	16,4740	
1970q04				110,5850	14,9306	16,4353	
1971q01				111,2626	15,0561	16,4256	
1971q02				111,8443	15,1973	16,4207	
1971q03				111,1806	15,6834	16,6678	
1971q04				110,7318	15,8089	16,7695	
1972q01				111,2126	15,7305	16,8809	
1972q02				111,8066	15,9971	17,1522	
1972q03				113,2423	16,0128	17,4525	
1972q04				111,8162	15,9030	18,0047	
1973q01				116,7211	16,4362	18,7603	
1973q02				118,6737	18,2217	19,6080	
1973q03				121,5663	21,5811	20,3588	
1973q04				120,2103	23,4295	21,5407	
1974q01	147,3379	54,7077	53,4890	121,9721	29,3152	23,3959	
1974q02	147,0064	55,7981	54,1240	121,9252	33,3499	25,0864	
1974q03	148,8269	54,1217	55,2125	123,7698	34,9669	25,4594	
1974q04	153,7384	55,4705	56,5127	127,5735	35,3031	25,8421	
1975q01	154,5060	57,1610	56,6639	127,8981	35,5593	25,7985	
1975q02	152,7442	56,2793	55,8172	126,4669	34,1344	26,2199	
1975q03	142,9625	54,0541	56,3313	119,0826	34,4546	26,3555	
1975q04	142,7954	55,0299	56,0894	118,9885	34,1865	26,7285	
1976q01	144,7781	56,8001	55,9382	121,1965	36,1168	27,0876	
1976q02	145,8748	57,8928	55,0008	122,3413	35,8033	27,1788	
1976q03	145,6119	58,5455	54,7589	121,9035	35,9775	27,2883	
1976q04	145,1563	59,4528	55,0613	121,6167	36,8133	27,9087	
1977q01	146,3515	60,4823	56,1801	122,5920	39,0772	28,2189	
1977q02	144,7845	61,2433	55,9684	121,2881	39,4603	29,2316	
1977q03	145,2398	62,0939	57,5407	122,3778	39,9479	29,9980	
1977q04	144,1492	63,7997	58,0548	120,6823	41,1669	30,3356	
1978q01	141,4296	65,6401	59,0526	117,8701	42,9779	30,6731	
1978q02	138,4918	66,8966	59,0526	115,0488	42,0376	31,6220	
1978q03	138,5704	70,0309	60,2621	114,6004	44,2511	32,1876	
1978q04	143,6462	73,5070	60,4737	117,6154	44,5257	32,6347	
1979q01	147,0538	74,9611	60,4435	121,0210	46,2314	32,8536	
1979q02	149,2541	79,1499	60,7156	123,1517	48,6072	33,8663	
1979q03	150,2443	85,1712	62,9229	124,2349	52,3904	35,7458	
1979q04	149,7380	86,4005	64,4952	124,6563	54,1672	37,2329	
1980q01	151,1837	93,9183	66,0071	126,7579	59,3141	39,3313	

Table I-7: Quarterly Data used in Section 5.4

		Singapore			Thailand	
	NEER	IMP	CPI	NEER	IMP	CPI
1980q02	150,2524	94,4517	66,9444	124,8051	61,4941	41,8038
1980q03	151,3316	98,4283	68,1236	125,8643	63,9070	42,5245
1980q04	147,2533	99,6296	68,6981	122,4041	65,0536	43,5646
1981q01	148,2458	102,4810	69,6960	123,9087	66,0514	45,1977
1981q02	154,5441	99,9479	72,1149	130,8152	67,7076	47,0133
1981q03	156,1772	97,1050	74,6246	132,1432	65,4055	47,5698
1981q04	157,8442	98,2113	75,4107	133,7521	67,0644	48,6190
1982q01	160,2850	96,6193	76,1666	137,4918	67,0953	48,9839
1982q02	162,2705	94,9668	75,2898	139,8335	66,0759	49,4492
1982q03	165,1067	92,7009	75,6526	143,1927	66,0759	49,5952
1982q04	162,2964	91,2293	76,1666	140,1677	63,2340	50,2795
1983q01	167,2578	93,5434	76,5295	145,7612	80,5819	50,1335
1983q02	168,0643	92,6286	76,3783	146,2908	79,6919	51,2466
1983q03	168,8655	91,9594	76,6504	147,5444	77,4326	51,9856
1983q04	170,1567	92,2839	77,3459	149,4031	78,0488	52,3323
1984q01	170,6554	93,2845	78,8275	149,7279	77,9803	51,6845
1984q02	174,9597	93,0959	78,5554	154,9671	79,0073	52,0221
1984q03	177,4104	89,8387	78,9787	158,4001	79,0757	51,8761
1984q04	178,0798	88,1644	78,5251	159,0517	77,1407	51,8943
1985q01	172,3446	86,8530	79,0089	153,9839	58,5212	52,3961
1985q02	173,3718	85,8064	79,0089	155,5250	58,3558	53,0530
1985q03	166,0125	84,4589	79,4020	147,5931	58,2070	53,3815
1985q04	162,0208	86,6854	78,9787	143,2480	58,5370	53,6917
1986q01	147,5213	80,8738	78,5856	129,6118	59,1162	53,6040
1986q02	140,8539	73,7603	77,7692	122,8959	55,1879	54,0189
1986q03	138,9003	75,0689	77,7390	119,4409	55,2071	54,2534
1986q04	139,7289	77,2121	77,9204	120,3901	55,6944	54,5780
1987q01	138,6414	82,8232	77,9506	119,2819	58,6247	54,5780
1987q02	138,2854	85,4813	78,1018	120,0518	60,1884	55,1011
1987q03	137,5829	86,7778	78,7065	119,4696	62,2453	55,7864
1987q04	129,4320	88,4878	78,8880	111,1126	64,9951	56,3275
1988q01	127,3280	89,9887	79,1903	109,9882	65,9091	56,7424
1988q02	129,8060	91,8162	79,2810	113,6674	68,4611	57,3556
1988q03	128,1805	89,0973	79,9160	113,1343	69,7700	57,8606
1988q04	122,3819	89,9237	80,0370	107,9054	71,1452	58,4017
1989q01	124,1835	93.5041	80,1881	110,2321	73,2067	59,1232
1989a02	130.2443	94.0380	81.1860	117.0878	73.3163	59.8987
1989a03	128,4231	91,5442	81,9116	116.3137	73,0168	61.5761
1989a04	127.3561	92.9508	82.6071	116.2593	73.2541	62.0992
1990a01	128.9586	94.6030	83.3025	119.9623	74.0959	62.7304
1990a02	127,9807	92,2118	83,8166	119,1672	74,1164	63.8126
1990a03	123.1655	101.1160	84.3911	114.0019	76,7358	64.4619
1990a04	122.0081	109.2440	85.6610	113.4877	82.1667	66.0852
1991a01	124,4368	101,5470	86.3565	117 0617	82,0750	66.3557
1991a02	125,3310	95,6274	87,0519	118 3776	80,0607	67,7806
1991a03	123 3763	97 1824	87 4148	116 1417	79 2658	68 3397
1991a04	120,2882	99.8577	87,8985	113,2300	80,1850	69.2596
1992a01	130,5113	99,1990	88,2916	125,1577	79,7464	69.4760

Table I-7: Quarterly Data used in Section 5.4 (continued)

							
	Singapore			Thailand			
	NEER	IMP	CPI	NEER	IMP	CPI	
1992q02	130,0052	101,0750	89,0173	124,6800	81,1051	70,4861	
1992q03	128,0293	102,7860	89,4406	123,2430	81,8386	71,6224	
1992q04	129,4226	100,7850	89,8639	126,8679	81,8941	71,0770	
1993q01	128,4759	100,0550	90,4687	126,8023	80,9410	71,6795	
1993q02	127,5847	103,0290	90,9222	126,8857	83,0120	72,7025	
1993q03	128,2208	102,3160	91,3758	128,8516	81,2296	73,7937	
1993q04	124,9328	102,2910	92,0108	127,4175	81,0861	74,2029	
1994q01	124,2092	101,3530	92,7969	127,4438	81,7294	75,1236	
1994q02	124,6089	105,1350	93,7645	129,1049	82,1627	76,3853	
1994q03	124,9629	109,4280	94,4902	128,8832	86,6965	77,5789	
1994q04	125,8983	111,3780	95,0344	129,8717	87,1942	78,1586	
1995q01	121,5331	113,4730	95,1252	124,3315	92,9860	78,7724	
1995q02	124,1569	117,5080	95,7299	126,7118	94,6514	80,4774	
1995q03	125,6492	114,2130	95,7904	129,1536	94,7438	82,1483	
1995q04	125,7428	114,5510	95,9113	129,2769	101,7820	83,6829	
1996q01	127,5660	114,5980	96,3649	131,4632	105,8600	84,5695	
1996q02	130,9664	114,2770	96,8487	135,3846	107,3890	85,5243	
1996q03	130,8126	112,8350	97,1510	135,2837	106,7630	86,4109	
1996q04	131,3232	114,9680	97,4836	135,9668	108,7340	87,5362	
1997q01	138,6361	111,9190	98,0279	145,0824	109,7500	88,3205	
1997q02	134,7323	108,8750	98,5117	140,4401	105,9560	89,1731	
1997q03	113,1848	105,8340	99,3583	115,1539	102,2370	91,7306	
1997q04	100,7267	101,3380	99,7212	100,3446	100,7060	94,0835	
1998q01	107,4699	94,4848	99,1594	106,8977	98,6959	96,2660	
1998q02	98,2171	94,2565	98,6319	96,0100	98,0445	98,4143	
1998q03	103,2240	89,8837	98,5001	101,8627	92,8853	99,2327	
1998q04	98,2847	93,3722	98,2693	97,0810	92,4310	98,7212	
1999q01	101,2327	89,9642	98,4342	101,0597	90,8942	98,7212	
1999q02	101,2616	91,6145	98,5990	101,8888	90,3414	98,0051	
1999q03	98,6045	93,9363	98,7968	97,6975	92,2372	98,3120	
1999q04	97,9509	97,9486	98,7968	97,5446	95,1239	98,7894	
2000q01	100,0000	98,2136	99,5220	100,0000	94,3284	99,6078	
2000q02	100,6382	99,8016	99,4231	100,3389	96,3752	99,5737	
2000q03	103,5038	100,8960	100,2800	103,6478	100,7680	100,3920	
2000q04	104,4194	101,0420	100,7750	104,3064	107,4310	100,4260	
2001q01	108,5977	98,3201	101,2030	109,3352	112,0270	101,0060	
2001q02	109,4067	97,0269	101,1040	110,3011	109,9650	102,0630	
2001q03	106,3511	97,3503	101,1040	107,1283	106,9720	102,0290	
2001q04	109,7165	93,3161	100,5770	111,2415	105,6980	101,4490	

Table I-7: Quarterly Data used in Section 5.4 (continued)

Source: Compiled from data in IMF's International Financial Statistics.

<u>Table I-7</u>: Grubel-Lloyd Intra-Industry Trade Indexes

	Indonesia- Malaysia	Indonesia- Philippines	Indonesia- Singapore	Indonesia- Thailand	Malaysia- Philippines	Singapore- Malaysia	Singapore- Philippines	Thailand- Malaysia	Thailand- Philippines	Thailand- Singapore
1962	6,8739	0,0729	5,6559	0,0363	0,0827	14,5228	2,3977	0,4694	5,6769	0,4499
1963	0,7093	0,0094	4,1012	0,0445	0,0735	16,3062	13,9066	0,5660	5,2752	0,6129
1964	2,1736	0,0744	0,6855	0,0338	0,2568	19,0658	1,0384	0,6663	0,4925	2,2498
1965	0,5229	0,0102	0,6889	0,2089	0,3283	19,1734	15,2560	0,7808	0,3445	2,1232
1966	0,8182	0,3917	0,4332	0,1415	0,2558	20,1502	12,3027	0,8825	0,4187	2,3356
1967	0,4552	0,2277	0,3718	0,1677	0,4238	19,5224	7,2475	1,0531	0,6592	3,0579
1968	0,2030	0,0000	0,0998	0,0991	0,6712	22,4213	1,0067	1,1836	0,6096	3,1737
1969	0,4434	0,0734	0,0698	0,4912	0,5927	15,9238	2,0636	1,8543	0,8323	2,6884
1970	0,6220	0,0450	0,4615	0,2097	1,2212	16,4909	5,6775	2,8570	2,1913	2,3861
1971	1,1487	0,2098	1,7166	0,6997	0,3591	20,4080	7,6103	2,8970	0,4383	6,2686
1972	0,5995	0,4707	0,0469	0,2877	0,3379	17,9054	5,1477	2,5563	0,6022	3,2534
1973	0,6998	0,1666	0,0812	0,5925	0,4328	14,9846	6,0003	3,5346	1,1720	4,4931
1974	0,8950	0,5284	0,1338	0,2147	0,3782	17,3717	9,4448	3,8763	1,2669	4,0474
1975	1,9631	0,0000	0,0413	0,6538	0,4913	22,7233	15,1294	3,3999	0,3804	3,0211
1976	2,4751	0,0135	0,0015	0,1473	0,3779	19,4481	9,3460	4,3960	0,8520	3,3481
1977	2,4649	0,0413	12,0013	0,0300	1,8999	18,5320	13,3737	3,3358	4,5338	3,6944
1978	1,2602	0,1628	0,0141	0,9305	21,7171	25,7656	9,5475	5,6215	2,5740	4,0100
1979	4,5804	0,1182	8,3915	1,5269	1,8392	17,1860	10,3968	8,6627	6,2001	3,4540
1980	2,6930	0,6612	7,4385	1,2375	1,3715	16,4110	10,5196	6,7591	3,3020	3,6564
1981	8,5942	0,1623	0,0387	0,8476	1,1511	15,5819	17,6078	6,2168	7,3941	4,0230
1982	2,6992	0,0673	0,0239	0,2395	1,3676	17,1229	19,0349	3,6663	8,3700	5,2035
1983	2,3587	0,4944	0,0146	0,6289	0,0000	26,9574	21,8208	4,2750	3,4467	6,6575
1984	11,3470	0,0000	1,1720	0,2014	3,6067	23,0938	16,7204	3,5474	3,5805	5,3321
1985	6,3302	0,0000	2,8435	0,0000	1,5764	24,9223	10,2909	2,6438	1,6278	7,2619
1986	1,7126	0,0000	3,5495	1,3369	1,1979	27,0908	10,0701	3,9132	1,5738	7,8727
1987	23,0419	0,5821	4,1089	1,3955	2,5079	27,8795	10,0599	5,9250	0,9985	16,8319
1988	18,4250	1,4274	6,4980	2,4443	3,5919	28,7582	10,6268	11,4364	1,6781	26,5802
1989	7,1122	5,6637	5,8882	2,9380	4,1722	29,1253	8,2485	12,7915	2,9402	29,4954

	-										
		Indonesia-	Indonesia-	Indonesia-	Indonesia-	Malaysia-	Singapore-	Singapore-	Thailand-	Thailand-	Thailand-
		Malaysia	Philippines	Singapore	Inailand	Philippines	Malaysia	Philippines	Malaysia	Philippines	Singapore
	1990	5,2020	5,0547	9,4300	3,9392	4,3147	36,5749	11,0704	10,2737	4,0177	35,6696
	1991	7,3262	4,9497	9,4700	4,5357	9,6656	39,7352	14,7633	17,2728	22,2211	37,1469
	1992	16,0835	5,9622	12,1829	6,6388	4,8878	41,3716	16,6050	22,8886	16,4769	40,1675
	1993	19,0238	5,5915	16,0267	9,7409	9,7497	42,3494	14,3700	27,6786	23,6901	34,6469
	1994	18,2594	5,1389	13,7392	13,8591	9,1832	45,9243	14,4446	29,7275	13,5720	38,7383
	1995	15,8565	5,4189	21,1069	12,9176	12,0858	45,8994	17,4937	33,1484	9,4755	37,8524
	1996	16,4870	6,6916	19,4392	16,7057	22,8149	46,7715	25,4386	36,1710	16,5041	38,1952
C	<u> </u>	(1.C E	·	114 (2005)							

<u>Table I-7</u>: Grubel-Lloyd Intra-Industry Trade Indexes (continued)

Source: Constructed from Feenstra, Lipsey, Deng and Ma (2005)

Table I-9: Geodesic Distances between Asean Countries

Country	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	-				
Malaysia	1174,20	-			
Philippines	2792,09	2470,86	-		
Singapore	886,10	315,54	2396,78	-	
Thailand	2316,47	1187,12	2210,02	1433,94	-

Source: Compiled from CEPII database.

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