DETERMINANTS OF TRADE AND INVESTMENT IN SOUTHEAST ASIA: AN APPLICATION OF THE GRAVITY TRADE MODEL

by

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ABSTRACT

This study is an analysis of the determinants of bilateral trade and foreign direct investment in ASEAN at the time of the establishment of ASEAN Free Trade Area and its enlargement. Beginning with an economic perspective on ASEAN and a review of the literature, the theoretical underpinning of the model is then demonstrated. This confirms that the gravity trade model can be derived from several trade theories. The model is then used to assess ASEAN's trade pattern in both aggregate and disaggregate level. The results show that, although there is trade diversion regarding its importing activities, the positive effect of ASEAN's trade creation is higher than the negative effect of its trade diversion. Moreover, the impact of distance is not diminishing overtime. The disaggregate model shows that the products that are not convenient to transport have high distant effect. The results from FDI model confirm that the gravity variables are significant determinants of FDI. The negative effect of proximity suggests that there is Vertical-FDI in this region and FDI is complementary to trade. ASEAN should continue facilitate trade and capital movement among members in order to increase aggregate economic activities and bring economic prosperity to the region in a whole.

DEDICATION

To my family

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CHAPTER 1

INTRODUCTION

1.1 The Motivation and Importance of the Study

In the last few decades, the global trading system has been subject to both multilateralism and regionalism. Recently, the growth of regional trading blocs, also known as Regional Integration Agreements (RIAs), has been one of the major developments in international economies. Many of the developed and developing countries are members of one or more regional integration agreements. The structure of regional trading blocs greatly varies in many ways, but usually they have the common objective of reducing trade barriers between member countries. At the least, they make it a priority to remove the tariffs on the intra-regional trade of goods. Additionally, non-tariff barriers and the liberalisation of trade and investment are included in many regional agreements. At the most ambitious, economic union is the goal, leading to the implication in the construction of shared executive, judicial and legislative institutions.

One of such regional trading agreements is the Association of Southeast Asian Nations or ASEAN. ASEAN consists of 10 countries: in alphabetical order, these are Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. The trading pattern in ASEAN is somewhat distinct from that of other regions. Developed countries such as Japan and the US have played an important role in its pattern of trade since the early 1960s. A quick glance on the trade flows in the last three

decades gives us the general idea that ASEAN is, to some extent, part of an integrated production centre which supplies manufactured goods to the 'Western' market.

At the same time, the volume of intra-ASEAN trade is increasing steadily, a sign that ASEAN trading between the members within the region is rising. This may be due to the fact that ASEAN introduced an ASEAN Free Trade Area (AFTA) in 1992, with the aim of reducing the tariff within the region down to 0 to 5 per cent by 2002. This process operated according to plan.

Furthermore, ASEAN's success is all the more astounding because it began at a time of poverty and political conflict in the region including Vietnam War and political conflict in Cambodia and Myanmar. In addition, the region was recently deep in a financial crisis. The crisis erupted in July 1997, threatening to reverse the region's economic and social gains for two decades (ASEAN Secretariat, 2004). However, the ASEAN economies recovered within two years of the economic crisis. This event has certainly proved their fundamental strength and spirit.

Note that while ASEAN is establishing an economic integration among its members, it is simultaneously embracing bilateral trade liberalisation initiatives for achieving deeper economic integration with several other countries. Thus, there has been a rapid proliferation of bilateral Free Trade Agreements (FTAs) between ASEAN and its major trading partners. ASEAN as a bloc and also many ASEAN individual countries are now pursuing trade and economic frameworks and agreements with non-ASEAN countries.

For example, Singapore has signed Free Trade Agreements with New Zealand, Japan, Australia, US, European Free Trade Association and Jordan. Thailand has signed or is pursuing agreements with US, New Zealand, Australia, China, and Japan. Malaysia and the

US agreed to a framework for a bilateral agreement in May 2004. Malaysia and Japan are negotiating a Closer Economic Partnership, and Malaysia and Australia are contemplating a bilateral FTA. The list of subjects includes services liberalisation, facilitation of trade and investment, promotion and protection of investment and intellectual property, tariff reduction for industrial and agricultural goods, environment and labour standards.

Besides individual ASEAN countries continuing to negotiate bilateral trade deals with their trading partners, there is also rising interest among the ASEAN members in negotiating bilateral FTAs with their major trading partners as a single grouping. So far, ASEAN as a group is negotiating bilateral FTAs with China, India, the Australia-New Zealand Closer Economic Relations (CER) grouping, Korea and Japan.

Regarding the foreign direct investment in the region (FDI), throughout the life of ASEAN, Southeast Asian industrial structures have experienced a process of adjustment into more capital-intensive and technologically sophisticated manufacturing sectors. These adjustments created intra-regional flows of FDI, followed by the expansion of capital and production of intermediate goods, as well as increased intra-firm and intra-industry trade within the region.

Today, the ASEAN region covers three time-zones and embraces a key part of Asia's continental landmass and several archipelagos. Economically, it belongs to the developing world; nevertheless it is a fast growing economy. Its population of over 500 million supplies a massive and still expanding middle-class market.

In addition to its economic importance and the natural resources, the location of ASEAN is also significant. Southeast Asia is one of the essential global marine territories. It

is the bridge between the Indian and Pacific Oceans and encompasses some of the busiest sea-lanes in the world.

For these reasons, it seems essential to investigate the pattern of trade and investment of ASEAN, in particular the impact of its geographical location and the distances between trading partners on trade flows and foreign direct investment of each manufactured commodity. The study will be on bilateral basis since as small open economies, ASEAN countries have been actively pursuing the bilateral negotiation more than the unilateral or multilateral one.

One of the issues debated most often in this field of study is whether this regionalism has arisen naturally due to geographical location or whether there are other factors determining the trade flows between the member countries. Many of the studies are on a bilateral basis as they are relevant to designing trade policies and studying international linkages. Several studies have used the gravity trade model to explore this issue since it is a standard framework to account for bilateral trade flows. It has been most often applied to study the determinants of bilateral trade flows and to assess the impact of various forms of regional economic integration, such as the creation of a customs union or the adoption of a common currency, on the volume of bilateral trade between integrating countries.

Nevertheless, most of these studies analyse only the trade pattern of developed countries or 'Western' regions. There are not many studies concerning specifically on the Asia Pacific region. A few exceptions include Frankel (1993) who applies the model to testing a Yen bloc with reference to Japan's large volume of trade with countries in East Asia and the Pacific Rim. Similar related empirical studies include those of Frankel et al (1995) and Frankel and Wei (1996). A more recent example is that by Elliott and Ikemoto (2004) which

applies a modified gravity trade equation to examine the intra- and extra-regional bias in Southeast Asian's bilateral trade flows.

Moreover, concerning bilateral trade and foreign direct investment flows at the disaggregate level; there are a small number of writers who investigate the diverse impacts of gravity-oriented variables in various industrial sectors. One study of this is by Hejazi and Trefler (1996), who investigate whether transaction costs are uniformly important across industries by disaggregating the regression into 37 industries. There are also studies which focus on the Southeast Asia region. Mathur (2000) employs cross-sectional data for three commodities groups, namely, Total Manufactures, Food and Raw Materials. Kim, Cho and Koo (2003) distinguish trade flow in three large categories: high-tech, medium-tech and low-tech commodities.

However, none of the previous studies applies the gravity trade model specifically to Southeast Asian countries at the industry level by disaggregating more into each sector of manufactured goods, nor applied the model of foreign direct investment flows to the region at industry level. Therefore, our intention is to explore this area of interest further.

Additionally, even though the gravity trade model has long been considered dubious and lacking respectable theoretical foundations, it has recently experienced a revitalisation within the field of international trade. This is due to its remarkable empirical success and its improved theoretical foundation, arising mostly from modern theories of trade in imperfect substitutes and differentiated products. Moreover, there is also among economists a growing interest in the influence of geography on trade, regarding countries or regions as physically positioned at particular locations rather than as constructed in a disembodied way.

In consequence, the aim of the present research is to apply the gravity trade model to studying the trade and investment pattern among Southeast Asian countries.

1.2 Objectives of the Study

This research is an analysis of the determinants of bilateral trade flow and foreign direct investment (FDI) of ASEAN in order to access whether it has been successful. We will also focus on the importance of geographical distances between trading partners and the impact of such distances on trade flows and FDI in industry level. In addition, we are interest in the differences of effect of each determinant of trade and FDI flows in each manufacturing sectors.

We base our study on the gravity trade model. For its theoretical foundation, we attempt to outline the model and illustrate a general condition of gravity to explain why it can be applied to a wide variety of trade conditions.

Regarding the bilateral trade, we use the gravity trade model to explain bilateral trade in order to put greater emphasis on ASEAN and contrasting this regional trading arrangement with other trade blocs. With an inclusion of a set of dummy variables which capturing the regional effects, the model can be used to assess whether there are trade creation and trade diversion as a result of such regional integration arrangement. The key point of the study is that ASEAN is successful if there is a trade creation effect as a result of ASEAN. However, the level of its trade creation effect on each manufacturing sector could be different because the divergence in the details of preferential trading agreement in each sector. The hypothesis regarding the importance of geographical distance between trading partners is that distance is

a proxy of transaction cost, therefore, its impact on the products that are difficult to transport; i.e. large in size, heavy or fragile, should be higher than those that are easier to transport.

The gravitational framework is also applied to the analysis of bilateral FDI in Southeast Asia. Although theoretical foundations of the gravity model mostly refer to trade flows and are much less clearly established for gravity models on bilateral FDI, it is still possible to justify this framework. Using gravity model in the analysis of regional FDI distribution presumes that county size and distance can be considered important FDI determinants. GDP of source country is a proxy of its financial power and should influence bilateral FDI positively while its population is proxy of size therefore the possibilities of profitable investment within its location, hence population of source country should impact negatively on bilateral foreign investment.

Host country's characteristics can be explained as a part of location advantages. GDP of the host country is a proxy of potential demand and should correlate positively with bilateral FDI while theoretically the large population size in the destination implies that it is less dependent on foreign financial flows than a country with smaller population, therefore we may expect number of population at host country to have negative impact on FDI flows.

In addition, distance variable is a proxy of transaction cost. In the case of horizontal-FDI which aims to avoid transportation cost or other trade barriers, distance can be an incentive for FDI therefore we expect a greater amount of flows to a distance country and expected sign of distance variable is positive. However, in the case of vertical-FDI which takes advantage of low production cost in destination location, distance is an impediment to FDI flows; therefore, we should expect a negative relationship between distance and FDI.

Therefore, our main aim concerning the bilateral FDI is to use the gravity model as a base model to explore the determinant of bilateral FDI in ASEAN. At this point, because the investment in ASEAN has a pattern of vertical-FDI as investors take advantage of low production cost in the region, we expect the distance has negative effect on FDI. We will, then, introduce a number of other variables to the model in order to capture the different characteristics of each location. We will also explore the impact of ASEAN on some manufacturing sectors since there are the differences in the patterns of investment and FDI promoting policies in each sector.

As a result, this thesis is committed not simply to a single question but rather a set of questions and to both theoretical and empirical aspects. The theories are partly linked with empirical applications in order to demonstrate their validity. In summary, the purpose of the thesis is to apply the gravity trade model to assess whether ASEAN has been success.

1.3 Scope of the Study

The time frame of this study regarding bilateral trade patterns extends from the time of the beginning of ASEAN's economic cooperation in the late 1980s, the introduction of the ASEAN Free Trade Area (AFTA) in 1992, the enlargement of ASEAN in the mid- to late 1990s and the period after the financial crisis which affected the region in 1997. Regarding FDI, the study will focus on the period after the financial crisis due to lack of bilateral FDI data prior to this period.

As for the countries included in the empirical study, our main focus is on ASEAN-10. In the bilateral trade analysis, our data cover 50 countries which represent around 83 per cent

of total world exports and constituted over 98 per cent of ASEAN's total exports, on average, within the period studied their main trading partners. For the analysis of bilateral FDI, our sample includes FDI flows from 16 source countries (both ASEAN and non-ASEAN) into 8 ASEAN countries. The selected source countries are the major suppliers of FDI flow in ASEAN and contributed approximately 97 per cent of total FDI inflow in 2000.

1.4 Outline of the Study

The outline of the thesis is organised as follows. The study begins with an overview of ASEAN's organisation and economies in Chapter 2. The details of its establishment and enlargement, its economic and functional cooperation and also each member country's economic perspective are described. Additionally, ASEAN's trade and investment performance are illustrated.

Chapter 3 surveys the literatures relevant to the issues examined in the thesis. Starting with the major writings which formulated a theoretical foundation for the gravity trade model, the chapter goes on to explore some significant empirical studies on this model, including recent writings about ASEAN and works which apply the gravity trade model at industry level or use disaggregate data or applies the gravity trade model in investigating foreign direct investment patterns.

Chapter 4 provides theoretical underpinnings for the gravity trade model. The basic concept of its formulation is then developed further so as to examine theoretical elements underlining the model and finally to capture the fundamental features of this successful

empirical trade device. The formulation also attempts to explain why the gravity trade model works with wide varieties of theoretical trade environments.

Chapter 5 contains an empirical study of the gravity trade model, starting by describing the models and research method used in the present analysis. The data sources and its adjustment are illustrated. The analysis covers both aggregate and disaggregate levels. In the aggregate level, the ordinary least square regression is applied in order to obtain estimation results of the model for each year in question, namely, 1982, 1987, 1992, 1997, 2002 and 2005. Thus, it is possible to explore changes over time in the impact of each variable. Afterwards, the present study also introduces dummy variables to measure the impact of ASEAN on trade creation and trade diversion. In the disaggregate level, using the same set of data as the aggregate level, the study divides the commodities into 35 sectors according to the BEA Classification[1], since this is the only data that are widely available at the industry level. These sectors are categorised into either homogeneous or differentiated products according to Rauch's Classification (Rauch, 1996). The data are also subjected to ordinary least square regression using the same model as the aggregate level, but taking only 3 different years due to lack of data in recent years. The years considered are 1987, 1992 and 1997. The results from this estimation will provide an idea of changes over time of the impact of each variable for each commodity, as well as the differences in effect of income and distance on each commodity.

Chapter 6 investigates the determinants of foreign direct investment in ASEAN using the gravity-type model. The regression is done both in the aggregate and disaggregate levels. Because of the limitation of data on bilateral FDI flows in ASEAN, we can apply the model

[1] US's Bureau of Economic Analysis, Department of Commerce.

only to the year and countries for which data are available. This limits our period of study to 1999-2003. The chapter also explores whether FDI in each sector is a complement to or substitute for trade. Using geographical distance as a proxy of transportation cost, the positive effect of distance to FDI implies that a foreign firm invests in a host country in order to avoid transportation cost; hence FDI is a substitute for trade. However, if the effect of distance on FDI is negative, it implies that foreign firms consider distance as information cost and invest only in order to take advantage of the lower production cost in a host country. This type of investment will generate more imports of intermediate products and more exports of final products. Hence, in the latter case, FDI is a complement to trade.

Finally, Chapter 7 concludes the thesis. It includes information on the limitations of this study and suggestions for some questions for further research.

CHAPTER 2

THE ASSOCIATION OF SOUTHEAST ASIAN NATIONS: THE GROWTH AND DEVELOPMENT OF ASEAN ECONOMIES

2.1 Introduction

The Association of Southeast Asian Nations or ASEAN, which comprises Brunei Darussalam[2], Cambodia, Indonesia, Laos, Malaysia, Myanmar[3], the Philippines, Singapore, Thailand and Vietnam, is generally regarded as one of the most successful regional groupings among developing countries. The political accomplishments of ASEAN have been significant. They have played an important role in the international efforts aimed at solving the difficult problems in the region and have been instrumental in working toward peace and stability in the region. However, their achievements in economic co-operation have hitherto been limited.

In terms of its total economy, on the other hand, it has been one of the fastest growing regional groupings in the world. For instance, for the period 1981 to 1990 its growth rate averaged 4.5 per cent and between 1991 and 2002, it averaged 5.7 per cent. These average growth rates were well above world growth rates in these periods, which were 3.3 and 2.7 per cent, respectively (see Table 2.1). As a result of their high growth rates, the members' standard of living, as measured by their per capita incomes and other quality of life indications, has vastly improved. Overall, they have graduated from the ranks of low-income countries, as classified by the World Bank, to middle and, in some cases, upper-middle

[2] Brunei Darussalam, henceforth, will be known as Brunei.
[3] Myanmar was known as Burma.

income countries (see Table 2.2). Singapore in particular, which has the highest per capita income among the ASEAN countries, has attained advanced developing country status and is recognised as one of the four Newly Industrialising Countries (NICs)[4] of Asia. Malaysia is well on its way to becoming one, while the Philippines, Indonesia and Thailand are on the verge of significant economic transformation and enjoying robust economies.

The ASEAN countries are also major world producers of important raw materials such as rubber, tin, copra, palm oil, petroleum and timber. Many ASEAN countries are also substantial world producers of manufactured goods. In addition, the location of the ASEAN countries puts them in a strategic economic position. Indonesia, Malaysia, Singapore and Thailand are positioned at the crossroads of world shipping and airline routes and Singapore is the hub of Southeast Asian trade. ASEAN countries are now regarded as a major grouping in world trade negotiations by international agencies such as the World Trade Organisation (WTO), the United Nations Conference on Trade and Development (UNCTAD), as well as by major world trading countries such as the US, Japan and the European Union. In the Asia-Pacific region, ASEAN countries constitute an important sub-group of countries in the Asia-Pacific Economic Co-operation forum (APEC). Hence, in world economic affairs, ASEAN is, indeed, a significant regional trading group.

The expansion of ASEAN, which included the whole region, has accompanied this spectacular growth by significant structural changes, poverty alleviation and improved levels of income distribution. This economic success is expected to continue into the new era.

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[4] NICs began to be recognized in the 1970s when the so-called East Asian Tigers of Hong Kong, South Korea, Singapore and the Republic of China (Taiwan) rose to global prominence with rapid industrial growth.

With this perspective, it is the objective of this chapter to focus on the significance of this regional trading arrangement. The chapter begins with the establishment of ASEAN and its membership and includes the process of ASEAN enlargement. Section 2 discusses its economic cooperation which has led to the ASEAN Free Trade Area (AFTA). Then, in Section 3, we explore the background of ASEAN's economies. Section 4 investigates its international trade performance. Foreign Direct investment outlook can be viewed in section 5. Finally, section 6 draws some conclusions.

2.2 The Establishment of ASEAN

Before the establishment of ASEAN, there were some attempts to develop forms of regional cooperation organisations in response to certain political and/or economic situations. These pre-ASEAN Organisations had considerable influence on the development and establishment of ASEAN. They include: (1) the Southeast Asian Treaty Organisation (SEATO); (2) the Asian and Pacific Council (ASPAC) (3) the Association of Southeast Asia (ASA); and (4) an organisation of three members, namely, Malaya, the Philippines and Indonesia (MAPHILINDO).

The Southeast Asian Treaty Organisation (SEATO) was initiated in a conference in 1954 in Manila. The member countries are Australia, France, New Zealand, Pakistan, Philippines, Thailand, United Kingdom and United States. It was established under the world-wide US-led system of anti-communist military alliances. SEATO has evoked criticism from not only the Soviet Union and China, but also the non-communist countries of Southeast Asia, in particular Indonesia. SEATO came to an end in 1977, with the military withdrawal of US forces from Vietnam.

The Asian and Pacific Council (ASPAC) was instituted in 1966. It was planned by assembling most of the leading non-communist nations in the Western Pacific to deal with the region's external threats and to provide a framework for more widespread cooperation. There were only four members from the Southeast Asian countries – Malaysia, the Philippines, South Vietnam and Thailand. Indonesia refused to join. ASPAC was dissolved in 1973.

The Association of Southeast Asia (ASA) was the first attempt initiated by the member countries themselves to form a system of regional cooperation. ASA was established in 1961 with the very limited membership of three countries, Malaya, the Philippines and Thailand. The objective of ASA was to promote cooperation in economic and cultural areas. ASA was later dissolved in 1963 due to the political conflict between Malaysia and the Philippines when the Federation of Malaysia was formed, uniting Malaya, Sabah, Sarawak and Singapore. Moreover, ASA did not get the support of Indonesia which also opposed to the formation of the Federation of Malaysia.

The cooperation of the three member countries, Malaya, the Philippines and Indonesia (MAPHILINDO) was established in 1963 in rivalry against ASA and to promote cooperation in the social, economic, military and cultural fields. The existence of MAPHILINDO was short-lived, little more than a month. It ended when the federation of Malaysia came into existence. MAPHILINDO, too, was not supported by the non-Malay countries of the region.

The early attempts to establish cooperation and shared organisations among the countries in Southeast Asia were, then, not successful. The rationale for this failure were the issues of nationalism, including lack of mutual trust and regional identity, and territorial claims, as well as conflicts on the perception of regional political order.

ASEAN was first initiated and officially founded in 1967, by five countries, namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand[5]. Brunei later joined as a new member in January 1984. The grouping was afterwards known collectively as ASEAN-6.

Political and economic considerations influenced the Southeast Asian countries, in forming regional cooperation. All the founding member countries of ASEAN understood the need to promote their economic development and to guard regional security in the midst of growing communist threats in the region. ASEAN was, therefore, established to provide mechanisms for cooperation. The common objectives of ASEAN include the acceleration of economic growth, social progress and cultural development and the promotion of regional peace and stability. ASEAN members realised that the achievement could best be made through mutual cooperation in the economics, social and cultural fields.

Nonetheless, there has been numerous obstacles in the formation of ASEAN, in particular during the preliminary stages of the development of cooperation. Member countries had diverse colonial traditions and influences. The American colonisation of the Philippines and the Dutch colonisation of Indonesia influenced the legal and political systems in the respective countries a great deal and were quite diverse from those of Malaysia and Singapore, which were colonised by the British. In addition, Thailand is the single member country which has never been colonised by any foreign power. Moreover, the pre-independence and post-independence problems of the ASEAN member countries – ethnic, pluralist and those brought by the communist insurgency, called for nationalism as a solution rather than regionalism.

[5] These five founding members are also known as ASEAN-5.

In the initial stage of ASEAN, there were also differences in economic priorities, arising from different stages of economic development and differences in factor endowment. Singapore, for example, with a small domestic market, pursued an export-oriented strategy and hence was extremely dependent on foreign investments, whereas other member countries, in particular Indonesia, the Philippines and Thailand, were sluggish in adopting export oriented strategies because of their relatively large domestic markets and their ineffective agricultural sector.

In spite of those obstacles, there was a great deal of common ground for regional cooperation. First, there was the realisation that regional cooperation would create economic benefits for the member countries. Second, the regional cooperation could benefit the member countries by increasing their bargaining power in multilateral negotiations with other countries outside the region. Third, the fast growing formation of several regional economic trade blocs around the world, along with the diminishing flows of capital to developing countries, accelerated the countries' decision to commit themselves to regional cooperation. Fourth, from the political standpoint, the growing threat of communism and vulnerability to external powers, together with the need for physical security, bound the ASEAN member countries to form a single regional group. Moreover, the geographical proximity of the countries in ASEAN and the importance of maritime trade, together with their similar approaches to national development, facilitated ASEAN cooperation and coordination.

The ASEAN Declaration, issued on its foundation in 1967, clearly stated that ASEAN is open for participation to all states in the Southeast Asian region agreeing to the objectives and principles of ASEAN. Therefore, the enlargement of ASEAN, so as to cover every country in Southeast Asia, is the priority and ultimate goal of ASEAN regional cooperation.

During the late 1960s and early 1970s, being invited to join as observers, Cambodia, Laos and South Vietnam attended some ASEAN Ministerial Meetings. Myanmar, in contrast, showed no interest in being a member of the organisation because the country was more concerned to preserve the country's neutrality. North Vietnam, meanwhile, was at war with South Vietnam and the US.

Unfortunately, the end of the war in Indochina in 1975 neither removed distrust and ideological animosity nor improved regional stability. The situation worsened with the conflict in Cambodia in 1978 and thus raised regional tensions to a dangerous level. Subsequently, all the countries in Southeast Asia were affected by this state of affairs, losing nearly 15 years of precious time, as well as the use of immeasurable human and economic resources, which should otherwise have been used in national reconstruction and regional cooperation.

In 1984, ASEAN membership began expanding with the admission of Brunei Darussalam immediately after the independence of the country from Britain. With a population of less than 300,000 and sandwiched by Indonesia and Malaysia, from Brunei's point of view as a small country, it found that it had a stronger voice through ASEAN and became more effective and beneficial than before. In economic terms, Brunei had a wider market. In political terms, Brunei, as a small country which was sometimes overlooked, has now been recognised.

More than ten years afterwards, in 1995 when the Heads of States from ten Southeast Asian countries signed the Treaty on the Southeast Asia Nuclear Weapon-Free Zone, ASEAN declared itself ready to work towards the realisation of ASEAN to include all ten Southeast Asian countries. These ten countries later became known as ASEAN-10. ASEAN admitted

Vietnam as the seventh member in late 1995. The event was indeed a paradigm shift in Southeast Asia.

The admission of Vietnam inspired other non-member countries in the region to speed up their preparations to join ASEAN. Laos, Cambodia and Myanmar planned to join in 1997, the thirtieth anniversary of ASEAN.

Unfortunately, according to the ASEAN Press Statement issued under the circumstances resulting from the use of force by the ruling party in Cambodia, the ASEAN Foreign Ministers decided to delay the admission of Cambodia to ASEAN until a later date. Nevertheless, the admissions of Laos and Myanmar to ASEAN proceeded as scheduled.

In 1999, ASEAN finally admitted Cambodia as the tenth Member of ASEAN. ASEAN has at last fulfilled the aim of establishing an organisation to represent all ten Southeast Asian Nations.

In summary, ASEAN, now known as ASEAN-10, comprises ten member countries – Brunei Darussalam, Cambodia, Indonesia, Laos, Myanmar, Malaysia, the Philippines, Singapore, Thailand and Vietnam. In 2002, ASEAN-10 had a total population of just over 500 million, with a total area of approximately 4.5 million square kilometres and a combined gross national product of around 685 billion US dollars, as well as a total trade of 720 billion US dollars (see Table 2.2)

2.3 ASEAN's Economic Cooperation and AFTA

Prior to the establishment of ASEAN, trade among the member countries was insignificant. The proportion of intra-regional trade to total trade of member countries, from

1967 to the early 1970s, was only 12 to 15 per cent[6]. Although the formal objectives of ASEAN include economic and cultural cooperation, the agreement did not lay down any scheme or timetable for such cooperation. The earliest ASEAN economic cooperation in 1977 was aimed at addressing the Preferential Trading Arrangement (PTA), which aimed to address the accorded tariff preferences for trade among the ASEAN economies. In the PTA, limited tariff reductions were granted for imports among participating member countries. Each country offered a list of items for tariff preferences on a product-by-product basis, with preferential tariffs being either reduced or stabilised for five years. Ten years later, an Enhanced PTA Programme was adopted in order to increase and promote intra-ASEAN trade. However, the Enhanced PTA schemes did not lead to success in creating stronger intra-regional trade and investment. Tariff reduction under the scheme was slow and not substantial. Statistics show that intra-ASEAN trade has not progressed much and remained only at around 15 per cent of the total ASEAN trade in the mid-1980s[7].

A milestone in the effort to increase economic cooperation came in 1992, when ASEAN decided to launch a scheme to build an ASEAN Free Trade Area (AFTA). The need for ASEAN to maintain and improve competitiveness against other countries outside ASEAN and the changes in the economies of its members created pressures and called for the establishment of a free trade area.

The objective of AFTA is to increase ASEAN's competitive advantage as a single production unit. The elimination of tariff and non-tariff barriers among the member countries is expected to promote greater economic efficiency, productivity and competitiveness. The agreement on the Common Effective Preferential Tariff Scheme (CEPT) was signed and

[6] Source: ASEAN Trade Statistic Database
[7] Source: ASEAN Trade Statistic Database

called for tariffs on locally produced manufactured goods in intra-ASEAN trade to be gradually reduced to 5 to 0 per cent within fifteen years. Quantitative restrictions and other non-tariff barriers would also be eliminated.

In principle, the free trade area covers all manufactured and agricultural products, although the timetables for reducing tariffs and removing quantitative restrictions and other non-tariff barriers differ depending on the category of the products; i.e., whether they were on the Inclusion List, the Temporary Exclusion list, the Sensitive list or the General Exception List[8]. In 1995, the time frame was tightened to ten years (AFTA Reader, 1996).

On the subject of tariff rates, in 1992 the average un-weight tariff rates for CEPT products were 0 per cent for Singapore, under 1 per cent for Brunei, 11 per cent for Malaysia, 14 per cent for Indonesia and 19 per cent in the case of the Philippines and Thailand[9]. In 2002, average tariff rates were reduced for all countries to approximately 3 per cent for Malaysia, 4 per cent for Indonesia, 5 per cent for the Philippines and 6 per cent for Thailand. Note that Singapore and Brunei already had low rates (see Table 2.3)

The most protected sectors were furniture, cement, electronics and textiles, while the major categories in actual intra-ASEAN trade were textiles and electronics. Due to the

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[8] (1) the Inclusion List contains products which have to undergo immediate liberalisation through reductions in the intra-regional (CEPT) tariff rates and the removal of quantitative restrictions and other non-tariff barriers.
(2) the Temporary Exclusion List includes products which can be shielded from trade liberalisation only temporarily. However, all these products eventually have to be transferred to the Inclusion List and begin a process of tariff reduction.
(3) the Sensitive List contains unprocessed agricultural products, which are given a longer time frame before being integrated with the free trade area. The commitment to reducing the tariff to 5 to 0 per cent, removing quantitative restrictions and other non-tariff barriers is extended to the year 2010 for the original members and even later for the four new members.
(4) the General Exception List consists of products which are permanently excluded from the free trade area because they protect national security, public morals, human, animal or plant life and health or articles of artistic, historic and archaeological value.

[9] Source: ASEAN Secretariat

differences in original tariff rates, each ASEAN member country applied a national scheme and timetable to gradually lower the CEPT tariff rates offered to other ASEAN members. Note that Malaysia excluded the automobile sector from the reductions scheme of CEPT, in order to protect its car industry. Thailand had 183 items in its temporarily excluded list in the CEPT scheme, including vegetable oils, electrical equipment, machinery and transportation equipment. In addition, Brunei excluded tea, coffee, tobacco, alcohol and motor vehicles from the CEPT provisions (WTO, 2002)

ASEAN member countries also cooperate to enhance trade and investment in adjacent border areas and the so-called growth triangles, which came up with specific trade preferences related to investment incentives provided by the participating countries. Furthermore, a Framework Agreement for the ASEAN Investment Area (AIA) was signed in 1998, with the objectives of national treatment in investment to be extended to investors from all ASEAN countries by 2010 and subsequently to all other investors outside ASEAN by 2020 (WTO, 2002).

Since the establishment of AFTA in 1992, intra-ASEAN trade has expanded. Within three years of launching AFTA, intra-ASEAN exports increased from 43.26 billion US dollars in 1993 to almost 80 billion US dollars in 1996, an average yearly growth rate of 28.3 per cent. In the process, the share of intra-regional trade from ASEAN's total trade rose from under 15 per cent to almost 20 per cent[10]. The regional production has become a network of industrial activities, in particular for parts and components in the electrical and electronics industries. The Automobile industry is also the main contributors to this change; for instance, the most important trading partners of Thailand are no longer the United States but ASEAN. However,

[10] Source: ASEAN Trade Statistic Database

the statistics alone could not prove that AFTA has resulted in raising intra-ASEAN trade. Most of Thailand's trade with ASEAN was mainly the trade with Singapore, for parts and components of its electrical and electronic products. So it may seem that AFTA was launched at a convenient moment. Still, the formation of AFTA is seen as an important achievement in regional integration.

In addition to trade and investment liberalisation, regional economic integration is being pursued through the development of the Trans-ASEAN transportation network, consisting of major inter-state highway and railway networks, principal ports and sea lanes for maritime traffic, inland waterway transport and major civil aviation links. ASEAN cooperation, therefore, has resulted in greater regional integration.

Today, ASEAN economic cooperation covers the following areas: trade, investment, industry, services, finance, agriculture, forestry, energy, transportation and communication, intellectual property, small and medium sized enterprises and tourism.

2.4 Background of the ASEAN Countries

ASEAN countries span almost every level of living standards and development that are found within developing economies. The member countries are highly diverse in many aspects, economically and socially, i.e., in terms of size, historical background, resource endowments and stages of economic development and culture.

Nevertheless, there are a number of common characteristics defining ASEAN as a single economic region. First, although the extent of government intervention varies among the ASEAN economies, the ASEAN countries are all market-based economies. Second, ASEAN countries are all export-oriented with a high degree of export dependence. Third,

ASEAN countries have a common economic objective, emphasising economic growth. Fourth, except for Brunei and Singapore, the economies of ASEAN countries are dualistic, more than 50 per cent of the population being in the agricultural and rural sector. The commonalities have bound the ASEAN countries together in search of higher economic development and the improvement of their people's well-being.

The economies of Southeast Asia recorded a rapid and sustained economic growth during the 1970s, and even though its growth rates declined in the mid-1980s as a result of the slowdown in the world economy, nowadays it remains one of the fastest growing regions in the world. Data on the recent economic performance of ASEAN are presented in Tables 2.1 to 2.4. A brief profile of each ASEAN member country follows.

Brunei Darussalam, or Brunei, has enjoyed political stability, being blessed with abundant oil and gas resources and free from problems of high population density and urban congestion. However, with the smallest population and the second highest per capita income in ASEAN, it relies heavily on export revenues from its oil and natural gas reserves. Unfortunately, having provided a high and consistent flow of income to Brunei for many years, the oil and natural gas resources have a limited life. Once they are depleted, the economy will face uncertainty. The need to diversify its economy has long been recognised as the only long-term path to sustainable development. However, the diversification policy has so far been unsuccessful. Brunei exports are very much concentrated, with a strong emphasis on natural gas and petroleum products and to a lesser extent photographic apparatus and miscellaneous manufacturing products. The volume of investment in the manufacturing sector has been inadequate due to its high operating costs, shortage of skilled and unskilled labour, very limited domestic market and inadequate support services sector.

Indonesia is an archipelago of over 3,000 islands, providing ethnic, religious and linguistic diversity among the population. Indonesia is rich in agricultural and mineral resources and also has an abundant supply of human resources. Having been colonised by the Dutch for more than 300 years, ending with a declaration of independence in 1949, Indonesia has an efficient plantation sector and a modern manufacturing sector, initiated by the Dutch. Petroleum and natural gas are its dominant exports, along with primary and semi-processed agricultural and mineral commodities, such as rubber, coffee, tin, shrimps and palm oil. The economic structure has been developed from a traditional agricultural economy to a more advanced one, supported by a strong industrial base. Recently, textiles and clothing have increased their share of its manufactured exports. Until the early 1980s, imports consisted largely of capital and intermediate goods since the domestic expansion of rice production and import-substituted manufacturing resulted in a sharp reduction in its imports of consumer goods. Indonesia has enjoyed high growth rate since the 1980s. The growth performance depended heavily on the petroleum and natural gas sector, which accounted for 70 per cent of total government revenue. The economic performance has been aided by many factors, including foreign investment reforms, financial deregulation, sensible stabilisation policies and economic diversification strategies, plus a large domestic market and relatively low-cost labour.

All these elements collectively attracted foreign investment, resulting in more economic diversification to exporting non-oil products such as textiles and clothing, wood products, metals and machinery, food and beverages and footwear. The main source of foreign direct investment for Indonesia has been Japan. In addition, the ASEAN NICs has also played increasingly important role as a source of Indonesian's FDI inflow. Indonesia, however, also has weaknesses and potential problems, if these are not handled effectively.

The level of bureaucratic inefficiency and quality of rural infrastructure are still inferior to those in some of their ASEAN neighbours, such as Singapore and Malaysia. Moreover, the matter of the political situation in recent years is not as stable as it heretofore.

Malaysia is also well endowed with mineral and agricultural resources and has none of the difficulties associated with high population density. The resources were the initial basis for the country's economic development. The British colonial regime encouraged a free enterprise economy in Malaysia, which was maintained in its economic policy even after independence in 1957. Development in the 1960s was first based on import-substitution, mainly in consumer goods, e.g., food and household appliances. In the 1970s, there was a major shift in policy, away from import-substitution to export-oriented manufacturing, resulting in significant structural changes in resource allocations and putting greater emphasis on labour-intensive and resource-intensive sectors, notably electronic components, textiles and clothing and wood products and later being extended to intermediate goods, e.g., chemicals and, to a small content, capital goods, such as electrical machinery and motor vehicles. Since 1980, the dominant share of FDI from the West has started to decline and has been replaced by FDI from Japan and Asian NICs. Investments were initially concentrated in primary industries, but later shifted to the manufacturing and services sectors. Malaysia has good infrastructure in both the urban and rural sectors. Malaysia, unlike Indonesia, has also enjoyed political and economic stability, which has continued. However, Malaysia has faced a difficulty in recruiting labour, both of skilled and unskilled workers.

The Philippines is an archipelago of over 7,000 islands endowed with plentiful natural resources, arable land, forests and substantial mineral resources, in particular copper and nickel. The Philippines traditionally relied on exporting natural resources and agricultural-based products, such as copper ore, coconut products and lumber. The industrial sector was

initially developed through import-substitution industrialisation, focusing on consumer goods, such as processed food, textiles, pharmaceuticals, soap and detergent. It later shifted to export-oriented and non-traditional manufactured products, such as clothing and electronic components, characterised by a high content of import inputs and corresponding low levels of value added.

The Philippines has, however, experienced social and economic turbulence and frequently been struck by natural disasters. There were high rates of growth in the past, resulting from a financial strategy of high external borrowing, largely to expand the public sector. The political and economic turmoil in the mid-1980s created an atmosphere of uncertainty, leading to limited private and public investment, the obsolescence of its manufacturing facilities and deficiencies in its infrastructure. Its domestic manufacturing sector depends heavily on imported intermediate and capital goods; as a result the Philippines has had payment difficulties from chronic shortages of foreign exchange and a balance of payments deficit. Domestic saving has been persistently low and as a result the saving-investments gap has been bridged by borrowing from abroad. Foreign investment in the Philippines has accounted for a large share of total investment. Foreign investment grew in the late 1970s and early 1980s, due to the relatively unrestrictive investment regulations and the growth of foreign equity investment, in particular in the manufacturing, mining and financial sectors of the economy. Subsequently, exports have slowly grown, with a positive performance by non-traditional items, such as electronic equipment and clothing. Other exports from the Philippines include fish and shellfish, chemicals, bananas, canned pineapples and coffee. By 1990, its foreign investment was dominated by the US, followed by Japan, but in recent years the input of Japan and Asian NICs has been increasing. Therefore, there was greater confidence in the country's economic and political future, as manifested in the

increased inflow of foreign capital. At the same time, the sustainability of its economic development greatly depends on how successfully the long-standing problems and difficulties of inadequate infrastructure, bureaucratic inefficiency, high rates of underemployment and unemployment and social instability can be resolved.

Singapore is a very small island country, initially founded as a free port in 1819. Singapore has the highest per capita income among ASEAN countries. Modern Singapore, being the entrepôt trading centre of Southeast Asia, has transformed its economy, from entrepôt trading to an internationally-oriented modern industrial economy. The principal exports include petroleum and non-petroleum products, for example, electronics products such as disk drivers, integrated and printed circuits, radio receivers and television sets. It has adopted an export-oriented industrialisation policy since the early 1970s emphasising labour-intensive manufacturing such as textiles and clothing, electronics assembly, furniture and petroleum refining, as well as the processing of rubber and wood, in an effort to solve the problem of massive unemployment. Due to the lack of industrial experience in the local private sector, the lack of technical skills in the labour force and the shortage of necessary capital, generous investment incentives were consequently introduced by the government in an attempt to attract foreign investment. The policies have promoted growth rates and decelerated unemployment. In the early 1980s the Singapore government decided to upgrade the manufacturing sector, away from labour-intensive activity and towards high technology, high-skill, high-productivity and higher-income activities. Rapid growth has accelerated its technological upgrading and relocated labour-intensive firms to Malaysia, in particular, and so have the increased training and supply of skilled manpower.

The policy of Singapore vis-à-vis foreign investment has been fairly liberal and non-interventionist. Singapore's development has relied heavily on foreign investment and foreign

labour, centring on high technology, high value added industries such as electronics, biotechnology and computer software. Singapore is now aiming at the development of competitive and world-class industries and also at activities among the league of developed countries. Shortage of labour and land resources, however, presents potential problems. The flows of FDI were dominated by the US and Europe in the 1970s and early 1980s. FDI flows from Japan, however, started growing in the mid-1980s. Hence, the economic strength of Singapore is based on a relatively superior infrastructure, efficient bureaucracy, political stability and sound macroeconomic fundamentals. But due to its limited domestic market, high labour and land costs as well as its lack of natural resources, including water, Singapore constantly has to depend on foreign trade. It is, therefore, highly vulnerable to changes in external conditions.

Thailand in contrast is well endowed with agricultural and mineral resources and has abundant labour. It was at first an agriculture- and mineral-exporting economy, depending on rice, rubber, teak and tin until the early 1970s, when diversification increased the variety of crops to include cassava, sugar cane and pineapples. There was also a move towards manufacturing, in particular, textiles and clothing, resulting in textiles becoming and remaining its largest manufacturing export in 1985. Nowadays, Thailand is regarded as one of the most attractive investment locations of Southeast Asia, because of the political stability due to the influence of the monarch, a private enterprise economy, the plentiful availability of cheap labour and a positive attitude towards foreign investment. However, Thailand has an inadequate physical infrastructure. The flows of foreign direct investment were dominated by the US in the 1970s and were later taken over by Japan in the late 1980s and by the Asian NICs in the 1990s. The high growth rate of Thailand's economy has been largely driven by exports of labour-intensive manufacturing products, such as textiles, footwear and electronics

and also by a significant inflow of foreign direct investment. The urban-biased development policy of the country has, however, resulted in poor infrastructure in rural areas, leading to greater economic opportunities in the urban sector and this has contributed to greater income inequality. Thailand has had a persistent current account problem and faces difficulties due to its heavy dependence on oil imports. It has been trying to move up the production ladder from highly labour-intensive manufacturing to something more capital-intensive and technology-intensive, since it faces competition from such low-wage newly-emerging economies as India, China and Vietnam. The effort of Thailand to restructure its industry has been hampered by the shortage of skilled labour. The urban traffic congestion has further constrained Thailand in its efforts to move ahead.

The economies of the new ASEAN members[11] are much smaller than those of the initial members, although Vietnam and Myanmar have larger GDPs than Brunei, the smallest economy in ASEAN-6. In 2002, the GDP of Myanmar, the largest of the new ASEAN members, was 155.29 billion US dollars, while the GDP of the Philippines, the smallest member of ASEAN-5, was 93.41 billion US dollars. Note than in 2002, Singapore has highest per capita GDPs while Cambodia has the smallest one.

Vietnam has abundant human resources; more than 50 per cent of the population is in its labour force, leading to serious unemployment and underemployment in the country despite the low wages which have largely resulted from its poor economic structure and economic performance, inherited from the past. Vietnam has experienced high rates of inflation since 1985. Its GDP per capita is one of the lowest in the Southeast Asian Region. However, the economy recorded rapid growth rates in the last year, but still its trade with the

[11] The term 'new members' henceforth refers to the four latest ASEAN members, i.e. Cambodia, Laos, Myanmar and Vietnam.

rest of the world has been consistently in deficit. The main exports of the country have been agricultural products, in particular rice and sea-food products. The major export destinations of Vietnam are Japan, South Korea and Singapore. Its imports are principally petroleum oil and raw materials, together with significant amounts of machinery and industrial equipment.

Laos is a mountainous land-locked country with the lowest GDP of all the ASEAN countries in 2002. Having no direct access to the sea, the country still has many rivers and mountains, with a great potential for the development of hydroelectric power. The country is also well endowed with other natural resources, including minerals such as potash, iron ore, gypsum, tin, salt and coal, as well as timber. The economy is still at an early stage of development. The main agricultural products are rice, coffee, maize, tobacco, cotton and sugar cane. Overall, the country has been a net importer for many years. The major exports have been timber and wood products, electricity, textiles and clothing, but also assembled motorcycles, with Thailand and Vietnam being the two main export destinations.

The main imports of Laos include consumer goods, vehicles and parts, oil and gas, construction materials, electrical appliances, machinery and industrial equipment, mainly from Thailand. Other sources of imports include Japan, Singapore and Vietnam. One main economic problem of the country is inefficient monetary management. Three major currencies, namely the US dollar, Thai Baht and Laos Kip circulate in Laos. The two foreign currencies contribute to its economy as unofficial components of its money supply, without, however, being either measured or controlled.

Myanmar is the largest country by land area among the new ASEAN members. During the late 1980s, Myanmar experienced a negative economic growth rate, but the economy has since recovered. Agriculture, livestock, fishing and forestry contribute nearly half of its GDP. The key agricultural products are rice, maize, vegetables, tea, spices and

animal feed. The manufacturing and mining sectors contributed no more than 10 per cent of GDP. Myanmar also has been a net importer for many years. Major exports include forest products, such as wood, and agricultural products, such as vegetables and fruit. Singapore, Thailand and India are its main markets, while its main imports are consumer goods, in particular food, raw materials, machinery and equipment, tools and spares, construction materials and transport equipment. The major sources of these imports are China, Japan, Singapore and Thailand.

Cambodia is the smallest in area of the four new ASEAN member countries. About 70 per cent of its land area is covered with forests. Cambodia has abundant water resources, with a good potential for developing hydroelectric power, irrigation and fisheries. The agriculture sector accounted in the late 1990s for just above 40 per cent of its economy on average. The services sector also had a relatively large share of GDP. Tourism has been an important source of income for Cambodia, notably its antiquities, in particular Angkor Wat. The main exports are timber, rubber, clothing and agricultural products. Most export destinations are in Singapore and Thailand. The major imports are petroleum, gas and consumer goods, such as cigarettes, beverages, food, clothing, motorcycles and cars. Imports come mainly from Hong Kong, Indonesia, Thailand and Vietnam. However, two sources of economic difficulties have been problems related to an inadequately skilled labour force and to inflation. The problems of inflation coupled with a volatile exchange rate in the past have led to the wide circulation of US dollars as the medium of exchange in the economy.

In summary, the economic growth rates of the new ASEAN members are satisfactory, although not as high as those of some former ASEAN members. From 1990 to 2002, the average GDP growth rates were 7.4 per cent for Laos, 6.6 per cent for Vietnam and 5.7 per

cent for Myanmar[12]. While the economies are small, the populations of the new ASEAN members are not negligible. With regard to the structure of production, agriculture preponderates in the new ASEAN member countries. Although the major trading partners of Vietnam and Myanmar are non-ASEAN, Cambodia and Laos relied more on ASEAN markets, notably Thailand. Note also that the trade statistics do not include informal cross border trading, significantly practised both between Thailand and the new ASEAN members and between new members themselves.

From recent studies, based on the revealed comparative advantage RCA index analysis[13] (Fujita, 2001); it is apparent that the new ASEAN members had a comparative advantage in resource-based industries and some labour-intensive industries, in particular clothing. For the original ASEAN members, the comparative advantages were in manufacturing products. Singapore leads in high-technology manufacturing products, such as computers, telecommunication equipment, electrical machinery and photographic equipment. Malaysia also showed competitiveness in manufacturing products, such as computers, electrical machinery, furniture, telecommunication equipments and in some resource-based products, such as crude rubber, wood, vegetable fat and petroleum. Thailand, the Philippines and Indonesia had similar patterns of export competitiveness in agricultural, resource-based and labour-intensive products. In addition, Indonesia was competitive in petroleum products.

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[12] Data for Cambodia are not available.

[13] The revealed comparative advantage (RCA) index compares a country's exports with those of the world as a whole. RCA indices are calculated using the following formula: $RCA_{xih} = (X_{ih}/X_i)/(W_h/W)$, where RCA_{xih} is the RCA index of country i in commodity h, X_{ih} is the export of commodity h from country i to the rest of the world, W_h is the world total of trade in commodity h and W is the total world trade volume. If the RCA index is above unity, the country has comparative advantage in the commodity. Similar indices using import data are comparative disadvantage indices (RCDM).

Incidentally, since the establishment of ASEAN, there have been two main structural changes in the original member countries forming ASEAN-5. First, they have transformed themselves from low income to middle and upper-middle income countries, reflecting their rapid economic growth, as well as the significant improvement rate of their living standards. Although their standards of living as measured by their per capita income differ considerably (Table 2.2), the ASEAN-5 countries have consistently enjoyed a rising living standard during the past few decades. They have graduated from the ranks of low-income countries, as classified by the World Bank, to the ranks of middle- and in some cases upper-middle and high-income countries. Singapore in particular has the highest per capita income among of all the members of ASEAN.

Second, the founding members have undergone structural changes. The role of their agricultural sector has diminished and their manufacturing and service sectors have grown in importance. Although agricultural production still accounts for a significant proportion of ASEAN-5, the share of manufactured output has, as a result of deliberate policy, clearly been increasing, by diversifying the products sent to export-oriented economies and reducing their dependency on the export of agricultural and mining products. Table 2.1 shows that from 1980 the average annual growth rates of manufacturing were either stable or increasing throughout ASEAN-5, while the growth rate of the agriculture sector was mostly decreasing.

Despite its initial difficulties, ASEAN has finally been able to move forward successfully in economic development and cooperation. The grouping resisted the Cold War and has developed their economies as a first step. With the appropriate conduct of their economic policies, all the countries in ASEAN have emerged over time as increasingly linked to the others. Over the years, ASEAN has been able to converge more closely, making the grouping an attractive region for trade and investment opportunities.

Eventually, each ASEAN country should reach the point where it can explore economic complementarities, not only those with the extra-regional markets, but also those with each other. ASEAN, in this sense, can accommodate all its members' interests within itself while remaining open to outsiders as well.

2.5 ASEAN's Trade Performance

ASEAN countries have always been the important participants in world trade. Since the nineteenth century, the founding members have been prominent world suppliers of essential raw materials, such as rubber and tin. Since the mid-1960s, ASEAN members have also become important exporters of manufactured goods. In 1985, the ASEAN-6 countries, as a group, accounted for 3.6 per cent of world exports, increasing to 6.3 per cent in 2001 (see Table 2.5) Table 2.6 shows that in 1985 over 76 per cent of all ASEAN exports came mainly from three countries, Singapore, Indonesia and Malaysia, while Brunei had the smallest share at only 4 per cent of ASEAN's total exports. In 2001, approximately 77 per cent of ASEAN exports were still coming from three main countries, but the combination had changed to Malaysia, Singapore and Thailand. Exports have grown fastest in Thailand, the Philippines and Malaysia during 1985–2001 (see Table 2.7). Indeed, the export growth rates of Thailand and the Philippines exceed those of Malaysia.

In term of major trading partners, Table 2.7 shows that from 1996 to 2002, the average percentages showing the main market share for ASEAN exports were the US (18.7 per cent),

ASEAN (23.0 per cent), Japan (12.1 per cent), the EU (14.8 per cent) and East Asia[14] (14.4 per cent).

ASEAN also established formal dialogue relations with several countries. These dialogue relationships constitute a central and dispensable part of ASEAN cooperation and contribute greatly to ASEAN's success. They provide technical and development assistance for common projects of ASEAN. It is also a route for obtaining trade and economic concessions for both ASEAN as a collective group and its individual members.

Currently, ASEAN's Dialogue Partners include Australia, Canada, China, the European Union, India, Japan, the Republic of Korea, New Zealand, the Russian Federation and the United States. The United Nations Development Programme (UNDP) also has dialogue status. ASEAN also promotes cooperation with Pakistan on certain sectors. Consistent with the resolution to enhance cooperation with other developing regions, ASEAN maintains contact with other inter-governmental organisations, namely, the Economic Cooperation Organization (ECO), the Gulf Cooperation Council, the Rio Group, the South Asian Association for Regional Cooperation and the South Pacific Forum. Most ASEAN member countries also participate actively in the work of the organisation for Asia Pacific Economic Cooperation (APEC), the Asia-Europe Meeting (ASEM) and the East Asia-Latin America Forum (EALAF).

The mechanism for a multilateral trading system has provided market access to the developed world for ASEAN products. Without such a mechanism, it would be difficult for ASEAN countries to advance trade in order to negotiate properly with the world. The value of ASEAN trade is even more impressive than its economic growth. The trade of goods as the

[14] East Asia includes China, Taiwan, the Republic of Korea and Hong Kong

percentage of GDP increased markedly between 1990 and 2002 (Table 2.9). Both private capital flows and foreign direct investment flows as percentages of GDP increased on average (Table 2.10). Tables 2.7 and 2.8 show that between 1996 and 2002, total exports of ASEAN-6 increased by 17.3 per cent, while total imports decreased by 7.5 per cent, due to the financial crisis in 1997, when total imports decreased dramatically. Intra-ASEAN trade expanded from 24.4 billion US dollars in 1980 to 63.9 billion US dollars in 1994[15] and to 158.7 billion US dollars in 2002 (Tables 2.14 and 2.16).

However, as shown in Tables 2.11 to Table 2.16, an external trade total in 2002 of 553.3 billion US dollars implies that intra-ASEAN trade accounted for less than a quarter of total trade. This simple set of figures is a reminder to ASEAN policy makers not to make ASEAN economic integration more inward-looking. Rather, they should aim for ASEAN investment-led integration combined with openness to world trade, which would help ASEAN to gain new opportunities more easily.

Note that amongst ASEAN countries, intra-ASEAN exports vary in relative importance; they were of the least importance for Indonesia, but of the greatest importance for Malaysia and Singapore, due to their long history of trade with each other (Table 2.6). It is also worth pointing out that intra-ASEAN exports are higher than intra-ASEAN imports. At first glance, this may seem odd, but the frequent occurrence of unrecorded cross border trade and smuggling in this area is likely to be a reason for this.

Nevertheless, since the implementation of AFTA, trade within ASEAN has increased. Intra-ASEAN trade volume has expanded from 82 billion US dollars in 1993 to 159 billion US dollars in 2002, which corresponds to an increase of 92 per cent.

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[15] Source: ASEAN Trade Statistic Database

The overall increase in the ASEAN trade volume can be explained by several factors. One of them is the overall expansion of trade due to a general world liberalisation of trade and internationalisation after the signing of the Uruguay round in 1994. However, in the period 1993-7, the growth of intra-ASEAN trade increased more than that of ASEAN's trade with the world, implying that there is increasing level of integration of ASEAN member countries relative to the internationalisation of the world. One contributing factor to the extraordinary trade performance experienced by the ASEAN member countries up until 1997 is the large volume of Japanese foreign direct investment in the region. Starting in the mid-1980s, the strong Japanese yen made assets elsewhere extremely cheap for Japanese investors. The obvious approach for Japanese companies was to buy productive assets overseas, in many instances in the ASEAN countries, leading to a reorientation in ASEAN towards outward-looking and export-oriented development strategies. At first, some of the investment was in textiles, but most of the capital entering the region from Japan was invested in the production of electrical components, machinery and appliances. To a lesser extent, but still important to the industrial development in ASEAN, was the appreciated Taiwanese dollar and the Korean won, enabling the foreign direct investment from these two countries to find a place in similar industries in ASEAN to the Japanese FDI. The lower production costs and labour surplus in ASEAN enabled such industries to diversify and expand.

However, the impressive record of trade levels and development sustained by ASEAN came to a sudden halt in 1997, when the financial crisis struck several ASEAN countries, starting in Thailand and quickly spreading to other countries in the region. The pegging of national currencies to the US Dollar in Indonesia, Malaysia and Thailand and the liberalisation of capital markets in the early 1990s contributed to a speculative trend, causing not only a financial crisis but also macroeconomic instability in the region. A crisis in the

financial sector triggered a chain reaction, involving a dramatic fall in exchange rates, a collapse in the real estate market, a dramatic fall in stock market values and a fiscal crisis for the government sector. The export-promoting countries, in particular those in the manufacturing sector, proved to be vulnerable to financial shocks. Nevertheless, the devaluation of the currencies then increased the demand for the ASEAN commodities once more and surpluses in the trade balance were achieved through increased exports. ASEAN trade performance is now getting back to its prosperous course.

We turn now to the intra-ASEAN trade pattern in each commodity sector. First, in the Information and Communication Technology (ICT) sector, the ASEAN-5 countries are exporting and importing the same products, to and from the same economy or economies, while each of the ASEAN countries specialise in a particular stage of the regional production network. The vertical specialisation of production across the ASEAN region is driven by differences of factor endowments in the member economies, i.e., particular skills in the workforce, or high fixed research and development costs. The pattern of trade has been the result of the liberal policy environment in the sectors. The market-determined environment enabled the multinational corporations to spread their operations across the region.

Just as in ICT, the pattern of trade in electronics confirms that high intra-industry trade occurred among the ASEAN-5 countries. The trade is highly concentrated on one product, each country exports and imports the same product to and from the same country. Singapore is the major export market and the source of imports, while Singapore's major export market and source of its imports is Malaysia.

The pattern of intra-ASEAN trade in healthcare products, however, differs from ICT and electronics. The pattern of trade shows that each economy differs in its product line and the export product line of each economy differs from its import one. The pattern shows that

each economy serves as the regional production centre for a certain healthcare product, which is ultimately distributed and exported to the rest of the region.

The textiles and clothing sector exhibits a pattern of trade which is very different from ICT, electronics and healthcare products. There was no product specialisation, because each economy produced a wide range of textile and garment products. The trade pattern substantiates the fact that ASEAN members are all competitors in every market. The only discernible pattern is that, for Brunei, Malaysia, Laos, Myanmar, the Philippines and Vietnam, intra-ASEAN exports were mostly clothing while intra-ASEAN imports were mostly textiles. For Indonesia and Thailand, however, intra-ASEAN exports and imports were both textiles. For Singapore, intra-ASEAN exports and imports were both clothing. This kind of trade pattern is basically inter-industry trade, driven by the differences in the resources of the member economies.

Regarding the automotive sector, the trade pattern is quite similar to that of the healthcare products discussed above. This implies that each member economy is aiming to be a regional production centre for specific automotive parts and products and supplying the entire region through exports.

Regarding agricultural-based products, as with textiles and clothing, there was no established pattern of trade or product specialisation, as each member economy exported and imported a wide range of products all differing from each other.

In the fisheries sector, the major exports and imports of fish products of the member economies were live, fresh/chilled, frozen, fillets or dried/salted/smoked products, together with live or fresh crustaceans. The pattern of trade shows that the major export product of each economy differs from its major import product. The major exports of Malaysia, for example, were crustaceans, while the major imports were frozen fish. The exception to the

general trade pattern was the Philippines, where the exports and imports to and from the region were the same, i.e., frozen fish. Nonetheless, some of the member economies have common major export or import products. For example, the major export product of Thailand, Myanmar, Malaysia and Vietnam were live and fresh crustaceans and these were also the major imports of Indonesia, Laos, Singapore and Vietnam. Another feature of the trade pattern was that the major export market of each economy differed from that of the major source of its imports.

The trade patterns of rubber-based products show that the less developed members, i.e., Indonesia, Myanmar, the Philippines, Thailand and Vietnam, exported natural rubber to the more developed members, i.e., Malaysia and Singapore, who in turn, were the major sources of imports of rubber-based products, e.g., new pneumatic tires, articles made of unhardened vulcanized rubber, articles of apparel and accessories made of unhardened vulcanized rubber. It is interesting to note, however, that while Malaysia and Singapore were the major sources of processed rubber-based products, Thailand also exported the same products, but to the markets of new ASEAN members.

Patterns of trade in wood-based products divide the countries into two groups. One group, Laos, Myanmar and Malaysia, exported wood products of lower value added, such as rough wood, plywood, wooden articles or sawn/chipped wood. Another group, Indonesia, the Philippines, Singapore and Thailand, exported wood products of higher value added, such as wood pulp, paper and paper products. This pattern is also very evident on the import side. The bulk of the imports of the former group were the exports of the latter group, while the bulk of imports of the latter group were the exports of the former group.

In brief, the development of the intra-ASEAN trade was positive, with a growth rate in its trade flow exceeding the growth rate of ASEAN in trading with the world. The sustained

growth of ASEAN's economy before it was struck by financial crisis was generally characterized by a pattern of development in which the key role was played by growth in manufacturing industries, stimulated by sustainable inflows of foreign direct investment.

2.6 Foreign Direct Investment in Southeast Asia

Foreign direct investment flows in the world have been growing faster than world GDP and merchandise trade; consequently, in recent years FDI has received more and more interest from economists and policy-makers. In the past decade both global output and global sales have grown faster than world GDP and world exports[16]. Therefore, the sales of foreign affiliates are now greater than the world's total exports of goods, implying that firms use FDI more than they use exports to service foreign markets.

The ASEAN region has been a major recipient of FDI (about 2 to 5 per cent of global investment in the 1990s), following the EU (40 to 50 per cent) and NAFTA (20 to 25 per cent). While intraregional investments in the EU and NAFTA have been historically high, that in ASEAN has been very low. The bulk of ASEAN's FDI has come from Japan, the US and the EU, which accounted for about 50 to 60 per cent of FDI in ASEAN during the 1990s. Since the 1950s the ASEAN region has received three types of FDI. The first type is in natural resources, given the region's abundance of minerals and fuel, particularly oil and gas. The second type has enabled foreign investors to access the ASEAN regional market, by setting up industries to produce cheap consumer goods for the domestic ASEAN market. The third type is trade-oriented FDI, in which foreign investors used the ASEAN region as a

[16] Source: UNCTAD, World Investment Report, 2000

production and export base for manufactured goods intended for intra-regional and extra-regional distribution.

The attractiveness of the ASEAN region as an investment destination is based on its strategic geographical position, ownership advantages and returns on investment. Geographical advantages include an abundance of raw materials, low production costs, generous investment incentives, a skilled and hardworking labour force and improved infrastructure.

The ASEAN region is not only a recipient of FDI, but also an investor itself. Relatively tight labour conditions and the rising levels of wealth in the 1990s prompted firms in Singapore and Malaysia to venture beyond their borders to the rest of ASEAN and countries such as China and India for new investment opportunities, in particular as savings rates have risen with the increasing per capita income of the ASEAN population.

ASEAN economies are open to FDI to various degrees. With no natural resources and a limited domestic market, Singapore is the most reliant upon FDI. The Philippines, Indonesia, Malaysia and Thailand have natural resources and much larger domestic markets and therefore could afford to be less dependent upon FDI. Indonesia and Malaysia are oil and gas producers and have benefited substantially from the oil price hikes in the 1970s. However, declining oil prices, combined with the fact that oil is a non-renewable resource, have convinced both Indonesia and Malaysia that they must diversify their economies and increase their dependence on FDI. Over the years, ASEAN governments have imitated Singapore by relaxing regulations on investments and foreign equity ownership for export firms. Most ASEAN governments now allow 100 per cent foreign ownership, as long as the business concerned produces mainly for export.

Since the mid-1990s, FDI inflows to ASEAN countries have fluctuated vastly. Although FDI in 1997 was the highest with 34 billion US dollars, following the financial crisis, the overall picture for the region has much scope for improvement. ASEAN as a region performed better in terms of FDI inflows; however, intra-region performance has been varied, with member countries showing an uneven pattern of distribution. Singapore accounted for almost 60 per cent of all FDI inflows into the region in 2003, while countries such as Indonesia saw a drop of 3 per cent from the previous year. In general, intra-ASEAN FDI has declined since the financial crisis.

Note that the manufacturing sector has the highest inflows followed by the trade and commerce sectors. The agriculture, fisheries and forestry sector had the lowest FDI inflows. The top five cumulative approvals of FDI in the manufacturing sector during 1999-2003 were[17], in order, for communication equipment and apparatus, chemical products, petroleum products, rubber and plastics products and paper products.

It is worth noting that, although the trend in substantial FDI flows to Southeast Asia began more than twenty years ago, only recently have the new members of ASEAN stimulated a considerable foreign investment appetite, when they opened their doors to private capital inflows in the early 1990s. These countries not only stood at the edge of the emerging markets, they were also well positioned to capture the beginnings of a substantial intra-Southeast Asian FDI flow, in particular from Malaysia, Singapore and Thailand. Note that Singapore is the biggest investor in Vietnam, while Malaysia favoured Cambodia and Laos' major FDI inflows came from Thailand.

[17] Source: ASEAN Secretariat

To conclude, although ASEAN has been an attractive region for investors for a long time, it has an unstable trend of FDI inflows due to the financial crisis in the region and the slowdown of the global economy.

2.7 Conclusions and Remarks

The economic environment of Southeast Asian is now very much changed from the 1980s when ASEAN was unsure about introducing a free trade area. The new scenario for regional trading arrangements in the region is energetic and could bring about positive results as long as these efforts are compatible with the multilateral trading system. There is no doubt that the economic performance of the ASEAN countries is strongly influenced by regional and global market forces. Consequently, the role of ASEAN as an organisation is to provide an efficient regional institutional arrangement which is consistent with the export oriented market-driven economy of ASEAN. Now is a good time for ASEAN to think optimistically about deeper integration and consider how to pursue this deeper integration of ASEAN with regard to the changes in the global and regional environment. It is, generally, in the interests of ASEAN to justify a deeper integration of ASEAN from within and outside. Nevertheless, ASEAN has to pursue such an aim with great care regarding its own ideals of convergence, harmonisation and policy coordination among members.

Overall, ASEAN continues its steady transformation within the global economy. As an outward-looking economic grouping, ASEAN has been able to take advantage of trade and investment flows by remaining a set of open economies. The strong growth in these countries originates from the significance of their export-oriented industrialisation. However, any major

change in international order, both at the multilateral and regional level, would cause ASEAN to be concerned and to adapt its strategy and its policy in order to respond to new trends. Therefore, the future of the ASEAN region depends on ASEAN's own capacity to react to these changes and, most of all, to remain competitive.

All in all, the region's economic integration is to be further enhanced by the rapid growth of intra-regional trade and investment as it has been in the past. While the trade and investment of the region are to continue their strong performance, ASEAN's main aim is to maintain this regional momentum at its best. Indisputably, ASEAN needs to position its own regional integration to be inter-connected with the world economy in today's multinational trading atmosphere, in order to advance its level of economic development and sustain its competitive advantage in the global market.

TABLE 2.1 Average Annual Growth Rates of Output by Sectors (selected countries)

Unit: Percentage

	GDP		Agriculture		Industry (Total)		Industry (Manu-facturing)		Services	
	1980 - 1990	1990 - 2002	1980 - 1990	1990 - 2002	1980 - 1990	1990 - 2002	1980 - 1990	1990 - 2002	1980 - 1990	1990 - 2002
World	3.3	2.7	2.6	1.8	3.1	2.1	…	2.9	3.5	3.1
US	3.5	3.3	3.2	3.8	3.0	3.4	…	3.9	3.3	3.7
Mexico	1.1	3.0	0.8	1.6	1.1	3.5	1.5	4.0	1.4	3.0
Argentina	-0.7	2.7	3.2	3.8	-1.3	1.8	-0.8	0.9	0.0	3.1
Brazil	2.7	2.7	0.5	5.7	2.0	2.2	1.6	1.6	3.3	2.8
Chile	4.2	5.9	3.5	4.9	3.5	5.4	3.4	3.8	2.9	4.5
ASEAN										
- Indonesia	6.1	3.6	3.6	1.9	7.3	4.5	12.8	5.9	6.5	3.4
- Malaysia	5.3	6.2	3.4	0.3	6.8	7.5	9.3	8.8	4.9	6.4
- Philippines	1.0	3.5	1.0	2.0	-0.9	3.5	0.2	3.1	2.8	4.2
- Singapore	6.7	6.7	-5.3	-3.1	5.2	7.3	6.6	6.9	7.6	6.8
- Thailand	7.6	3.7	3.9	1.5	9.8	4.9	9.5	6.1	7.3	3.1
- Vietnam	4.6	7.6	2.8	4.2	4.4	11.4	1.9	11.2	7.1	7.1
- Laos	3.7	6.3	3.5	4.9	6.1	10.9	8.9	12.6	3.3	6.5
- Cambodia	…	6.6	…	3.2	…	14.8	…	17.8	…	5.8
- Myanmar	0.6	7.4	0.5	5.7	0.5	10.5	-0.2	7.9	0.8	7.2
Asian NICs										
- Hong Kong	6.8	3.8	…	…	…	…	…	…	…	…
- S. Korea	8.9	5.6	3.0	1.8	11.4	6.2	12.1	7.6	8.4	5.6
China	10.3	9.7	5.9	3.9	11.1	12.6	10.8	11.9	13.5	8.8
Japan	4.1	1.3	1.3	-2.9	4.2	-0.0	…	0.7	4.2	2.2
Europe EMU	2.4	2.0	1.3	1.4	1.7	1.7	…	1.5	2.9	2.4
UK	3.2	2.6	2.4	-1.1	3.3	3.3	…	…	3.1	3.4
France	2.4	1.9	1.3	1.9	1.4	1.4	1.3	2.4	3.0	2.1
Germany	2.3	1.6	1.6	1.4	1.4	1.5	…	0.2	3.0	2.6

Note: … = not available or not applicable
Source: World Bank, World Development Indicators, Various Issues

TABLE 2.2 ASEAN members' National Income Level as ranked by World Bank in 2000

High-income countries	Brunei Singapore
Middle-income countries	Indonesia Malaysia Philippines Thailand
Low-income countries	Cambodia Laos Myanmar Vietnam

Source: World Bank

TABLE 2.3 Average AFTA CEPT Tariff Rates

Unit: Percentage

	1998	1999	2000	2001	2002	2003
Brunei	1.35	1.29	1.00	0.97	0.94	0.87
Indonesia	7.04	5.85	4.97	4.63	4.20	3.71
Laos	5.00	5.00	5.00	5.00	5.00	5.00
Malaysia	3.58	3.17	2.73	2.54	2.38	2.06
Myanmar	4.47	4.45	4.38	3.32	3.31	3.19
Philippines	7.96	7.00	5.59	5.07	4.80	3.75
Singapore	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	10.56	9.75	7.40	7.36	6.02	4.64
Vietnam	6.06	3.78	3.30	2.90	2.89	2.02
ASEAN	5.37	4.37	3.87	3.65	3.25	2.68

Source: ASEAN secretariat

TABLE 2.4 Population, Size of Economy and Level of Income (selected countries)

	Population (Millions)		GDP (Billions of 1995 US$)		GDP (US$ Per Capita)	
	1980	2002	1980	2002	1980	2002
US	227.2	288.4	4805.95	9234.13	2152.95	32018.48
Mexico	67.6	100.8	220.83	375.43	3266.72	3724.50
Argentina	28.1	36.5	220.32	249.54	7840.57	6836.71
Brazil	121.6	174.5	489.12	812.11	4022.37	4653.93
Chile	11.1	15.6	34.71	91.76	3127.02	5882.05
ASEAN						
- Indonesia	148.3	211.7	83.93	218.97	565.95	1034.34
- Malaysia	13.8	24.3	31.90	111.41	2311.59	4584.77
- Philippines	48.0	79.9	56.35	93.41	1173.96	1169.09
- Singapore	2.4	4.2	27.13	114.49	11304.17	27259.52
- Thailand	46.7	61.6	52.19	184.18	1117.56	2989.94
- Brunei	0.2	0.4	5.66	4.54	29789.47	12971.43
- Vietnam	53.7	80.4	11.29	33.20	210.24	412.94
- Laos	3.2	5.5	0.75	2.66	234.38	483.64
- Cambodia	6.8	12.5	1.46	4.08	214.71	326.40
- Myanmar	33.7	48.8	70.93	155.29	2104.75	3182.17
Asian NICs						
- Hong Kong	5.0	6.8	57.22	171.29	11444.00	25189.71
- Korea, Rep.	17.2	22.5	149.08	680.29	8667.44	30235.11
China	981.2	1280.4	163.69	1207.27	166.83	942.89
Japan	116.8	127.2	3298.42	5666.83	28239.90	44550.55
Europe EMU	285.5	305.5	…	…	…	…
UK	56.3	59.2	799.48	1361.09	14200.36	22991.39
France	53.9	59.5	1169.01	1831.53	21688.50	30782.02
Germany	78.3	82.5	1651.05	2708.08	21086.21	32825.21

Note: The data presented in this table are obtained by converting the gross domestic product (GDP) for each country measured in 1995 foreign currency units to U.S. dollars using 1995 annual average foreign currency market exchange rates.

… = not available or not applicable

Source: International Monetary Fund, International Statistic Yearbook, various issues.

TABLE 2.5 The Relative Importance of ASEAN and Other Regions in World Trade

Group/Year	Total Exports (US$ Billion)				Share of World Trade (per cent)			
	1975	1985	1995	2001	1975	1985	1995	2001
Australia/New Zealand	14.7	32.6	70.1	84.6	1.8	1.6	1.4	1.3
East Asia	44.5	186.2	839.0	1194.4	5.4	9.4	16.3	18.7
ASEAN	22.0	72.0	307.8	403.8	2.7	3.6	6.0	6.3
EU-15	325.3	711.6	1893.4	2194.8	39.2	36.0	36.9	34.3
Japan	49.1	190.3	476.1	448.6	5.9	9.6	9.3	7.0
Latin America	45.3	115.8	245.3	382.1	5.5	5.9	4.8	6.0
Middle East	84.7	109.1	155.1	247.8	10.2	5.5	3.0	3.9
NAFTA	148.9	351.9	922.4	1214.7	15.0	17.8	18.0	19.0
North Africa	13.4	29.4	33.9	49.3	1.6	1.5	0.78	0.8
South Asia	6.2	16.5	52.0	70.3	0.7	0.8	1.0	1.1
Sub-Saharan Africa	28.9	52.8	74.7	101.2	3.5	2.7	1.5	1.6
Intra-NAFTA	55.6	159.5	396.0	646.5	6.7	8.1	7.7	10.1
Intra-EU-15	200.2	416.9	1168.5	1296.6	24.1	21.1	22.7	20.2
Intra- MERCOSUR	1.0	2.0	14.5	16.6	0.1	0.1	0.3	0.3
Intra-ASEAN	2.5	11.3	64.6	74.2	0.3	0.6	1.3	1.2
World Exports	829.2	1975.9	5137.3	6403.1	100	100	100	100

Source: International Monetary Fund Direction of Trade Statistics

Note: East Asia is defined here as consisting of Brunei, Cambodia, China, Republic of Korea, Hong Kong, Indonesia, Laos, Malaysia, Mongolia, the Philippines, Singapore, Taiwan (China), Thailand and Vietnam.

TABLE 2.6 The Geographic Destination of ASEAN-6 Exports: 1985, 1995 and 2001

Country	Year	Global Exports	Share of Total exports Destined For (Per cent)							
		US$ Million	ASEAN	China	Japan	EU-15	NAFTA	AUS/NZ	South Asia	ROW
Brunei	1985	28	20.7	0.0	66.6	1.2	0.1	0	0.0	0.0
	1995	25	20.4	0.0	52.2	8.2	1.7	0	0.0	0.3
	2001	36	16.3	4.1	46.7	1.5	11.7	7	0.1	0.3
Indonesia	1985	196	2.0	1.7	51.8	7.5	25.5	1	0.6	3.1
	1995	478	5.9	4.3	29.7	16.9	18.0	2	1.4	6.3
	2001	361	7.6	6.2	23.6	15.6	19.2	3	2.3	8.0
Malaysia	1985	179	26.5	1.1	24.2	13.1	14.1	1	4.1	4.7
	1995	862	30.6	2.4	12.2	13.1	22.8	1	2.4	4.1
	2001	1112	24.4	5.6	11.5	12.9	23.9	2	2.3	5.1
Philippines	1985	61	8.4	1.6	20.5	16.5	39.6	1	0.5	3.4
	1995	197	11.4	1.4	17.7	15.5	39.6	1	0.2	2.4
	2001	428	13.4	4.5	15.0	16.1	31.2	0	0.2	2.3
Singapore	1985	171	22.1	1.4	9.3	10.8	26.8	5	4.7	8.2
	1995	886	23.0	3.8	7.7	14.8	22.9	2	2.3	5.9
	2001	932	22.4	5.5	5.8	14.7	18.6	2	5.1	8.3
Thailand	1985	77	14.4	3.4	13.3	224	21.1	1	2.5	13.4
	1995	548	19.7	2.9	18.5	16.6	23.4	1	1.1	6.7
	2001	727	17.0	6.5	14.2	15.7	24.0	2	1.5	8.7

Source: International Monetary Fund Direction of Trade Statistics

TABLE 2.7 ASEAN Exports by country of destination

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
ASEAN	80973.7	85351.8	69312.9	74903.5	92876.0	82325.9	86390.6
Dialogue Partners							
Hong Kong	1057.0	20069.2	16162.7	76885.3	22067.5	20329.3	22360.4
South Korea	446.7	10667.8	7813.0	10890.8	14454.2	14734.3	15702.5
Taiwan	11316.7	12708.3	6799.6	8932.5	10299.1	8698.5	18560.3
China	7474.1	9167.9	9202.6	9590.8	14178.9	14516.0	19547.5
India	3722.8	4473.2	5217.9	5760.4	6446.8	6211.0	8418.2
Pakistan	1245.9	1755.6	1288.0	1168.9	3199.9	1124.3	1406.5
Japan	43150.3	42008.6	34716.8	37687.1	50559.9	48250.0	44503.4
EU-15	46926.0	46086.7	46143.6	55730.4	62904.4	56690.2	547386.3
Austria	371.1	390.7	706.2	319.3	1017.6	266.4	355.9
Belgium	2739.8	2861.0	2150.0	2108.0	2456.6	4245.0	2080.0
Denmark	474.0	923.6	483.7	667.7	560.2	410.4	384.4
Finland	418.2	610.7	516.6	465.8	723.2	1101.9	4665.2
France	4915.9	4663.4	3639.5	3583.4	5588.3	3072.8	4549.2
Germany	10728.5	9714.2	7339.3	8715.2	10633.5	11209.8	8690.6
Greece	1073.9	456.6	339.3	299.0	335.4	350.3	353.3
Ireland	1732.5	2420.5	2555.8	2228.9	4073.5	1536.0	1244.6
Italy	3796.4	2112.7	1955.8	3823.9	1871.4	1617.2	1748.7
Luxembourg	4832.0	0.0	12.3	13.3	27.7	29.0	34.7
Netherlands	7703.4	8151.9	9409.5	10700.4	11303.1	10713.2	10609.5
Portugal	237.5	145.8	155.3	127.6	2000.8	1705.5	728.3
Spain	3328.3	1844.8	1682.2	1536.5	1718.3	1612.4	1748.3
Sweden	882.8	422.9	379.8	2292.6	533.0	400.2	515.2
UK	8275.7	11368.0	14818.2	18848.7	9186.2	7914.9	6762.5
Unspecified	…	…	…	…	10875.5	10505.3	9915.9
Canada	1988.2	1881.9	2314.7	2252.4	2706.9	4355.6	3038.0
USA	59515.5	70030.4	64620.0	70081.1	73769.6	62741.4	61557.0
Australia	6106.0	6418.4	7120.3	7863.8	8893.5	8511.8	9583.7
New Zealand	812.5	773.8	757.4	892.5	1213.5	986.7	1088.2
Others	40111.9	31276.6	45181.4	39172.2	46570.7	40880.7	37311.4
Total*	323361.3	342670.1	316650.8	341811.8	410140.6	370355.7	383854.1

Source: ASEAN Trade Statistic Database

Note: (1) Unspecified EU represents exports of Thailand to EU of which the data are not available at detailed by country.
(2) * Exclude Laos and Vietnam; data are not available.

TABLE 2.8 ASEAN Imports by country of origin

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
ASEAN	64211.2	64621.2	51604.9	57770.9	73208.9	66833.9	72323.6
Dialogue Partners							
Hong Kong	5355.9	8671.2	6386.9	7082.8	8419.3	7258.7	8236.9
South Korea	13294.4	14857.4	9267.4	12277.9	15181.1	13457.5	14830.7
Taiwan	12796.6	14605.4	5972.7	7429.3	8660.6	6905.9	12683.7
China	9217.6	13482.9	11211.5	123317.7	18137.0	17399.2	23212.2
India	2843.8	4395.5	1750.4	2193.9	3209.6	3672.1	3696.4
Pakistan	367.4	236.5	233.2	230.1	292.9	369.7	300.4
Japan	73310.1	71264.2	46693.7	51466.0	65630.8	53258.5	53083.7
EU-15	57380.5	51009.8	33256.1	34711.9	39093.2	39681.6	40041.8
Austria	1032.9	909.1	1021.6	646.8	823.1	538.9	479.3
Belgium	2641.2	2408.4	1315.6	1185.1	1554.7	1451.6	1125.9
Denmark	1074.9	681.4	555.5	440.2	431.9	421.4	431.2
Finland	1386.2	1451.6	935.7	883.5	935.4	2011.9	483.0
France	7236.2	7763.5	4625.9	4323.1	4402.1	3979.1	4392.7
Germany	16739.9	14821.5	8492.9	8144.3	8901.1	8474.4	8685.7
Greece	326.4	107.5	50.0	6.4	63.5	79.3	65.7
Ireland	1288.5	1068.3	1013.7	1681.4	1348.5	1986.7	1579.1
Italy	7795.0	4738.2	2392.2	2281.4	2842.3	2992.7	2663.8
Luxembourg	13.0	1.6	59.4	35.5	43.8	24.1	18.0
Netherlands	3176.0	3151.2	2055.4	2029.8	3394.1	2244.5	2473.1
Portugal	168.1	116.9	75.2	1251.6	69.4	97.7	235.9
Spain	3087.2	1370.5	726.9	896.8	928.7	932.4	753.9
Sweden	3056.2	2714.9	1315.1	1700.6	1449.4	1338.5	1419.1
UK	8358.8	9705.0	8591.1	9195.3	5604.8	5508.7	8366.6
Unspecified	…	…	…	…	6300.5	7599.7	6868.9
Canada	24445.6	2568.0	1766.7	2078.3	2126.1	1676.8	1983.9
USA	53011.4	61695.0	5094.2	45990.9	48448.0	46618.8	43397.4
Australia	8688.8	7963.9	5702.1	6093.4	8695.4	9500.2	7234.7
New Zealand	1150.8	1297.1	863.5	751.6	1034.8	1243.9	966.7
Others	46532.1	39276.7	33805.6	40937.2	53719.2	50252.0	46120.6
Total*	350606.2	355971.8	259456.9	281346.0	345856.7	317128.6	328112.6

Source: ASEAN Trade Statistic Database

Note: Unspecified EU represents exports of Thailand to EU of which the data are not available at detailed by country.

* Exclude Laos and Vietnam; data are not available.

TABLE 2.9 Trade in Goods (Selected Countries)

	Trade in Goods (per cent of GDP)		Trade in Goods (per cent of Goods GDP)		Ratio of Commercial Service Exports to Merchandise Exports (per cent)		Growth in Real Trade less Growth in Real GDP (per cent)
	1990	2002	1990	2002	1990	2002	1990-2002
World	32.5	40.3	80.2	116.0	21.5	23.1	…
US	15.8	18.3	44.8	66.8	33.8	39.3	4.5
Mexico	32.1	52.4	78.9	148.7	17.7	7.8	9.2
Argentina	11.6	33.7	27.0	74.4	18.3	11.4	5.1
Brazil	11.7	24.3	…	…	1.8	14.7	4.8
Chile	53.1	55.2	100.5	111.2	21.3	21.1	3.2
ASEAN							
- Indonesia	41.5	51.1	68.1	82.6	9.7	11.3	0.8
- Malaysia	133.4	182.4	232.3	347.4	12.8	15.8	3.3
- Philippines	47.7	91.7	84.7	194.1	35.7	8.4	3.1
- Singapore	307.6	277.8	…	921.3	24.1	23.6	…
- Thailand	65.7	105.6	132.2	205.0	27.3	22.1	2.9
- Vietnam	79.7	101.3	129.7	…	…	17.6	…
- Laos	30.5	43.4	40.2	…	13.5	42.5	…
- Cambodia	22.4	94.9	33.6	…	57.8	39.5	8.5
- Myanmar	…	…	…	…	29.0	13.4	…
Asian NICs							
- Hong Kong	221.5	252.8	772.3	2020.6	…	22.5	14.9
- South Korea	53.4	66.0	102.7	152.0	14.1	16.7	6.9
China	32.5	49.0	47.4	73.8	9.3	12.1	4.5
Japan	17.1	18.9	44.1	64.2	14.4	15.6	2.6
Europe EMU	44.9	56.3	112.6	141.9	24.4	23.7	…
UK	41.2	39.9	102.6	123.9	29.1	44.0	3.9
France	37.1	46.2	101.6	148.5	34.6	25.9	4.0
Germany	46.5	55.8	108.8	161.3	12.2	16.2	4.0

Note: … = not available or not applicable

Source: World Bank, World Development Indicators, Various Issues

TABLE 2.10 Gross Private Capital Flows and Gross Foreign Direct Investment Flows (Selected Countries)

	Gross Private Capital Flows (% of GDP)		Gross Foreign Investment Flows (% of GDP)	
	1990	2002	1990	2002
World	10.1	20.8	2.7	6.0
US	5.7	9.2	2.8	2.4
Mexico	9.2	6.3	1.0	2.4
Argentina	8.2	39.4	1.3	9.0
Brazil	1.9	13.2	0.4	4.4
Chile	15.0	23.6	2.2	5.5
ASEAN				
- Indonesia	4.1	5.4	1.0	2.1
- Malaysia	10.3	19.9	5.3	5.8
- Philippines	4.4	41.2	1.2	1.5
- Singapore	54.2	47.8	20.6	11.7
- Thailand	13.5	13.6	3.0	0.8
- Vietnam	…	5.8	…	4.0
- Laos	3.7	1.4	0.7	1.4
- Cambodia	3.2	5.5	1.7	1.6
- Myanmar	…	…	…	…
Asian NICs				
- Hong Kong	…	92.4	…	29.6
- South Korea	5.6	7.4	0.7	1.0
China	2.5	8.0	1.2	4.7
Japan	5.4	15.3	1.7	1.4
Europe EMU	14.1	49.3	2.9	14.8
UK	35.3	60.3	7.4	23.8
France	20.6	20.2	3.9	8.0
Germany	9.8	21.7	1.8	5.4

Note: … = not available or not applicable

Source: World Bank, World Development Indicators, Various Issues

TABLE 2.11 ASEAN Exports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	2493.3	2714.2	1923.7	2340.7	2169.1	3530.4	2690.9
Cambodia	…	…	…	…	1367.5	1495.1	1916.1
Indonesia	53844.5	21274.3	48847.6	48665.5	62124.0	56317.6	57158.8
Malaysia	74246.5	77457.6	77098.6	84287.9	98154.5	88031.6	93277.2
Myanmar	…	…	…	744.8	1193.8	2218.4	2452.2
Philippines	19533.0	25227.7	29496.4	35036.9	38078.2	32150.2	35208.2
Singapore	117349.4	128174.3	109802.9	114625.1	138352.5	121686.8	125042.7
Thailand	55894.7	57822.0	49481.6	56110.9	68700.9	64925.6	66108.2
Total*	323361.3	342670.1	316650.8	341811.8	410140.6	370355.7	383854.1
ASEAN-6	323361.3	342670.1	316650.8	341067.0	407579.3	366642.3	379485.9

Source: ASEAN Trade Statistic Database
Note: ASEAN 6 covers Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand.

* Exclude Laos and Vietnam; data are not available.

TABLE 2.12 ASEAN Imports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	4434.8	2310.7	1276.3	1720.4	1067.6	1310.0	1600.4
Cambodia	…	…	…	…	1404.6	1502.0	1664.8
Indonesia	46618.5	41679.8	27336.9	24003.3	33514.8	30962.1	31288.9
Malaysia	75303.1	76988.3	60976.5	63677.8	79647.5	73097.9	78797.8
Myanmar	…	…	…	1886.1	2219.4	2811.4	2118.1
Philippines	28392.6	35932.5	29659.9	30742.5	31387.4	29550.8	33576.4
Singapore	123411.6	135972.7	101495.9	110998.0	134680.1	115919.0	116336.4
Thailand	72445.6	63087.8	38711.6	48318.0	61935.3	61975.4	62729.9
Total*	350606.2	355971.8	259456.9	281346.0	345856.7	317128.6	328112.6
ASEAN-6	350606.2	355971.8	259456.9	279469.9	342232.7	312815.2	324329.8

Source: ASEAN Trade Statistic Database
Note: See table 2.11

TABLE 2.13 Extra-ASEAN Exports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	2046.9	2217.7	1702.8	1965.5	1529.7	2755.6	2006.7
Cambodia	…	…	…	…	1291.5	1422.5	1824.2
Indonesia`	45534.4	42423.4	39500.9	40387.1	51240.3	46810.5	47225.3
Malaysia	51552.5	54208.9	55487.2	62402.9	73745.8	67007.5	71150.1
Myanmar	…	…	…	540.3	800.4	1267.1	1230.9
Philippines	16562.7	21791.5	25675.3	30047.8	32095.7	27164.2	29678.5
Singapore	82907.9	92380.4	83804.7	85355.8	100568.5	88871.4	91080.1
Thailand	43783.2	44296.3	41166.9	46209.0	55992.7	52730.9	53267.8
Total*	242387.6	257318.3	247337.9	266908.3	317264.6	288029.8	297463.5
ASEAN-6	242387.6	257318.3	247337.9	266368.1	315172.8	285340.2	294408.5

Source: ASEAN Trade Statistic Database
Note: ASEAN 6 covers Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand.

* Exclude Laos and Vietnam; data are not available.

TABLE 2.14 Intra-ASEAN Exports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	446.4	496.4	220.8	375.2	639.5	774.8	684.2
Cambodia	…	…	…	…	76.0	72.6	91.9
Indonesia	8310.1	8850.9	9346.7	8278.3	10883.7	9507.1	9933.5
Malaysia	22694.0	23248.7	21611.4	21885.0	24408.6	21024.2	2217.1
Myanmar	…	…	…	204.5	393.5	951.3	1221.3
Philippines	2970.3	3436.2	3821.0	4989.1	5982.6	4986.0	5529.7
Singapore	34441.4	35793.8	25998.2	29269.3	37784.0	32815.4	33962.6
Thailand	12111.5	13525.7	8314.7	9901.9	12708.2	12194.6	12840.4
Total*	80973.7	85351.8	69312.9	74903.5	92876.0	82325.9	86390.6
ASEAN-6	80973.7	85351.8	69312.9	74698.9	92406.5	81302.1	85177.4

Source: ASEAN Trade Statistic Database
Note: See table 2.13

TABLE 2.15 Extra-ASEAN Imports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	1586.2	1333.9	685.2	842.4	533.3	765.2	972.9
Cambodia	…	…	…	…	855.4	410.3	1066.8
Indonesia	41069.4	36266.7	22777.6	19219.7	23733.6	25235.3	24293.3
Malaysia	60620.8	62148.2	48036.4	51265.0	63712.6	57843.6	61552.7
Myanmar	…	…	…	896.5	1106.1	1492.3	927.3
Philippines	24380.8	3159.7	25231.0	26281.5	26432.0	24886.0	28034.4
Singapore	96049.5	105575.8	77848.3	84757.0	10388.8	86928.1	85894.9
Thailand	62688.4	54966.1	33273.5	40330.6	51885.9	52734.0	53046.8
Total*	286395.0	291350.5	207852.0	223575.0	272647.8	250294.7	255789.1
ASEAN-6	286395.0	291350.5	207852.0	222678.5	270686.2	248392.2	253795.0

Source: ASEAN Trade Statistic Database
Note: ASEAN 6 covers Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand.

* Exclude Laos and Vietnam; data are not available.

TABLE 2.16 Intra-ASEAN Imports by country

Unit: US $ Millions

Country	1996	1997	1998	1999	2000	2001	2002
Brunei	2848.6	976.8	591.1	895.6	534.4	5448.7	627.5
Cambodia	…	…	…	…	549.1	1091.7	598.0
Indonesia	2216.0	5413.0	4559.2	4783.6	6781.2	5726.8	6995.5
Malaysia	14682.3	14840.1	12940.0	12412.8	15934.8	1257.3	17245.2
Myanmar	…	…	…	989.6	1113.3	1319.2	1190.8
Philippines	4011.8	4872.8	4428.9	4461.0	4955.4	4664.8	5542.0
Singapore	27362.2	30396.9	23647.6	26241.0	33291.3	28991.0	30441.4
Thailand	9757.2	8121.6	5438.1	7987.4	10049.4	9241.4	9683.1
Total*	64211.2	64621.2	51604.9	57771.0	73208.9	66833.9	72323.6
ASEAN-6	64211.2	64621.2	51604.9	56781.4	71546.5	64423.0	70534.8

Source: ASEAN Trade Statistic Database
Note: See table 2.15

CHAPTER 3

LITERATURE REVIEW: GRAVITY TRADE MODEL

3.1 Introduction

Studies in Economics and Social Sciences have often borrowed laws or relation from the natural sciences, such as physics or biology, mainly because of their strong scientific and directly intuitive nature. One example of this is the application of epidemic theory[18], developed by mathematician William Farr, to derive a logistic function in order to explain technology innovation and diffusion (Griliches, 1957 and Stoneman, 1983). More examples are an application of Lotka-Volterra's prey-predator model to growth cycles (Goodwin 1967), management strategy (Faure-Grimaud, 1997) and ample examples in International Trade. In many cases, from an empirical point of view, the results of these types of relationship have been very positive for economists and social science scholars. Many of such relations also show a high degree of robustness under different econometric tests.

The gravity trade equation or model[19] is one relationship of this kind. Sir Isaac Newton defined the Law of Universal Gravitation in the seventeenth century, stating that two celestial bodies or planets were subjected to an attraction force, depending positively on the

[18] The epidemic model presumes that the primary factor limiting diffusion is information and that the most important source of information about a new technology is people or firms who have tried it. Thus technology spreads like a disease, with the instigation of adoption being the contact between the "infected" population (people who have already adopted) and the uninfected population.

[19] The gravity trade model or equation, henceforth, is also known as the gravity model or equation.

product of their masses and negatively on the square of their distance[20]. Tinbergen (1962) and Pöyhönen (1963) are credited as the first authors to have applied Newton's law of gravity to analyse international trade flows. Since then the gravity model has been applied to a wide variety of goods and factors of production moving across regional and national boundaries under various situations. The model has been successfully applied to numerous types of flow, such as migration, the flows of buyers to shopping centres, recreational traffic, commuting, patient flows to hospitals and intra-regional and international trade.

In the case of its application to international trade flows, the gravity model states that the size or the magnitude of trade flows between two countries is determined by supply conditions at the origin, demand conditions at the destination and stimulating or restraining forces relating to the specific flows between the two countries. The goal of the model is to observe how much of the high level of trade within each region can be explained by simple economic factors, common to bilateral trade throughout the world, and how much of the level of trade is left over and can be attributed to a special regional effect.

Although the model has been praised for its simplicity and high level of statistical explanatory power, several scholars have argued that the gravity model suffers from the absence of a vigorous derivation based on economic theory.

This chapter will begin, in the next section, by reviewing the theoretical structure which has been proposed to underpin the gravity model. The third section investigates significant empirical works which have applied the gravity trade model to investigate

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[20] In 1687, Newton proposed the "Law of Universal Gravitation". It held that the attractive force between two objects i and j is given by $F_{ij} = G\frac{M_i M_j}{D_{ij}^2}$ where F_{ij} is the attractive force, M_i and M_j are the masses, D_{ij} is the distance between the two objects and G is the gravitational constant depending on the units of measurement.

international trade flows; beginning with a review of traditional empirical works. Then, studies using variations of the gravity trade model and also works which apply the model at the disaggregate level will be investigated. There have been a few studies which focused on the ASEAN region. The fourth section examines studies which have applied the gravity-type model to foreign direct investment. The final section will hold the summary and conclusions.

3.2 Theoretical Foundation of the Gravity Trade Model

Notwithstanding its widespread empirical application, the gravity trade equation has been a model in search of a theory. Nevertheless, a number of different theories have been developed in support of the gravity trade model. The differences in these theories help to explain the various forms of gravity equations, as well as the discrepancies in their results.

The earliest justification for the gravity trade model can be seen in the studies by Tinbergen (1962) and Pöyhönen (1963). The model is rooted in physics. The physical law of gravitation created the gravity model in international economics, having also a distance term, to help explain the volume of economic transaction between two countries. Tinbergen (1962) and Pöyhönen (1963) conclude that the incomes of the trading partners and the distances between them are statistically significant of the expected signs.

Another approach to deriving a gravity trade model, introduced by Linnemann (1966), is based on the Walrasian General Equilibrium Model, with each country having its own supply and demand function for all goods. Aggregate income proxies the level of demand in the importing country and the level of supply in the exporting country. The gravity trade model is viewed as a reduced form of equation for trade volume (proxied by its value),

without the appearance of a process because it is endogenous. Distance proxies transport costs which drive a wedge between demand and supply.

The study on world trade flows by Linnemann (1966) is the basis for the derivation of the gravity trade model. In order to construct the model, Linnemann categorised the factors of international trade into three groups:

(i) Factors indicating the total potential supply of the exporting country.

(ii) Factors indicating the total potential demand of the importing country.

(iii) Factors representing the 'resistance' to a trade flow from potential supplier to potential buyer.

Linnemann explained that the first two factors are each other's counterpart, thus, determined by the same force. The reason given was potential supply and potential demand on the world market should be virtually equal, once disregarded international capital flows or income transfers. Linnemann explained that a country engages in foreign trade because its domestic production does not correspond in detail with the composition of its domestic demand. Such production is not adapted completely to domestic demand because the country has developed comparative advantages in certain fields of production, whereas other countries have relative advantages in other fields, leading to a greater volume of production altogether for all countries.

To determine the factors indicating potential foreign supply and potential foreign demand, Linnemann based his investigation on the theoretical nature as well as the results of previous empirical research. He started his explanation by stating that the productions in any country of the world take place partly for the domestic market and partly for foreign markets. Disregarding the possible discrepancies between geographic product and national product and assuming a constant relation between production and product, a country's potential foreign

supply depends on its national product (or income) and on the ratio between production for the home domestic market and production for foreign demand (the DM/FM production ratios).

Moreover, concerning the DM/FM production ratios, Linnemann stated that differences between them can be explained satisfactorily by the differences in population size. This rationale was based on two essential elements: (i) the existence of economies of scale and (ii) the diversification of demand at higher levels of per capita income.

A certain country, with a given income and a given population, will try to produce as much of its requirements as possible at home. Limiting forces for domestic production include (1) the size of the domestic market since the domestic market may be too small for certain production to be processed, (2) the impossibility of finding substitutes for certain factors of production, (3) specific conditions being absent, for instance, a tropical climate or certain technical skills. As a result, the country concerned will be characterised by a certain DM/FM production ratio.

Such a country can be compared with another country of higher income with the same population, hence, a higher per capita income. The higher per capita income country tends to have a higher demand for commodities already produced domestically and may create sufficient additional demand for products so far not made domestically. This additional demand could be high enough to make home production feasible. At the same time, a higher per capita income implies higher demand for new products which were previously unable to be made economically in the country, due to either the market is too small, or the preference for goods of particular quality or design is to be foreign-made. Hence, the two tendencies will probably largely offset each other, so that the DM/FM production ratio corresponding to a given population size is virtually the same for different levels of per capita income. In other

words, per capita income has no relation to DM/FM production ratios and therefore has no effect on the potential of foreign supply.

Now two countries of different population sizes with equal per capita incomes can be compared. It is obvious that the more populated country can reach or exceed the minimum market size of efficient domestic production and can produce more lines of production than the less populated country can. The DM/FM production ratio, therefore, is higher in the country with a larger population. Hence, the larger the population size, the higher the DM/FM production ratio.

However, when taking into account the previous empirical research, Linnemann found that, apart from national income and population size, per capita income also played a significant role in the determination of trade flows between countries. At this point, therefore, Linnemann set up the hypothesis that the determination of potential supply and potential demand for a country links systematically to the followings:

(i) The size of national or domestic product of the country

(ii) The size of population of the country

(iii) The level of per capita income of the country.

Regarding the factors of trade resistance, Linnemann classified these factors into two groups, namely, Natural Trade Resistance and Artificial Trade Resistance.

Natural Trade Resistance consists of three elements, namely, transport cost, transport time and economic horizon. The cost of shipping an article from one country to another depends on a number of considerations. Thus, trade resistance between countries varies not only with the geographical distance, but also with the kind of commodity being traded, the kind of surface for the transportation to take place and the numbers involved in the reloading operation, as well as some similar factors. The second element of Natural Trade Resistance is

the time element which constitutes an obstacle to trade, not only in the case of perishable goods and not only because of interest costs, but also because of the possibility of losing the opportunity to adapt immediately to changing conditions and increasing irregularities in supply, in particular with regard to raw materials and semi-finished goods. The longer the time of transportation for a certain commodity, the more stock is needed in the importing country and also the greater the risk of losing profitable opportunities. The last element of Natural Trade Resistance is described as relating to the 'economic horizon' of the country or the 'psychic distance'. A country is much better informed of what is happening and what exists in the immediate neighbourhood than about the conditions customary in far-away countries. Thus, the conveniences, due to greater familiarity with the laws, institutions, habits and language of the partner country, plus greater similarity in the way of life and also the preference patterns between the countries, stimulate the trade between those countries.

However, Linnemann proposed to simply measure the Natural Trade Resistance between any pair of countries by their geographical distance. The reason was that the distance stands for a variety of factors, constituting altogether the obstacles to trade due to the existence of space. Hence, the geographical distance is a proxy variable for the total natural trade impediment in its widest sense.

The second group, Artificial Trade Resistance, arises when goods are not allowed to pass a country's frontiers freely (in either direction). In addition, it sometimes happens that political and economic alliances have a selective lowering of tariff barriers and quantitative restrictions, usually through the establishment of a preferential trading area. The member countries of such a preferential trading area meet less than usual trade resistance than in their dealings with other countries. Therefore, in order to include member countries of preferential trading agreements in the analysis of world trade flows, the distortion of trade flows between

countries needs to be corrected for deviation from the average or normal trade-resistance level. Linnemann corrected the deviation by including a preferential trade factor in his analysis.

Finally, Linnemann combined three factors, namely, the Factors of Potential Supply and Potential Demand (national income, population sizes and per capita income) and the Factor of Trade Resistance (geographical distance and preferential trade factors), into one expression, in order to explain the size of an individual trade flow. The relationship was constructed on the basis of a remark of Ferber and Verdoorn (1962), to the effect that "interactions in economic life are often of geometric rather than of arithmetic form".

Let E^P denote total potential supply, M^P denote potential demand and R denote resistance. The trade flow from country *i* to country *j*, indicated by X_{ij}, will depend on E_i^P and M_j^P. So the trade flow equation combining the three determining factors is as follows:

$$X_{ij} = \beta_0 \frac{\left(E_i^P\right)^{\beta_1}\left(M_j^P\right)^{\beta_2}}{\left(R_{ij}\right)^{\beta_3}} \qquad (3.1)$$

The three explanatory factors in (3.1) are, then, replaced by their determined variables. Let

Y = Gross National Product - GDP

N = Population Size

y = National Income per capita

D = Geographical Distance

P = Preferential-trade Factor

Since E^P is a function of Y, N and y, therefore:

$$E^P = \gamma_0 Y^{\gamma_1} N^{\gamma_2} y^{\gamma_3} \qquad (3.2)$$

Where γ_1=1 and γ_2 is negative, according to the theory explained earlier.

Since $y = Y / N$, its coefficient is dependent; therefore, per capita income is not introduced as an individual variable, but incorporated automatically in the exponents of the two other variables. This yields:

$$E^P = \gamma'_0 Y^{\gamma'_1} N^{\gamma'_2} \tag{3.3}$$

The same formation can be applied to the potential supply M^P, which is determined by identical forces,

$$M^P = \gamma'_4 Y^{\gamma'_5} N^{\gamma'_6} \tag{3.4}$$

In principle, Potential Supply and Potential Demand are equal, i.e., $\gamma'_0 = \gamma'_4$, $\gamma'_1 = \gamma'_5$ and $\gamma'_2 = \gamma'_6$. In an equilibrium situation, this has to be realised. However, in short-term disequilibria, Linnemann allowed these exponents to be different.

The trade resistance factor *R* is simply replaced by two variables: Geographic Distance *D* (with a negative exponent) and Preferential Trade Factor *P* (with a positive component). Several other variables may replace this final variable to distinguish between various types of preferential trading areas. The trade flow equation is finally formulated as follows:

$$X_{ij} = \delta_0 \frac{Y_i^{\delta_1} Y_j^{\delta_3} P_{ij}^{\delta_6}}{N_i^{\delta_2} N_j^{\delta_4} D_{ij}^{\delta_5}} \tag{3.5}$$

or

$$X_{ij} = \delta_0 Y_i^{\delta_1} N_i^{-\delta_2} Y_j^{\delta_3} N_j^{-\delta_4} D_{ij}^{-\delta_5} P_{ij}^{\delta_6} \tag{3.6}$$

The equation (3.6) is the standard gravity model, according to Linnemann. The equation implies that exports have a constant elasticity with respect to each of their

explanatory variables, i.e., a one (1) per cent increase in GNP of country j always results in an increase of δ_3 per cent of exports from country i.

Apart from the above theoretical foundation, Linnemann also derived a model, based on a general model, bearing a resemblance to the Walrasian model, with the same result as equation (3.6).

There is also an explanation for the gravity trade equation based on the probability model. Demanders are supposedly assigned to suppliers in a random fashion. Leamer and Stern (1970) tried to predict trade flows between countries regarded as stochastic trade flow events.

However, the most recent micro-foundations approach to the gravity trade model claims that other approaches lack strong theoretical foundations. The micro-foundations approach alleges that the critical assumption of perfect product substitution ability of the conventional gravity model is unrealistic, for evidence in recent times has shown that trade flows are differentiated by place of origin. Authors who share this views include Armington (1969), Anderson (1979), Bergstrand (1985, 1989) and Helpman and Krugman (1985).

Anderson (1979) was the first to apply more formal attempts, assuming product differentiation with Cobb-Douglas and CES Preferences. Bergstrand (1985) also used CES preferences over Armington-differentiated goods to derive a reduced-form equation for bilateral trade, involving price indices. Using GDP deflators to approximate these price indices, Bergstrand estimated the system in order to test the assumption of product differentiation. For richness, the CES preferences were also nested with different elasticity substitution among imports and then between imports and domestic goods. Helpman and Krugman (1985) embedded the equation in a model of monopolistic competition with increasing returns to scale, which can be used to yield a prediction regarding the sectoral

pattern of trade. The recent paper of Eaton and Kortum (2001) also uses a similar framework with homogeneous goods and embedded gravitational forces in a Ricardian setting.

In the midst of various attempts to underpin the theoretical foundation of the gravity equation, Evenett and Keller (1998), along with Deardorff (1995), evaluate the usefulness of the gravity model in testing alternative theoretical models of trade. Evenett and Keller (1998) demonstrate how the data and the empirical result can be used to distinguish between the theory based on product differentiation and the theory based on homogeneous goods. Deardorff (1995) shows that a gravity model can be consistent with the Heckscher-Ohlin-Samuelson model, with non-homothetic preferences and without any role for monopolistic competition.

In summary, a basic formulation of the gravity model is a way of combining three sets of factors in determining the size of a bilateral or international trade flow, namely: i) economic forces at the origin of flow, ii) economic forces at the destination of flow and iii) economic forces either aiding or resisting the movement of flow from the origin to the destination.

Algebraically, the common formulation of the gravity model is as follows;

$$X_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} N_i^{\alpha_3} N_j^{\alpha_4} D_{ij}^{\alpha_5} A_{ij}^{\alpha_6} e_{ij} \qquad (3.7)$$

Or, by natural logarithms:

$$\ln X_{ij} = \ln \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln Y_j + \alpha_3 \ln N_i + \alpha_4 \ln N_j + \alpha_5 \ln D_{ij} + \alpha_6 A_{ij} \qquad (3.8)$$

Where:

X_{ij} is the flow of goods from country i to country j;

Y_i and Y_j are incomes of country i and country j;

N_i and N_j are the population of country i and country j;

D_{ij} is the distance between country i and country j;

A_{ij} is any other factor(s) either aiding or resisting trade between countries i and j;

e_{ij} is the log normally-distributed error term, where $E(\ln e_{ij}) = 0$.

Taking into account the economic theory justification of the gravity trade equation as explained by Linnemann (1966), the hypotheses underlining the gravity trade equation can be summarised as follows.

The income variables are expected to have a positive effect on the trade flow. On the supply side, an increase in income will indicate greater production available for exports. On the demand side, a rise in income, given a relatively high marginal propensity to import, will lead to an increase in imports, all else remaining constant.

The effect of population variables on trade flow is indeterminate. Population size can enhance trade flow as well as restrain it. On the one hand, a large population may indicate a large resource endowment, self-sufficiency and less reliance on international trade. Hence, population size should have a negative effect on trade flow. On the other, it is possible that a large domestic market (or population) can promote the division of labour and consequently create opportunities for trade in a wide variety of goods. In the latter case, the population size has a positive effect on trade flow.

Regarding the trade-resistance variables, distance obviously has an adverse effect on trade flow between countries. Therefore the coefficients are expected to be negative. The longer the distance between trading countries, the higher the cost, leading to lower profit margins for the importer. Long distance also leads to increased “psychic distance” between the trading countries. All these characteristics of distance will reduce the trade flow between countries.

In addition, when we are dealing with disaggregate data, we would expect the estimation of a coefficient of distance variable to be a large negative value in the case of commodities which are more difficult to transport and more complicated to sell at a great distance.

The factors which cause resistance in trade flows will adversely affect the trade flow between trading countries. Their coefficients, hence, are expected to be negative. For instance, a tariff, as a tax on imported goods, raises the delivery price in the importing country, as well as the prices which the consumer eventually pays for the imported goods. This in turn leads to a fall in the demand for imports, given that the imported goods are normal goods.

The factors which aid trade flows will favourably affect the trade flow between trading countries. Their coefficients, hence, are expected to be positive. For example, the dummy variables for countries sharing their land border and the dummy variables for countries in the same preferential trading agreement will enhance the trade flow between the countries.

3.3 Empirical Works of International Trade Flows based on the Gravity Trade Model

Tinbergen's (1962) seminal work with the gravity model is an early example of how it may be used to examine the effects of economic integration. Tinbergen statistically determined the basic factors governing the volume of trade between any pair of countries. A comparison of the actual trade volume with the volume expected on theoretical grounds may show discrepancies indicating that a country's exports are either receiving preferential treatment in importing countries (in case of a positive deviation) or being discriminated against (in case of a negative deviation). The significance of the deviation between actual and calculated trade depends on the accuracy and reliability of the theoretical values of the trade

volume as estimated with the help of econometric methods. The better the standardized pattern of international trade describes reality, the more significant are the individual exceptions or deviations from the normalized empirical trade pattern. It is precisely these deviations that we are interested in.

The purpose of this econometric exercise is to find which countries show substantial negative deviations, for these would be indicative of the existence of special barriers and obstacles to the optimum flow of international trade. An economic model describing international trade flows was formulated in varying degrees of detail. Tinbergen's main model is a very simple one, having only that aspect which is relevant to the aim of the study, i.e., the deviations from the normalized trade pattern. It consists of only one equation in which the value of the total exports from one country to another is explained by a small number of variables. The explanatory variables which play a major role are:

(i) The Gross National Product (GNP) of the exporting country;

(ii) The GNP of the importing country; and

(iii) The distance between the two countries.

In other calculations, various extra explanatory variables are introduced. However, their contribution to an explanation of the value of exports is very limited, as compared to these three main variables.

Tinbergen, therefore, constructed the following trade flow equation in its simplest form, as follows:

$$E_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3} \tag{3.9}$$

The meaning of the symbols used is:

E_{ij} = exports of country i to country j

Y_i = GNP of country i

Y_j = GNP of country j

D_{ij} = distance between country i and country j.

Tinbergen used this equation to calculate the "normal" or "standardized" flow of trade between countries. The numerical values of the four αs had to be estimated before normal trade flows could be calculated. The estimations were based on actual trade flows, given the essential assumption that the actual trade of most countries does not extensively diverge from the normal or standard pattern and volume of trade. Nevertheless, a number of divergences can be expected in practice and the aim of the present study is to trace these divergences. Tinbergen's study assumes that the individual deviations from the normal pattern are relatively few in number; hence, the actual trade flows should follow the usual or standard pattern closely. In addition, his analysis was confined to commodity trade flows due to lack of data on the export and import of services on a country-by-country basis.

The hypothesis that the three explanatory variables are the most relevant ones was tested first for a limited number of countries of similar economic structure. In the first series of calculations (series A), Tinbergen applied data on the 1958 exports of 18 countries – mainly the more developed ones. Equation (3.9) was rewritten for this purpose as:

$$\log E_{ij} = \alpha_1 \log Y_i + \alpha_2 \log Y_j + \alpha_3 D_{ij} + \alpha_0' \tag{3.10}$$

Where $\alpha_0' = \log \alpha_0$ or $\alpha_0 = 10^{\alpha_0'}$

Exports were expressed in 100 million US dollars, GNP in 10 billion US dollars and distance (measured between the commercial centres of the countries involved) in 1,000

nautical miles. The values of the coefficients were fitted to 306 (18 x 17) sets of observations by the method of least squares.

With the same set of data, another exercise was then undertaken by introducing additional explanatory variables. Tinbergen states that, apart from purely economic variables, it is likely that political or semi-economic factors also have a role in determining the volume of trade between countries. The existence of special trade agreements is the most outstanding factor. The importance of such trade arrangements was estimated by the introduction of a dummy variable for (1) the British Commonwealth preference and (2) the Benelux preference. When the trade flow analysed concerned two members of the Commonwealth, a certain positive value was given to the dummy variable to indicate that the goods being traded received preferential treatment in the importing country; where the two countries were not members of the Commonwealth, the variable had zero value – no preferential treatment. The dummy variable for the Benelux preference was given a zero value in all cases except for trade flows between Belgium (actually the Belgium-Luxembourg Economic Union) and the Netherlands. A third dummy variable was also introduced for adjacent or neighbouring countries.

With the three additional variables introduced, the trade flow equation reads:

$$E_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3} N^{\alpha_4} P_C^{\alpha_5} P_B^{\alpha_6} \tag{3.11}$$

$$\log E_{ij} = \alpha_1 \log Y_i + \alpha_2 \log Y_j + \alpha_3 D_{ij} + \alpha_4 \log N + \alpha_5 \log P_C + \alpha_6 \log P_B + \alpha_0' \tag{3.12}$$

Where

N = dummy variable for neighbouring countries

P_C = dummy variable for the Commonwealth preference

P_B = dummy variable for the Benelux preference

The introduction of three additional variables increased the regression coefficient. Although the algebraic signs of the regression coefficients of the three variables were all positive, as expected, only the coefficient for the Commonwealth was significant. In addition, the dominant roles played by the first three variables i.e., the GNPs of exporters and importers and the distance, were almost the same as in the previous estimation.

The results obtained from this study of data from 18 countries encouraged further research. The number of countries included in the analysis was enlarged to 42. The mutual export trade of these 42 countries amounted to about 70 per cent of total world trade in 1959, the year to which the following calculations refer.

In the next series of calculation (series B), first the coefficients of equation (3.10) were first estimated from 1,722 (42 x 41) sets of observations. Then a fourth explanatory variable i.e., a dummy variable for neighbouring countries, was introduced. The regression coefficient was only slightly higher than in the previous estimation. Up to now, all computations were made on the basis of GNP figures converted into US dollars but calculated in national prices. Tinbergen, therefore, did an experiment with GNP figures corrected for differences in price level. This test was based on the supposition that the dollar exchange rates of most countries do not adequately reflect the differences in domestic buying power between the dollar and the national currency and the nominal GNP figures may not be the best measurement of a country's export potential, or its import market; but again they may well be a prime indicator of a country's buying power on international markets. However, judged by the estimated regression coefficient, the results were not an improvement over previous computations.

Tinbergen also added the fifth variable, a dummy variable standing for all preferential trade relations. It was given a value of 2 in logarithms (or 100 in antilogarithms) for the trade flows between the United Kingdom and a Commonwealth partner and for trade flows between a metropolitan country and its (former) colony or colonies. It was given a value of zero for all trade flows without preferential treatment. In a number of cases, the value 1 was given to the dummy variable, expressing the existence of a semi-preferential trade relation.

As a final exercise, Tinbergen introduced another explanatory variable. It was thought that the trade flows of a country which specialised in exporting a small number of products might differ (in value) from those of a country with a more diversified export structure. The degree of commodity concentration in exports can be measured in various ways; Tinbergen chose to use the Gini coefficient of concentration. If a country exports only one commodity, the value of the Gini index is 100; the more diversified the export package is, the lower is the value of this index. Because of the requirement of comparability, the Gini coefficient could be computed only for those countries which base their export statistics on the three-digit SITC code. This procedure was possible for only 28 of the 42 countries. This last series of calculation (series C), therefore, consists of 756 (28 x 27) observations.

Overall, the three sets of calculations differ mainly in the number and type of countries from which the basic data were taken. The same three explanatory variables were used in all cases. The regression coefficient varies little from calculation to calculation. While the average value of the regression coefficient was not very high, i.e., around 0.81, Tinbergen stated that it was not unsatisfactory, since the actual pattern of trade is almost certain to deviate substantially from the normal (or the theoretical) pattern.

A comparison of the results of series A calculation with those of series B and C shows that the absolute value of all coefficients is lower in A than in B and C. Tinbergen believed

that these differences were due to the different coverage of the samples. The list of countries included in series B (42 countries) and also but to a lesser extent in series C (28 countries) differs from that in series A in three respects. First, whereas series A consists predominantly of developed countries, series B and C include a number of developing nations, which means that the GNP indicates mainly geographic size in series A and both geographic and economic size in series B and C. Second, the countries added in series B and C generally have a low GNP in comparison to those included in series A so that the range of values occupied by the first two explanatory variables is enlarged (in one direction) in B and C. Third, the countries added in series B and C are in general more remote countries from the West and so the role of the distance factor can be estimated more accurately here than in the geographically less balanced sample used in A. Therefore, Tinbergen concluded that the estimations with broader coverage are more meaningful than the ones based on the trade pattern of developed countries only.

Focusing on the results of calculations B and C, Tinbergen found that the coefficients of both an exporting country's GNP and an importing country's GNP have values close to 1. This means that the export flow is almost proportional to the GNP of the exporting and the importing country. An interesting feature of the results regarding the GNP is that the coefficient of an exporting country's GNP are slightly higher than those of the GNP of an importing country, which implies that export volume depends, to some extent, more on the GNP of the exporting country than on the GNP of the importing country. It also implies that there is no equilibrium in the balance of trade between two countries with different levels of GNP. Hence, the large countries, in terms of GNP, always export more to smaller countries than they import from them. This leads to a positive balance of trade for the bigger countries and a negative trade balance for the smaller ones.

Regarding the effect of specialisation, where Tinbergen had introduced additional variables in series C, the coefficient of the Gini variable has a negative sign implying that an increase in commodity concentration leads to a smaller flow of exports. In other words, the more diversified the export package the greater the export volume. On the subject of the main aim of his research, he calculated the deviations of actual trade from standardised or theoretical trade. Tinbergen concluded that the negative deviations of actual from calculated imports can be considered as indicative of the existence of discriminatory trade impediments. Tinbergen stressed that his analysis is only a first step in an interesting approach to the study of world trade flows. The analysis here is so crude that only tentative conclusions are possible.

Linnemann (1966) applies the trade flow equation constructed in his theoretical foundation (equation 3.3) to a cross section study in order to investigate the world trade flow. The study takes the form of a multivariate single-equation regression analysis. Linneman's aims are (1) to determine whether the factors enumerated in the model indeed make a significant contribution to an explanation of world trade flow; (2) to estimate the numerical values of the parameters of the trade-flow equation; and (3) to calculate and scrutinize the deviations between 'actual' and 'explained' trade.

First of all, Linnemann chose to use data from the year 1959 in order to be able to compare his results with those of Tinbergen. Based on a maximum geographical coverage, Linnemann states that all the possible countries were included, but some had to be excluded. These excluded countries are (1) Most of the communist countries where the mechanism determining imports and exports has been centrally-planned politically; (2) The countries whose imports and exports shown in the trade statistics contain a substantial proportion of transit goods which are neither produced nor consumed in the country itself. This is because

these countries can be considered as market places only; and (3) Countries whose import and export data are either completely lacking or extremely unreliable.

Therefore, Linnemann considered 80 countries altogether. These gave 80 x 79 = 6320 trade flows. However some of the zero trade flows had been dropped, due partly to political factors, such as the boycott on Israel by the Arab League and due partly to the lack of data, such as those relating to trade between Egypt and Syria. Linnemann finally had 6300 trade flows, which accounted for about 83 per cent of total world trade in commodities (excluding trade with and within the communist bloc.)

This set of data was applied to several sets of models. For the first set, the following model was estimated statistically using least-squares regression methods:

$$\log X_{ij} = \varphi_1 \log Y_i + \varphi_2 \log N_i + \varphi_3 \log Y_j + \varphi_4 \log N_j + \varphi_5 D_{ij} + \varphi_6 \log P_{ij}^{UUC} + \varphi_7 \log P_{ij}^{FFC} + \varphi_8 \log P_{ij}^{PB} + \varphi_0' \quad (3.13)$$

There are only three preference factors in this first series of calculations, namely, British Commonwealth preference (P^{UUC}), French Community preference (P^{FFC}) and Belgian and Portuguese colonial preferences (P^{PB}).

The first series of calculations was performed using only the trade flow data which were recorded in the statistics, i.e., all flows of US Dollars of 0.1 million or more annually. Therefore, for the 80 countries altogether, there were 3,400 flows when using export (X_e) statistics and 3,532 flows when using the import (X_m) data. The results were quite acceptable where all of φ parameters of equation (3.13) had the expected sign and were statistically significant. The alternatives with regard to the dependent variable (export or import data) and with regard to nominal or real national income did not substantially influence the outcome.

The regression coefficients varied from 0.79 to 0.80. With the estimated equation obtained, the 'explained size of trade flow' for all 6,300 observations was calculated. The pattern of explained trade which resulted from this set of coefficients led to positive trade balances for the larger countries and negative balances for small countries. However, regarding the smallest trade flows, the theoretical value, in comparison with the actual value, were on the whole, appreciably high. This means that parameter values estimated in this first series of computations did not explain the many zero flows among the basic data. This leads to the conclusion that in the regression analysis it was inadmissible to leave all zero flows out of consideration.

In addition, for the eight Commonwealth countries the preference parameter has so low a value that it is not even significantly different from zero. Linnemann suggests that this is, on the one hand, because this analysis does not distinguish between trade preference for the metropolitan country in the colony and vice versa, and, on the other, preferential treatment between the colonies themselves. Since there are some important instances of discrimination with regard to preferences given by an individual member to the others, it would have been better to introduce separate preferential dummy variables for the relations between a metropolitan country and a colony, and vice versa and for the mutual trade flows between the dependent countries.

For the second set of calculations, since the result from the first set suggests that some small value trade flows have been wrongly omitted, this calculation uses an enlarged and improved basic sample consisting of a) the non-zero flows of the first sample, minus b) the non-zero flows with an explained value of zero, plus c) the zero flows with an explained value larger than zero. By 'explained value', although this should be the explained value of this

second set of computation, Linnemann means 'the value explained in the first set as a short-cut'.

The selection for the second sample was made in such a way that for the X_e and the X_m data the same number of observation was obtained, namely, 4,831. The zero flows included in the sample had introduced as a small non-zero value as the computation is performed in logarithms. For the zero flows added to the original X_e data, an arbitrary value of 0.01 million US dollars was chosen; for the X_m the value was fixed at 0.02 million US dollars so that it would be possible to determine the effect of alternative assumptions about zero value. The preference effect on trade between Commonwealth partners other than the United Kingdom was now distinguished from the preference factor which operates in transactions between Commonwealth partners and the United Kingdom itself. In the same way, the preference variable for the trade of French associates with France differs from the one which applies to trade between associates. However, in the computational set-up for the second set of regressions, only three preference variables could be accommodated. Thus, in the second set of computations the three preference variables are as follows:

P^{UC} : Preference for UK associates between one another

P^{FC} : Preference for French associates between one another

P^{UFPB} : UK, French, Portuguese and Belgian preference in transactions with their own associated countries.

The new parameters estimated have higher absolute values than those of the first series. The parameter of the GNP variable increased by about half of their original value, the coefficients of the population variable are twice as large as before and the distance parameter

also increased by more than half its magnitude. This means that the explained trade flow has become more sensitive to variations in the independent variables. With regard to the preference parameters, it is worth noting that the coefficient for the Commonwealth without UK is greater than that of the Commonwealth with the UK. Correspondingly, the coefficient of French associates without France surpasses those with France.

The regression coefficients are much the same as those of the first round of regressions. As regard the smallest size trade flows the present performance is clearly much better than that in the first series of calculations. However, the difficulties with these results lie at the opposite end of the scale. The large flows are greatly overestimated.

In spite of the size of deviations of the actual from the explained trade pattern in both calculations, Linnemann concludes that for most countries the correspondence between actual and explained is good enough to recognize the more important deviations as exceptions due to special factors. In practical terms, one may try to incorporate these neglected factors explicitly in the statistical analysis.

Linnemann in his third calculation, therefore, introduced an additional explanatory variable. He called this variable the commodity composition of trade. This was based on the fact that the flow of trade from country i to country j will increase the better the commodity composition of the exports of i fits in with the composition of the imports of j. The Commodity composition variable indicates the goodness of fit of country i's exports to country j's imports. Linnemann calculated the commodity composition index by breaking down the commodity composition into n classes and comparing the n-dimension vector between each pair of countries. For computation convenience only those observations which have a non-zero value according to both export statistics and import statistics have been

included in the basic set of data. The number of observation satisfying this criterion is 3175. As before, ordinary multiple regression analysis was applied.

In this third calculation the number of preference variables is increased from three to five. These are:

P^{PB} : Preference of Portugal and of Belgian in transactions with their associated countries.

P^{U} : Preference of United Kingdom in transactions with its associated countries.

P^{F} : Preference of France in transactions with its associated countries.

P^{UC} : Preference for UK associates among themselves.

P^{FC} : Preference for French associates among themselves

The introduction of the additional variable slightly raises the multiple regression coefficients. In addition, the systematic dominance of the exporting country's GNP parameter over the importing country's GNP parameter disappears. However, it does not improve the situation with regard to the many zero flows. Linnemann concludes that the Commodity composition variable will have changed and improved the results to some extent, but usually not in a fundamental way.

Bergstrand (1985) developed the gravity model based on the debate that Linneman's model lacked price variables. Bergstrand derived the gravity model from the general equilibrium model and argued that if aggregate trade flows are differentiated by national origin, Linneman's model mis-specified the gravity model by omitting certain price variables. The reason that the model should include price variables according to Bergstrand is that aggregate trade flows are, in fact, differentiated by national origin. On the demand side, consumers choose first between domestic and imported products and then choose among

import suppliers. On the supply side, suppliers choose between the domestic market and foreign market and then choose within the foreign market.

In order to show strong evidence implying the existence of nationally differentiated products, Bergstrand presented estimates of a gravity equation which included price variables.

As with Linneman's basic gravity equation, Bergstrand used variables indicating the presence of preferential trading arrangements as a proxy of a tariff variable. The transport cost factor is proxied by the distance between the economic centres of i and j and a dummy of adjacency. As for price variables, he used aggregate price indices as proxies for import price indices. He also included the exchange rate index to indicate changes in the i's currency value of a unit of j's currency.

The generalised gravity model is estimated for 1965, 1966, 1975 and 1976 based on statistical data from 15 OECD countries. The years were chosen to help specify the stability of parameter estimates from year to year, from one decade to another and from fixed to floating exchange rates.

The equation of the gravity model derived by Bergstrand (1985) is expressed as follows:

$$PX_{ij} = \alpha Y_i^{\beta_1} Y_j^{\beta_2} D_{ij}^{\beta_3} T_{ij}^{\beta_4} E_{ij}^{\beta_5} P_i^{\beta_6} P_j^{\beta_7} K_i^{\beta_8} K_j^{\beta_9} \quad (3.14)$$

Where;

PX_{ij} : the value of trade flow from i to j

Y_i : Country i's income

Y_j : Country j's income

D_{ij} : transport-cost factor proxied by the distance between the economic centres of country i and country j and a dummy for adjacency

T_{ij} : tariff variable between i and j, proxied by dummy variables indicating the presence of preferential trading arrangements

E_{ij} : exchange rate index indicating i's currency value of a unit of j's currency since the common base period.

P_i : countries i's export unit value index

P_j : countries j's export unit value index

K_i : i's GDP deflators

K_j : j's GDP deflators

We can see that Bergstrand introduced price variables into the equation and excluded population variables. P_j and K_j are indicators on the demand side and P_i and K_i are indicators on the supply side.

All the coefficient estimate signs match his hypothesis in all four years. Importer income, adjacency and preferential trading arrangements have positive coefficient signs resembled the basic gravity model; distance has a negative coefficient sign. An appreciation of the importer currency increases the trade flow from i to j. A rise in exporter income increases the trade flow, implying that the elasticity of substitution among importable goods exceeds unity. The negative coefficient estimate for the importer GDP deflator supports the conclusion about this elasticity of substitution.

As a result, empirically the price and exchange rate variables have plausible and significant effects on aggregate trade flows. Coefficients estimated suggest that products are differentiated by national origin and commodity arbitrage is imperfect. Moreover, the results imply that the elasticity of substitution among importables exceeds unity and that of imported products is below unity and the elasticity of transformation among export markets exceeds

that between the production for domestic and foreign markets. The results, therefore, support the idea that the gravity equation is a reduced form of a partial equilibrium subsystem of a general equilibrium trade model with nationally differentiated products.

Frankel et al (1995) applied the gravity model to examine bilateral trade patterns throughout the world in order to distinguish between the high level of trade within each region which can be explained by simple economic factors common to bilateral trade and the level of trade left over to be attributed to a special regional effect.

The dependent variable used is the total trade volume (exports plus imports) between pairs of countries in a given year, in logarithm form. The data set has 63 countries; thus, it yields (63x62/2) 1953 observations for a given year.

A main part of the apparent bias toward intraregional trade, geographical proximity, is measured in the log of the distance between the two major cities (usually the capitals) of the countries in question. Frankel et al also added a dummy 'Adjacent' variable to indicate when two countries have a common land border.

GNPs were included in the model in product form, which was justified by the modern theory of trade under imperfect competition that one will choose to trade more with a larger country than a smaller country because it offers more variety and consumers like variety. The product of GNP per capita is also included in the model, since there is reason to believe that GNP per capita has a positive effect on trade because as countries a given size become more developed, they tend to specialise more and trade more.

Therefore, Frankel et al's equation to be estimated, in its most basic form, is

$$\ln(T_{ij}) = \alpha + \beta_1 \ln(GNP_i * GNP_j) + \beta_2 \ln(GDPpc_i * GDPpc_j) + \beta_3 \ln(DISTANCE_{ij}) + \beta_4(ADJACENT_{ij}) + \gamma_1(EA_{ij}) + \gamma_2(EC_{ij}) + \gamma_3(NAFTA_{ij}) + u_{ij} \quad (3.15)$$

Where;

T_{ij} : Total bilateral trade between country i and country j

GNP_i : Country i 's GNP

GNP_j : Country j's GNP

$GDPpc_i$: Country 's GNP per capita

$GDPpc_j$: Country j's GNP per capita

$DISTANCE_{ij}$: Distance between country i and country j

$ADJACENT_{ij}$: Dummy variable for adjacency

The three region dummy variables; EA (East Asia), EC (the European Community), NAFTA (the North American Free Trade Area), are examples of dummy variables applied to test the effects of membership in a common regional grouping.

The reported result extends from 1965 to 1990 and shows that four standard gravity variables are highly significant statistically.

The 1990 coefficient on the log of distance is about –0.6, when the adjacency variable (which is also highly significant statistically) is included at the same time. This means that when the distance between two non-adjacent countries is higher by 1 per cent, the trade between them falls by about 0.6 per cent. The distance measures which take into account the greater distances involved in sea voyages around obstacles such as the Cape of Good Hope and Cape Horn, are then applied to the model instead of the simple geographical distance. However, this produces little effect on the results. In addition, the coefficient of distance varies a little over the course of the earlier observations, but with no clear trend.

The estimated coefficient on the product of per capita GNPs varies in the 0.26-0.40 range from 1965 to the 1980s, indicating that richer countries do indeed trade more. This term

shows a decline during the 1980s. The estimated coefficient for the log of product of the two countries' GNPs holds roughly steady at about 0.7, indicating that, though trade increases with size, it increases less than proportionately (holding the GNP per capita constant). This reflects the familiar pattern that small economies tend to be more dependent on international trade than larger and more diversified economies.

Regarding the dummy variables for intra-regional trade, first of all, Frankel et al applied only a Western Hemisphere dummy variable whose estimation yields a highly significant coefficient. The results show that if two countries are both located in the Western Hemisphere, they traded with each other by an estimated 86 per cent more in 1980 than they would have otherwise, after taking into account distance and other gravity variables. When the Western Hemisphere bloc variable is broken into sub-region dummy variables, i.e., NAFTA, MERCOSUR and the Andean Pact, these writers found that the estimates for MERCOSUR and the Andean Pact turn positive in 1970 but only the latter is significant in 1975 and 1980. Both are significant in 1990. The NAFTA coefficient turned positive only in 1985 but it was not statistically significant.

In addition, the EC bloc effect became highly significant in 1985 with a coefficient value of 1.14, which suggests that if two countries are both located in the European Community, their bilateral trade is three times as high as it would be otherwise. EFTA is never significant. As for the coefficient for an East Asian grouping, it was highly significant but diminished in the 1980s, rather than increasing, as is often assumed.

Next, Frankel et al added a dummy variable to signify when both countries of a pair spoke a common language or had had colonial links earlier in the century. They allowed for English, Spanish, Chinese, Arabic, French, German, Japanese, Dutch and Portuguese. The results show that two countries sharing linguistic or colonial links tend to trade roughly 65 per

cent more than they would otherwise. These writers also tested whether some of the major languages were more important than the others; Chinese is the only one to qualify under this heading. Two Chinese-speaking countries appear to trade with each other four times as much as other countries. Additionally, the inclusion of linguistic and colonial terms has little effect on the other coefficients. The trade blocs remain significant with increasing trends over the period 1965-1990 in each case except East Asia.

They also tried to capture the classic Heckscher-Ohlin effect that countries trade capital-intensive products for unskilled-labour-intensive products. First, they included bilateral absolute differences in GNP per capita figures for 1990. Contrary to the hypothesis, the variable did not have this positive effect. Instead, it had a moderately significant negative effect, as in the Linder hypothesis that similar countries trade more than dissimilar ones.

Finally, a more direct measurement of factor endowments was included. There are the two countries' differences in (1) capital/labour ratios, (2) educational attainment levels and (3) land/labour rations. However, the coefficients on the bloc variables and other effects quantitatively change only a little.

Frankel and Wei (1997), too, used the gravity model to establish a "norm" of bilateral trade volume in order to detect and quantify a possible intra-regional trade bias. This study focused on the East Asian region and was based on two observable accounts. The first is that the only formal regional arrangement in the area, ASEAN, does not in fact function as an economic bloc; in particular, trade between members is thought to be very low. The second is that East Asia taken as a whole does, under Japanese direction, function as a trading and investment bloc and has increasingly done so over time, despite the absence of a formal preferential trading area among these countries.

The dependent variable in their gravity estimation, as with Frankel et al (1995), is the bilateral volume of total trade between Countries i and j. Other aspects of the model are also similar to Frankel et al's except that these writers applied GDP data instead of GNP. They still included a common language dummy variable to capture its effect on trade facilitation.

A representation of their model is:

$$\begin{aligned} \ln(T_{ij}) = \quad & \alpha + \beta_1 \ln(GDP_i * GDP_j) + \beta_2 \ln(GDPpc_i * GDPpc_j) \\ & + \beta_3 \ln(DISTANCE_{ij}) + \beta_4 (ADJACENCY_{ij}) \\ & + \beta_5 (LANGUAGE_{ij}) + \gamma ASEAN_{ij} \end{aligned} \tag{3.16}$$

The last three explanatory factors are dummy variables. $ASEAN_{ij}$ is an example of the sort of dummy variable used by them when testing the effects of membership in a common regional grouping. It is defined as 1 for a given pair when both countries are members of ASEAN and 0 otherwise. The other free trade areas considered in the statistical analysis included the EU, NAFTA, MERCOSUR, the Andean Pact countries (ANDEAN) and ANZCERTA). The estimation technique used is ordinary least square (OLS) regression.

Their base data set covers 63 countries (or 1,953 country pairs) for 1980, 1990, 1992 and 1994, to observe how the coefficients vary over time.

The result shows that the coefficient of the ASEAN dummy variable is statistically significant and has a clear intra-regional bias in every year tested. The coefficient estimate in 1992 is 1.80. The implication is that any two ASEAN countries trade six times more than two otherwise similar countries. (Because trade is expressed in logs, one must take the exponential of the coefficient: [exp(1.8)= 6].) It is in this sense that intra-ASEAN trade can be said to be high.

However, Frankel and Wei were aware of Singapore's substantial role in the region. Its imports and exports are more than 100 per cent of GDP and account for almost half of intra-ASEAN trade. It is possible that the obvious intra-ASEAN bias is partly or wholly evidence of the extreme openness of Singapore. To examine this, they added a dummy to the regression which represents any bilateral trade involving Singapore. The results show that the Singapore dummy does indeed have a positive and very significant coefficient. Note that although the coefficient of ASEAN reduces to 1.40, it remains quantitatively large and statistically significant. This suggests that Singapore's extreme openness does not explain all of the obvious bias among the ASEAN countries.

Frankel and Wei also added a dummy variable representing observations where either of two partners is a member of ASEAN (or likewise with any other grouping). A positive coefficient indicates openness. The result indicates that ASEAN is beyond question open. Part of what appeared to be a propensity to trade with other ASEAN members was really a propensity to trade with everyone. However, some intra-ASEAN trade remains unexplained. The bloc coefficient is in every year still highly significant statistically. Frankel and Wei found that ASEAN countries are significantly more open than was predicted by gravity determinants, but that allowing for this openness reduces the strong estimate bloc effect only a little.

Nevertheless, when the effect of ASEAN trade among its member was estimated simultaneously with the test for an East Asian bloc effect, the ASEAN effect disappears completely. Hence, the estimated effect of ASEAN on trade among its members can change radically, depending on what other bloc effects are being tested at the same time.

Consequently, Frankel and Wei conclude that when the size of economies is taken into account intra-regional trade is high, as much within ASEAN as within East Asia as a whole. The same is true when taking into account the proximity of the countries.

Hejazi and Trefler (1996) provide an update to Canadian trade patterns and analyse the implications of growth in trade with the East Asian region. They focus their attention on three alternative empirical models of Canadian international trade. One of their approaches is the gravity trade model.

Their data set consists of bilateral trade between 103 countries for 37 tradable sectors over the period 1970-1992. Throughout, observations corresponding to unrecorded and zero bilateral trade are omitted. They were trying to follow as closely as possible the work of Frankel et al (1995) to allow for simple comparisons with previous work. They constructed their model as follows.

Let t indicate equal years, g indicate goods, i indicate the importing country, j indicate the exporting country and r indicate regions. Hence, country i or j is a member of region r. Let M_{ijgt} denotes the bilateral imports of country i from Country j. There are three types of determinant explaining M_{ijgt} – transaction costs, regional variables and unobservables:

$$\ln(M_{ijgt}) = \alpha_g + \ln(X_{ijt})\beta_g + \Sigma_r D_{ijr}\, \delta_{rg} + \Sigma_r D^*_{ijr}\, \delta^*_{rg} + \varepsilon_{ijgt} \qquad (3.17)$$

X_{ijt} captures transaction costs broadly defined.

It includes (letting GDP denote gross domestic product):

gdp_{it} x gdp_{jt} : product of GDPs in countries i and j,

gdp_{it}/pop_{it} x gdp_{it}/pop_{it} : product of per capita GDPs in countries i and j,

ppp_{ijt} : purchasing-power-parity index between countries i and j,

$distance_{ij}$: a measure of distance between countries i and j,

$neighbours_{ij}$: a dummy variable equal to unity for adjacent countries,

$language_{ij}$: a dummy variable equal to unity if countries i and j share the same language

The idea is that countries of a similar size and per capita GDP have similar needs in terms of both intermediate input need and consumption patterns. In addition, neighbouring countries, countries which are close together, countries with a similar language and countries with small exchange rate deviations from fundamentals will have small transaction costs in doing business and correspondingly large levels of bilateral trade.

The D_{ijr} and D^{*}_{ijr} are dummies whose coefficients capture systematic but unobserved differences in each region. D_{ijr} is unity if both i and j are members of region r. Its coefficient is the average level of good g bilateral trade within the region unexplained by observed transaction costs. D^{*}_{ijr} is unity if only either i or j is a member of region r. Its coefficient is the average level of industry g's bilateral trade between the region and the rest of the world which is unexplained by observed transaction costs.

Note that the regions included in the study are the EAEC (East Asia Economic Caucus), NAFTA (the North American Free Trade Area), EC (the European Community), EFTA (the European Free Trade Area), WH (the Western Hemisphere) and APEC (Asia Pacific Economic Cooperation).

In addition to Frankel et al (1995), Hejazi and Trefler recognise that the importance of transaction-cost motives for trade varies between goods. For example, transaction-cost motives are likely to be entirely unimportant for homogeneous goods with low transportation costs and to be important for goods with variable quality or high transportation costs.

Their estimation results show that all the transaction-cost variables have the expected sign. Analysis of variance (ANOVA) decomposition indicates that the transaction-cost variables explain between 22 and 58 per cent of sample variation. In contrast, the regional dummies explain only between 4 and 30 per cent of the sample variation.

Regarding the details of the regional dummies, with the exception of EAEC and NAFTA, the obvious pattern is that the within-region effects preponderate over the between-region effects. That is, unexplained trade within regional blocks exceeds unexplained trade between regional blocks. In addition, the dummies with large coefficients and standardised betas are all positive. That is, both within-region and between-region trade exceeded unexplained trade outside regional blocks.

Some of the between-region dummies, such as those for North America and the Western Hemisphere (WH) are negative. This result can be interpreted as evidence of trade diversion.

Hejazi and Trefler go on to investigate the importance of transaction costs across industries. They disaggregate the regression by 37 industries – 28 in manufacturing and 9 in other sectors. In all cases, the regional dummies are jointly significant. The results show that, for North America, the industries which have high values of within region trade are mainly in the natural resources sectors. Hence, trade within North America is dominated by natural resources. In contrast, trade within East Asia is dominated by high-end manufactures, such as electrical and electronics. A similar picture emerges from the between-region trade, except that East Asia focuses on mid-range manufactures.

Endoh (1999) uses a modified gravity model by including additional dummy variables similar to the approach of Hejazi and Trefler (1996), although the work did not cover the ASEAN region. Endoh studied the intensity and transitions in trade creation and trade

diversion in the European Economic Community (EEC), the Latin American Free Trade Association (LAFTA) and the Council of Mutual Assistance (CMEA) for the period 1960 - 1994 in terms of trade among 80 countries. Thus, he covers 88 per cent of the world's trade occurring in 1960 and 93 per cent of the world's trade in 1994.

Introducing dummy variables to the basic gravity equation, Endoh constructs the following model.

$$\begin{aligned}\log X_{ij} = {} & \log a_0 + a_1 \log Y_i + a_2 \log Y_j + a_3 \log N_i + a_4 \log N_j + a_5 \log D_{ij} + a_6 \log A_{ij} \\ & + a_7 \log L_{ij} + a_8 \log EEC1_{ij} + a_9 \log EEC2_{ij} + a_{10} \log EEC3_{ij} \\ & + a_{11} \log LAFTA1_{ij} + a_{12} \log LAFTA2_{ij} + a_{13} \log LAFTA3_{ij} \\ & + a_{14} \log CMEA1_{ij} + a_{15} \log CMEA2_{ij} + a_{16} \log CMEA31_j + \log e_{ij} \end{aligned} \quad (3.18)$$

Where;

X_{ij} : value in US dollars of the exports of country i to country j

Y_i and Y_j : nominal values for gross domestic product (GDP) of Countries i and j in US dollars

N_i and N_j : the populations of Countries i and j

D_{ij} : the great circle distance between the capitals of the two countries

A_{ij} : a dummy variable reflecting the adjacency of Countries i and j

L_{ij} : a dummy variable reflecting the commonness of the official languages of Countries i and j

$EEC1_{ij}$, $LAFFTA1_{ij}$, $CMEA1_{ij}$

: dummy variables reflecting exports from a country excluded from the

EEC, LAFTA or CMEA, to a member country of the same institution.

$EEC2_{ij}$, $LAFTA2_{ij}$, $CMEA2_{ij}$

: dummy variables reflecting intra-institutional trade for the EEC, the LAFTA or CMEA,

$EEC3_{ij}$, $LAFTA3_{ij}$, $CMEA3_{ij}$

: dummy variables reflecting exports from one country of the EEC, the LAFTA or CMEA, to a country which does not belong to the same institution

e_{ij} : the log normally distributed error term where $E(\log e_{ij}) = 0$ and the term log refers to a natural logarithm.

The additional dummy variables were introduced in order to distinguish the trade creation and trade diversion effect. The dummy variables EEC1, LAFTA1 and CMEA1 reflect any trade diversion occurring in that respective region's import structure. If the coefficients of these variables are negative and statistically significant, then it can be stated that the members of these respective institutions have switched their importing activities from non-member economies to member nations. This effect is referred to as import trade diversion.

EEC2, LAFTA2 and CMEA2 reflect trade creation which results from economic integration occurring in any of the institutions. If the coefficients of these variables are positive and statistically significant, then it can be said that the members of these institutions have traded with each other above the hypothetical trade level.

EEC3, LAFTA3 and CMEA3 represent trade diversion with respect to each regional institution's exporting activities. Negative and statistically significant coefficients of these

variables indicate that integration has caused members to prefer member countries to non-member economies in their exporting activities. This new preference is termed export trade diversion.

All dummy variables are given a value of unity in natural logarithms where the respective condition is satisfied and 0 otherwise. Thus a value of 0.5 for the coefficient of a dummy variable for any one year pushes up the volume of trade for that same year by 64.9 per cent ($e^{0.5}$ is approximately 1.649)

While not all estimated values are supported by high statistical significance, it is apparent that the coefficients of Y_i, Y_j, N_i, N_j, D_{ij}, A_{ij} and L_{ij} all have the expected signs. As for the trend of the coefficients, before 1970 the coefficients of Y_i and Y_j have increasing values while those of N_i and N_j have decreasing values. Endoh explains that this is the result of expansion in world trade during this period. After 1970, the trend is reversed. Endoh continues that this is due to the sluggish performance of world trade and in particular the impact of two oil crises of 1970s, which brought about a global recession. Values obtained for the coefficients of D_{ij} exhibit a negative sign and become larger for every five-year period. Endoh states that the reason for this is not clear, but it may be regarded as one of the factors explaining recent economic regionalism. The tendency for countries to trade with countries located adjacent to their own and/or countries using the same official language were weakened during the 1960s and 1970s with the facilitation and liberalisation of world trade, until around the 1980s, when they started to show an upward trend. The turning point of the coefficients of A_{ij} and L_{ij} seem to be indicative of recent economic regionalism.

Concerning the values obtained for the preferential trading agreement variables, their coefficient values for both trade creation and trade diversion are generally large in absolute terms and statistically significant. The coefficients of the EEC dummies are all positive,

regardless of the trade creation dummies and trade diversion dummies. This means that the EEC members have traded with extra-region countries as well as with intra-region countries above the hypothetical level. It can therefore be concluded that the EEC has a trade creation effect and a negative trade diversion effect. Regarding the coefficients of the LAFTA dummies, both trade creation and trade diversion dummies are all negative. This suggests that the trade activities of the LAFTA have a negative trade creation effect and a trade diversion effect. Coefficients of the CMEA trade creation dummies are all positive while those of the CMEA trade diversion dummies are all negative. It is therefore has both a trade creation and trade diversion effect. In general, however, these three regional economic arrangements have been weakening, in particular during the 1990s.

Elliott and Ikemoto (2004) also include additional variables to the gravity model to study the effects of AFTA and the Asian Financial crisis on intra-regional trade in ASEAN using a modified gravity equation as follows:

$$\begin{aligned}\text{Log } M_{ij} = {} & \log \beta_0 + \beta_1 \log GDP_i + \beta_2 \log GDP_j + \beta_3 \log PGDP_i \\ & + \beta_4 PGDP_j + \beta_5 \log D_{ij} + \beta_6 \log (|PGDP_i - PGDP_j|) + \beta_7 COM_{ij} + \beta_8 ADJ_{ij} \\ & + \Sigma\beta_{9k} RTA_{ijk} + \Sigma\beta_{10k} imRTA_{ijk} + \Sigma_{11k} exRTA_{ijk} + \log u_{ij} \end{aligned} \quad (3.19)$$

Where;

M_{ij} : US dollar value of imports of Country i from trade partner j

$GDP_{i(j)}$: Country i(j)'s GDP

$PGDP_{i(j)}$: Country i(j)'s GDP per capita

D_{ij} : distance between capital cities

COM_{ij} : a complementarity index between Countries i and j

ADJ_{ij} : a dummy variable which has a value of 1 when two countries share a common land border and 0 otherwise

RTA_{ijk} : a dummy variable which has a value of 1 if both Countries i and j belong to RTA k and 0 otherwise

$imRTA_{ijk}$: a dummy variable which has a value of 1 if only the importing Country i belongs to RTA k and 0 otherwise

$exRTA_{ijk}$: a dummy variable which has a value of 1 if only the exporting Country i belongs to RTA k and 0 otherwise

Elliott and Ikemoto estimate the above equation using pooled data for six distinct time periods, i.e., three five-year periods; 1983-1987, 1988-1992, 1993-1997 and 1998-1999, as well as two summary periods; 1983-1997 and 1993-1999.

Since these are pooled data, changes of real exchange rate over the period of study can affect the trade relationship. Unlike the yearly cross section analysis in which real exchange rates are not relevant, as it is not possible to tell with pooled data whether a currency is over- or under-valued, competitiveness via real exchange rates matters. Hence, Elliott and Ikemoto's approach was to include a single variable where country i's real exchange rate relative to country j's and where i is the importer and j is the exporter country was defined as country i's local currency value of one unit of country j's currency multiplied by a GDP deflator and divided by country i's GDP deflator. However, the results of the real exchange rates were questionable.

The structure of equation (3.19) differs from the basic gravity model in two main ways. First, Elliott and Ikemoto include an index of complementarity to capture endowment differences between countries. Elliott and Ikemoto state that Com_{ij} is able to separate the impact of the commodity composition from other factors which drive trade flows and

represents the extent of the fit between the structure of exports and imports of bilateral trade partners based on the assumption that traded commodities reflect factor endowment. Note that this approach is similar to Linnemann's (1966) when the variable of the Commodity composition of trade was added to the model.

Regarding the trade creation and trade diversion effect, Elliott and Ikemoto follow Endoh (1999) by including dummies defined as import trade diversion and export trade diversion. The dummy RTA (Regional Trading Arrangement) captures the total intra-regional trade bias or trade creation. The dummy imRTA captures the extra regional import bias of intra-RTA trade or the import trade diversion as a result of changes to the import structure of the RTA where a negative and significant coefficient indicates that member countries have switched to importing from members rather than non-members. The dummy exRTA captures the extra regional export bias of the RTA to the rest of the world or the export trade diversion where a negative and significant coefficient means that the RTA has resulted in a member country finding it better to export to members rather than non members.

Elliott and Ikemoto, first, estimate a relative simple gravity equation with a single intra-regional bias dummy for four Preferential Trading Agreements, i.e., ASEAN, APEC, NAFTA and the EU. Second, they investigate the degree of trade creation and trade diversion by incorporating two additional dummies, imRTA and exRTA. Finally, they estimate equation 3.19 with ASEAN dummies alone in order to focus on intra-ASEAN trade flows.

In their first estimation, the signs of the coefficients on the variables are as expected and are generally highly significant. The only difference is that GDP per capita records a decline in significance over time. The coefficients for RTA variables are positive for ASEAN and APEC, implying that countries located within these regions do trade more with each other over and above the levels predicted by the basic explanatory variables. When all four regional

groupings are included, all the RTA coefficients have a positive sign except the NAFTA coefficient which is negative and significant for the first two periods before it became positive. Note that the ASEAN coefficient decreases from 1993 to 1997 after the AFTA process started and it was not until after the Asian economic crisis that the trend reverted to an upward one. Elliott and Ikemoto also observe that when both ASEAN and APEC dummies are included, the ASEAN coefficient is considerably lower.

In their second estimation where imRTAs and exRTAs are included, focusing on ASEAN, imASEAN and exASEAN, all record positive and significant coefficients with the first being the largest in all periods. The fact that all three RTA dummies are positive and significant means that members and non-members have traded with each other more than the hypothetical level would suggest. Concerning the changes of coefficients over time, they observe that the coefficient of ASEAN falls between 1993 and 1997 and then rises, while that of imASEAN increased until 1997 and then declined, whereas that of exASEAN demonstrated consistent rise. More specifically the upward trend in exASEAN indicates that the volume of export trade between members and non-members has been increasing. The slight falls in the coefficient of imASEAN after 1997 indicate that members begin to prefer to import goods from members rather than non-members, but the effect is only small against a large increase in intra-regional trade in general. Elliott and Ikemoto, therefore, conclude that ASEAN countries retained their openness and outward orientation, despite AFTA and the Asian economic crisis.

When only ASEAN regional coefficient are included in the third estimation, results are similar to the first estimation, with the ASEAN coefficient increasing constantly over time in particular after the AFTA formation period. This suggests that the AFTA process may have had some effect on intra regional trade, after all.

In addition to Hejazi and Trefler (1996), there are a few more studies which apply the gravity trade model at the disaggregate level. These include Feenstra et al (1998), Mathur (2000) and Carrillo and Li (2002).

Feenstra et al (1998) estimated gravity equations using the bilateral exports of each country categorised into three groups on the basis of Rauch's classification scheme (Rauch, 1996), namely, homogeneous, reference priced and differentiated goods. This empirical work was done in order to test their theoretical prediction, which suggested that the estimated key parameter of a gravity equation can be used to distinguish whether goods are homogeneous or differentiated and whether or not there are barriers to entry. However, since the barriers to entry in an industry are not directly observable, they cannot distinguish whether the industry is homogeneous or differentiated. They can only test their theory's power to predict whether the industry has barriers to entry or not. Their theory predictions are as follows. If the coefficient of an exporter's income (B_1) is higher than that of the importer's income (B_2), it is a model with free entry; it represents Monopolistic Competition or Reciprocal Dumping with Free Entry. Conversely, if B_1 has a smaller value than B_2, it is a model with restricted entry; representing Armington National Product Differentiation (in which products are differentiated on the basis of their country of origin) or Reciprocal Dumping with No Entry.

They estimate the following augmented gravity equation:

$$\ln X_{ij} = B_0 + B_1 \ln Y_i + B_2 \ln Y_j + B_3 \ln D_{ij} + B_4 A_{ij} + B_5 L_{ij} + B_6 FTA_{ij} + B_7 Rem_{ij} + e_{ij} \quad (3.20)$$

Where;

X_{ij} : value of exports from country i to country j

Y_i : real GDP of country i

Y_j : real GDP of country j

D_{ij} : distance between i and j

A_{ij} : dummy variable for Adjacency

L_{ij} : dummy variable for common language

FTA_{ij} : dummy variable for common free trade agreement

Rem_{ij} : remoteness of j, given i, equal to GDP-weighted negative of distance

e_{ij} : error term

The sample includes over 110 countries, though the exact observation number depends on the year, with some data missing. The data for five different cross-sections: in 1970, 1975, 1980, 1985 and 1990, were applied to the above model. The results show that, in the case of differentiated goods, B_1 all exceed unity while B_2 have values between 0.60-0.71. However, in the case of homogeneous goods, B_2 have the value nearly twice that of B_1. Hence, Feenstra et al conclude that for differentiated goods, the result is consistent with the theoretical predictions of a monopolistic competition model or a reciprocal-dumping model with free entry, while homogeneous goods are described by a model with national product differentiation or by a reciprocal-dumping model with barriers to entry. In addition, they find that the elasticity of exports with respect to an exporter's GDP regarding differentiated goods is significantly higher than that for homogeneous goods. This is consistent with their theoretical hypothesis that the differentiated goods fit the prediction of the monopolistic competition model with free entry and the results for the homogeneous goods fit the prediction of the reciprocal dumping model with restricted entry.

Mathur (2000) applies the gravity equation to cross-sectional data for each year from 1991 to 1994 and for each commodity group, i.e., total manufactures, food and raw materials.

Mathur includes 43 major trading partners representing NAFTA, the European Union (EU) and the Asia/Oceanic countries. One distinctive point in Mathur's method is the proxies of distance. Mathur measured the distance between two countries by measuring the geographical distance between their capital cities and then converted it on a nine point scale (the stanine scale). Although some academics argue that a rescaling or grouping of distances in this manner may reduce the reliability of the statistical results, Mathur, based on Cox (1957), argues that the loss of information due to grouping on a nine scale point is hardly 2.9 per cent.

The results are consistent across the years except for the coefficients of the importer's per capita GDP for total manufacture in years 1991 and 1992, which were not significant. The exporter's GDP is the most dominant explanatory variable, followed by distance, exporter's per capita GDP, importer's per capita GDP and importer's GDP.

The results also indicate that in the case of manufactures, the role of the exporter's GDP is more prominent than that for food and raw materials. This is in keeping with Mathur's hypothesis that in the case of trade in differentiated products the country size in terms of GDP plays a dominant role.

The explanatory variable distance gives significant negative regression coefficients for all commodity groups. Food seems to be more affected by the distance variable across the years. Mathur explains that this is because food products are perishable and need particular care in transportation.

Carrillo and Li (2002) apply the gravity model to examine the effects of the Andean community and Mercosur on both intra-regional and intra-industrial trade in the period 1980 - 1997. To form properly the empirical findings, they also use Rauch's (1996) trade classification, which distinguishes between homogeneous and differentiated products and

also subdivides the data further using the United Nations factor intensity classification to separate trade in natural resources from manufactured goods.

Carrillo and Li estimate the following equation.

$$\log M_{ij} = \beta_0 + \beta_1 \log Y_i + \beta_2 \log Y_j + \beta_3 \log DIF_{ij} + \beta_4 D_{ij} + \beta_5 ADJ_{ij} + \beta_6 PTAC + \beta_7 PTAM + \beta_8 DUM90 + u_{ij} \quad (3.21)$$

Where;

M_{ij} : Value of Country i's imports from Country j or the value of country j's exports to country i)

Y_i and Y_j : Income of Country i or country j

DIF_{ij} : Absolute different in per capita income

D_{ij} : Distances between i and j

ADJ_{ij} : Dummy variable for when Countries i and j have a common geographical frontier.

PTAC : Dummy variable for the Andean Preferential Trade Agreement

PTAM : Dummy variably for Mercosur

DUM90 : Dummy variable added to account for the re-opening of the international credit market and the trade forms implemented in the area after 1990.

The estimation method applied was a random effect Tobit left censoring estimation, in order to account for country-pairs with zero exports between them. The variables were expressed in three-year period averages to reduce the business cycle fluctuations and irregular variations in trade statistics. With 11 countries and 6 time periods, the samples are of 660 observations.

The results show that across the different products traded, the effect of importer's GDP and exporter's GDP are positive and statistically significant. In addition, the effect of exporter's income is higher in the case of differentiated products, while importer's income elasticity in differentiated products is smaller than that in homogeneous products. On the basis of the theoretical predictions for the gravity equation by Feenstra et al (1998), Carrillo concluded that there was a home market effect for differentiated goods with monopolistic competition and restricted entry with reciprocal dumping for homogeneous goods. However when these categories subdivided further, the result were not so clear.

The estimated coefficients of distance and adjacency have the expected sign and are highly significant. In addition, the absolute estimated value of the distance coefficient is higher for differentiated products than for the reference price but not for homogeneous products. Further disaggregation shows that the estimated distance coefficient is larger for both differentiated agriculture and mineral intensive goods relative to their reference price and for their homogeneous counterparts.

3.4 Empirical Works on Foreign Direct Investment based on the Gravity Trade Model

The empirical work on international trade and Foreign Direct Investment (FDI) is vast but studies which investigate the relationship between trade and FDI, based on the gravity model, are much fewer in number.

Most of the studies which apply the gravity trade model to Foreign Direct Investment flows are rooted in the studies of the determinants of foreign direct investment.

There is a considerable body of literature on what determines where Multinational Enterprises (MNEs) locate or expand their affiliates. The earliest studies cover questionnaire

surveys in selected countries and these were followed by studies based on the analysis of cross sectional and time series, with larger sets of data. Much of the analysis is partial equilibrium in nature, but some general equilibrium studies have been built on trade theory.

Lipsey and Weiss (1981) use data for 1970 on exports from the United States and 13 other major countries to a cross-section of 44 countries. They use a gravity model with country size, distance and membership in a trade bloc and add to it some variables describing direct investment by the United States and other countries. Their main aim is to investigate whether the direct investment has any impact on exports beyond the country's characteristics. For the studies of 14 industries, the level of US affiliate activity is found to be positively related to US exports to that country in the same industry and negatively related to the exports of rival producers. The presence of firms from foreign countries was negatively related to US exports and positively related to exports from other countries. This is interpreted as indicating that US manufacturing affiliate activity tends to promote US exports and that a foreign manufacturing country's production in overseas markets substitutes for its own domestic production and employment. These writers also find that distance is insignificant in explaining exports when affiliate sales are included as a dependent variable.

Grosse and Trevino (1996) analyse in a gravity model framework the determinants of FDI flows into the United States from 23 countries on a bilateral basis over the period 1980 - 1992. Their empirical results indicate that the main positive influences on inward FDI are home country exports to the United States and home country market size. The main negative influences are cultural differences between the home and the host, geographical distance and the exchange rate. Political risks, the cost of funds, relative rates of return and a Japan dummy were either insignificant or only marginally significant. The analysis was also conducted using foreign production as the dependent variable. Although the R^2 statistic is much higher

in the latter analysis there were no significant differences in the coefficients between the two analyses. This result is important, because it lends support to the notion that FDI may be a good proxy for foreign sales.

Grosse (1997) studies the determinants of aggregate FDI flows into several Latin American economies. Inflows of FDI were regressed on several country-specific determinants. Variables exhibiting a positive influence on FDI flows were GDP, GDP per capita, inflation, fiscal balance and interest rates. Variables exhibiting a negative influence are official reserves, country risks and oil prices. Only inflation and official reserves were not statistically significant.

Note that trade theory is ambiguous on the question of whether trade and factor mobility are substitutes, although the Heckscher-Ohlin theory holds that they are. Subsequent developments in theory have left the issue unresolved and it seemed that everything depends upon the model being used. A recent survey of the historical experience from 1870 to 1940 rejects substitutability and leans toward complementarity. However, this does not resolve the issues raised by recent experience (Collins, O'Rourke and Williamson, 1997).

In addition, a review of some recent works illustrates the difficulty of providing a clear or single explanation of the links between trade and FDI. Graham (1994) suggested that the evidence points to modest support of the idea that FDI abroad makes a positive contribution to net exports and to the balance of payments. However, as Hufbauer and Adler (1968) demonstrate, in empirical terms the results depend heavily on how firms abroad respond in supplying the foreign market if there is no FDI into the home country. In addition the results vary according to region. Graham also notes that it is not clear whether or not FDI abroad drives the increase in exports or whether both are responding to changes in the production process.

Rao and Ahmad (1996) analyse trade and FDI patterns among APEC countries. They observe that the growth of FDI has partly led and partly followed the growth in trade. Furthermore, the trends point to complementarity rather than substitutability between international trade and FDI within the APEC region. This is tested empirically in their work by regressing total trade (exports plus imports) relative to GDP. The coefficient on the investment variable is positive and highly significant. This is interpreted as suggesting that there is a strong and complementary relationship between total trade and total FDI for the APEC region.

Döhrn (1996) focuses specifically on EU enlargement and its role in channelling investment flows from the EU to the CEEC. He includes a variable which, in order to better capture possible substitution effects between trade and FDI, measures net trade flows and makes trade dependent on the factors explaining FDI. To reduce the bias from differences in starting levels of investment, Döhrn estimates the model both with FDI flows and FDI stocks as dependent variables. Nevertheless, the results for the flow estimations and the results for stock estimation are qualitatively similar. The models are estimated using OECD data from 1990 to 1992. The coefficient for GDP has the expected, positive sign, while distance has a negative sign.

In Brenton and Di Mauro (1998), the main aim is to check the amount of inflows of FDI from EU countries to CEEC. These authors first estimate an extended gravity model both for (net) exports and FDI, with dummy variables representing preferential relationships. Next, they estimate the residuals from the trade model on the residuals from the FDI model, in order to find out whether there are substitution effects. The analysis is performed with pooled FDI and export data over the years 1992 to 1995, for Germany, France, the UK and the US and a panel of around 35 destination countries. The fit is reasonable where Adjusted R^2 ranges

between 0.50 for UK and 0.64 for France. The results are as expected, with a positive significant impact for GDP. The distance variable is negative and significant, indicating that countries further away receive less FDI inflow. Population is insignificant. The authors conclude that "the amount of overseas investment by EU countries in the more advanced transition economies [is] already greater than one would expect given their current level of income".

Hejazi and Safarian (1999) estimate a gravity model of Canada's trade with 35 countries. To this gravity model, they then add measured FDI stock. The test is, therefore, to see whether FDI has any predictive value for trade after the determinants of international trade are accounted for. The gravity model has transaction costs as its source of comparative advantage. They suggest that the presence of FDI stocks may indicate a reduction of information and transaction costs between the two countries; thus, not only does FDI serve simply as an alternative mode of servicing the foreign market, but also it may improve networks and, hence, increase international trade.

The results show that when Canada's outward FDI is added as an additional determinant of exports, the coefficients are positive and strongly significant. This indicates that higher Canadian's outward FDI increases Canadian's exports to that country. In other words, there is a complementary relationship between outward FDI and exports.

However, when Canadian's inward FDI is added as an additional determinant of imports, the coefficient is only one-third the size of the impact of outward FDI on exports and it is statistically insignificant. Hence, there is no convincing evidence of complementarity on the inward side. This study also measured the links between trade and FDI at the industry level. However, the only data available are bilateral trade and FDI figures at the industry level on the outward side between Canada and the United States, the United Kingdom; and on the

inward side between Canada and the United States, the United Kingdom and Japan. Therefore, they were unable to use distance, language and other variables, as there was simply not sufficient variability to identify the independent effects of these variables. The industry level regression used GDP alone as the independent variable and therefore added FDI as an additional determinant of exports has been estimated. The results show that the relationship between trade and FDI varies greatly across industries. In sum, considering only signs and not significance either on the outward or the inward side, there is far more trade and FDI in industries characterised by a complimentary relationship than in industries which have a substitutability relationship.

3.5 Summary and Conclusions

The summary of significant empirical studies presented in this chapter is available in Tables 3.1 and 3.2. We see that the researchers based their models on the basic gravity model developed by Tinbergen (1962) and Linnemann (1966). The modified or augmented models included selections of explanatory variables varying from price index to the commodity composition variable. There are also different methods to add dummy variables in order to measure the trade creation and trade diversion effects. However, among these numbers of studies, there is still a gap in the research. There is no exploration of the bilateral trade and investment pattern of the ASEAN region at the industry level. For this reason, the main intention of the present study is to investigate the bilateral trade and investment pattern in the region at both the aggregate and disaggregate levels.

TABLE 3.1 Summary of empirical studies which apply the Gravity Model to data on International Trade

Study	Data Set	De-pen-dent Vari able	Coefficient of Quantitative Explanatory Variables		Coefficient of Dummy Variables		R^2 $(\overline{R}^2)$
Tinbergen (1962)	18 countries (306 Obs) Year: 1958	X_{ij}	Y_i Y_j D_{ij}	0.74* 0.62* -0.56*	A_{ij} P_C P_B	0.02* 0.05* 0.04	0.84
Tinbergen (1962)	42 countries (1722 Obs) Year: 1959	X_{ij}	Y_i Y_j D_{ij}	1.00* 0.91* -0.78*	A_{ij} P_{ij}	0.24* 0.47*	0.82
Tinbergen (1962)	28 countries (756 Obs) Year: 1959	X_{ij}	Y_i Y_j D_{ij} G_{ij}	0.85* 0.97* -0.86* -0.78*	A_{ij} P_{ij}	0.24* 0.47*	0.82
Linnemann (1966)	80 countries (3400 Obs) Year: 1959	X_{ij}	Y_i Y_j N_i N_j D_{ij}	0.99* 0.85* -0.20* -0.15* -0.81*	P_{UUC} P_{FFC} P_{PB}	0.94* 0.53 6.83*	0.79
Linnemann (1966)	80 countries (3175 Obs) Year: 1959	X_{ij}	Y_i Y_j N_i N_j D_{ij} C_{ij}	0.78* 0.74* -0.13* -0.06* -0.82* 0.60*	P_{PB} P_U P_F P_{UC} P_{FC}	6.38* 3.68* 3.44* 0.74* 1.57*	0.81
Bergstrand (1985)	15 countries (OECD) (210 Obs) Year: 1965, 1966, 1975, 1976 (only the 1976 results are shown here)	X_{ij}	*GDPi* *GDPj* *Dij* *Eij* *Pi* *Pj* PP_i PP_j	0.84* 0.56* -0.77* 0.73 -0.96 1.85* -0.05 -1.12	A_{ij} *EEC* *EFTA*	0.76* 0.18 0.73*	(0.81)
Frankel et al (1995)	63 countries 1965-1990 (1573 Obs) (only the 1990 results are shown here)	T_{ij}	Y_iY_j $Y^N{}_iY^N{}_j$ D_{ij}	0.75* 0.09* -0.56*	*Aij* *EAEC* *APEC* *EC* *EFTA* *NAFTA* *MER* *AND*	0.79* 0.63* 1.32* 0.49* -0.05 0.05 2.09* 0.90*	0.77

TABLE 3.1 (continued) Summary of Empirical Studies which apply the Gravity Model to data on International Trade

Study	Data Set	De-pen-dent Vari able	Coefficient of Quantitative Explanatory Variables		Coefficient of Dummy Variables		R^2 $\left(\overline{R}^2\right)$
Hejazi and Trefler (1996)	1970-1992 (146,203 Obs) (Pooled Data)	M_{ij}	GDP_iGDP_j $GDP^N{}_iGDP^N{}_j$ PPP_{ij} D_{ij}	0.74* 0.49* -0.23* -1.01*	A_{ij} L_{ij} *EAEC* *EAEC^* *NA* *NA^* *EEC* *EEC^* *EFTA* *EFTA^* *WH* *WH^* *APEC* *APEC^*	0.71* 0.69* 0.06* 0.12* -0.81* -0.26* 1.42 1.19* 1.62* 0.58* 0.50* -0.09* 2.70* 0.83*	0.62
Frankel and Wei (1997)	63 countries 1965-1994 (1,546 Obs) (only the 1992 results are shown here)	T_{ij}	GDP_iGDP_j $GDP^N{}_iGDP^N{}_j$ D_{ij}	0.93* 0.13* -0.77*	A_{ij} L_{ij} *EU* *NAFTA* *MER* *AND* *ASEAN* *ANZ*	0.46* 0.77* -0.08 -0.22 0.69* 0.97* 1.77* 1.72*	0.80
Frankel and Wei (1997)	63 countries 1965-1994 (1,546 Obs) (only the 1992 results are shown here)	T_{ij}	GDP_iGDP_j $GDP^N{}_iGDP^N{}_j$ D_{ij}	0.96* 0.15* -0.73*	A_{ij} L_{ij} *EU* *NAFTA* *MER* *AND* *ASEAN* *ANZ* EU^o $NAFTA^o$ MER^o AND^o $ASEAN^o$ ANZ^o	0.51* 0.82* -0.14 0.20* 0.93* 1.19* 1.13* 1.70 -0.13* -0.72* -0.30* -0.19* 0.61* -0.15	0.82

TABLE 3.1 (continued) Summary of Empirical Studies which apply the Gravity Model to data on International Trade

Study	Data Set	De-pen-dent Vari able	Coefficient of Quantitative Explanatory Variables		Coefficient of Dummy Variables		R^2 $\left(\overline{R}^2\right)$
Endoh (1999)	80 countries 1960-1994 (4,380 obs) (only the 1994 results are shown here)	X_{ij}	GDP_i GDP_j N_i N_j D_{ij}	0.96* 0.77* -0.13* -0.01 -0.74*	A_{ij} L_{ij} *EEC1* *EEC2* *EEC3* *LAFTA1* *LAFTA2* *LAFTA3* *CMEA1* *CMEA2* *CMEA3*	0.78* 0.55* 0.37* 0.01 0.25* -0.52* -0.25 -0.54* -0.59* 0.53* -0.40*	0.73
Elliott and Ikemoto (2004)	1983-1999 (Pooled Data) (20,200 Obs)	M_{ij}	GDP_i GDP_j GDP^N_i GDP^N_j $/GDP^N i - GDP^N_j/$ D_{ij} COM_{ij}	0.73* 0.78* 0.17* 0.18* 0.01 -0.63* 1.18*	A_{ij} *ASEAN* *EEC* *NAFTA* $ASEAN^m$ EEC^m $NAFTA^m$ $ASEAN^x$ EEC^x $NAFTA^x$	0.39* 2.03* 0.33* 1.04* 0.83* 0.31* -0.02* 0.82* 0.29* -0.36*	(0.78)
Mathur (2000)	43 countries 1991-1994 (3,096 Obs) Manufac-tures (Only the results of 1994 are shown here)	X_{ij}	GDP_i GDP_j GDP^N_i GDP^N_j D_{ij}	0.60* 0.10* -0.18 0.76* -0.70*			0.53 (0.47)
Mathur (2000)	43 countries 1991-1994 (3096 Obs) Food (Only the results of 1994 are shown here)	X_{ij}	GDP_i GDP_j GDP^N_i GDP^N_j D_{ij}	0.86* -0.00 -0.58* 1.72* -0.49			0.54 (0.48)

TABLE 3.1 (continued) Summary of Empirical Studies which apply the Gravity Model to data on International Trade

Study	Data Set	De-pen-dent Vari able	Coefficient of Quantitative Explanatory Variables		Coefficient of Dummy Variables		R^2 $\left(\overline{R}^2\right)$
Mathur (2000)	43 countries 1991-1994 (3096 Obs) Raw Materials (only the results of 1994 are shown here)	X_{ij}	GDP_i GDP_j GDP^N_i GDP^N_j D_{ij}	1.05* 0.27 -4.43* 0.70 -1.59*			0.49 (0.42)
Carrillo and Li (2002)	11 countries 1980-1997 Differen-tiated Goods (only the results of 1997 are shown here)	M_{ij}	GDP_i GDP_j $/GDP^N_i$-$GDP^N_j/$ D_{ij}	0.69* 1.33* 0.21* -1.13*	A_{ij} *PTAC* *PTAM* *DUM90*	1.12* 0.43* -0.18 1.14*	
Carrillo and Li (2002)	11 countries 1980-1997 References Price Goods (only the results of 1997 are shown here)	M_{ij}	GDP_i GDP_j $/GDP^N_i$-$GDP^N_j/$ D_{ij}	1.08* 1.14* 0.17 -0.92*	A_{ij} *PTAC* *PTAM* *DUM90*	1.74* 0.51 0.18 0.69*	
Carrillo and Li (2002)	11 countries 1980-1997 Homogene-ous Goods (only the results of 1997 are shown here)	M_{ij}	GDP_i GDP_j $/GDP^N_i$-$GDP^N_j/$ D_{ij}	1.28* 0.98* 0.32* -1.45*	A_{ij} *PTAC* *PTAM* *DUM90*	1.01* -0.16 -1.37 0.86*	

Note:

(1) All variables excepts dummy variables are in logarithm

(2) * denotes significance of at least a 5 per cent level.

TABLE 3.2 List of Variables in Table 3.1

Variables	Description
i	Import country
j	Exporter country
Dependent Variables	
Mij	Import Volume from i to j
Tij	Total Trade Volume (Export plus Import) between i and j
Xij	Export Volume from i to j
Quantitative explanatory Variables	
Cij	Commodity Composition Variable
COMij	Compliment Index between i and j
D_{ij}	Geographical Distance between i and j
Eij	Exchange Rate
G_{ij}	Gini Coefficient
GDP_i	Gross Domestic Product (GDP) of i
GDP_j	Gross Domestic Product (GDP) of j
GDP^N_i	GDP per capita of i
GDP^N_j	GDP per capita of j
$/GDP^N_i\text{-}GDP^N_j/$	Absolute value of Difference between GDP per capita of i and j
N_i	Population of i
N_j	Population of j
Pi	i's Export Unit Value Index
Pj	j's Import Unit Value Index
PP_i	i's GDP Deflator
PP_j	J's GDP Deflator
PPPij	Purchasing Power Parity Index
Y_i	Gross National Product (GNP) of i
Y_j	Gross National Product (GNP) of j
Y^Ni	GNP per capita of i
Y^Nj	GNP per capita of j
Dummy Variables (Row=The rest of the world)	
A_{ij}	Adjacency (=1 when i and j have a common border)
AND	ANDEAN Preference (=1 when both i and j are ANDEAN countries)
AND^o	ANDEAN open (=1 when i is ANDEAN and j is Row or vice versa)
ANZ	ANZCERTA Preference (=1 when both i and j are ANZCERTA countries)
ANZ^o	ANZCERTA open (=1 when i is ANZCERTA and j Row or vice versa)
APEC	APEC Preference (=1 when both i and j are APEC countries)
*APEC^*	APEC Preference (=1 when i is APEC and j is Row or vice versa)
ASEAN	ASEAN Preference (=1 when both i and j are ASEAN countries)
$ASEAN^m$	ASEAN Preference (=1 when j is ASEAN)
$ASEAN^o$	ASEAN Preference (=1 when i is ASEAN and j is Row or vice versa)
$ASEAN^x$	ASEAN Preference (=1 when i is ASEAN)

TABLE 3.2 (continued) List of Variables in Table 3.1

Variables	Descriptions
Dummy Variables	
CMEA1	CMEA Preference (=1 when j is CMEA and i is Row)
CMEA2	CMEA Preference (=1 when both i and j are CMEA countries)
CMEA3	CMEA Preference (=1 when i is CMEA and j is Row)
DUM90	Dummy of year 1990 (=1 when the data are for 1990)
EAEC	EAEC Preference (=1 when both i and j are EAEC countries)
*EAEC^*	EAEC Preference (=1 when i is EAEC and j is Row or vice versa)
EC	EC Preference (=1 when both i and j are EC countries)
EEC	EEC Preference (=1 when both i and j are EEC countries)
*EEC^*	EEC Preference (=1 when i is EEC and j is Row or vice versa)
EEC1	EEC Preference (=1 when j is EEC and i is Row)
EEC2	EEC Preference (=1 when both i and j are EEC countries)
EEC3	EEC Preference (=1 when i is EEC and j is Row)
EEC^m	EEC Preference (=1 when j is EEC and i is Row)
EEC^x	EEC Preference (=1 when i is EEC and j is Row)
EFTA	EFTA Preference (=1 when both i and j are EFTA countries)
*EFTA^*	EU Preference (=1 when i is EU and j is Row or vice versa)
EU	EU Preference (=1 when both i and j are EU countries)
EU^o	EU open (=1 when i is EU and j is Row or vice versa)
LAFTA1	LAFTA Preference (=1 when j is LAFTA and i is Row)
LAFTA2	LAFTA Preference (=1 when both i and j are LAFTA countries)
LAFTA3	LAFTA Preference (=1 when i is LAFTA and j is Row)
MER	MERCOSUR Preference (=1 when both i and j are MERCOSUR countries)
MER^o	MERCOSUR open (=1 when i is MER and j is Row or vice versa)
NA	North America Preference (=1 when both i and j are NA countries)
*NA^*	North America Preference (=1 when i is EU and j is Row or vice versa)
NAFTA	NAFTA Preference (=1 when both i and j are NAFTA countries)
$NAFTA^m$	NAFTA Preference (=1 when j is NAFTA and i is Row)
$NAFTA^o$	NAFTA open (=1 when i is NAFTA and j is Row or vice versa)
$NAFTA^x$	NAFTA Preference (=1 when i is NAFTA and j is Row)
P^B	Preference for Benelux
P^C	Preference for Commonwealth
P^F	Preference of France in transactions with associated countries
P^{FC}	Preference of French associates trading among themselves
P^{FFC}	Preference of France trading with associates and between associates
P_{ij}	Preferential Trading Bloc Preference
P^{PB}	Preference of Portugal and of Belgium in transactions with their associates
PTAC	Andean Preferential Trade Agreement Preference
PTAM	MERCOSUR Preference (=1 when both i and j are MERCOSUR)
P^U	Preference of United Kingdom in transactions with its associates.
P^{UC}	Preference of UK associates among themselves
P^{UUC}	Preference of UK to trade with its associates and trade between associates.
WH	Western Hemisphere Preference (=1 when both i and j are WH countries)
*WH^*	Western Hemisphere Preference (=1 when i is WH and j is Row or vice versa)

CHAPTER 4

THEORY OF THE GRAVITY TRADE MODEL

4.1 Introduction

The gravity trade model is an empirical model which explains trade between two countries, or regions, in terms of their incomes, populations and the stimulating or restraining factors of bilateral trade between them. The model has been repeatedly used in empirical studies in international trade. Nevertheless, the gravity trade model used to suffer from the absence of vital derivation based on economic theory until it began to attract more attention from theoretical economists. The latest interest in the gravity trade equations takes on some new aspects as a few researchers begin to focus more sharply on its theoretical foundation.

In search of an acceptable theory, several different theories have been developed in order to support the gravity trade model. Moreover, the differences in these theories help to explain the many different forms of the gravity equation and the differences among the results.

The earliest formulation of the gravity trade model is rooted in physics. This approach, based on the physical laws of gravity and electrical forces, arrived at the conclusion that the flow of goods from country i to country j is equal to the product of the potential trade capacities of the two countries divided by any resistance to trade, such as the distance factor. Isard and Peck (1954) and Beckerman (1956) conducted their studies within this framework. They all found that trade flows were greater between geographically closer areas. In addition, Tinbergen (1962) and Pöyhönen (1963), who also used this same framework for their work, both concluded that the incomes of the trading partners and the distances between them are

statistically significant and provide the expected signs. Many authors, such as Aitken (1973) and Leamer (1974), extended the use of the framework.

Deardorff (1984) states that the empirical success of the gravity trade equation is due to the fact that it can explain some phenomena that the conventional factor endowment theory of international trade cannot explain; for example, the trade between industrialised countries, or the intra-industry trade, because of the lack of dramatic re-allocations of resources when trade liberalisation processes have taken place.

Theoretical support of the research in this field was originally very poor, but since the late 1970s several theoretical developments have appeared in support of the gravity model. Therefore, it is certainly no longer the case that the gravity trade equation is without a theoretical basis, since several of the same authors who noted its absence went on to provide one.

Discussions by Deardorff (1984), Leamer and Levisohn (1995) and Helpman (1998) show that the gravity model has a relatively long history. It differs from most other theories in that it tries to explain the volume of trade but does not focus on the composition of this trade. The model uses an equation framework to predict between any two countries the volume of trade on a bilateral basis.

Although Tinbergen (1962) and Pöyhönen (1963) provided the earliest empirical studies of trade flows based on the gravity trade equation, they supplied only intuitive justification. Linnemann (1966) added more variables and applied a Walrasian general equilibrium to the model, but the Walrasian model tends to include too many explanatory variables for each trade flow to be reduced to the gravity trade equation (Deardorff, 1995).

Leamer and Stern (1970) derived a gravity trade model from a probability model of transactions. Then Leamer (1974) used both the gravity equation and the Heckscher-Ohlin

model to motivate explanatory variables in a regression analysis of trade flow. However, these two approaches have not been integrated theoretically.

There have been several more formal attempts to derive the gravity equation from models which assumed product differentiation. Anderson (1979) was the first to do so, by assuming Cobb-Douglas preferences and, afterwards, CES preferences. In both cases, he made the assumption that products were differentiated by country of origin, i.e., the Armington assumption. Anderson modelled preferences over traded goods only. His primary concern was to examine the econometric properties of the resulting equation, rather than to extract interpretable theoretical implications.

Bergstrand also explored the theoretical determination of bilateral trade in a series of papers. Bergstrand (1985) used CES preferences over Armington-differentiated goods to derive a reduced form equation for bilateral trade involving price indices. Using GDP deflators to approximate these price indices, Bergstrand estimated his system in order to test his assumption of product differentiation. His empirical results supported the assumption that goods were not perfect substitutes and that imports were closer substitutes for each other than for domestic goods. Bergstrand (1989, 1990) assumed monopolistic competition and therefore product differentiation among firms rather than among countries. This was embedded in a two-sector economy where each monopolistically competitive sector had different factor proportions and was thus a hybrid of the perfectly competitive Heckscher-Ohlin model and the one-sector monopolistically competitive model of Krugman (1979). Bergstrand used this framework to derive, yet again, a version of the gravity equation.

This line of research essentially has been stimulated by the claim of Helpman and Krugman (1985) and Helpman (1987) that monopolistic competition is the source of gravity in international trade.

Many authors, empirically and theoretically, have challenged this view (Hummels and Levinsohn, 1995; Davis, 1997; Deardorff, 1995; Evenett and Keller, 2002 and Haveman and Hummel, 2004). Deardorff (1995) argues that the versions of the gravity equation which Anderson and Bergstrand obtained were, to some extent, unclear and complex and it was not obvious that they would lead to the success of the very simple gravity equation.

In any case, it is now well understood that gravity trade equations can be derived from a number of models, including the Ricardian, Armington, Monopolistic Competition and multi-cone Heckscher-Ohlin models. Hence, it has been suggested that not the monopolistic competition but the specialisation generates the force of gravity (Grossman, 1998).

However, there are also several models of trade which generate gravity without specialisation. The random selection model of Deardorff (1995) is one example. Feenstra, Markusen and Rose (1998) argue that Cournot competition can generate gravity. Evenett and Keller (2002) demonstrate that a gravity-like equation can be derived from a single-cone Heckscher-Ohlin model. Therefore, specialisation does not seem to be necessary for gravity. However, we have little understanding of what is then the source of gravity and why gravity-like equations can be obtained without specialisation.

In addition, Deardorff (1995) has proven that the gravity equation characterises many models and can be justified from standard trade theories. The differences in these theories help to explain the various specifications and some diversity in the results of the empirical application. Hence, the success of the gravity trade model cannot be considered as evidence of a specific trade theory.

Among several theoretical studies on the gravity trade model, Song (1999), in his study of intra-industry trade based on the Cournot-Ricardo approach, explains why the gravity equation works in varied economic environments. He proposes that the simple gravity trade

equation holds as long as the market shares of each exporting country in the importing countries are identical across the world. Therefore, it is the equality of the market shares, not specialisation, which generates the force of gravity. However, this section of his study is brief; Song states that a tiny amount of trade friction would totally reshuffle the equilibrium of trade flow, but does not elaborate on this point.

The aim of this chapter, thus, is to investigate a general condition for the gravity equation, following the approach of Song (1999). With a general condition for gravity, we could explain why gravity emerges in such a wide variety of models and even when multiple producers compete with homogeneous goods. We will also seek to explain why the model can be applied at the industry level either when a group of countries trades in differentiated products or when a group of countries trades in homogeneous products, i.e., intra-industry trade. We go on to describe more clearly how we can incorporate a transport cost in the model.

This chapter is organised as follows. Section 2 demonstrates the microeconomic foundation of the gravity trade model. Section 3 constructs the condition for gravity and looks into its application in various examples. The final section draws some conclusions.

4.2 Microeconomic Foundations of the Gravity Trade Model

The simplest possible gravity trade model originates from a rearrangement of a Cobb-Douglas expenditure system. Assume that each country is completely specialised in the production of its own good, so there is one good for each country. No tariffs or transport costs exist. The fraction of income spent on the product of country i is denoted s_i and is the same in all countries, i.e., there are identical Cobb-Douglas preferences everywhere ($\sum_i s_i = 1$ included where i=j). Therefore, an import of country i's goods by country j can be denoted as

$s_i Y_j$, where Y_j is the income of country j. With cross-section analysis, prices are constant at equilibrium values and units are chosen such that they are unity. The consumption value and quantity of country i's good in country j are equal to the imports of country i's good by country j, which are also equal to the exports of country i's good to country j (X_{ij}). This can be shown as follows:

(1) $X_{ij} = s_i Y_j$

If it is assumed that income must equal sales, we can write a budget constraint or the trade balance equation for a country as

(2) $Y_i = \sum_j X_{ij} = s_i \sum_j Y_j$

From equation (2)

(3) $s_i = \frac{Y_i}{\sum_j Y_j}$

Substitute equation (3) into equation (1). The result is

(4) $X_{ij} = \frac{Y_i Y_j}{\sum_j Y_j}$

Let Y_w denotes World's income (World's GDP).

(5) $Y_w = \sum_j Y_j$

Therefore, we can write equation (4) as

(6) $X_{ij} = \frac{Y_i Y_j}{Y_w}$

This is the simplest form of the gravity trade model. If we disregard error structure, a generalisation of equation (6) can be estimated by the ordinary least squares regression method. The economic interpretation of equation (6) is that the functional form of the gravity

trade equation and a major portion of its explanatory power are encompassed by the expenditure system of the trading partners.

From equation (6), taking the logarithm, we get

(7) $\log X_{ij} = b_0 + b_1 \log Y_i + b_2 \log Y_j$

where $b_0 = -\log Y_w$ and $b_1 = b_2 = 1$

The same method can also apply to the industry level where X_{ij}^k is the export of good k from country i to country j and s_i^k is the fraction of income spent on the good k from country i. Note that since we assume the identical preference, s_i^k is the same in any j.

The consumption value of good k from country i in country j is, therefore,

(8) $X_{ij}^k = s_i^k Y_j$

Hence, the income that country i received from exporting good k is

(9) $Y_i^k = \sum_j X_{ij}^k = s_i^k \sum_j Y_j$

From equation (9)

(10) $s_i^k = \frac{Y_i^k}{\sum_j Y_j}$

Substitute equation (10) into equation (8). The result is the industry level of the simple gravity equation, as follows:

(11) $X_{ij}^k = \frac{Y_j Y_i^k}{\sum_j Y_j}$

or

(12) $X_{ij}^k = \frac{Y_j Y_i^k}{Y_w}$

Taking the logarithm, we get

(13) $\log X_{ij}^{k} = b_0 + b_1 \log Y_j^{k} + b_2 \log Y_j$

Where $b_0 = -\log Y_w$ and $b_1 = b_2 = 1$

Even though these simple gravity equations are too simple to be applied to the real world since they assumed that there are identical preferences, income elasticities of unity (the Cobb-Douglas Utility Function) and also that prices are constant and the same in all countries, it is still useful to use this simple model to explore the condition for gravity, as we will do in the next section.

4.3 General Condition for Gravity

Consider the world to be without trade barriers, natural or artificial. The price of a good (i.e., good k) is identical everywhere. The world is composed of N countries, each of which runs balanced trade. Thus total production equals total expenditure in each country. Consumers in the world have identical homothetic preferences.

Let us define the following variables:

X_{ij}^{k} is the value of good k shipped from country i to country j.

Total export from country i to country j is $\sum_{k} X_{ij}^{k} = X_{ij}$.

Y_i^{k} is the value of the good k produced in country i which must equal to $\sum_{j} X_{ij}^{k}$ since we assumed balanced trade.

Note that the summation over all commodities k, $\sum_k Y_i^k$, is denoted by Y_i (total income of country i) and the summation over all countries i, $\sum_i Y_i^k$, is denoted by Y_w^k (total world income from exporting good k or the world's production of good k).

Y_w is world production, which is equal world income or $\sum_i Y_i$.

It will be very convenient to use the following share variables in the derivations afterwards.

Let s^k be the expenditure share of good k ; since we assume identical homothetic preferences, s^k is the same in every country.

$$\sigma_{ij}^k = \frac{X_{ij}^k}{s^k Y_j} = \text{share of country } i \text{ in country } j \text{ 's expenditure on good } k .$$

$$\sigma_i^k = \frac{Y_i^k}{s^k Y_w} = \text{share of country } i \text{ in the world's expenditure on good } k .$$

$$\sigma_{ij} = \frac{X_{ij}}{Y_j} = \text{share of country } i \text{ in country } j \text{ 's total expenditure.}$$

$$\sigma_i = \frac{Y_i}{Y_w} = \text{share of country } i \text{ in the world's total expenditure.}$$

We are interested in the theoretical foundation of the simple gravity equation as we derived it in section 2, i.e., equation (6); $X_{ij} = \frac{Y_i Y_j}{Y_w}$ and equation (12); $X_{ij}^k = \frac{Y_j Y_i^k}{Y_w}$. Let us recall that the first equation is the aggregate version and the latter is widely used in the studies of gravity at industry level. We introduce our first proposition:

Proposition 1:

For all i and j, $X_{ij} = \frac{Y_j Y_i}{Y_w}$ if and only if for each i, $\sigma_{ij} = \sigma_i$ in any j.

Proof:

If $\sigma_{ij} = \sigma_i$,

Then, $\frac{X_{ij}}{Y_j} = \frac{Y_i}{Y_w}$

$\therefore \quad X_{ij} = \frac{Y_i Y_j}{Y_w}$

Proposition 2:

For all i, j and k, $X_{ij}^k = \frac{Y_j Y_i^k}{Y_w}$ if and only if for each i, $\sigma_{ij}^k = \sigma_i^k$ in any j

If $\sigma_{ij}^k = \sigma_i^k$,

Then, $\frac{X_{ij}^k}{s^k Y_j} = \frac{Y_i^k}{s^k Y_w}$

$\therefore \quad X_{ij}^k = \frac{Y_i^k Y_j}{Y_w}$

These simple propositions allow us to understand why the gravity equation holds under diverse conditions. In addition, before we can give examples, let us introduce the following lemma.

Lemma 1:

For all i and j, $\sum_k s^k \sigma_{ij}^k = \sigma_{ij}$

Proof:

$$\sum_k s^k \sigma_{ij}^k = \sum_k s^k \frac{X_{ij}^k}{s^k Y_j}$$

$$= \sum_k \frac{X_{ij}^k}{Y_j}$$

$$= \frac{\sum_k X_{ij}^k}{Y_j}$$

$$= \frac{X_{ij}}{Y_j}$$

(14) $\therefore \sum_k s^k \sigma_{ij}^k = \sigma_{ij}$

According to our propositions, the conditions of simple gravity equations, in aggregate and disaggregate level, are $\sigma_{ij} = \sigma_i$ in any j and $\sigma_{ij}^k = \sigma_i^k$ in any j. In other words, σ_{ij} and σ_{ij}^k are constant in any j.

The first example is the case of complete specialisation. In a world in which each good is produced in only one country, then if k is produced in country i, $Y_i^k = Y_w^k$ so $\frac{Y_i^k}{Y_w^k} = \sigma_i^k = \sigma_{ij}^k = 1$, in any j. However, if k is not produced in country i, Y_i^k =0 so $\frac{Y_i^k}{Y_w^k} = \sigma_i^k = \sigma_{ij}^k = 0$, in any j. In other words, σ_{ij}^k is constant in any j.

In the aggregate version, since there is only one good produced in (and exported from) each country, the total income of country i equals the income from good k that i has produced ($Y_i = Y_i^k$, where k is the good produced in country i). Recall that when country i produced goods k, the share of country i in the world's expenditure of good k is equal to 1 or

$\frac{Y_i^k}{s^k Y_w} = \sigma_{ij}^k = 1$; therefore, $Y_i^k = s^k Y_w = Y_i$. Hence, in this aggregate version, $\sigma_i = \frac{Y_i}{Y_w} = \frac{s^k Y_w}{Y_w} = s^k$. With homothetic preferences, s^k is the same in any j, therefore $\sigma_i = \sigma_{ij}$ and they are constant in any j.

In the random selection model, we assume that there are possibly multiple producers of good k. The world's production of good k is Y_w^k. Consumers in the world come to a common world pool of good k, since all goods are equally priced; a consumer randomly selects a producer. The probability that a consumer from country j selects country i's good is given by $\frac{Y_i^k}{Y_w^k}$ which is equal to σ_i^k, so it is constant and identical in any j. Since the probability that a consumer from country j selects country i's good is constant, the proportion of good k shipped from country i to country j to country j's total expenditure on good k is also constant, i.e., σ_{ij}^k is constant and equal to $\frac{Y_i^k}{Y_w^k}$ which is equal to σ_i^k. In the aggregate version, recall that in lemma 1, $\sigma_{ij} = \sum_k s^k \sigma_{ij}^k = \sum_k s^k \frac{Y_i^k}{Y_w^k} = \sum_k s^k \frac{Y_i^k}{s^k Y_w} = \sum_k \frac{Y_i^k}{Y_w}$. Since Y_i^k and Y_w are constant in any j, σ_{ij} is constant in any j, thus, the condition is satisfied.

In Cournot competition, let assume that every consumer in the world has an identical homothetic utility function with the elasticity given by ε. country i has n_i^k firms producing good k, whose unit costs are all equal to c_i^k. The national border segments the market and in each country $\sum_i n_i^k$ firms play a distinct Cournot game; that is, each firm sets its own price

independently in order to maximise its profit, taking the other firms' prices as given. The equilibrium in country j's market requires:

Marginal Revenue (MR) = Marginal Cost (MC)

(17) $P_j^k\left(1-\frac{\alpha_{ij}^k}{\varepsilon}\right) = c_i^k$

P_j^k is the price of good k in country j

α_{ij}^k is the share of each i's firm in country j

$\alpha_{ij}^k = \left(1-\frac{c_i^k}{P_j^k}\right)\varepsilon$

since $\sigma_{ij}^k = n_i^k \alpha_{ij}^k$,

$\sigma_{ij}^k = n_i^k \alpha_{ij}^k = \left(1-\frac{c_i^k}{P_j^k}\right) n_i^k \varepsilon$

If the equilibrium does exist, P_j^k is identical in every j because the identical set of firms competes in every market. Demand elasticity does not vary in j. If we assume that unit costs and the number of firms in country i do not vary with the market locations, for each i, σ_{ij}^k is constant in any j, so the condition is satisfied.

In addition, with identical homothetic utility function, α_{ij}^k is constant in any j, or $\alpha_{ij}^k = \alpha_i^k$. In other words, the share of country i's firm in any j equals the share of country i's firm in the world. Therefore, $\sigma_i^k = n_i^k \alpha_i^k = n_i^k \alpha_{ij}^k = \sigma_{ij}^k$.

In the aggregate version, again, from lemma 1, $\sigma_{ij} = \sum_k s^k \sigma_{ij}^k = \sum_k s^k \left[1-\frac{c_i^k}{P_j^k}\right]\varepsilon$.

Recall that s^k, c_i^k, P_j^k and ε are constant in any j; therefore $\sigma_i (= \sigma_{ij})$ is constant in any j.

Therefore, what matters for the simple gravity equation is that the market shares of an exporting country should not vary with different importing countries. Note that the common market share does not have to be 1 or 0. As the example above shows, it can be any number between 0 and 1. Furthermore, the common market share can vary across industry (k). Thus, the gravity equation will also hold in a model where complete specialisation occurs in a subset of industries and random selection in another subset and Cournot Competition in the rest, as long as the market share in each industry (σ_{ij}^{k}) is constant in all importing countries.

However, the above propositions are in the simplest form of the gravity trade model. To make them more estimable, some studies such as those of Anderson (1979) and Oguledo and Macphee (1994) add a constant term and log-normal disturbance term to the model to capture other factors which drive the gravity of trade. Therefore, we create G_{ij} and G_{ij}^{k} to capture such factors. We call them the gravity coefficients, which will have different values depending on circumstance.

First of all, let us introduce the following lemma:

Lemma 2:

For any i and j, $\sum_{j} \sigma_j \sigma_{ij} = \sigma_i$

This relationship can be derived as follows.

$$\sum_{j} \sigma_j \sigma_{ij} = \sum_{j} \frac{Y_j}{Y_w} \times \frac{X_{ij}}{Y_j}$$

$$= \sum_{j} \frac{X_{ij}}{Y_w}$$

$$= \frac{\sum_{j} X_{ij}}{Y_w}$$

$$= \frac{Y_i}{Y_w}$$

(15) $\therefore \sum_j \sigma_j \sigma_{ij} = \sigma_i$

Now let us introduce our next proposition:

Proposition 3:

For any i and j, $X_{ij} = G_{ij} \frac{Y_j Y_i}{Y_w}$, where $G_{ij} = \frac{\sigma_{ij}}{\sigma_i}$ and $\sum_j \sigma_j G_{ij} = 1$

Proof:

Recall Lemma 2;

$\sum_j \sigma_j \sigma_{ij} = \sigma_i$,

$\frac{\sum_j \sigma_j \sigma_{ij}}{\sigma_i} = 1$,

Substitute $\frac{\sigma_{ij}}{\sigma_i} = G_{ij}$ into above equation,

$\therefore \sum_j \sigma_j G_{ij} = 1$

When we substitute $G_{ij} = \frac{\sigma_{ij}}{\sigma_i}$ into the right-hand side of the proposition 1, $X_{ij} = G_{ij} \frac{Y_j Y_i}{Y_w}$, we get

$$G_{ij} \frac{Y_j Y_i}{Y_w} = \frac{\sigma_{ij}}{\sigma_i} \times \frac{Y_j Y_i}{Y_w}$$

$$= \frac{X_{ij}}{Y_j} \times \frac{Y_w}{Y_i} \times \frac{Y_j Y_i}{Y_w}$$

$$= X_{ij}$$

For the disaggregate version, let us introduce another lemma:

Lemma 3:

For any i, j and k, $\sum_j \sigma_j \sigma_{ij}^k = \sigma_i^k$.

We can show how this results in this relationship, as follows.

$$\sum_j \sigma_j \sigma_{ij}^k = \sum_j \frac{Y_j}{Y_w} \times \frac{X_{ij}^k}{s^k Y_j}$$

$$= \sum_j \left[\frac{X_{ij}^k}{s^k Y_w} \right]$$

Because consumers in the world have identical homothetic preferences, s^k, j's expenditure share of good k, is constant in any j.

$$= \frac{\sum_j X_{ij}^k}{s^k Y_w}$$

$$= \frac{Y_i^k}{s^k Y_w}$$

$$(16)\ \therefore \sum_j \sigma_j \sigma_{ij}^k = \sigma_i^k$$

Proposition 4:

For any i, j and k, $X_{ij}^k = G_{ij}^k \frac{Y_j Y_i^k}{Y_w}$, where $G_{ij}^k = \frac{\sigma_{ij}^k}{\sigma_i^k}$ and $\sum_j \sigma_j G_{ij}^k = 1$

Proof:

Recall Lemma 3,

$\sum_j \sigma_j \sigma_{ij}^k = \sigma_i^k$ j

$$\frac{\sum_j \sigma_j \sigma_{ij}^k}{\sigma_i^k} = 1$$

Substitute $\frac{\sigma_{ij}^k}{\sigma_i^k} = G_{ij}^k$ into the above equation,

$$\therefore \sum_j G_{ij}^k \sigma_j = 1$$

When we substitute $G_{ij}^k = \frac{\sigma_{ij}^k}{\sigma_i^k}$ into the right-hand side of Proposition 2, $X_{ij}^k = G_{ij}^k \frac{Y_j Y_i^k}{Y_w}$, we get

$$G_{ij}^k \frac{Y_j Y_i^k}{Y_w} = \frac{\sigma_{ij}^k}{\sigma_i^k} \times \frac{Y_j Y_i^k}{Y_w}$$

$$= \frac{X_{ij}^k}{s^k Y_j} \times \frac{s^k Y_w}{Y_i^k} \times \frac{Y_j Y_i^k}{Y_w}$$

$$= X_{ij}^k$$

In addition, we can derive a relationship between G_{ij} and G_{ij}^k by using our lemma 1 ($\sigma_{ij} = \sum_k s^k \sigma_{ij}^k$) as follows,

$$G_{ij} = \frac{\sigma_{ij}}{\sigma_i}$$

Substitute $\sigma_{ij} = \sum_k s^k \sigma_{ij}^k$,

$$G_{ij} = \frac{\sum_k s^k \sigma_{ij}^k}{\sigma_i}$$

Since $G_{ij}^k = \frac{\sigma_{ij}^k}{\sigma_i^k} \therefore \sigma_{ij}^k = \sigma_i^k G_{ij}^k$, therefore,

$$G_{ij} = \frac{1}{\sigma_i} \sum_k s^k \sigma_i^k G_{ij}^k$$

$$= \frac{Y_w}{Y_i} \sum_k s^k \frac{Y_i^k}{s^k Y^w} G_{ij}^k$$

$$= \sum_k \frac{Y_w}{Y_i} \frac{Y_i^k}{Y_w} G_{ij}^k$$

$$\therefore G_{ij} = \sum_k \frac{Y_i^k}{Y_i} G_{ij}^k$$

From these propositions, the gravity coefficient is the proportion of the share of country i in country j's expenditure (in good k where the industry level applies) and the share of country i in the world's expenditure (in good k where the industry level is considered). These propositions contain an important message. For exporter i, the gravity coefficients vary across importers (since σ_{ij} and σ_{ij}^k vary across j), its distribution being influenced by such variables as distance, trade agreements or currency unions. However, the weighted average of the gravity coefficient must equal unity ($\sum_j \sigma_j G_{ij} = 1$), the weight σ_j given by the relative sizes of importers (since $\sigma_j = \frac{Y_j}{Y_w}$). In other words, the simple gravity equation should hold "on average", regardless of the reason for trade.

Therefore, if the gravity coefficients (G_{ij}) exceed unity for some importers j, then they must fall short of unity for other importers. Suppose that an exporter i has 10 potential importers (j = 1,…,10) of equal size, i.e., $Y_j=Y_1= Y_2=\ldots=Y_{10}$. As a result, $Y_w=10Y_j$ hence $\sigma_j = \frac{Y_j}{Y_w} = \frac{1}{10} = 0.1$. If we found that this exporter i exports to only two of j (j =1, 2); equally divided ($G_{i1} = G_{i2}$) and for j=3,…,10, $X_{ij}=0$ therefore for j=3,…,10; $\sigma_{ij} = \frac{X_{ij}}{Y_j} = 0$ and $G_{ij} = \frac{\sigma_{ij}}{\sigma_i} = 0$. So $\sum_{j=3}^{10} \sigma_j G_{ij} = 0$

$$\sum_{j=1}^{10}\sigma_j G_{ij} = 0.1G_{i1} + 0.1G_{i2} + \sum_{j=3}^{10}\sigma_j G_{ij}$$

Substitute $\sum_{j=3}^{10}\sigma_j G_{ij} = 0$, $\sum_{j=1}^{10}\sigma_j G_{ij} = 1$ and $G_{i1} = G_{i2}$ into above equation;

$$0.2G_{i1} = 1$$

$$G_{i1} = \frac{1}{0.2} = 5 = G_{i2}$$

Therefore, the gravity coefficients for these two importers j=1,2 must equal 5 while the gravity coefficients for the rest are zero.

Note that, if its exports are equally divided among 10 importers of equal size, then $\sigma_{i1} = \sigma_{i2} = ... = \sigma_{i10} \therefore G_{i1} = G_{i2} = ... = G_{i10}$.

Since $\sum_{j=1}^{10}\sigma_j G_{ij} = 0.1G_{i1} + 0.1G_{i2} + 0.1G_{i3} + 0.1G_{i4} + 0.1G_{i5} + ... + 0.1G_{i10}$

Substitute $G_{i1} = G_{i2} = ... = G_{i10}$ and $\sum_{j=1}^{10}\sigma_j G_{ij} = 1$

$$10 \times 0.1G_{i1} = 1$$

$$\therefore G_{i1} = 1$$

or $G_{i1} = G_{i2} = ... = G_{i10} = 1$

Thus, when exports are equally divided among importers of equal size, gravity coefficient for each importer must be the same and equal unity. This observation where gravity coefficient equal unity ($G_{ij} = 1$) is one of the case of simple gravity equation we derived in proposition 1 and 2.

Since we have assumed a frictionless world; when there are border effects such as transport costs or tariffs, our propositions in industry level are no longer plausible since price

of a good are no longer equalised across countries. Hence, the pattern of trade is more complex than the simple gravity equation.

Nevertheless, in proposition 3 and, G_{ij} and G_{ij}^{k} are allowed to vary across j depending on factors other than income, therefore G_{ij} and G_{ij}^{k} are the elements which capture these additional factors; for example, transportation costs, tariff and trade blocs. Note that, if there are differences in demand (when we relax the homothetic preferences assumption), or differences in prices across countries (if we introduce transportation costs into the model), the weighted average of the gravity coefficient is not necessarily equal unity. Even so, our gravity coefficient still reflects factors other than income which drive the gravity of trade.

4.4 Conclusions

This study confirms the validity of the argument by many authors which states that the presence of gravity in international trade can be derived from several trade theories. In contrast to popular belief, the gravity equation can hold when multiple producers compete with homogeneous goods. Our frictionless model suggests that gravity is equivalent to the constancy of market shares. Therefore, in a model with complete specialisation, the gravity equation obviously holds. In addition, in a model without complete specialisation, for example a Cournot model when firms from multiple countries are producing in a single industry, the force of gravity still exists because of the constancy of market shares. It also implies that there can be two-way trade (reciprocal dumping) in the k product, which is not the consequence of differentiation but instead occurs as firms in each country attempt to maximise their profits by also selling in other markets apart from their home countries. This idea substantially widens the scope of gravity equations. With the models derived in this

paper, we can now understand why gravity works under such diverse condition and why it can coexist with incomplete specialisation and trade in homogeneous goods.

CHAPTER 5

DETERMINANTS OF ASEAN TRADE FLOWS: A GRAVITY MODEL APPROACH

5.1 Introduction

Several studies have carried out an analysis of bilateral trade flows between countries in the world based on the gravity trade model. Despite its simplicity, the model explains well the bilateral trade flows between any two trading partners in terms of their economic masses, i.e., GDP, population and the geographical distance between them.

The model is rooted in Newton's gravitational model, which says that the attraction between two heavenly bodies is proportional to the product of their masses and inversely related to the distance between them. The gravity model of bilateral trade, in its basic form, says that trade between Countries i and j is proportional to the product of each country's GDPs and inversely related to the distance between them. Other explanatory variables which are often added are the other measures of size, namely population (or per capita GDPs), land areas and dummy variables representing other measures of geographical proximity or cultural factors, such as landlockedness, common borders, common languages and common membership in trading blocs.

In spite of the great number of studies, as reviewed in Chapter 3, there is a scarcity of studies which apply the gravity trade model to the East Asian region and in particular to ASEAN countries. For several decades now, ASEAN has been developing faster than any other part of the world. This has led to a strong shift in global trade. ASEAN is among the

very foremost countries as far as shares in world trade are concerned (International Monetary Fund, 1997). These shares have been increasing at a very rapid rate.

In addition, a major milestone in ASEAN economic integration was the decision to establish the ASEAN Free Trade Area (AFTA); the Common Effective Preferential Tariff Agreement (CEPT) under the AFTA scheme required that tariff rates levied on a wide range of products traded within the region were to be reduced to a range from zero to five per cent. Quantitative restrictions and other non-tariff barriers would also be eliminated. Although originally scheduled to take effect by 2008, the target of a free trade area in ASEAN was continuously moved forward so that it was actually enforced in 2002.

This chapter aims to employ the gravity trade model to analyse the international trade flows between countries by examining the data on bilateral trade between pairs of countries in order to explore the influence of geographical proximity and preferential trading policies in creating regional concentration in ASEAN, in particular, differences in the effects in each commodity sector. Its other aim is to use an estimation of the gravity trade equation to find the level of trade creation and trade diversion of ASEAN's Free Trade Area.

The plan of this chapter is as follows. Section 2 provides a full description of our model. Section 3 explains the regression method to be applied. Sections 4 to 7 describe the sample data. Section 8 gives a summary of the model. The empirical results of the gravity model are presented in section 9 accompanied by the corresponding economic interpretations. The final section draws some conclusions, with comments.

5.2 Model Identification

We have used cross-sectional data and worked out a separate gravity equation for each of the years for both the trade in total and disaggregate into commodity groups. We estimated two models: one is the traditional model which is based on the simple form of the gravity equation and the other is a modified model where extra dummy variables are added to capture the effect of trade creation and trade diversion of each trading bloc.

5.2.1 The Traditional Model

The simple form of gravity equation applied in our study is given by,

$$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(D_{ADJACENTij}) + \Sigma\gamma_k D_{kij} + \mu_{ij} \quad (5.1)$$

Where;

X_{ij} : Export of country i to country j.

GDP_i : GDP of exporting country i.

GDP_j : GDP of importing country j.

POP_i : Population of exporting country i.

POP_j : Population of importing country j.

$DIST_{ij}$: Geographical distance between Countries i and j.

$D_{ADJACENTij}$: Dummy variable which takes the value of 1 where Countries i and j are adjacent and takes the value of 0 otherwise.

$\Sigma\gamma_k D_{kij}$: Set of dummy variables for artificial trade barriers or regional trade arrangements. They take the value of 1 where Countries i and j are both in the same trading bloc k and take the value of 0 otherwise.

μ_{ij} : error term

Substantial Hypotheses

In keeping with our discussion given in earlier chapter, we hypothesise that:

(1) For all commodity groups, the regression coefficient β_1 and β_2 of the exporter's and importer's GDP, respectively, will be significantly positive. The higher the exporter's GDP, the higher the volume and varieties of its national output and the greater the scope for its exports. The higher the importer's GDP, the higher the expenditure capabilities and demand for imports.

(2) For the disaggregate level, we used the basis of the theoretical finding by Feenstra, Markusen and Rose (1998), which stated that in the case of homogeneous products, if β_1 has a higher value than β_2 i.e., the own income elasticity of exports exceeds the importer's income elasticity, the sector complies with reciprocal dumping with free entry. If it is the other way round, i.e., if β_1 has a lower value than β_2, the sector has restricted entry. In the case of differentiated products, if β_1 has s higher value than β_2, the sector has monopolistic competition, while when β_1 is lower than $\beta 2$, the sector is in accordance with the Armington formulation with perfect competition and national-level product differentiation.

(3) The population variable is included to show that the more populous a country is, the greater its tendency toward self-sufficiency and therefore the less its active

engagement in trade. Hence, β_3 and β_4, the regression coefficients for the exporter's and importer's population respectively, will be significantly negative.

(4) The regression coefficient for the distance variable, β_5, will be negative. The larger the distance between trading partners, the larger the trading cost between them and the larger the impediment to bilateral trade. The shorter the distance between two countries, the more acquainted they are with each other's tastes and preferences. Also the nearer countries are to each other, the greater the likelihood of their common membership of some regional Preferential Trading Arrangement.

(5) The inclusion of additional variables takes account of artificial trade barriers, regional trade arrangements and the fact that countries tend to trade more intensively as a result of geographical adjacency.

5.2.2 The Modified Model

In this section, we add extra variables to measure the artificial distance (i.e., psychic distance) between exporter and importer. Firstly, we will introduce remoteness of the exporter and importer from the world at large. It is computed as the weighted-average distance from trading partners. The weight is incomes. Until recently, most studies implicitly assumed that remoteness is constant across countries and therefore becomes the intercept in the regression equation. However, remoteness is a key variable because it measures each importer's set of alternatives. Countries with many nearby sources of goods, i.e. those with low values of remoteness will import less from each particular source, while two remote partners will trade more with each other.

Therefore, our first modified model is given by,

$$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \Sigma \gamma_k D_{kij} + \mu_{ij} \quad (5.2)$$

where,

REM_i : Remoteness of exporting country i.

REM_j : Remoteness of importing country j.

Note that:

$REM_i = \sum_j w_j D_{ij}$, where $w_j = \frac{GDP_j}{\sum_i Y_i}$ for any $i \neq j$.

Additional Substantial Hypothesis (Remoteness variables)

The idea is that remote countries will trade more with partners at a given closeness; consequently, we expect their coefficients to be significantly positive.

Furthermore, we replace the original preferential trade arrangement dummies in equation 5.2 with a new set of dummy variables D_{ijr} , D^{EX}_{ijr} and D^{IM}_{ijr}

Table (5.1) illustrates their definition. D_{ijr} is unity if both i and j are members of region r. D^{EX}_{ijr} is unity if only the exporting country (i) is a member of region r. Similarly, D^{IM}_{ijr} is unity if only the importing country (j) is a member of region r. The usefulness of introducing these regional dummy variables provide a simple and clear distinction between the trade creation and trade diversion effect, thus, we can assess trade creation and trade diversion resulting from each respective regional economic integration

Additional Substantial hypotheses (Regional Preferences Dummy Variables)

D_{ijr} reflects trade creation which results from economic integration occurring in each respective region. If the coefficient of this variable is positive and statistically significant, then it can be said that the members of the respective region have traded with each other more than hypothetical trade level.

The dummy variable D^{EX}_{ijr} reflects any trade diversion or expansion occurring in that respective region's export structure. If the coefficient of this variable is negative and significant, then it can be stated that the members of these respective region have switched their exporting activities from non-member economies to member countries. This effect is referred to as "export trade diversion". If the coefficient of this variable is positive and significant, then it can be stated that the members of these respective region have exported to non-member higher than hypothetical level. This effect is referred to as "export trade expansion"

D^{IM}_{ijr} represents trade diversion or expansion with respect to each region's importing activities. Negative and statistically significant coefficient of this variable indicates that the integration have caused members to prefer member countries to non-members economies in their import activities. This effect is referred to as "import trade diversion". If the coefficient of this variable is positive and significant, then it can be stated that the members of these respective region have imported from non-member higher than hypothetical level. This effect is referred to as "export trade expansion"

TABLE 5.1 Definition of Regional Preferences Dummy Variables in the Modified Model

Definition of Dummy Variables		Country i					
		In Region r			Outside Region r		
		D_{ijr}	D^{EX}_{ijr}	D^{IM}_{ijr}	D_{ijr}	D^{EX}_{ijr}	D^{IM}_{ijr}
Country j	In Region r	**1**	**0**	**0**	**0**	**0**	**1**
	Outside Region r	**0**	**1**	**0**	**0**	**0**	**0**

According to the above modelling explanation, we construct the following model.

$$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \Sigma\gamma D_{ijr} + \Sigma\gamma^{EX} D^{EX}_{ijr}) + \Sigma\gamma^{IM} D^{IM}_{ijr} + \mu_{ij} \quad (5.3)$$

Additionally, dummy variable for pairs of countries that share the same official language is included to the above model. Dummy variable for pairs of countries that have colonial ties also added.

$$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \beta_9 \ln(D_{LANGj}) + \beta_{10} \ln(D_{COLONIALij}) + \Sigma\gamma D_{ijr} + \Sigma\gamma^{EX} D^{EX}_{ijr}) + \Sigma\gamma^{IM} D^{IM}_{ijr} + \mu_{ij} \quad (5.4)$$

Where,

D_{LANGij} is a dummy variable for countries that share the same official language. It takes the value of 1 where countries i and j are both in has the same official language and take the value of 0 otherwise.

$D_{COLONIALij}$ is a dummy variable for countries that have colonial ties. It takes the value of 1 where country i was colonised by country j or vice versa, and take the value of 0 otherwise.

Additional Substantial hypotheses (Language and Colonial Dummy Variables)

Countries that share the same language would be able to do business with each other more convenient that those that speak different language, therefore, a pair of countries that share the same official language should trade with each other more than a pair of those that does not. Hence, we expect the coefficient of Language dummy variable to be significantly positive.

Similarly, countries that have colonial-ties would have understood each other culture better that those that have not have such ties. For this reason, they should trade more between them. Thus, a pair of countries that has colonial ties should trade with each other more than a pair of those that does not. Therefore, we expect the coefficient of Colonial dummy variable to be significantly positive.

5.3 Regression Method

Our study is a cross-section approach, which will take form of multivariate single equation regression analysis. In other words, the aim is to determine whether the factors specified earlier do indeed make a significant contribution to an explanation of trade flows, to estimate the numerical values of the parameters of the trade flows equation.

We fit the gravity trade model to the data by means of Ordinary Least Squares (OLS) regression analysis. OLS regression technique holds constant for various factors in order to

determine the effect of another factor. The technique is not invalidated when the explanatory variables are correlated with each other. For example, there is a strong correlation between proximity, as measured by the distance between a pair of countries and whether they share a common boundary. However, OLS regression can estimate the independent effect of each factor, providing we have correctly specified the additive form of the equation. Trade between Thailand and Indonesia, for example, will be high, due to their proximity, but trade between Thailand and Malaysia will be further boosted by the effect of their common border, in addition to their proximity.

The estimates of the effects will be subject to a margin of error, as we might expect, but the estimates will be as good as they can be, given the data, as long as the model is correctly specified. In addition, the standard errors reported for the coefficient estimates will be the correct ones. Thus we will be able to judge whether the estimates are reliable or whether, on the contrary, the data set is too small to give us the information we want. The same point holds with respect to whether the explanatory variables are too highly correlated to give us the information we want. Fortunately, our samples are relatively large, to the extent that we can in fact obtain relatively reliable estimates of the effects of country size, proximity, common borders and the other variables in the gravity model.

5.4 The Year Chosen for Empirical Estimation

The cross-section approach using economic data at a single point in time forms the basis of the analysis proposed here. We run tests at five-year intervals, except the final one where it is, instead, at three-year interval. Thus, we have estimates for 1982, 1987, 1992, 1997, 2002 and 2005 for the aggregate model and 1987, 1992 and 1997 for the disaggregate model.

The reasons for using these periods, apart from the availability of the data required, are the following.

(1) There are a number of new economic integration agreements, which have been established in the world since the1980s. We are interested in seeing whether and how these new regional agreements have influenced trade flow.

(2) When ASEAN was established, trade among the member countries was insignificant. To address this situation, ASEAN adopted one of the earliest economic cooperation schemes; the preferential Trading Arrangement of 1977, which accorded tariff preferences for trade among the ASEAN economies. 10 years later, in 1987, an enhanced Preferential Trading Arrangement was adopted at the third ASEAN summit, further increasing intra-ASEAN trade. Hence, 1987 marks the actual beginning of the trading enhancement among member countries.

(3) As regards the choice of year 1992, it was the year when the "Framework Agreement on Enhancing Economic Cooperation" was adopted, which included the launching of a scheme toward an ASEAN Free Trade Area or AFTA. The strategic objective of AFTA is to increase the ASEAN region's competitive advantage as a single product unit. The elimination of tariff and non-tariff barriers among member countries is expected to promote greater economic efficiency, productivity and competitiveness.

(4) In 1997, the ASEAN leaders adopted the ASEAN Vision 2020, aimed at forging closer economic integration within the region. The vision statement also resolved to create a stable, prosperous and highly competitive ASEAN Economic Region, in

which there were a free flow of goods, services, investments and capital, equitable economic development and reduced poverty and socio-economic disparities.

(5) ASEAN enhancement should also be considered. In 1987, ASEAN contained 6 member countries, namely, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Brunei Darussalam. Vietnam joined in 1995, Laos and Myanmar in 1997 and Cambodia in 1999. Hence the studies during this period also provide an idea of regional trade moving toward an ASEAN enlargement.

(6) It should not be forgotten that when the financial and economic crisis struck in mid-1997, intra-ASEAN exports had actually been increasing. But the advent of the crisis has adversely affected intra-regional trade more than trade with the rest of the world, due to the devaluation of the exchange rate.

5.5 Countries Chosen for the Empirical Analysis

Table 5.2 lists the countries responding the sample upon which the empirical analysis is based. We operate with a sample which consists of 50 countries classified according to World Bank criteria into two groups: developed and developing economies.

Sample countries have been chosen because they played a significant role (i.e., they were among the highest 25 trading partners of ASEAN, according to their trade flows) in ASEAN trade within the periods studied. This set of countries represents around 86 per cent

of total world exports in 1997 or an average of 83 per cent in the period covered. These data constituted over 98 per cent, on average, of ASEAN's total exports[21].

Note that in this analysis, Belgium-Luxembourg is regarded as one country, standing for the Belgium-Luxembourg Economic Union.

From 50 sample countries; we will have potentially 2,450 (50 x 49) observations for each year studied. However, each estimated equation might not contain all observations, since we need to exclude zero value data due to the logarithm function in the model.

[21] Source: WTO's Annual Report 1998, World Trade Organisation.

TABLE 5.2 List of Countries Chosen for the Empirical Studies

	Developed Economies	Developing Economies
The Americas	Canada US	Argentina Brazil Chile Mexico
Oceanic	Australia	
Middle East		Qatar Jordan Oman Saudi Arabia Turkey United Arab Emirates Yemen
Europe	Austria Belgium-Luxembourg Denmark France Finland Germany Greece Ireland Italy Netherlands Norway Spain Sweden Switzerland United Kingdom	Former Czechoslovakia Former USSR Hungary Poland
Asia	Japan	Brunei Cambodia China Hong Kong India Indonesia Korea Republic Laos Malaysia Myanmar Pakistan The Philippines Singapore Taiwan Thailand Vietnam

5.6 Industrial Sector Classified for Disaggregate Model

As well as the aggregate data, to investigate that transaction costs are uniformly important across industries, we disaggregate the regression by 34 manufacturing sectors and 1 non-manufacturing sector according to the categories of the International Surveys Industry (ISI) in compliance with the Bureau of Economic Analysis (BEA) of the US Department of Commerce. This classification was created in order to relate US trade flows to direct investment in foreign countries, which is a concordance created between the Standard International Trade Classification (SITC) and the International Standard Industry Classification (ISIC). Hence, this classification will also be useful for our analysis of Foreign Direct Investment in the next chapter.

A list of BEA's ISI categories, corresponding to the 1987 SIC codes, is shown in Table 5.3.

TABLE 5.3 List of BEA Manufacturing Industries and ISI codes

BEA's Industrial Categories		SIC CODE
1	Grain mill and bakery products	204, 205
2	Beverages	208
3	Tobacco products	210
4	Other food and kindred products[22]	201,202,203,206,207,209
5	Textile products and apparel	22,23
6	Leather and leather products	310
7	Pulp, paper and board mills	262
8	Other paper and allied products	265
9	Printing and publishing	271,272,275
10	Drugs	283
11	Soaps, cleaners and toilet goods	284
12	Agricultural chemicals	287
13	Industrial chemicals and synthetics	281
14	Other chemicals	289
15	Rubber products	301,302,305,306
16	Miscellaneous plastic products	308
17	Primary metal industries, Ferrous	331
18	Primary metal industries, Nonferrous	335
19	Fabricated metal products	341, 342, 343, 349
20	Farm and garden machinery	352
21	Construction and Mining and material handling machinery	353
22	Computer and office Equipment	357
23	Other Non-electric Machinery	351, 354, 355, 356, 358, 359
24	Household appliances	363
25	Household audio, video and communication equipment	366
26	Electronic components and accessories	367
27	Other electrical machinery	369
28	Motor vehicles and equipment	374
29	Other transportation equipment	379
30	Lumber, wood, furniture and fixtures	240, 250
31	Glass Products	321
32	Stone, Clay and other non-metallic mineral products	329
33	Instruments and related products[23]	381, 384, 386
34	Other Manufacturing industries	390
35	Non-manufacturing industries	n/a

Source: US Department of Commerce

[22] 'Other food and kindred products' includes, but is not limited to, meat products, dairy products and preserved fruits and vegetables.

[23] 'Instrument and related products' includes, but is not limited to, measuring, scientific and optical instrument, medical instrument and supplies and ophthalmic goods and photographic equipment and supplies.

We also categorise these sectors into homogeneous and differentiated goods, according to Rauch's Classification[24] (Rauch 1996), as shown in Table 5.4.

TABLE 5.4 BEA Industrial Sectors Categorised into Homogeneous and Differentiated Products

BEA code	Homogeneous products
1	Grain mill and bakery products
2	Beverages
3	Tobacco products
4	Other food and kindred products
7	Pulp, paper and board mills
12	Agricultural chemicals
13	Industrial chemicals and synthetics
17	Primary metal Industries, Ferrous
18	Primary metal Industries, Nonferrous
30	lumber, wood, furniture and fixtures

(Continued)

[24] Rauch (1996) divides internationally traded commodities into three groups, based on the characteristics of information which matches international buyers and sellers. The three groups are (1) Organised exchange commodities, which is composed of products traded by specialised traders, who centralise price information; (2) Reference priced commodities. The commodities which possess reference prices are the products which are not branded and whose prices can be quoted without mentioning the name of their manufacturers, when these reference prices are found to be sufficiently useful by industry actors to be worth quoting in trade publications. When transportation costs are accounted for, it is then possible for traders to perform international commodity arbitrage, matching distant buyers and sellers just as would traders on an organised exchange; and (3) Differentiated commodities, which are composed of branded or differentiated products. Even if they belong to the same SITC four-digit category they can be disaggregated into types by design, form, brand or producer.

TABLE 5.4: (continued) BEA Industrial Sectors Categorised into Homogeneous and Differentiated Products

	Differentiated Products
5	Textile products and other apparel
6	Leather and leather products
8	Other paper and allied products
9	Printing and publishing
10	Drugs
11	Soaps, cleaners and toilet goods
14	Other chemicals
15	Rubber products
16	Miscellaneous plastic products
19	Fabricated metal products
20	Farm and garden machinery
21	Construction, mining and materials handling machinery
22	Computer and office equipment
23	Other non-electric machinery
24	Household appliances
25	Household audio, video and communications equipment
26	Electronic components
27	Other electrical machinery
28	Motor vehicles and equipment
29	Other transportation equipment
31	Glass products
32	Stone, Clay and other non-metallic mineral products
33	Instruments and apparatus
34	Other manufacturing
35	Non-manufacturing

5.7 Other Data's Details and Measurements

(1) Trade data

The first problem regarding the choice of trade data to use in the model is choosing between Free-on-Board (FOB) and Cost-Insurance-Freight (CIF) Data. As far as the measurement of trade is concerned, we can measure the size of a trade flow at either the point of export or the point of import. Similar results are expected from either of the two measurements. However, it is worthwhile mentioning at this stage the differences in valuation

since exports are calculated at free-on-board prices, while imports are calculated at cost insurance freight prices. We should also note the differences due to the time-lags between the moment of the exports being recorded by the exporting countries and the moment when the same trade flow is recorded by the importing countries. This study uses only export data; hence, all the trade data are in FOB measurements.

We obtained the bilateral trade data from 1987-1997, both aggregate and disaggregate levels, in current US Dollars from the CD-ROM database, WORLD TRADE FLOWS, 1980-1997, by the Centre for International Data, Institute of Government Affairs, University of California and the National Bureau of Economic Research. The same data were used by Hejazi and Trefler (1996). The data were available in both the BEA classifications of aggregate and disaggregate levels, as discussed. The bilateral trade data for 2002 and 2005 are from UN Comtrade Database (http://comtrade.un.org/)

(2) GDP and GNP

According to Linnemann (1966), with respect to exports, the domestic products are the most proper concept since all domestically produced goods which leave a country are counted as exports no matter whether produced by national factors of production or by foreign factors of production. As far as imports are concerned, the import of current producer goods relates probably more to national product. Taking into account that this study concerns only export data, we use Gross Domestic Product (GDP) data.

The GDP data, in current US dollars, were obtained from the World Bank Development Database.

(3) Population Data

Population data were obtained from the World Bank Development Database expressed in millions.

(4) Distance Data

The calculation of the distance variable requires some elaboration. The proximity measurement used in our tests is the log of the distance between the two major cities of the respective countries. The cities are usually the capitals of the two countries but in a few cases we substitute for the capital a major city which seems closer to the country's economic centre of gravity; these are Chicago for the United States, rather than Washington DC, and Shanghai for China, rather than Beijing.

There are a number of ways to measure the distance between two points on the globe. Several methods distinguish between land and sea distances or measure distances along the shipping routes; however, most of the results do not turn out to shed a great deal of additional light. We should also note that much trade goes neither by land nor sea these days, but by air; it represents a great increase in the use of air transport at the expense of sea transport. Air routes, whether used for shipping goods or human travel, would be the most convenient justification for using the straight-line or Great Circle measure of distance. The ultimate justification, moreover, is that the Great Circle distance seems to be a reasonable way of averaging across different modes of transportation and works well in practice (Linnemann 1966) Indeed, there are a few studies which have found that the precise method of measuring distance appears to be less of an issue than one might have thought. These include Wang (1992) and Bikker (1987). Wang entered measures of such sea distances and land distances separately in a gravity model; the result, although statistically significant, shows that

differences in coefficients were very small. Bikker (1987) measured distance by sea routes by isolating the role of physical shipping cost when the Suez Canal was closed by a blockade in 1967-1975. He added a variable for the additional sea distance to be covered between the pair of countries in question, divided by the normal distance. The Suez variable is statistically significant although its estimated coefficient is low. This led Bikker to conclude that physical shipping costs are less important than conventionally assumed. Additionally, Mathur (2000) used a stanine scale as a proxy of the distance between trading partners; however, academics argue that rescaling distances in this manner may reduce the reliability of the statistical results.

Therefore, to proxy the trading cost, we followed the common practice of using Great Circle Distance[25] between capital cities as our proxy.

These data were obtained from computerised programming, which calculated the Great Circle distance in miles using the latitude and longitude of the two points in question[26] . Countries' locations used to calculate Great Circle Distance are taken from the CIA's the World Fact Book website,[27] which also provides observations for a number of other geographical variables, including adjacency.

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[25] Great Circle distance corresponds to an arc linking two points on a sphere. It is useful to establish the shortest path to use when travelling at the intercontinental level, because the Earth is approximately spherical. Because of the distortions caused by projections of the globe on a flat sheet of paper, a straight line on a map is not necessarily the shortest distance. Ships and aircraft usually follow the Great Circle geometry to minimize distance and save the time and money of customers.

[26] The formula applied in this software to calculate the Great Circle distance (D) is as follows:
$\cos(D) = Sin(a)Sin(b) + Cos(a)Cos(b)Cos(|c|)$
Where a and b are the latitudes in degrees of the respective coordinates and $|c|$ is the absolute value of the difference of longitude between the respective coordinates. The result of this equation is in degrees. Each degree in the earth's surface equals about 111.32 km (69.17 miles), so the result must be multiplied by this number to yield the Great Circle distance between respective coordinates.

[27] https://www.cia.gov/cia/publications/factbook/

(5) Preferential Trade Relations

In addition to standard gravity model coefficients, we add dummy variables to represent the bloc effects. The dummy variable is equal to 1 when both countries in a given pair belong to the same regional group and 0 otherwise. The estimated coefficient will then tell us how much of the trade within each region can be attributed to a special regional effect. Again, note that the free trade area (FTA) is correlated with geographical proximity. Despite this correlation, the regression analysis can still separate out the independent effects of each on trade, providing we have not omitted any correlated factors from the list of explanatory variables.

To judge which group we should include in our analysis, we must decide whether we are interested in the regression results which include these groups. One could argue that dummy variables for all possible groups should be tested, so that the data can decide what questions are important. However, there is the problem that a data set of 50 countries has only so much information to give. Some studies have allowed each country to have its own dummy variable or constant term. This would reflect the possibility that some countries are more open than others to all partners, regardless of whether they share membership in a regional trading arrangement. However, we think that most of the variation in openness may be captured by the effects of income, i.e., richer countries tend to be more open.

Note that the country composition of each region or trade bloc has been kept constant regards to what we aim to consider as members of the same group, ignoring the actual accession date of each member, in order to avoid distortions due to changes in the number of

member countries. Therefore, the EU is held to consist of 14 countries[28] and ASEAN of 10 countries throughout the period of study.

Apart from the inclusion of official preferential trading agreement in our model, we will also include East Asia dummy variable. Over recent decades East Asia, i.e., China, Hong Kong, Japan, South Korea and Taiwan, has demonstrated that it is integrating faster than any other region. The countries in this region are also growing rapidly. While ASEAN has made minimal progress towards economic integration within the last twenty-five years, no serious attempt at regional operation has been successfully made among Ease Asian countries except the proposal of the East Asia Economic Group in 1990 where the membership would have comprised of 5 East Asian countries and ASEAN-5. Later, it was modified to the East Asia Economic Caucus (EAEC) with its focus on the promotion of an open and free global trading system. Therefore, EAEC seems very modest and is not as restrictive as most trading blocs are. All in all, East Asia, for its part, is more like a natural grouping, in which member countries are already each other's main trading partners. With this in mind, the result of the analysis looks very interesting.

Considering the countries included in our analysis, we applied dummy variables for the main preferential trade relations, as follows:

- ASEAN (Association of Southeast Asian Nation)
- EA (East Asia)
- NAFTA (North American Free Trade Area)
- EFTA (European Free Trade Area)
- EU (European Union)

[28] This is EU-15 with the exclusion of Portugal, since it is not included in our set of samples due to the low volume of its bilateral trade with ASEAN.

Table 5.5 below summarises the reciprocal regional integration agreements between the countries included in our analysis.

TABLE 5.5 Regional Groupings

Regional Groupings		
ASEAN	EA	NAFTA
Brunei Cambodia Indonesia Laos Malaysia Myanmar Philippines Singapore Thailand Vietnam	China Hong Kong Japan Korea Republic Taiwan	Canada Mexico United States
EFTA	EU	
Austria Finland Norway Sweden Switzerland	Austria Belgium-Luxembourg Denmark Finland France Germany Greece Ireland Italy The Netherlands Spain Sweden United Kingdom	

We also included an adjacency dummy variable, which takes the value of 1 when the countries have a common border over which to have border trade and 0 otherwise.

5.8 Summary of the Models

The empirical work is based on the following models:

(5.1)	$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(D_{ADJACENTij}) + \Sigma\gamma_k D_{kij} + \mu_{ij}$
(5.2)	$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \Sigma\gamma_k D_{kij} + \mu_{ij}$
(5.3)	$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \Sigma\gamma D_{ijr} + \Sigma\gamma^{EX} D^{EX}_{ijr}) + \Sigma\gamma^{IM} D^{IM}_{ijr} + \mu_{ij}$
(5.4)	$\ln X_{ij} = \alpha + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(POP_i) + \beta_4 \ln(POP_j) + \beta_5 \ln(DIST_{ij}) + \beta_6 \ln(REM_i) + \beta_7 \ln(REM_j) + \beta_8 \ln(D_{ADJACENTij}) + \beta_9 \ln(D_{LANGij}) + \beta_{10} \ln(D_{COLONIALij}) + \Sigma\gamma D_{ijr} + \Sigma\gamma^{EX} D^{EX}_{ijr}) + \Sigma\gamma^{IM} D^{IM}_{ijr} + \mu_{ij}$

In order to estimate the relationship between the trade flows and the various explanatory variables, this analysis will use Ordinary Least Squares regression.

The variables used in the estimation are measured in the following units and at current exchange rates.

TABLE 5.6 Summary of Variables used in the Models

Variable	Symbol	Unit of Measurement
Export	X	Thousand US dollars
Gross Domestic Products	GDP	Thousand US dollars
Population	POP	Million
Distance	DIST	Kilometres
Remoteness	REM	
Adjacency Dummy	$D_{ADJACENT}$	Take value 1 for countries sharing the same land border, or 0 otherwise.
Common Language Dummy	D_{LANG}	Take value 1 for countries sharing the same official language, or 0 otherwise.
Colonial Ties Dummy	$D_{COLONIAL}$	Take value 1 for countries having colonial ties, or 0 otherwise.
Preference Factors:		
1) Association of Southeast Asian Nation	ASEAN	Take value 1 where a preference applies, or 0 otherwise.
2) East Asia	EA	
3) North American Free Trade Area	NAFTA	
4) European Free Trade Area	EFTA	
5) European Union	EU	

The next section will discuss the results of the above regressions.

5.9 Empirical Results

This section examines the estimated gravity models based on the equations in section 5.8. We examine whether the factors indicated in the gravity equations make a significant contribution to an explanation of trade flow within ASEAN.

The estimation results confirm the hypotheses put forward in the analysis. From these estimations, we seek to identify not only the 'level' effect on trade but also the variation of their effects over time, to assess whether any observed 'abnormal' trade are directly associated with preferential trade effects. All regression coefficients have the expected sign and most, including non-dummy and dummy coefficients, are statistically different from zero.

5.9.1 Aggregate Model

We conduct several series of computations. First one was based on the traditional gravity trade equation (equation 5.1) which focuses on the transaction-cost determinants of trade. The others were based on the modified models introduced in part 5.2.2 (equation 5.2-5.4), which, apart from traditional determinants, also include remoteness, language dummy, colonial dummy and dummies whose coefficients capture effects of trade creation and trade diversion as a result of the respective region's economic integration. The estimations have been applied with White's heteroscedasticity corrected standard error, in order to avoid the problem of misspecification. The years considered are 1982, 1987, 1992, 1997, 2002 and 2005. All models use the same set of data and cover the same set of countries.

(1) Traditional Gravity Trade Model

A summary of the results obtained following the estimation of gravity trade equation by using the ordinary least squares regression method is presented in Table 5.7.

The coefficients of GDPs, population and distance variables have expected signs and are significantly different from zero. The proportion of variance explained is also satisfactory. R^2 are in the region of 50-70 per cent. All the F-statistics are overwhelmingly significant; therefore, taken jointly as a set, the coefficients of all variables in the regression have predictive value.

The positive and significant GDP coefficients for both exporting and importing countries suggest that trading partners' incomes strongly influence international trade. The scale of both exporter's and importer's GDP coefficients are approximately 1.00 and hardly change over time.

The negative results in coefficients of the population variables support the view that the higher one country's population, the easier it becomes to achieve minimum efficient scale and, therefore, the less motivated the country becomes to engage in trade, as compared to a less populous country. Note that the absolute value of population coefficients are reducing dramatically over time, thus, population variables become less important in 2005 than in 1982 and 1987.

Regarding the coefficients of the distance variable, they are highly significant and negative; confirming the intuition that trade between any two countries is negatively correlated with the geographical distance between them. The estimated coefficients of the distance variable in 1982 is -0.72. Over the time, its impact increase constantly to -0.95 in 2005. This means that, in 1982, when we hold constant for other variables, if the distance between countries is increased by 1.0 per cent, exports from one country to another falls

nearly three-quarter of a per cent. However, in 2005, when we hold constant for other variables, if the distance between countries is increased by 1.0 per cent, exports from one country to another falls nearly proportionately.

As far as the dummy variables are concerned, the adjacency is highly significant and has a positive sign. This result confirms that sharing the same land border tends to make countries trade more. The coefficients on the dummy variables for a common border (adjacency) were estimated at around 0.14 in 1982 and increased over time to 0.62 in 2005. Since export volume is specified in logarithmic form, the way to interpret the coefficient on a dummy variable is to take the exponent. In 1997, exports from one country to another which shares its common border could be estimated to be 1.8 times of its exports to otherwise similar countries. [exp (0.62) = 1.86].

Regarding the preference variables, the coefficients of dummy variables of ASEAN, EU and NAFTA are all highly significant and show positive signs confirming that countries in the same regional trading association trade more with each other over and above the levels predicted by the basic explanatory variable. However, none of the coefficients for EA are significant while only some of the EFTA are significant. In the EA case, it is possible that East Asian countries are indeed open and does not operate as a trade bloc at all. As for EFTA, the reason for this may be that the selection of countries included in this study does not reflect those two regions very well.

We observe that the size of the coefficients of the ASEAN preference dummy is highest among the preferential coefficients. The high value of this coefficient may suggest that the economic integration effects of the ASEAN are stronger than the other economic integration arrangements in our analysis.

(2) Modified Model: Gravity Trade Model with Remoteness Variables

The summary of results obtained following the estimation of the modified gravity trade model using the Ordinary Least Squares regression method is presented in Table 5.8. All the estimations have acceptable F-Statistics and R^2. The coefficients of GDPs, population, distance and adjacency are all significant, have the correct sign and show similar results to those of previous model (one without remoteness variable). One main difference is the smaller ASEAN dummy coefficient, but it is still remain significantly positive.

As for the remoteness variables themselves, both exporter's and importer's remoteness have positive effect on their bilateral trade flow. Note that the remoteness coefficients of both exporter and importer are increase dramatically from 0.41 and 0.33 in 1997 to 1.66 and 1.01 in 2002.

(3) Modified Model: Gravity Trade Model with Intra- and Extra-region Dummy Variables

The summary of results obtained following the estimation of the modified gravity trade model using the Ordinary Least Squares regression method is presented in Table 5.9. All the estimations have acceptable F-Statistics and R^2. The coefficients of GDPs, population, distance, remoteness and adjacency are all significant and have the correct signs.

The coefficients of GDPs show that exporter's income effect dominates importer's income effect. The coefficients of the distance, remoteness and adjacency variables have similar patterns to those of the previous model, i.e., they increased over time. Note that GDPs population and distance variables show similar impacts than their corresponding counterparts in the previous model, while remoteness shows slightly lower impact.

Concerning the results obtained for the coefficients of the regional dummy variables, most of the ASEAN dummy coefficients are highly significant while none of coefficients of EA trade creation dummy variables are significant.

The positive value of intra-ASEAN dummy variable implies that the intra-regional trade of ASEAN in each corresponding years is larger than the hypothetical trade level predicted by explanatory variables. Therefore, it is possible to say that the intra-regional trade is high and that a trade creation effect exists. Though, their values are decreasing over time, with only a small increase in 2002. This decreasing trend implies a weakening of the trade creation effect. Regarding extra-ASEAN dummy variables, all of extra-ASEAN's export variables are positive and highly significant, implying that there is no trade diversion effect but a trade expansion effect at exporting activities. On the other hand, coefficients of extra-ASEAN's import dummy variables are all negative, although they are only significant in 1997, 2002 and 2005. This result implies that the ASEAN members have switched their import activities from non-member economies to member countries in these periods. Thus, there is trade diversion effect in importing actitivities. In other words, non-members' welfare is reduce. Note that the negative effect of trade diversion in importing activities is generally smaller than the positive effect of trade creation in ASEAN. The results seem to suggest that ASEAN countries retained their openness and outward orientation.

The insignificant of intra-EA dummy coefficients imply that countries in this region did not exhibit any propensity to trade with each other more than the hypothetical level. This result confirms by the positive and highly significant of extra-region dummy variables. It can be said that EA countries are indeed promoting an open and free global trading system.

(4) Modified Model: Gravity Trade Model with Common Language and Colonial Dummy Variables

The summary of results obtained following the estimation of the modified gravity trade model using the Ordinary Least Squares regression method is presented in Table 5.10. All the estimations have acceptable F-Statistics and R^2. The coefficients of GDPs, population, distance and remoteness are all significant and have the correct signs. All of regional dummy variables show similar results as previous estimations. With the inclusion of dummy variables for common language and countries that have colonial-ties, the adjacency variable is no longer significant.

Coefficients of dummy variables for common language are highly significant and have positive sign, confirming our intuition that a pair of countries with the same official language will trade more with each other than a pair that does not use the same language because the cost of doing business will be smaller.

Coefficients of dummy variables for a pair of countries that share colonial-ties (one country have been colonised by another country, e.g., i is UK and j is India, or vice versa) are highly significant and have positive sign, up to 1997 and become insignificant at 5 per cent lever of confident in 2002 and 2005. We have also tried another definition for colonial dummy variable, when we replace a colonial-ties dummy variable with common coloniser dummy variable ($D_{COLONISE}$, both i and j have been colonised by the same coloniser, e.g., both Hong Kong and India have been colonised by UK, thus their common coloniser dummy variable will take a value of 1). The estimation results of this specification are shown in Table 5.11. All other variables show similar outcome. The coefficients for common coloniser dummy variables are all highly significant and have positive sign.

5.9.2 Disaggregate Model.

The estimation results of all specifications at the disaggregate level are very similar regarding the coefficients of traditional variables. Therefore, only the results from the modified model in equation 5.3[29] are reported (Table 5.12-5.46).

(1) GDP and the Population Effects

Across the different products traded, the effects of the exporter GDP and the importer GDP are positive and most of them are statistically significant. Recall that we categorised sectors into homogeneous and differentiated products in accordance with Rauch (1996) as shown in table 5.4.

In general, opposite to the results in aggregate level, importer's income elasticity is larger than own income elasticity of exports. In other words, Country i's bilateral exports are more sensitive to its partner's income than to its own income, with the exception of Grain mill and bakery products, beverages, other food and kindred, textiles products and apparel, leather and leather products, glass products and stone, clay and concrete where, same as aggregate model, its own income has a stronger effect. Note that most of these sectors are natural-resource intensive manufacturing.

Based on the study of Feenstra, Markusen and Rose (1998), our results imply that for the homogeneous sectors, manufacture of food related products and lumber and wood sector

[29] These estimations have been applied with White's correction for heteroscedasticity in order to avoid the problem of misspecification.

have the pattern of reciprocal dumping with free entry, while the rest of homogeneous sectors have the pattern of restricted entry. In addition, most of differentiated sectors have the pattern of national-level product differentiation, with the exception of textile and apparel products, leather and leather products and miscellaneous plastic products that have pattern of monopolistic competition.

Regarding the population variables, in most sectors, the effects of both exporter's and importer's population coefficients is negative and mostly significant. However, the coefficient of exporter's population is positive in drugs and both agricultural and industrial chemicals sectors. The coefficient of importer's population is positive and significant in textile products and apparel, leather and leather products and stone, clay and concrete. In addition, the effects of both exporter's and importer's population in some sectors become positive, instead of negative, in year 1997.

(2) Distance, Adjacency and Remoteness

The coefficients of the distance variable have given significant negative regression coefficients for all the commodity groups. Distance, as indicated earlier, was used as a proxy of transportation costs and, therefore, of the cost of trade. In addition, the estimated regression coefficients show that, in all categories of commodities, distance has a significant impact on trade.

Sectors which seem to have been affected by distance more than the rest continually so their coefficients show higher value than other categories include textile products and apparel, other paper and allied products, soaps, cleaners and toilet goods, miscellaneous

plastic products, motor vehicles and equipment, lumber, wood, furniture and fixtures, metal products, glass products and stone, clay and other non-metallic mineral products.

Obviously, motor vehicles and equipment and stone, clay and other non-metallic mineral products, are bulky. This confirms our hypothesis that the impact of distance on goods in categories of such bulk on the trade should be higher than that of categories which are easier to ship and deliver to the destination countries. In addition, there is no technological development which would have reduced the size of these products; hence it is impossible to save transportation costs in these sectors.

Papers and metal products, even though they are not bulky, are of considerable weight. So their transportation cost per volume would be fairly high if the cost of transport depended on weight rather than volume. Glass products, being fragile, are difficult to transport.

Textile products and apparel, although not bulky in themselves, have high transportation costs per unit in comparison the product's cost if they are shipped in small quantities. Hence, these low cost products are usually exported in large consignments, which puts them into the bulky category.

Categories on which distance generally has a smaller effect include beverages, other food products, electronic components and instruments and apparatus (i.e., medical and photographic instruments). Two of these sectors are food-related categories, which are necessary goods and essential to importers; therefore no matter how distant a trading partner is, if the goods are necessary, importers still have to buy. The remaining two categories are small components, which should be easy to transport and have low transportation costs.

These results are, however, opposite to the findings of Mathur (2000), that foods seem to be more affected by the distance variable than other goods. Mathur posits that maybe this is due to the fact that food products are perishable and need particular care in transportation. In

our finding, however, we think that apart from food being a necessary good, the developments in preserving technology and the expansion of the frozen food business have also lowered the effect of distance on exporting volume.

The adjacency variable is also a proxy of transportation cost. In all categories, its coefficients all have a positive effect and most of them are highly significant. Note that the two sectors which have the highest value of adjacency coefficients are lumber, wood, furniture and fixtures, printing and publishing, farm and garden machinery, motor vehicle and equipments and other transportation equipments. Also note that there are two sector that their adjacency coefficients are not significant, i.e., textile products and apparel and drugs.

Regarding the different impacts of distance on homogeneous and differentiated products, while Hejazi and Trefler (1996) hypothesise that transaction cost are likely to be entirely unimportant for homogeneous goods and to be important for goods with variable quality, our results do not show such pattern.

As for the coefficients of remoteness variables, most of them are significantly positive as expected, with the exception of manufacture of drugs where the importer's remoteness has negative effect on its bilateral trade flow. This possibly due to the reason that the pharmaceutical industry is subject to several patent and copyright issues and the pharmaceutical companies are mostly based in highly developed countries.

(3) Dummies Variables

Our main aim is to focus on the effect of ASEAN. Although not all of its trade creation dummy coefficients are significant. For the sectors that have insignificant result, it implies that in these sectors, ASEAN did not exhibit any propensity to trade with each other more than the level predicted by other gravity variables. In the sectors that show significant

results, they are all have positive signs. For these sectors, we can say that trade creation is exists. The exceptions are both of the primary metal industries where there is negative trade creation.

Regarding trade diversion effect, in many of the sectors, there is no evidence of trade diversion. However, the results are different year by year. There are export trade diversion effect in some sectors, namely, rubber products, miscellaneous plastic products, and household appliance. There is also import trade diversion effect in several sectors.

Note that we have also tried estimating disaggregate model with the inclusion of common language and colonial ties dummy variable. In all sectors, common languages dummy coefficients are significantly positive. On the other hand, all of the colonial ties dummy coefficients are insignificant. When we replace the colonial ties dummy variables with common coloniser dummy variable, however, their coefficients are significantly positive in all sectors. This implies that, for all commodity groups, a country will trade more with one another when they had been colonised by the same coloniser.

5.10 The Distance Parameter

The results in the previous section regarding the impact of distance leads to another intuition that there must be some factors that cause the differences in the estimated distance parameter among the various commodity sectors.

Therefore, in this section, we aim to test our hypothesis that the estimated distance parameter depends on the type of its corresponding commodity. Commodities in the previous section can be divided into two groups, according to how easily that can be transported. The products which are not convenient to transport are commodities which are (1) bulky, such as

motor vehicles, or (2) fragile, such as glass products, or (3) necessary to ship in large consignments in order to keep the cost per unit in comparison the product's cost as low as possible, such as textile products and apparel. Grouping of the product is shown in Table 5.51.

Subsequently, we estimated the following model.

$$M_i = \alpha + \beta I_i$$

Where M_i is the absolute value of distance coefficient from estimation results in the previous section and I_i is a dummy variable which has the value of 1 if the product is inconvenient to transport (category 1) and has the value of 0 otherwise (category 2) and i denotes the categories. We disregard the last two sectors, namely, other manufacturing and non-manufacturing sectors. Therefore we have 33 observations. Using the ordinary least square method, the results are shown in Table 5.52.

Even though the R2 are quite low at 43 per cent for the year 1997 and 35 per cent for the year 1992, their F-statistics are significant. The estimation for the year 1987 has the lowest R2. Both coefficients and are statistically significant at 99 per cent confidence level. The coefficient of dummy variable I has a positive sign, confirming above hypothesis that in the case of products which are inconvenient to transport, the impact of the distance parameter is stronger than the impact of the distance of products in the opposite categories. For example, in 1997, the coefficient of dummy variable I of 0.26 implied that the negative effect of distance between country i and country j on export from country i to country j of sectors in category 1 will be 26 per cent higher than those in category 2. Note that the low correlation in the year 1987 may be because the criteria of categorised products (i.e., whether convenient to transport or not) is somewhat different from the years 1992 and 1997. It would be interesting to see whether the pattern is changed after 1997, since in the new century, technological advances are being made so fast and many household products, such as televisions, computers and

communication devices have been considerably reduced in size. Unfortunately, our data are limited.

5.11 Conclusions and Remarks

In this study, we estimated gravity models of bilateral trade focusing on the ASEAN region at both the aggregate and disaggregate levels. The trade data used in estimating the gravity model are those of 50 countries from 1982 to 2005. The results in this chapter are in broad agreement with most previous studies. The estimated coefficients of the basic determinants of the gravity trade model such as GDP, population and distance between capitals of the trading partners explain trade flow well at both the aggregate level and across different industrial sectors.

In addition, we found that distance has a dominant impact on trade flow and sectors of goods that are inconvenient to transport face a higher distance effect. Our estimates of the effect of ASEAN on the trade flows found that, in most estimation results, it has trade creation effect. However, the disaggregate model shows that there is trade diversion effect in some sectors.

This result suggests that the region is benefit from ASEAN. The challenge to policy makers is to continue to facilitate trade and capital movements among members, thereby reducing the cost of doing business and increasing investments and the aggregated economic activity of the members.

TABLE 5.7 Estimation result based on aggregate data

Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		**1987**		**1992**		**1997**		**2002**		**2005**	
No. of Obs	2116		2156		2231		2196		2164		2135	
C	**-26.35**	***	**-27.31**	***	**-27.36**	***	**-28.5**	***	**-34.17**	***	**-36.17**	***
	(-22.22)		(-24.41)		(-25.39)		(-26.86)		(-32.33)		(-33.17)	
ln GDP_i	**1.16**	***	**1.17**	***	**1.08**	***	**1.12**	***	**1.12**	***	**1.13**	***
	(-32.34)		(-34.02)		(-35.88		(-35.20)		(-32.24)		(-32.76)	
ln GDP_j	**0.86**	***	**0.96**	***	**0.88**	***	**0.92**	***	**1.02**	***	**1.05**	***
	(-24.15)		(-26.58)		(-28.64)		(-32.44)		(-34.37)		(-34.35)	
ln POP_i	**-0.32**	***	**-0.34**	***	**-0.17**	***	**-0.16**	***	**0.02**	**	**0.04**	
	(-8.34)		(-9.09)		(-5.05)		(-4.94)		(-0.53)		(-1.12)	
ln POP_j	**-0.11**	***	**-0.19**	***	**-0.11**	***	**-0.12**	***	**-0.09**	***	**-0.07**	***
	(-2.97)		(-5.22)		(-3.36)		(-3.63)		(-2.95)		(-2.20)	
ln $DIST_{ij}$	**-0.72**	***	**-0.78**	***	**-0.81**	***	**-0.89**	***	**-0.98**	***	**-0.95**	***
	(-11.07)		(-12.82)		(-13.36)		(-15.11)		(-21.61)		(-22.40)	
$D_{ADJACENT}$	**0.14**		**0.41**	**	**0.48**	***	**0.45**	***	**0.59**	***	**0.62**	***
	(-0.72)		(-2.29)		(-2.82)		(-2.97)		(-4.06)		(-4.59)	
D_{ASEAN}	**1.27**	***	**1.30**	***	**1.16**	***	**1.06**	***	**1.31**	***	**1.65**	***
	(-3.68)		(-3.99)		(-4.12)		(-4.18)		(-4.32)		(-6.24)	
D_{EA}	**0.44**		**0.43**		**0.42**	*	**0.32**	*	**0.36**		**0.72**	
	(-1.47)		(-1.52)		(-1.78)		(-1.90)		(-0.71)		(-1.50)	
D_{EU}	**0.90**	***	**0.71**	***	**0.67**	***	**0.44**	***	**-0.39**	***	**-0.51**	***
	(-5.85)		(-4.46)		(-3.96)		(-2.69)		(-3.32)		(-4.49)	
D_{EFTA}	**0.42**	**	**-0.1**		**-0.08)**		**-0.27**	*	**-0.18**		**-0.27**	*
	(-2.3)		(-0.73)		(-0.63)		(-1.75)		(-1.27)		(-1.78)	
D_{NAFTA}	**0.73**	***	**0.59**	**	**0.59**	**	**0.70**	**	**-0.35**		**-0.36**	
	(-2.86)		(-2.15)		(-2.10)		(-2.13)		(-1.09)		(-1.08)	
R^2	**0.53**		**0.58**		**0.59**		**0.61**		**0.67**		**0.69**	
Adjusted R^2	**0.53**		**0.58**		**0.59**		**0.61**		**0.67**		**0.69**	
F-Value	213.63	***	268.07	***	288.88	***	312.63	***	394.72	***	437.82	***

Notes: Estimation is by ordinary least square.
t-statistic are in parentheses where,
* denotes Significant at 0.90 level,
** denotes Significant at 0.95 level,
*** denotes Significant at 0.99 level.

TABLE 5.8 Estimation result based on aggregate data with Remoteness variables

Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		**1987**		**1992**		**1997**		**2002**		**2005**	
No. of Obs	2116		2156		2231		2196		2164		2135	
C	**-31.81**	***	**-33.46**	***	**-32.66**	***	**-33.77**	***	**-59.27**	***	**-57.63**	***
	(-23.33)		(-25.73)		(-27.21)		(-28.03)		(-20.13)		(-21.00)	
ln GDP_i	**1.21**	***	**1.19**	***	**1.09**	***	**1.12**	***	**1.30**	***	**1.23**	***
	(33.14)		(34.62)		(36.07)		(35.20)		(32.65)		(34.02)	
ln GDP_j	**0.87**	***	**0.99**	***	**0.88**	***	**0.92**	***	**1.10**	***	**1.10**	***
	(24.25)		(27.41)		(29.20)		(32.96)		(30.03)		(33.26)	
ln POP_i	**-0.36**	***	**-0.35**	***	**-0.18**	***	**-0.17**	***	**-0.09**	**	**-0.05**	
	(-9.02)		(-9.33)		(-5.33)		(-5.10)		(-2.47)		(-1.47)	
ln POP_j	**-0.11**	***	**-0.21**	***	**-0.11**	***	**-0.12**	***	**-0.13**	***	**-0.10**	***
	(-2.97)		(-5.76)		(-3.49)		(-3.71)		(-3.88)		(-3.24)	
ln $DIST_{ij}$	**-0.83**	***	**-0.89**	***	**-0.92**	***	**-0.99**	***	**-1.27**	***	**-1.28**	***
	(-13.41)		(-15.47)		(-15.96)		(-18.15)		(-23.44)		(-21.92)	
ln REM_i	**0.50**	***	**0.38**	***	**0.42**	***	**0.41**	***	**1.66**	***	**1.47**	***
	(8.27)		(6.64)		(8.99)		(8.32)		(9.74)		(8.88)	
ln REM_j	**0.21**	***	**0.43**	***	**0.33**	***	**0.33**	***	**1.01**	***	**1.05**	***
	(3.48)		(8.46)		(6.45)		(6.38)		(4.92)		(5.14)	
$D_{ADJACENT}$	**0.06**		**0.33**	**	**0.41**	**	**0.38**	**	**0.32**	**	**0.33**	**
	(0.31)		(1.90)		(2.44)		(2.57)		(2.16)		(2.40)	
D_{ASEAN}	**1.04**	***	**1.01**	***	**0.86**	***	**0.77**	***	**0.41**	***	**0.68**	***
	(3.05)		(3.16)		(3.10)		(3.09)		(1.29)		(2.40)	
D_{EA}	**0.25**		**0.14**		**0.14**		**0.09**		**-0.53**		**-0.13**	
	(1.19)		(0.68)		(1.02)		(0.87)		(-0.96)		(-0.24)	
D_{EU}	**0.95**	***	**0.77**	***	**0.75**	***	**0.50**	***	**-0.40**	***	**-0.50**	***
	(6.37)		(4.90)		(4.46)		(3.07)		(-3.30)		(-4.27)	
D_{EFTA}	**0.53**	***	**0.01**		**0.04**		**-0.17**		**0.04**		**-0.06**	
	(2.90)		(0.07)		(0.27)		(-1.07)		(0.22)		(-0.37)	
D_{NAFTA}	**0.70**	***	**0.56**	**	**0.58**	**	**0.69**	**	**-0.23**		**-0.73**	**
	(2.83)		(2.10)		(2.09)		(2.13)		(-0.79)		(-2.14)	
R^2	**0.54**		**0.59**		**0.60**		**0.62**		**0.69**		**0.71**	
Adjusted R^2	**0.54**		**0.59**		**0.60**		**0.62**		**0.68**		**0.71**	
F-Value	190.08	***	239.81	***	255.18	***	274.64	***	360.54	***	397.92	***

Notes: Estimation is by ordinary least square.
t-statistic are in parentheses where,
* denotes Significant at 0.90 level,
** denotes Significant at 0.95 level,
*** denotes Significant at 0.99 level.

TABLE 5.9 Estimation results of the Modified Model based on aggregate data

Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		1987		1992		1997		2002		2005	
No. of Obs	2116		2156		2231		2196		2164		2134	
C	**-30.37**	***	**-29.59**	***	**-28.98**	***	**-30.79**	***	**-48.25**	***	**-51.81**	***
	(-19.25)		(-19.37)		(-20.85)		(-22.45)		(-16.22)		(-20.62)	
ln GDP_i	**1.26**	***	**1.26**	***	**1.05**	***	**1.02**	***	**1.37**	***	**1.34**	***
	(24.38)		(23.89)		(20.41)		(21.29)		(24.01)		(24.92)	
ln GDP_j	**0.81**	***	**0.99**	***	**0.86**	***	**0.89**	***	**1.04**	***	**1.10**	***
	(18.98)		(21.01)		(21.59)		(24.16)		(23.93)		(28.96)	
ln POP_i	**-0.39**	***	**-0.42**	***	**-0.15**	***	**-0.08**	*	**-0.10**	**	**-0.08**	*
	(-8.11)		(-8.52)		(-3.39)		(-1.87)		(-2.27)		(-1.90)	
ln POP_j	**-0.08**	**	**-0.27**	***	**-0.14**	***	**-0.14**	***	**-0.15**	***	**-0.13**	***
	(-2.06)		(-6.35)		(-3.87)		(-3.91)		(-4.10)		(-4.00)	
ln $DIST_{ij}$	**-0.84**	***	**-0.95**	***	**-0.95**	***	**-1.00**	***	**-1.20**	***	**-1.23**	***
	(-13.44)		(-14.83)		(-15.52)		(-17.48)		(-20.93)		(-22.58)	
ln REM_i	**0.27**	***	**0.16**	**	**0.27**	***	**0.35**	***	**0.69**	**	**0.91**	***
	(3.83)		(2.46)		(5.07)		(6.26)		(2.96)		(4.50)	
ln REM_j	**0.22**	***	**0.23**	***	**0.23**	***	**0.25**	***	**0.67**	***	**0.69**	***
	(3.22)		(4.15)		(4.13)		(4.64)		(2.89)		(3.73)	
$D_{ADJACENT}$	**0.27**		**0.37**	**	**0.43**	**	**0.42**	***	**0.46**	***	**0.42**	***
	(1.35)		(2.11)		(2.58)		(2.66)		(3.00)		(2.94)	
D_{ASEAN}	**1.70**	***	**1.35**	***	**0.81**	***	**0.65**	**	**1.08**	***	**0.23**	
	(4.82)		(4.23)		(2.64)		(2.26)		(3.30)		(0.83)	
D^{ex}_{ASEAN}	**0.93**	***	**0.62**	***	**0.34**	**	**0.50**	***	**1.15**	***	**1.14**	***
	(5.59)		(3.96)		(2.20)		(3.18)		(7.70)		(8.33)	
D^{im}_{ASEAN}	**-0.20**		**0.07**		**-0.17**		**-0.24**	**	**-0.30**	***	**-0.44**	***
	(-1.55)		(0.57)		(-1.44)		(-2.14)		(-2.66)		(-4.20)	
D_{EA}	**0.37**		**0.24**		**0.27**		**0.20**		**-0.13**		**0.10**	
	(1.06)		(0.90)		(1.13)		(1.00)		(-0.23)		(0.19)	
D^{ex}_{EA}	**1.63**	***	**1.10**	***	**1.28**	***	**1.14**	***	**0.59**	***	**0.84**	***
	(11.12)		(6.83)		(9.33)		(8.90)		(4.12)		(6.29)	
D^{im}_{EA}	**0.73**	***	**1.04**	***	**0.85**	***	**0.78**	***	**0.56**	***	**0.46**	***
	(4.38)		(7.26)		(6.02)		(5.63)		(3.67)		(3.28)	
D_{EU}	**1.50**	***	**0.63**	***	**0.98**	***	**1.00**	***	**-0.57**	***	**-0.81**	***
	(7.40)		(2.87)		(4.13)		(4.67)		(-2.62)		(-4.02)	
D^{ex}_{EU}	**0.74**	***	**0.16**		**0.53**	***	**0.96**	***	**-0.02**		**-0.05**	
	(4.98)		(1.04)		(3.17)		(6.67)		(-0.12)		(-0.29)	
D^{im}_{EU}	**0.74**	***	**0.09**		**0.21**		**0.34**	**	**0.01**		**-0.28**	**
	(5.01)		(0.58)		(1.40)		(2.50)		(0.06)		(-2.09)	
D_{EFTA}	**0.98**	***	**-0.24**		**0.21**		**0.29**		**-0.21**		**-0.39**	*
	(4.40)		(-1.16)		(0.96)		(1.42)		(-0.87)		(-1.67)	
D^{ex}_{EFTA}	**0.33**	**	**-0.39**	**	**0.12**		**0.53**	***	**0.21**		**0.24**	
	(2.11)		(-2.33)		(0.67)		(3.37)		(1.24)		(1.41)	
D^{im}_{EFTA}	**-0.05**		**-0.77**	***	**-0.62**	***	**-0.77**	***	**-0.67**	***	**-0.88**	***
	(-0.29)		(-4.50)		(-3.66)		(-4.93)		(-3.88)		(-5.50)	
D_{NAFTA}	**1.40**	***	**0.61**	*	**1.10**	***	**1.44**	***	**-0.48**		**-0.58**	
	(4.31)		(1.78)		(3.19)		(4.02)		(-1.08)		(-1.27)	
D^{ex}_{NAFTA}	**0.14**		**-0.30**		**-0.22**		**0.01**		**-1.37**	***	**-1.06**	***
	(0.65)		(-1.58)		(-1.10)		(0.03)		(-6.17)		(-5.99)	
D^{im}_{NAFTA}	**0.10**		**-0.06**		**0.24**		**0.22**		**0.16**		**0.06**	
	(0.44)		(-0.31)		(1.18)		(1.17)		(0.82)		(0.33)	
R^2	**0.58**		**0.62**		**0.62**		**0.65**		**0.71**		**0.74**	
Adjusted R^2	**0.57**		**0.61**		**0.62**		**0.65**		**0.71**		**0.74**	
F-Value	123.11	***	149.86	***	158.62	***	175.45	***	231.04	***	262.23	***

Notes: See Table 5.7

TABLE 5.10 Estimation results of the Modified Model based on aggregate data
Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		1987		1992		1997		2002		2005	
No. of Obs	2116		2156		2231		2196		2164		2134	
C	**-31.24**	***	**-30.44**	***	**-29.59**	***	**-30.78**	***	**-45.75**	***	**-47.70**	***
	(-20.11)		(-20.56)		(-22.31)		(-23.35)		(-16.52)		(-20.22)	
ln GDP$_i$	**1.26**	***	**1.26**	***	**1.07**	***	**1.03**	***	**1.37**	***	**1.39**	***
	(25.04)		(24.90)		(21.64)		(22.12)		(24.29)		(25.88)	
ln GDP$_j$	**0.82**	***	**0.99**	***	**0.87**	***	**0.89**	***	**1.03**	***	**1.11**	***
	(19.44)		(21.72)		(22.62)		(25.23)		(24.03)		(29.72)	
ln POP$_i$	**-0.37**	***	**-0.39**	***	**-0.15**	***	**-0.07**	*	**-0.09**	**	**-0.09**	**
	(-7.78)		(-8.44)		(-3.36)		(-1.72)		(-2.11)		(-2.12)	
ln POP$_j$	**-0.06**	*	**-0.25**	***	**-0.13**	***	**-0.13**	***	**-0.14**	***	**-0.14**	***
	(-1.67)		(-6.18)		(-3.73)		(-3.84)		(-3.88)		(-4.15)	
ln DIST$_{ij}$	**-0.81**	***	**-0.92**	***	**-0.91**	***	**-0.97**	***	**-1.14**	***	**-1.10**	***
	(-13.34)		(-14.56)		(-15.30)		(-17.14)		(-20.87)		(-20.67)	
ln REM$_i$	**0.24**	***	**0.14**	**	**0.21**	***	**0.30**	***	**0.47**	**	**0.41**	**
	(3.78)		(2.21)		(4.21)		(5.59)		(2.02)		(1.95)	
ln REM$_j$	**0.19**	***	**0.20**	***	**0.18**	***	**0.20**	***	**0.53**	***	**0.42**	***
	(2.92)		(3.81)		(3.35)		(3.89)		(2.65)		(2.69)	
D$_{ADJACENT}$	**-0.33**	*	**-0.27**		**-0.15**		**-0.07**		**0.19**		**0.23**	
	(-1.61)		(-1.44)		(-0.86)		(-0.44)		(1.20)		(1.59)	
D$_{LANG}$	**1.24**	***	**1.43**	***	**1.42**	***	**1.21**	***	**1.11**	***	**0.97**	***
	(8.95)		(11.68)		(11.97)		(10.63)		(9.95)		(8.64)	
D$_{COLONIAL}$	**1.33**	***	**1.33**	***	**1.51**	***	**1.31**	***	**-0.23**		**-0.29**	*
	(6.48)		(5.58)		(6.61)		(5.87)		(-1.30)		(-1.78)	
D$_{ASEAN}$	**1.86**	***	**1.47**	***	**1.35**	***	**1.27**	***	**1.24**	***	**0.76**	***
	(5.35)		(4.67)		(4.80)		(4.94)		(3.87)		(3.32)	
D$^{ex}_{ASEAN}$	**0.91**	***	**0.59**	***	**0.54**	***	**0.60**	***	**1.18**	***	**1.58**	***
	(5.62)		(3.93)		(3.81)		(4.14)		(7.92)		(5.72)	
D$^{im}_{ASEAN}$	**-0.18**		**0.10**		**-0.08**		**-0.16**		**-0.29**	***	**1.23**	***
	(-1.40)		(0.82)		(-0.72)		(-1.49)		(-2.64)		(8.94)	
D$_{EA}$	**0.30**		**0.16**		**0.19**		**0.13**		**-0.13**		**-0.38**	***
	(1.05)		(0.80)		(1.13)		(0.95)		(-0.26)		(-3.68)	
D$^{ex}_{EA}$	**1.64**	***	**1.10**	***	**1.37**	***	**1.22**	***	**0.57**	***	**0.27**	
	(11.76)		(7.16)		(10.39)		(10.04)		(4.12)		(0.56)	
D$^{im}_{EA}$	**0.75**	***	**1.05**	***	**0.85**	***	**0.79**	***	**0.55**	***	**0.83**	***
	(4.66)		(7.68)		(6.40)		(6.01)		(3.70)		(6.23)	
D$_{EU}$	**1.60**	***	**0.75**	***	**1.09**	***	**1.12**	***	**-0.56**	***	**0.40**	***
	(8.10)		(3.53)		(4.72)		(5.31)		(-2.64)		(2.91)	
D$^{ex}_{EU}$	**0.67**	***	**0.09**		**0.47**	***	**0.91**	***	**-0.08**		**-0.84**	***
	(4.60)		(0.59)		(2.93)		(6.63)		(-0.48)		(-4.23)	
D$^{im}_{EU}$	**0.66**	***	**0.02**		**0.12**		**0.26**	**	**-0.01**		**-0.15**	
	(4.56)		(0.12)		(0.85)		(2.01)		(-0.07)		(-0.90)	
D$_{EFTA}$	**1.00**	***	**-0.21**		**0.20**		**0.30**		**-0.26**		**-0.27**	**
	(4.03)		(-0.83)		(0.74)		(1.26)		(-1.08)		(-2.08)	
D$^{ex}_{EFTA}$	**0.45**	***	**-0.27**	*	**0.26**		**0.66**	***	**0.19**		**-0.47**	**
	(2.83)		(-1.60)		(1.49)		(4.24)		(1.15)		(-2.01)	
D$^{im}_{EFTA}$	**0.06**		**-0.65**	***	**-0.51**	***	**-0.68**	***	**-0.64**	***	**0.18**	
	(0.37)		(-3.83)		(-3.11)		(-4.37)		(-3.88)		(1.08)	

(Continue)

TABLE 5.10 (Continued) Estimation results of the Modified Model based on aggregate data
Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		1987		1992		1997		2002		2005	
D_{NAFTA}	**1.30**	***	**0.49**		**0.94**	**	**1.35**	***	**-0.66**		**-0.83**	***
	(3.47)		(1.13)		(2.04)		(2.88)		(-1.19)		(-5.38)	
D^{ex}_{NAFTA}	**-0.12**		**-0.57**	***	**-0.46**	**	**-0.17**		**-1.57**	***	**-0.75**	
	(-0.56)		(-3.09)		(-2.43)		(-1.07)		(-7.11)		(-1.34)	
D^{im}_{NAFTA}	**-0.18**		**-0.34**	*	**-0.12**		**-0.08**		**-0.01**		**-1.28**	***
	(-0.86)		(-1.84)		(-0.61)		(-0.44)		(-0.07)		(-7.43)	
R^2	**0.59**		**0.64**		**0.65**		**0.67**		**0.72**		**0.00**	
Adjusted R^2	**0.59**		**0.64**		**0.65**		**0.67**		**0.72**		**0.75**	
F-Value	122.69	***	151.86	***	163.56	***	176.91	***	220.19	***	3.78	***

TABLE 5.11 Estimation results of the Modified Model based on aggregate data
Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		1987		1992		1997		2002		2005	
No. of Obs	2116		2156		2231		2196		2164		2134	
C	**-32.97**	***	**-32.22**	***	**-31.32**	***	**-31.58**	***	**-45.86**	***	**-47.70**	***
	(-20.78)		(-20.86)		(-22.72)		(-23.04)		(-16.69)		(-20.14)	
ln GDP_i	**1.27**	***	**1.27**	***	**1.07**	***	**1.03**	***	**1.40**	***	**1.40**	***
	(24.95)		(24.83)		(21.34)		(21.81)		(25.00)		(26.28)	
ln GDP_j	**0.89**	***	**1.08**	***	**0.97**	***	**0.93**	***	**0.98**	***	**1.06**	***
	(20.70)		(22.95)		(24.96)		(25.22)		(22.56)		(28.32)	
ln POP_i	**-0.37**	***	**-0.39**	***	**-0.14**	***	**-0.06**		**-0.09**	**	**-0.09**	**
	(-7.74)		(-8.32)		(-3.29)		(-1.54)		(-2.17)		(-2.18)	
ln POP_j	**-0.08**	**	**-0.29**	***	**-0.17**	***	**-0.15**	***	**-0.07**	**	**-0.08**	**
	(-2.12)		(-6.99)		(-4.93)		(-4.31)		(-2.01)		(-2.44)	
ln $DIST_{ij}$	**-0.80**	***	**-0.89**	***	**-0.91**	***	**-0.96**	***	**-1.10**	***	**-1.07**	***
	(-12.97)		(-14.11)		(-15.23)		(-16.87)		(-19.79)		(-20.17)	
ln REM_i	**0.26**	***	**0.15**	**	**0.21**	***	**0.29**	***	**0.17**		**0.36**	*
	(3.92)		(2.33)		(4.34)		(5.66)		(1.14)		(1.73)	
ln REM_j	**0.22**	***	**0.21**	***	**0.16**	***	**0.19**	***	**0.38**	*	**0.44**	***
	(3.23)		(3.90)		(3.08)		(3.64)		(1.60)		(2.79)	
$D_{ADJACENT}$	**-0.15**		**-0.16**		**-0.03**		**0.03**		**0.53**	***	**0.20**	
	(-0.77)		(-0.87)		(-0.15)		(0.16)		(2.72)		(1.42)	
D_{LANG}	**1.29**	***	**1.52**	***	**1.49**	***	**1.34**	***	**1.06**	***	**0.98**	***
	(9.05)		(11.31)		(11.31)		(10.58)		(9.44)		(9.02)	
$D_{COLONISE}$	**0.64**	**	**0.56**	**	**0.83**	***	**0.38**		**0.60**	**	**0.86**	***
	(2.13)		(2.35)		(3.55)		(1.48)		(2.21)		(3.77)	
D_{ASEAN}	**1.70**	***	**1.37**	***	**1.20**	***	**1.19**	***	**1.34**	***	**1.68**	***
	(4.92)		(4.42)		(4.36)		(4.63)		(4.19)		(6.08)	
D^{ex}_{ASEAN}	**0.87**	***	**0.56**	***	**0.55**	***	**0.58**	***	**1.16**	***	**1.22**	***
	(5.27)		(3.64)		(3.83)		(3.89)		(7.81)		(8.85)	
D^{im}_{ASEAN}	**-0.27**	**	**0.04**		**-0.15**		**-0.19**	*	**-0.28**	**	**-0.36**	***
	(-2.12)		(0.33)		(-1.28)		(-1.72)		(-2.54)		(-3.47)	
D_{EA}	**0.32**		**0.18**		**0.21**		**0.17**		**0.01**		**0.38**	
	(1.10)		(0.86)		(1.26)		(1.10)		(0.02)		(0.76)	
D^{ex}_{EA}	**1.57**	***	**1.06**	***	**1.34**	***	**1.19**	***	**0.54**	***	**0.83**	***
	(11.00)		(6.81)		(9.91)		(9.56)		(3.88)		(6.26)	
D^{im}_{EA}	**0.56**	***	**0.85**	***	**0.59**	***	**0.66**	***	**0.67**	***	**0.52**	***
	(3.42)		(6.03)		(4.29)		(4.79)		(4.43)		(3.82)	
D_{EU}	**1.46**	***	**0.62**	***	**0.88**	***	**1.04**	***	**-0.32**		**-0.62**	***
	(7.09)		(2.83)		(3.69)		(4.76)		(-1.52)		(-3.12)	
D^{ex}_{EU}	**0.76**	***	**0.22**		**0.62**	***	**1.03**	***	**-0.09**		**-0.16**	
	(5.08)		(1.40)		(3.81)		(7.31)		(-0.56)		(-1.01)	
D^{im}_{EU}	**0.59**	***	**-0.07**		**-0.03**		**0.25**	*	**0.22**		**-0.08**	
	(4.01)		(-0.46)		(-0.20)		(1.83)		(1.46)		(-0.59)	
D_{EFTA}	**0.94**	***	**-0.26**		**0.08**		**0.30**		**0.00**		**-0.25**	
	(4.01)		(-1.12)		(0.35)		(1.31)		(0.01)		(-1.08)	
D^{ex}_{EFTA}	**0.45**	***	**-0.21**		**0.32**	*	**0.68**	***	**0.21**		**0.20**	
	(2.83)		(-1.27)		(1.83)		(4.32)		(1.24)		(1.16)	
D^{im}_{EFTA}	**-0.08**		**-0.83**	***	**-0.77**	***	**-0.78**	***	**-0.36**	**	**-0.58**	***
	(-0.52)		(-4.82)		(-4.57)		(-4.91)		(-2.19)		(-3.84)	

(Continue)

TABLE 5.11 (Continued) Estimation results of the Modified Model based on aggregate data
Dependent Variable: ln X_{ij}

Variable	Coefficient Value											
	1982		1987		1992		1997		2002		2005	
D_{NAFTA}	**1.03**	***	**0.26**		**0.62**		**1.16**	**	**-0.48**		**-0.59**	
	(2.64)		(0.56)		(1.28)		(2.32)		(-0.89)		(-1.07)	
D^{ex}_{NAFTA}	**-0.01**		**-0.47**	***	**-0.36**	*	**-0.12**		**-1.64**	***	**-1.33**	***
	(-0.07)		(-2.65)		(-1.87)		(-0.76)		(-7.50)		(-7.77)	
D^{im}_{NAFTA}	**-0.31**		**-0.51**	***	**-0.35**	*	**-0.16**		**0.14**		**-0.13**	
	(-1.46)		(-2.73)		(-1.85)		(-0.87)		(0.74)		(-0.80)	
R^2	**0.60**		**0.64**		**0.65**		**0.67**		**0.73**		**0.76**	
Adjusted R^2	**0.60**		**0.64**		**0.65**		**0.67**		**0.73**		**0.76**	
F-Value	123.13	***	151.36	***	163.23	***	173.02	***	226.03	***	259.13	***

TABLE 5.12 Estimation results of Sector 1: Grain mill and bakery products
Dependent Variable: ln $X01_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1070		1333		1510	
C	**-7.12**	***	**-11.60**	***	**4.59**	*
	(-2.91)		(-5.53)		(1.79)	
ln GDP_i	**0.48**	***	**0.53**	***	**0.18**	**
	(6.17)		(8.19)		(2.39)	
ln GDP_j	**0.43**	***	**0.42**	***	**0.08**	
	(4.97)		(5.71)		(0.99)	
ln POP_i	**-0.29**	***	**-0.20**	***	**-0.04**	
	(-3.87)		(-3.28)		(-0.63)	
ln POP_j	**0.00**		**0.05**		**-0.01**	
	(-0.06)		(0.70)		(-0.12)	
ln $DIST_{ij}$	**-0.80**	***	**-0.86**	***	**-0.42**	***
	(-8.40)		(-10.00)		(-4.12)	
ln REM_i	**0.06**		**0.18**	*	**-0.04**	
	(0.60)		(1.79)		(-0.30)	
ln REM_j	**0.18**	*	**0.19**	**	**0.03**	
	(1.71)		(2.08)		(0.23)	
$D_{ADJACENT}$	**0.96**	***	**0.64**	**	**0.42**	
	(3.44)		(2.49)		(1.27)	
D_{ASEAN}	**0.55**		**0.88**	**	**0.46**	
	(1.11)		(1.92)		(1.05)	
D^{ex}_{ASEAN}	**0.49**	**	**0.36**		**-0.03**	
	(1.97)		(1.56)		(-0.14)	
D^{im}_{ASEAN}	**-0.12**		**-0.11**		**0.31**	
	(-0.46)		(-0.53)		(1.31)	
D_{EA}	**-0.06**		**-0.10**		**-0.75**	
	(-0.36)		(-0.50)		(-1.09)	
D^{ex}_{EA}	**0.27**		**0.18**		**-0.07**	
	(0.96)		(0.77)		(-0.25)	
D^{im}_{EA}	**-0.56**	**	**-0.40**	**	**-0.33**	
	(-2.30)		(-1.81)		(-1.29)	
D_{EU}	**1.34**	***	**2.10**	***	**-0.22**	
	(3.93)		(6.92)		(-0.52)	
D^{ex}_{EU}	**-0.12**		**-0.25**		**0.18**	
	(-0.53)		(-1.15)		(0.78)	
D^{im}_{EU}	**0.38**	*	**1.08**	***	**0.45**	**
	(1.62)		(4.89)		(2.07)	
D_{EFTA}	**-0.48**		**-0.50**		**-0.06**	
	(-1.38)		(-1.15)		(-0.11)	
D^{ex}_{EFTA}	**-1.09**	***	**-1.12**	***	**-0.55**	*
	(-3.84)		(-4.65)		(-1.82)	
D^{im}_{EFTA}	**-0.77**	***	**-0.66**	***	**-0.25**	
	(-2.98)		(-2.74)		(-0.92)	
D_{NAFTA}	**0.19**		**1.77**	**	**1.51**	
	(0.21)		(2.00)		(1.38)	
D^{ex}_{NAFTA}	**0.79**	***	**0.75**	***	**0.41**	
	(2.74)		(3.23)		(1.43)	
D^{im}_{NAFTA}	**1.08**	***	**1.24**	***	**0.67**	**
	(2.78)		(3.66)		(1.98)	
R^2	**0.33**		**0.38**		**0.05**	
Adjusted R^2	**0.31**		**0.37**		**0.04**	
F-Value	22.10	***	34.68	***	3.52	***

Notes: See Table 5.7

TABLE 5.13 Estimation results of Sector 2: Beverages

Dependent Variable: ln $X02_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1071		1245		1329	
C	**-6.35**	***	**-8.64**	***	**-13.91**	***
	(-2.63)		(-3.85)		(-5.84)	
ln GDP_i	**0.85**	***	**0.72**	***	**0.75**	***
	(11.15)		(10.50)		(11.88)	
ln GDP_j	**0.52**	***	**0.42**	***	**0.63**	***
	(6.54)		(5.39)		(7.95)	
ln POP_i	**-0.52**	***	**-0.39**	***	**-0.36**	***
	(-7.32)		(-5.84)		(-6.17)	
ln POP_j	**-0.43**	***	**-0.25**	***	**-0.41**	***
	(-5.08)		(-3.32)		(-5.80)	
ln $DIST_{ij}$	**-0.59**	***	**-0.64**	***	**-0.71**	***
	(-5.26)		(-6.13)		(-6.66)	
ln REM_i	**-0.05**		**0.04**		**0.18**	*
	(-0.45)		(0.40)		(1.65)	
ln REM_j	**-0.19**	**	**0.05**		**0.15**	
	(-2.06)		(0.54)		(1.52)	
$D_{ADJACENT}$	**1.23**	***	**1.35**	***	**1.41**	***
	(4.26)		(4.95)		(4.68)	
D_{ASEAN}	**0.20**		**0.93**	**	**0.78**	*
	(0.32)		(2.16)		(1.76)	
D^{ex}_{ASEAN}	**0.65**	***	**0.62**	***	**0.70**	***
	(2.60)		(2.59)		(3.06)	
D^{im}_{ASEAN}	**-0.23**		**-0.69**	***	**-0.24**	
	(-1.02)		(-3.04)		(-1.09)	
D_{EA}	**1.89**	***	**2.40**	***	**1.68**	***
	(3.55)		(4.82)		(3.17)	
D^{ex}_{EA}	**0.43**		**0.65**	**	**0.92**	***
	(1.54)		(2.43)		(3.85)	
D^{im}_{EA}	**-0.07**		**-0.12**		**-0.55**	***
	(-0.31)		(-0.51)		(-2.28)	
D_{EU}	**2.07**	***	**2.88**	***	**2.23**	***
	(5.92)		(8.18)		(6.13)	
D^{ex}_{EU}	**-0.56**	**	**0.22**		**0.26**	
	(-2.48)		(1.03)		(1.20)	
D^{im}_{EU}	**0.66**	***	**1.55**	***	**1.43**	***
	(2.98)		(6.69)		(6.54)	
D_{EFTA}	**-2.28**	***	**-0.83**	*	**-1.53**	***
	(-4.00)		(-1.74)		(-2.65)	
D^{ex}_{EFTA}	**-0.79**	***	**-0.36**		**-0.24**	
	(-2.99)		(-1.48)		(-1.01)	
D^{im}_{EFTA}	**-1.82**	***	**-1.13**	***	**-1.35**	***
	(-6.94)		(-4.25)		(-5.26)	
D_{NAFTA}	**2.51**	***	**3.41**	***	**3.26**	***
	(3.74)		(4.98)		(7.17)	
D^{ex}_{NAFTA}	**1.20**	***	**1.26**	***	**1.16**	***
	(4.09)		(4.42)		(4.24)	
D^{im}_{NAFTA}	**0.81**	***	**1.67**	***	**1.23**	***
	(2.84)		(5.52)		(4.33)	
R^2	**0.46**		**0.45**		**0.42**	
Adjusted R^2	**0.45**		**0.44**		**0.41**	
F-Value	39.46	***	44.30	***	41.83	***

Notes: See Table 5.7

TABLE 5.14 Estimation results of Sector 3: Tobacco products

Dependent Variable: ln $X03_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	570		742		788	
C	**12.88**	***	**5.04**		**8.66**	**
	(3.24)		(1.37)		(2.46)	
ln GDP_i	**0.13**		**0.32**	***	**0.29**	***
	(0.99)		(2.89)		(2.70)	
ln GDP_j	**0.29**	**	**0.34**	***	**0.61**	***
	(2.22)		(2.87)		(5.43)	
ln POP_i	**-0.05**		**-0.14**	*	**-0.09**	
	(-0.45)		(-1.28)		(-0.91)	
ln POP_j	**-0.41**	***	**-0.28**	**	**-0.51**	***
	(-3.33)		(-2.48)		(-5.29)	
ln $DIST_{ij}$	**-0.53**	***	**-0.78**	***	**-0.98**	***
	(-4.47)		(-6.04)		(-8.01)	
ln REM_i	**0.13**		**0.02**		**0.03**	
	(0.98)		(0.10)		(0.13)	
ln REM_j	**-0.92**	***	**-0.33**		**-0.87**	***
	(-3.45)		(-1.57)		(-5.95)	
$D_{ADJACENT}$	**0.86**	**	**0.75**	**	**0.62**	*
	(2.20)		(2.03)		(1.88)	
D_{ASEAN}	**1.49**	**	**0.27**		**1.32**	**
	(2.05)		(0.43)		(2.41)	
D^{ex}_{ASEAN}	**0.36**		**0.78**	**	**0.59**	*
	(0.93)		(2.07)		(1.68)	
D^{im}_{ASEAN}	**0.92**	**	**0.64**	*	**0.80**	**
	(2.00)		(1.82)		(2.09)	
D_{EA}	**2.31**	**	**1.59**		**1.86**	**
	(2.50)		(1.55)		(2.44)	
D^{ex}_{EA}	**0.91**	**	**1.00**	**	**1.25**	***
	(2.17)		(2.46)		(3.38)	
D^{im}_{EA}	**-0.30**		**-0.01**		**0.66**	**
	(-0.78)		(-0.02)		(1.65)	
D_{EU}	**1.32**	**	**0.21**		**-0.31**	**
	(2.27)		(0.37)		(-0.63)	
D^{ex}_{EU}	**-0.78**	**	**-1.00**	***	**-0.75**	**
	(-2.13)		(-3.01)		(-2.35)	
D^{im}_{EU}	**-0.39**		**-0.40**		**-0.91**	***
	(-0.92)		(-0.98)		(-2.69)	
D_{EFTA}	**0.31**		**-0.92**		**-2.86**	***
	(0.45)		(-1.21)		(-3.81)	
D^{ex}_{EFTA}	**0.15**		**-1.37**	***	**-1.27**	***
	(0.41)		(-3.50)		(-3.11)	
D^{im}_{EFTA}	**-1.30**	**	**-1.90**	***	**-1.85**	***
	(-2.56)		(-4.10)		(-5.06)	
D_{NAFTA}	**0.36**		**0.16**		**-0.33**	
	(0.33)		(0.14)		(-0.40)	
D^{ex}_{NAFTA}	**0.71**		**-0.40**		**0.04**	
	(1.53)		(-0.89)		(0.11)	
D^{im}_{NAFTA}	**2.44**	***	**1.98**	***	**0.79**	
	(3.30)		(3.63)		(1.47)	
R^2	**0.34**		**0.26**		**0.27**	
Adjusted R^2	**0.31**		**0.24**		**0.25**	
F-Value	12.16	***	11.10	***	12.49	***

Notes: See Table 5.7

TABLE 5.15 Estimation results of Sector 4: Other food and kindred products
Dependent Variable: ln $X04_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1657		1833		1907	
C	**-17.68**	***	**-18.81**	***	**-24.54**	***
	(-8.94)		(-10.29)		(-12.97)	
ln GDP_i	**0.91**	***	**0.87**	***	**0.76**	***
	(13.92)		(15.65)		(14.10)	
ln GDP_j	**0.40**	***	**0.53**	***	**0.66**	***
	(5.61)		(8.51)		(10.75)	
ln POP_i	**-0.37**	***	**-0.37**	***	**-0.19**	***
	(-6.24)		(-7.29)		(-3.72)	
ln POP_j	**0.10**		**0.06**		**0.15**	***
	(1.52)		(1.19)		(2.95)	
ln $DIST_{ij}$	**-0.63**	***	**-0.73**	***	**-0.81**	***
	(-9.51)		(-11.86)		(-12.82)	
ln REM_i	**-0.15**		**0.02**		**0.01**	***
	(-1.51)		(0.24)		(0.14)	
ln REM_j	**0.42**	***	**0.30**	***	**0.43**	
	(4.72)		(2.92)		(3.89)	
$D_{ADJACENT}$	**0.65**	***	**0.75**	***	**1.02**	***
	(3.26)		(3.79)		(5.43)	
D_{ASEAN}	**0.42**		**0.38**		**0.42**	
	(1.12)		(1.12)		(1.30)	
D^{ex}_{ASEAN}	**0.43**	**	**0.52**	***	**0.33**	*
	(2.05)		(2.79)		(1.80)	
D^{im}_{ASEAN}	**-0.60**	***	**-0.57**	***	**-0.78**	***
	(-3.00)		(-3.25)		(-4.40)	
D_{EA}	**0.37**		**0.29**		**0.08**	
	(1.25)		(1.17)		(0.41)	
D^{ex}_{EA}	**0.39**	*	**0.78**	***	**0.78**	***
	(1.79)		(3.89)		(3.77)	
D^{im}_{EA}	**-0.44**	**	**-0.95**	***	**-1.41**	***
	(-2.07)		(-4.98)		(-7.24)	
D_{EU}	**2.13**	***	**1.98**	***	**1.94**	***
	(8.34)		(8.03)		(8.05)	
D^{ex}_{EU}	**-0.01**		**0.38**	**	**0.47**	***
	(-0.06)		(2.25)		(2.90)	
D^{im}_{EU}	**0.82**	***	**0.65**	***	**0.91**	***
	(4.32)		(3.60)		(5.35)	
D_{EFTA}	**-0.07**		**-0.34**		**-0.27**	
	(-0.23)		(-1.21)		(-0.95)	
D^{ex}_{EFTA}	**-0.99**	**	**-0.73**	**	**-0.89**	**
	(-5.01)		(-4.10)		(-4.87)	
D^{im}_{EFTA}	**-0.48**	**	**-0.95**	***	**-0.54**	***
	(-2.18)		(-4.60)		(-2.82)	
D_{NAFTA}	**2.08**	***	**1.75**	*	**1.63**	***
	(5.46)		(3.43)		(4.21)	
D^{ex}_{NAFTA}	**-0.06**		**0.43**		**0.27**	
	(-0.24)		(1.81)		(1.27)	
D^{im}_{NAFTA}	**0.83**	***	**0.10**	***	**0.16**	
	(2.93)		(0.36)		(0.68)	
R^2	**0.40**		**0.45**		**0.46**	
Adjusted R^2	**0.39**		**0.45**		**0.45**	
F-Value	47.48	***	65.01	***	70.11	***

Notes: See Table 5.7

TABLE 5.16 Estimation results of Sector 5: Textile products and other apparel
Dependent Variable: ln $X05_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1697		1909		1960	
C	**-14.79**	***	**-19.49**	***	**-21.45**	***
	(-7.35)		(-11.15)		(-11.68)	
ln GDP_i	**0.97**	***	**0.92**	***	**0.95**	***
	(15.32)		(16.95)		(18.09)	
ln GDP_j	**0.32**	***	**0.35**	***	**0.27**	***
	(4.55)		(6.00)		(4.96)	
ln POP_i	**-0.49**	***	**-0.37**	***	**-0.32**	***
	(-8.55)		(-7.34)		(-6.77)	
ln POP_j	**0.29**	***	**0.37**	***	**0.53**	***
	(4.28)		(7.00)		(10.25)	
ln $DIST_{ij}$	**-1.07**	***	**-1.07**	***	**-1.21**	***
	(-12.29)		(-13.01)		(-14.21)	
ln REM_i	**0.06**		**0.16**	*	**0.08**	
	(0.61)		(1.75)		(0.78)	
ln REM_j	**0.19**	**	**0.31**	***	**0.48**	
	(2.11)		(4.28)		(7.24)	
$D_{ADJACENT}$	**0.18**		**0.02**		**0.18**	
	(0.76)		(0.09)		(0.71)	
D_{ASEAN}	**0.58**		**1.15**	***	**0.04**	
	(1.28)		(2.95)		(0.09)	
D^{ex}_{ASEAN}	**0.10**		**-0.28**		**0.05**	
	(0.52)		(-1.57)		(0.26)	
D^{im}_{ASEAN}	**0.37**	**	**0.09**		**0.00**	
	(2.01)		(0.58)		(0.01)	
D_{EA}	**0.53**		**0.48**		**0.29**	
	(0.97)		(0.90)		(0.61)	
D^{ex}_{EA}	**0.51**	**	**-0.02**		**0.21**	
	(2.33)		(-0.10)		(1.12)	
D^{im}_{EA}	**2.44**	***	**2.30**	***	**2.17**	***
	(12.31)		(12.26)		(12.17)	
D_{EU}	**1.96**	***	**2.00**	***	**2.02**	***
	(7.10)		(7.29)		(7.78)	
D^{ex}_{EU}	**0.25**		**0.43**	**	**0.56**	***
	(1.30)		(2.43)		(3.38)	
D^{im}_{EU}	**0.94**	***	**1.21**	***	**1.56**	***
	(4.72)		(6.49)		(9.27)	
D_{EFTA}	**1.02**	***	**0.69**	**	**0.27**	
	(3.04)		(2.07)		(0.89)	
D^{ex}_{EFTA}	**-0.24**		**-0.33**	*	**-0.47**	**
	(-1.09)		(-1.64)		(-2.48)	
D^{im}_{EFTA}	**-0.01**		**0.20**		**0.26**	
	(-0.05)		(0.98)		(1.41)	
D_{NAFTA}	**0.80**	*	**1.41**	***	**2.13**	***
	(1.72)		(2.65)		(4.10)	
D^{ex}_{NAFTA}	**0.69**	**	**0.60**	**	**0.62**	***
	(2.49)		(2.55)		(2.99)	
D^{im}_{NAFTA}	**0.07**		**-0.06**		**0.23**	
	(0.26)		(-0.24)		(1.05)	
R^2	**0.49**		**0.52**		**0.55**	
Adjusted R^2	**0.48**		**0.51**		**0.54**	
F-Value	69.90	***	88.07	***	101.80	***

Notes: See Table 5.7

TABLE 5.17 Estimation results of Sector 6: Leather and leather products
Dependent Variable: ln $X06_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1353		1574		1690	
C	**-18.25**	***	**-22.76**	***	**-23.41**	***
	(-8.45)		(-11.88)		(-11.71)	
ln GDP_i	**0.97**	***	**0.89**	***	**0.87**	***
	(13.14)		(14.36)		(13.75)	
ln GDP_j	**0.36**	***	**0.31**	***	**0.17**	**
	(4.46)		(4.82)		(2.58)	
ln POP_i	**-0.57**	***	**-0.32**	***	**-0.26**	***
	(-8.93)		(-5.87)		(-4.54)	
ln POP_j	**0.11**	*	**0.27**	***	**0.51**	***
	(1.68)		(4.94)		(9.12)	
ln $DIST_{ij}$	**-0.65**	***	**-0.72**	***	**-0.89**	***
	(-7.54)		(-9.32)		(-11.07)	
ln REM_i	**0.00**	*	**0.12**	***	**0.14**	
	(0.05)		(1.14)		(1.31)	
ln REM_j	**0.48**	***	**0.52**		**0.58**	***
	(5.88)		(7.64)		(7.52)	
$D_{ADJACENT}$	**1.20**	***	**0.72**	***	**0.72**	***
	(4.50)		(2.83)		(3.04)	
D_{ASEAN}	**-0.34**		**0.06**		**-0.05**	
	(-0.70)		(0.14)		(-0.13)	
D^{ex}_{ASEAN}	**0.14**		**-0.07**		**-0.07**	
	(0.61)		(-0.34)		(-0.30)	
D^{im}_{ASEAN}	**0.93**	***	**0.51**	***	**0.20**	
	(4.80)		(3.07)		(1.31)	
D_{EA}	**0.47**		**0.46**		**0.38**	
	(1.05)		(0.98)		(0.81)	
D^{ex}_{EA}	**0.98**	***	**0.18**		**0.50**	**
	(3.82)		(0.73)		(2.18)	
D^{im}_{EA}	**1.32**	***	**1.36**	***	**1.47**	***
	(6.66)		(6.70)		(6.30)	
D_{EU}	**1.62**	***	**1.46**	***	**1.85**	***
	(4.91)		(4.49)		(6.28)	
D^{ex}_{EU}	**0.39**	*	**0.52**	***	**0.53**	***
	(1.82)		(2.61)		(2.81)	
D^{im}_{EU}	**0.80**	***	**0.97**	***	**1.41**	***
	(3.52)		(4.57)		(7.12)	
D_{EFTA}	**0.62**		**0.27**		**0.31**	
	(1.59)		(0.68)		(0.93)	
D^{ex}_{EFTA}	**-0.50**	*	**-0.39**		**-0.38**	
	(-2.17)		(-1.81)		(-1.75)	
D^{im}_{EFTA}	**-0.54**	**	**-0.55**	**	**-0.19**	
	(-2.06)		(-2.26)		(-0.90)	
D_{NAFTA}	**-0.19**		**0.67**		**1.50**	***
	(-0.25)		(1.19)		(3.11)	
D^{ex}_{NAFTA}	**0.69**	**	**0.25**		**0.40**	
	(2.11)		(0.91)		(1.56)	
D^{im}_{NAFTA}	**-1.04**	***	**-0.82**	***	**-0.47**	*
	(-3.36)		(-3.01)		(-1.85)	
R^2	**0.43**		**0.43**		**0.43**	
Adjusted R^2	**0.42**		**0.42**		**0.42**	
F-Value	43.27	***	50.65	***	53.57	***

Notes: See Table 5.7

TABLE 5.18 Estimation results of Sector 7: Pulp, paper and board mills
Dependent Variable: ln $X07_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1173		1373		1413	
C	**-17.17**	***	**-20.70**	***	**-26.06**	***
	(-7.29)		(-9.33)		(-10.76)	
ln GDP_i	**0.44**	***	**0.39**	***	**0.51**	***
	(6.13)		(6.34)		(8.12)	
ln GDP_j	**0.87**	***	**0.89**	***	**1.03**	***
	(9.01)		(10.01)		(12.18)	
ln POP_i	**0.04**		**0.08**		**0.09**	*
	(0.65)		(1.38)		(1.67)	
ln POP_j	**-0.38**	***	**-0.21**	***	**-0.25**	***
	(-4.00)		(-2.90)		(-3.74)	
ln $DIST_{ij}$	**-0.84**	***	**-0.99**	***	**-1.14**	***
	(-8.48)		(-10.53)		(-11.52)	
ln REM_i	**0.32**	***	**0.41**	***	**0.41**	***
	(3.19)		(4.13)		(3.60)	
ln REM_j	**0.06**		**0.14**	*	**0.21**	*
	(0.54)		(1.39)		(1.80)	
$D_{ADJACENT}$	**0.88**	***	**0.51**	**	**0.62**	***
	(3.50)		(2.03)		(2.70)	
D_{ASEAN}	**-0.14**		**-0.93**	**	**0.11**	
	(-0.29)		(-2.02)		(0.28)	
D^{ex}_{ASEAN}	**0.69**	***	**0.76**	***	**0.35**	*
	(3.10)		(3.53)		(1.71)	
D^{im}_{ASEAN}	**-0.27**		**-0.36**	***	**-0.78**	***
	(-1.00)		(-1.46)		(-3.43)	
D_{EA}	**0.12**		**0.07**	***	**-0.05**	
	(0.42)		(0.26)		(-0.55)	
D^{ex}_{EA}	**0.73**	***	**0.75**	***	**0.30**	
	(2.73)		(2.97)		(1.04)	
D^{im}_{EA}	**-0.49**	*	**-0.68**	***	**-1.15**	***
	(-1.80)		(-3.04)		(-5.24)	
D_{EU}	**1.04**	***	**1.49**	***	**0.86**	***
	(2.94)		(4.11)		(2.68)	
D^{ex}_{EU}	**0.63**	***	**0.54**	***	**0.35**	*
	(2.59)		(2.35)		(1.61)	
D^{im}_{EU}	**-0.27**		**0.30**	***	**0.43**	**
	(-1.11)		(1.21)		(1.99)	
D_{EFTA}	**1.25**	***	**1.88**	***	**1.34**	***
	(2.82)		(4.23)		(3.38)	
D^{ex}_{EFTA}	**-0.08**		**-0.40**	**	**-0.71**	**
	(-0.29)		(-1.55)		(-3.00)	
D^{im}_{EFTA}	**1.05**	***	**1.59**	***	**1.55**	***
	(3.82)		(6.02)		(6.61)	
D_{NAFTA}	**2.29**	***	**2.47**	***	**1.90**	***
	(3.66)		(3.66)		(2.90)	
D^{ex}_{NAFTA}	**0.22**		**0.27**	***	**0.02**	
	(0.67)		(0.97)		(0.09)	
D^{im}_{NAFTA}	**1.61**	***	**1.58**	***	**1.36**	***
	(4.53)		(4.22)		(4.32)	
R^2	**0.42**		**0.43**		**0.46**	
Adjusted R^2	**0.41**		**0.42**		**0.46**	
F-Value	35.80	***	45.06	***	52.39	***

Notes: See Table 5.7

TABLE 5.19 Estimation results of Sector 8: Other paper and allied products
Dependent Variable: ln $X08_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1173		1382		1510	
C	**-14.17**	***	**-16.71**	***	**-17.11**	***
	(-6.13)		(-9.01)		(-8.90)	
ln GDP_i	**0.59**	***	**0.56**	***	**0.61**	***
	(8.79)		(10.47)		(11.15)	
ln GDP_j	**0.89**	***	**0.74**	***	**0.56**	***
	(11.45)		(11.22)		(8.76)	
ln POP_i	**-0.29**	***	**-0.21**	***	**-0.11**	**
	(-4.86)		(-3.93)		(-2.23)	
ln POP_j	**-0.48**	***	**-0.25**	***	**-0.12**	*****
	(-6.29)		(-4.50)		(-2.36)	
ln $DIST_{ij}$	**-0.94**	***	**-1.03**	***	**-1.23**	***
	(-9.21)		(-13.18)		(-15.76)	
ln REM_i	**0.09**		**0.27**	**	**0.42**	***
	(0.77)		(2.48)		(3.90)	
ln REM_j	**0.26**	***	**0.35**	***	**0.38**	***
	(3.61)		(5.64)		(6.13)	
$D_{ADJACENT}$	**1.07**	***	**1.12**	***	**0.87**	***
	(3.96)		(5.27)		(3.69)	
D_{ASEAN}	**-0.04**		**-0.32**	**	**0.24**	
	(-0.10)		(-0.79)		(0.68)	
D^{ex}_{ASEAN}	**0.61**	***	**0.52**	***	**0.23**	
	(2.76)		(2.80)		(1.30)	
D^{im}_{ASEAN}	**0.51**	**	**-0.28**	**	**-0.42**	**
	(2.44)		(-1.76)		(-2.51)	
D_{EA}	**0.23**		**0.27**	**	**0.21**	
	(0.69)		(0.86)		(0.66)	
D^{ex}_{EA}	**0.20**		**0.28**	**	**-0.19**	
	(0.84)		(1.27)		(-0.87)	
D^{im}_{EA}	**0.96**	***	**1.06**	***	**1.46**	***
	(4.78)		(6.31)		(8.65)	
D_{EU}	**1.33**	***	**1.37**	***	**1.32**	***
	(4.12)		(4.60)		(4.62)	
D^{ex}_{EU}	**0.21**		**0.36**	**	**0.15**	
	(1.03)		(2.03)		(0.89)	
D^{im}_{EU}	**0.59**	***	**0.80**	***	**1.27**	***
	(2.78)		(4.11)		(7.30)	
D_{EFTA}	**0.67**	*	**0.90**	***	**0.70**	**
	(1.81)		(3.01)		(2.20)	
D^{ex}_{EFTA}	**-0.65**	**	**-0.48**	**	**-0.48**	*
	(-2.77)		(-2.44)		(-2.57)	
D^{im}_{EFTA}	**0.26**		**0.38**	**	**0.88**	***
	(1.10)		(1.87)		(4.84)	
D_{NAFTA}	**1.53**	*	**2.65**	***	**3.41**	***
	(1.70)		(3.35)		(5.96)	
D^{ex}_{NAFTA}	**0.56**	**	**0.34**	**	**0.10**	
	(2.02)		(1.44)		(0.53)	
D^{im}_{NAFTA}	**0.49**	*	**1.02**	***	**1.53**	***
	(1.67)		(3.81)		(6.28)	
R^2	**0.46**		**0.49**		**0.51**	
Adjusted R^2	**0.45**		**0.48**		**0.50**	
F-Value	41.94	***	55.87	***	66.07	***

Notes: See Table 5.7

TABLE 5.20 Estimation results of Sector 9: Printing and publishing
Dependent Variable: ln $X09_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1265		1466		1500	
C	**-14.84**	***	**-17.72**	***	**-21.20**	***
	(-7.01)		(-9.29)		(-10.02)	
ln GDP_i	**0.71**	***	**0.69**	***	**0.68**	***
	(11.08)		(12.54)		(11.86)	
ln GDP_j	**1.05**	***	**0.94**	***	**0.97**	***
	(15.02)		(14.15)		(15.22)	
ln POP_i	**-0.36**	***	**-0.25**	***	**-0.14**	***
	(-6.21)		(-4.82)		(-2.73)	
ln POP_j	**-0.72**	***	**-0.62**	***	**-0.51**	***
	(-11.17)		(-10.89)		(-9.39)	
ln $DIST_{ij}$	**-0.96**	***	**-0.98**	***	**-1.13**	***
	(-11.05)		(-12.13)		(-11.65)	
ln REM_i	**0.13**		**0.19**	**	**0.31**	***
	(1.29)		(1.93)		(2.63)	
ln REM_j	**0.08**		**0.26**	***	**0.19**	***
	(1.24)		(4.18)		(2.66)	
$D_{ADJACENT}$	**1.13**	***	**1.03**	***	**1.04**	***
	(4.14)		(4.08)		(4.14)	
D_{ASEAN}	**0.52**		**0.52**		**0.60**	*
	(1.21)		(1.52)		(1.81)	
D^{ex}_{ASEAN}	**0.08**		**0.11**		**0.03**	
	(0.39)		(0.61)		(0.15)	
D^{im}_{ASEAN}	**0.04**		**-0.14**		**-0.22**	
	(0.25)		(-0.81)		(-1.16)	
D_{EA}	**0.15**		**0.25**		**0.18**	
	(0.50)		(0.80)		(0.77)	
D^{ex}_{EA}	**0.20**		**-0.07**		**-0.11**	
	(0.94)		(-0.32)		(-0.42)	
D^{im}_{EA}	**0.95**	***	**1.01**	***	**1.25**	***
	(5.09)		(5.84)		(7.24)	
D_{EU}	**0.99**	***	**1.60**	***	**1.42**	***
	(3.25)		(5.17)		(4.72)	
D^{ex}_{EU}	**-0.24**		**0.17**		**0.23**	*
	(-1.16)		(0.90)		(1.26)	
D^{im}_{EU}	**0.60**	***	**1.12**	***	**1.25**	***
	(3.05)		(5.50)		(6.45)	
D_{EFTA}	**-0.52**		**0.09**		**0.06**	
	(-1.27)		(0.24)		(0.16)	
D^{ex}_{EFTA}	**-0.62**	**	**-0.44**	*	**-0.29**	
	(-2.89)		(-2.06)		(-1.40)	
D^{im}_{EFTA}	**-0.74**	***	**-0.40**	*	**-0.09**	
	(-3.39)		(-1.88)		(-0.46)	
D_{NAFTA}	**1.13**		**2.66**	***	**2.56**	***
	(1.43)		(4.03)		(4.30)	
D^{ex}_{NAFTA}	**0.92**	***	**1.20**	***	**0.85**	***
	(3.65)		(5.30)		(3.74)	
D^{im}_{NAFTA}	**0.74**	***	**1.51**	***	**1.21**	***
	(2.61)		(5.17)		(4.43)	
R^2	**0.51**		**0.53**		**0.53**	
Adjusted R^2	**0.50**		**0.52**		**0.53**	
F-Value	56.02	***	71.30	***	73.43	***

Notes: See Table 5.7

TABLE 5.21 Estimation results of Sector 10: Drugs

Dependent Variable: ln $X10_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1376		1557		1558	
C	**-13.76**	***	**-17.51**	***	**-18.84**	***
	(-7.28)		(-9.80)		(-10.19)	
ln GDP_i	**0.58**	***	**0.58**	***	**0.62**	***
	(9.58)		(11.30)		(11.60)	
ln GDP_j	**0.80**	***	**0.84**	***	**0.83**	***
	(10.90)		(13.50)		(12.36)	
ln POP_i	**-0.11**	**	**-0.04**		**-0.03**	
	(-2.12)		(-0.94)		(-0.53)	
ln POP_j	**-0.35**	***	**-0.20**	***	**-0.21**	***
	(-5.02)		(-3.52)		(-3.66)	
ln $DIST_{ij}$	**-0.84**	***	**-0.91**	***	**-0.96**	***
	(-10.23)		(-11.86)		(-12.90)	
ln REM_i	**0.24**	***	**0.21**	**	**0.33**	***
	(3.26)		(2.52)		(3.97)	
ln REM_j	**-0.25**	***	**-0.35**	***	**-0.35**	***
	(-3.44)		(-4.46)		(-4.91)	
$D_{ADJACENT}$	**0.29**		**0.09**		**0.22**	
	(1.14)		(0.37)		(0.93)	
D_{ASEAN}	**0.68**	*	**0.86**	**	**1.10**	***
	(1.79)		(2.39)		(3.04)	
D^{ex}_{ASEAN}	**0.19**		**0.03**		**-0.07**	
	(1.02)		(0.16)		(-0.42)	
D^{im}_{ASEAN}	**0.08**		**0.15**		**0.10**	
	(0.42)		(0.85)		(0.60)	
D_{EA}	**0.13**		**0.18**		**0.11**	
	(0.42)		(0.56)		(0.76)	
D^{ex}_{EA}	**0.23**		**0.13**		**-0.34**	
	(1.05)		(0.65)		(-1.47)	
D^{im}_{EA}	**0.87**	***	**1.10**	***	**1.11**	***
	(4.34)		(6.25)		(6.22)	
D_{EU}	**1.56**	***	**2.16**	***	**2.58**	***
	(5.22)		(7.07)		(9.58)	
D^{ex}_{EU}	**-0.12**		**0.11**		**0.02**	
	(-0.62)		(0.59)		(0.13)	
D^{im}_{EU}	**1.33**	***	**1.86**	***	**2.37**	***
	(6.89)		(9.42)		(12.30)	
D_{EFTA}	**0.32**		**1.23**	***	**1.40**	***
	(0.78)		(3.14)		(3.55)	
D^{ex}_{EFTA}	**-0.44**	*	**-0.47**	**	**-0.75**	**
	(-1.92)		(-2.26)		(-3.57)	
D^{im}_{EFTA}	**0.27**		**1.19**	***	**1.48**	***
	(1.16)		(5.58)		(6.80)	
D_{NAFTA}	**0.45**		**1.14**	**	**1.72**	***
	(0.96)		(2.51)		(5.54)	
D^{ex}_{NAFTA}	**0.22**		**0.27**		**0.19**	
	(0.85)		(1.11)		(0.80)	
D^{im}_{NAFTA}	**0.71**	***	**0.92**	***	**1.21**	***
	(2.75)		(3.96)		(5.33)	
R^2	**0.47**		**0.53**		**0.56**	
Adjusted R^2	**0.46**		**0.53**		**0.55**	
F-Value	51.39	***	76.40	***	84.02	***

Notes: See Table 5.7

TABLE 5.22 Estimation results of Sector 11: Soaps, cleaners and toilet goods
Dependent Variable: ln $X11_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1117		1389		1457	
C	**-17.90**	***	**-17.00**	***	**-24.34**	***
	(-7.68)		(-8.12)		(-11.60)	
ln GDP_i	**0.76**	***	**0.74**	***	**0.76**	***
	(10.40)		(12.55)		(13.43)	
ln GDP_j	**0.94**	***	**0.74**	***	**0.85**	***
	(12.48)		(11.70)		(13.83)	
ln POP_i	**-0.41**	***	**-0.37**	***	**-0.25**	***
	(-5.92)		(-6.74)		(-4.88)	
ln POP_j	**-0.48**	***	**-0.23**	***	**-0.22**	***
	(-6.83)		(-4.22)		(-4.17)	
ln $DIST_{ij}$	**-1.06**	***	**-1.05**	***	**-1.26**	***
	(-9.38)		(-9.90)		(-11.54)	
ln REM_i	**0.13**		**0.07**		**0.44**	***
	(1.22)		(0.69)		(3.87)	
ln REM_j	**0.40**	***	**0.40**	***	**0.43**	***
	(5.09)		(5.45)		(6.06)	
$D_{ADJACENT}$	**0.91**	***	**0.93**	***	**0.85**	***
	(3.10)		(3.94)		(3.50)	
D_{ASEAN}	**0.07**		**0.71**	*	**1.16**	***
	(0.14)		(1.81)		(3.03)	
D^{ex}_{ASEAN}	**0.62**		**0.59**		**0.19**	
	(2.59)		(2.77)		(0.93)	
D^{im}_{ASEAN}	**0.23**		**-0.27**		**-0.36**	*
	(1.15)		(-1.54)		(-2.08)	
D_{EA}	**0.11**		**0.19**		**-0.01**	
	(0.43)		(0.89)		(-0.10)	
D^{ex}_{EA}	**0.18**		**0.21**		**-0.41**	*
	(0.66)		(0.90)		(-1.62)	
D^{im}_{EA}	**0.64**	***	**0.35**	**	**0.33**	**
	(3.15)		(1.93)		(1.92)	
D_{EU}	**0.69**	**	**1.31**	***	**1.34**	***
	(2.08)		(4.04)		(4.31)	
D^{ex}_{EU}	**-1.05**	***	**-0.63**	***	**-0.88**	***
	(-5.19)		(-3.37)		(-4.90)	
D^{im}_{EU}	**0.83**	***	**1.43**	***	**1.76**	***
	(3.68)		(7.09)		(9.48)	
D_{EFTA}	**-0.86**	**	**-0.59**	*	**-0.65**	*
	(-2.18)		(-1.69)		(-1.72)	
D^{ex}_{EFTA}	**-1.36**	**	**-1.43**	**	**-1.51**	**
	(-5.38)		(-6.06)		(-7.19)	
D^{im}_{EFTA}	**-0.42**	*	**-0.10**		**-0.12**	
	(-1.68)		(-0.43)		(-0.57)	
D_{NAFTA}	**0.01**		**2.01**	***	**1.78**	***
	(0.02)		(3.93)		(3.83)	
D^{ex}_{NAFTA}	**-0.06**		**-0.17**		**-0.28**	
	(-0.20)		(-0.70)		(-1.24)	
D^{im}_{NAFTA}	**0.69**	**	**1.02**	***	**1.16**	***
	(2.18)		(3.71)		(4.63)	
R^2	**0.46**		**0.49**		**0.55**	
Adjusted R^2	**0.45**		**0.48**		**0.54**	
F-Value	40.46	***	56.14	***	75.80	***

Notes: See Table 5.7

TABLE 5.23Estimation results of Sector 12: Agricultural chemicals
Dependent Variable: ln $X12_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1017		1169		1250	
C	**-12.25**	***	**-9.94**	***	**-12.74**	***
	(-4.70)		(-4.39)		(-5.49)	
ln GDP_i	**0.16**	***	**0.15**	**	**0.28**	***
	(1.86)		(2.22)		(4.09)	
ln GDP_j	**0.92**	***	**0.66**	***	**0.63**	***
	(10.17)		(8.92)		(8.14)	
ln POP_i	**0.35**	***	**0.33**	***	**0.21**	***
	(4.77)		(5.23)		(3.32)	
ln POP_j	**-0.51**	***	**-0.20**	***	**-0.02**	
	(-5.96)		(-3.24)		(-0.34)	
ln $DIST_{ij}$	**-0.92**	***	**-0.72**	***	**-0.88**	***
	(-7.85)		(-7.84)		(-9.06)	
ln REM_i	**0.25**	***	**0.12**		**0.18**	*
	(2.69)		(1.22)		(1.60)	
ln REM_j	**-0.07**		**-0.21**	**	**-0.18**	*
	(-0.78)		(-2.18)		(-1.73)	
$D_{ADJACENT}$	**0.89**	***	**0.77**	***	**1.00**	***
	(3.43)		(2.92)		(4.48)	
D_{ASEAN}	**1.35**	**	**0.29**		**0.80**	**
	(2.56)		(0.60)		(2.03)	
D^{ex}_{ASEAN}	**0.12**		**0.44**	*	**0.19**	
	(0.46)		(1.87)		(0.84)	
D^{im}_{ASEAN}	**0.68**	***	**0.32**		**-0.33**	
	(2.58)		(1.34)		(-1.42)	
D_{EA}	**0.51**		**0.06**		**-0.01**	
	(1.23)		(0.70)		(-0.11)	
D^{ex}_{EA}	**0.09**		**0.34**		**0.04**	
	(0.30)		(1.32)		(0.16)	
D^{im}_{EA}	**0.05**		**-0.28**		**-0.38**	*
	(0.20)		(-1.31)		(-1.83)	
D_{EU}	**0.80**	**	**1.52**	***	**1.11**	***
	(2.15)		(4.62)		(3.74)	
D^{ex}_{EU}	**0.11**		**0.48**	**	**-0.14**	
	(0.45)		(2.25)		(-0.66)	
D^{im}_{EU}	**0.06**		**0.10**		**0.51**	**
	(0.28)		(0.43)		(2.42)	
D_{EFTA}	**-1.35**	***	**-0.41**		**-1.45**	***
	(-2.83)		(-0.93)		(-3.12)	
D^{ex}_{EFTA}	**-0.07**		**-0.17**		**-0.98**	**
	(-0.23)		(-0.62)		(-3.58)	
D^{im}_{EFTA}	**-0.86**	***	**-0.23**		**-0.77**	***
	(-3.14)		(-0.91)		(-2.98)	
D_{NAFTA}	**-0.24**		**1.17**	*	**1.55**	**
	(-0.20)		(1.67)		(2.22)	
D^{ex}_{NAFTA}	**-0.01**		**0.17**		**0.24**	
	(-0.02)		(0.55)		(0.83)	
D^{im}_{NAFTA}	**0.27**		**-0.19**		**0.08**	
	(0.70)		(-0.52)		(0.23)	
R^2	**0.36**		**0.31**		**0.35**	
Adjusted R^2	**0.35**		**0.30**		**0.33**	
F-Value	24.49	***	22.28	***	28.21	***

Notes: See Table 5.7

TABLE 5.24 Estimation results of Sector 13: Industrial chemicals and synthetics
Dependent Variable: ln $X13_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1656		1771		1824	
C	**-23.26**	***	**-24.86**	***	**-29.09**	***
	(-12.65)		(-13.99)		(-15.57)	
ln GDP_i	**0.59**	***	**0.67**	***	**0.80**	***
	(10.58)		(12.25)		(14.52)	
ln GDP_j	**1.09**	***	**0.96**	***	**0.95**	***
	(16.33)		(15.30)		(14.28)	
ln POP_i	**0.13**	***	**0.10**	**	**0.02**	
	(2.65)		(2.11)		(0.46)	
ln POP_j	**-0.51**	***	**-0.31**	***	**-0.22**	***
	(-8.06)		(-5.91)		(-4.03)	
ln $DIST_{ij}$	**-1.11**	***	**-1.12**	***	**-1.13**	***
	(-14.02)		(-14.71)		(-16.08)	
ln REM_i	**0.33**	***	**0.41**	***	**0.38**	***
	(4.62)		(5.39)		(4.67)	
ln REM_j	**0.15**	**	**0.04**		**0.20**	***
	(2.00)		(0.58)		(2.99)	
$D_{ADJACENT}$	**0.32**		**0.33**		**0.62**	***
	(1.47)		(1.46)		(2.85)	
D_{ASEAN}	**0.18**		**0.63**	*	**0.30**	
	(0.42)		(1.65)		(0.76)	
D^{ex}_{ASEAN}	**0.66**	***	**0.42**	**	**0.28**	
	(3.48)		(2.25)		(1.59)	
D^{im}_{ASEAN}	**0.17**		**0.38**	**	**0.44**	***
	(1.00)		(2.29)		(2.63)	
D_{EA}	**0.24**		**0.35**		**0.26**	
	(0.69)		(1.08)		(1.02)	
D^{ex}_{EA}	**1.24**	***	**0.79**	***	**0.70**	***
	(6.93)		(4.21)		(3.76)	
D^{im}_{EA}	**0.79**	***	**1.01**	***	**0.80**	***
	(4.35)		(6.19)		(4.50)	
D_{EU}	**1.55**	***	**1.46**	***	**1.42**	***
	(5.86)		(4.75)		(5.12)	
D^{ex}_{EU}	**0.71**	***	**0.79**	***	**0.35**	**
	(4.12)		(4.62)		(2.03)	
D^{im}_{EU}	**0.58**	***	**0.79**	***	**1.16**	***
	(3.35)		(4.12)		(6.60)	
D_{EFTA}	**0.31**		**0.42**		**-0.10**	
	(0.53)		(-0.62)		(-3.05)	
D^{ex}_{EFTA}	**0.11**		**-0.12**		**-0.61**	**
	(0.53)		(-0.62)		(-3.05)	
D^{im}_{EFTA}	**-0.44**	**	**0.09**		**-0.12**	
	(-2.32)		(0.45)		(-0.64)	
D_{NAFTA}	**1.06**	**	**0.96**	**	**0.99**	***
	(2.50)		(1.97)		(2.79)	
D^{ex}_{NAFTA}	**0.47**	**	**0.36**	*	**0.06**	
	(2.05)		(1.63)		(0.25)	
D^{im}_{NAFTA}	**0.82**	***	**0.59**	**	**0.57**	**
	(3.44)		(2.42)		(2.55)	
R^2	**0.55**		**0.55**		**0.53**	
Adjusted R^2	**0.55**		**0.54**		**0.53**	
F-Value	87.57	***	91.65	***	89.35	***

Notes: See Table 5.7

TABLE 5.25 Estimation results of Sector 14: Other chemicals

Dependent Variable: ln $X14_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1442		1635		1738	
C	**-18.19**	***	**-26.87**	***	**-31.02**	***
	(-8.83)		(-15.00)		(-16.67)	
ln GDP_i	**0.58**	***	**0.76**	***	**0.75**	***
	(9.12)		(14.13)		(13.94)	
ln GDP_j	**0.77**	***	**0.86**	***	**0.96**	***
	(11.09)		(14.29)		(14.37)	
ln POP_i	**-0.02**		**-0.12**	*	**-0.04**	
	(-0.44)		(-2.36)		(-0.75)	
ln POP_j	**-0.26**	***	**-0.20**	***	**-0.16**	***
	(-4.13)		(-3.91)		(-3.08)	
ln $DIST_{ij}$	**-0.96**	***	**-0.95**	***	**-1.08**	***
	(-11.33)		(-13.46)		(-14.79)	
ln REM_i	**0.25**	***	**0.36**	***	**0.38**	***
	(2.76)		(4.18)		(4.02)	
ln REM_j	**0.16**	**	**0.28**	***	**0.34**	***
	(2.09)		(3.91)		(4.46)	
$D_{ADJACENT}$	**0.44**	**	**0.45**	**	**0.54**	***
	(1.98)		(2.27)		(2.62)	
D_{ASEAN}	**0.49**		**1.01**	***	**0.87**	**
	(1.14)		(2.75)		(2.38)	
D^{ex}_{ASEAN}	**0.40**	**	**0.26**		**0.00**	
	(2.02)		(1.44)		(0.00)	
D^{im}_{ASEAN}	**-0.07**		**0.08**		**0.06**	
	(-0.39)		(0.47)		(0.39)	
D_{EA}	**0.36**		**0.37**		**0.33**	
	(0.96)		(1.29)		(1.35)	
D^{ex}_{EA}	**0.63**	***	**0.23**		**0.17**	
	(2.88)		(1.07)		(0.84)	
D^{im}_{EA}	**0.87**	***	**0.75**	***	**0.70**	***
	(4.83)		(4.85)		(4.29)	
D_{EU}	**1.67**	***	**1.63**	***	**1.66**	***
	(5.63)		(5.75)		(6.17)	
D^{ex}_{EU}	**0.22**		**0.24**		**0.06**	
	(1.13)		(1.37)		(0.36)	
D^{im}_{EU}	**1.33**	***	**1.49**	***	**1.73**	***
	(6.83)		(7.99)		(9.63)	
D_{EFTA}	**0.56**	*	**0.42**		**0.51**	
	(-2.80)		(-3.72)		(-3.99)	
D^{ex}_{EFTA}	**-0.63**	***	**-0.73**	***	**-0.76**	**
	(-2.80)		(-3.72)		(-3.99)	
D^{im}_{EFTA}	**0.16**		**0.40**	**	**0.55**	***
	(0.73)		(2.08)		(2.88)	
D_{NAFTA}	**1.22**	**	**1.01**	**	**1.19**	***
	(2.29)		(2.07)		(2.96)	
D^{ex}_{NAFTA}	**0.39**		**0.20**		**0.28**	
	(1.57)		(0.98)		(1.40)	
D^{im}_{NAFTA}	**0.51**	*	**0.43**	*	**0.18**	
	(1.82)		(1.77)		(0.76)	
R^2	**0.47**		**0.53**		**0.55**	
Adjusted R^2	**0.46**		**0.52**		**0.54**	
F-Value	53.81	***	78.72	***	89.98	***

Notes: See Table 5.7

TABLE 5.26 Estimation results of Sector 15: Rubber products

Dependent Variable: ln $X15_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1339		1498		1595	
C	**-19.05**	***	**-23.49**	***	**-24.40**	***
	(-9.55)		(-13.22)		(-12.21)	
ln GDP_i	**0.70**	***	**0.64**	***	**0.66**	***
	(11.58)		(11.82)		(12.06)	
ln GDP_j	**0.88**	***	**0.85**	***	**0.86**	***
	(12.08)		(12.86)		(12.75)	
ln POP_i	**-0.33**	***	**-0.25**	***	**-0.17**	***
	(-6.04)		(-4.99)		(-3.69)	
ln POP_j	**-0.34**	***	**-0.15**	***	**-0.12**	**
	(-5.15)		(-2.76)		(-2.28)	
ln $DIST_{ij}$	**-0.75**	***	**-0.83**	***	**-1.01**	***
	(-9.18)		(-10.41)		(-13.05)	
ln REM_i	**0.09**		**0.32**	***	**0.33**	***
	(1.03)		(3.93)		(3.22)	
ln REM_j	**0.25**	***	**0.33**	***	**0.30**	***
	(3.06)		(5.54)		(5.36)	
$D_{ADJACENT}$	**0.63**	***	**0.51**	**	**0.64**	***
	(2.67)		(2.09)		(3.11)	
D_{ASEAN}	**1.38**	***	**1.14**	***	**0.91**	***
	(3.68)		(2.94)		(2.62)	
D^{ex}_{ASEAN}	**-0.04**		**-0.29**	*	**-0.61**	***
	(-0.21)		(-1.67)		(-3.54)	
D^{im}_{ASEAN}	**0.25**		**0.12**		**0.00**	
	(1.27)		(0.67)		(0.02)	
D_{EA}	**0.04**		**0.05**		**0.06**	
	(0.24)		(0.36)		(0.48)	
D^{ex}_{EA}	**-0.16**		**-0.21**		**-0.44**	**
	(-0.72)		(-1.02)		(-2.15)	
D^{im}_{EA}	**0.86**	***	**0.91**	***	**1.23**	***
	(4.09)		(4.95)		(7.05)	
D_{EU}	**1.35**	***	**1.40**	***	**0.89**	***
	(4.93)		(4.46)		(3.06)	
D^{ex}_{EU}	**0.10**		**0.37**	**	**0.27**	
	(0.53)		(2.01)		(1.59)	
D^{im}_{EU}	**0.52**	**	**0.60**	***	**0.74**	***
	(2.57)		(2.95)		(4.08)	
D_{EFTA}	**0.29**		**0.12**		**-0.22**	
	(-2.24)		(-2.20)		(-4.40)	
D^{ex}_{EFTA}	**-0.49**	**	**-0.46**	**	**-0.89**	**
	(-2.24)		(-2.20)		(-4.40)	
D^{im}_{EFTA}	**-0.82**	***	**-0.87**	***	**-0.58**	***
	(-3.68)		(-4.13)		(-3.21)	
D_{NAFTA}	**0.46**		**1.26**	*	**1.97**	***
	(0.38)		(1.73)		(5.28)	
D^{ex}_{NAFTA}	**0.31**		**0.64**	***	**0.37**	*
	(1.17)		(2.67)		(1.68)	
D^{im}_{NAFTA}	**-0.49**	*	**-1.01**	***	**-0.82**	***
	(-1.80)		(-3.89)		(-3.35)	
R^2	**0.46**		**0.47**		**0.49**	
Adjusted R^2	**0.45**		**0.46**		**0.48**	
F-Value	48.57	***	57.53	***	65.86	***

Notes: See Table 5.7

TABLE 5.27 Estimation results of Sector 16: Miscellaneous plastic products
Dependent Variable: ln $X16_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1324		1590		1749	
C	**-18.69**	***	**-22.42**	***	**-23.94**	***
	(-9.52)		(-12.82)		(-13.44)	
ln GDP_i	**0.81**	***	**0.83**	***	**0.85**	***
	(13.43)		(16.01)		(15.99)	
ln GDP_j	**0.73**	***	**0.80**	***	**0.63**	***
	(10.36)		(13.43)		(10.56)	
ln POP_i	**-0.46**	***	**-0.39**	***	**-0.28**	***
	(-8.26)		(-8.07)		(-6.15)	
ln POP_j	**-0.35**	***	**-0.35**	***	**-0.09**	**
	(-5.82)		(-6.71)		(-1.92)	
ln $DIST_{ij}$	**-0.80**	***	**-0.93**	***	**-1.10**	***
	(-9.59)		(-11.94)		(-13.69)	
ln REM_i	**0.03**	***	**0.22**	***	**0.22**	**
	(0.32)		(2.39)		(2.29)	
ln REM_j	**0.65**		**0.60**	**	**0.69**	***
	(8.06)		(9.83)		(11.03)	
$D_{ADJACENT}$	**0.84**	***	**0.76**	***	**0.78**	***
	(3.46)		(3.34)		(3.59)	
D_{ASEAN}	**1.29**	***	**1.39**	***	**0.96**	**
	(2.82)		(3.99)		(2.52)	
D^{ex}_{ASEAN}	**-0.13**	***	**0.00**		**-0.36**	**
	(-0.66)		(-0.02)		(-2.27)	
D^{im}_{ASEAN}	**-0.10**		**-0.33**	**	**-0.82**	***
	(-0.56)		(-2.06)		(-5.30)	
D_{EA}	**0.34**		**0.34**		**0.33**	
	(0.85)		(0.87)		(0.83)	
D^{ex}_{EA}	**-0.02**		**-0.21**		**-0.55**	***
	(-0.10)		(-0.97)		(-2.76)	
D^{im}_{EA}	**1.71**	***	**1.69**	***	**2.26**	***
	(9.10)		(10.12)		(13.90)	
D_{EU}	**2.02**	***	**1.89**	***	**1.87**	***
	(7.28)		(7.18)		(7.68)	
D^{ex}_{EU}	**-0.02**		**0.38**	**	**0.14**	
	(-0.10)		(2.04)		(0.80)	
D^{im}_{EU}	**1.31**	***	**1.05**	***	**1.85**	***
	(6.36)		(5.68)		(11.33)	
D_{EFTA}	**0.87**	***	**0.66**	**	**0.62**	**
	(-2.62)		(-2.69)		(-3.88)	
D^{ex}_{EFTA}	**-0.59**	***	**-0.54**	***	**-0.76**	**
	(-2.62)		(-2.69)		(-3.88)	
D^{im}_{EFTA}	**0.33**		**0.05**	*	**0.80**	***
	(1.50)		(0.26)		(4.64)	
D_{NAFTA}	**1.32**		**2.81**	***	**3.40**	***
	(1.53)		(4.07)		(5.35)	
D^{ex}_{NAFTA}	**0.46**	*	**0.55**	**	**0.16**	
	(1.78)		(2.34)		(0.75)	
D^{im}_{NAFTA}	**0.61**	*	**0.62**	**	**1.48**	***
	(1.87)		(2.55)		(6.61)	
R^2	**0.49**		**0.54**		**0.55**	
Adjusted R^2	**0.49**		**0.53**		**0.54**	
F-Value	55.37	***	78.97	***	90.50	***

Notes: See Table 5.7

TABLE 5.28 Estimation results of Sector 17: Primary metal industries: Ferrous
Dependent Variable: ln $X17_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1313		1497		1563	
C	**-14.10**	***	**-19.32**	***	**-25.34**	***
	(-5.78)		(-8.67)		(-11.38)	
ln GDP_i	**0.48**	***	**0.53**	***	**0.60**	***
	(6.72)		(8.39)		(10.05)	
ln GDP_j	**0.76**	***	**0.93**	***	**0.83**	***
	(8.98)		(11.74)		(11.21)	
ln POP_i	**0.07**		**0.02**		**-0.07**	
	(1.16)		(0.33)		(-1.41)	
ln POP_j	**-0.22**	***	**-0.10**		**0.17**	***
	(-2.81)		(-1.52)		(2.84)	
ln $DIST_{ij}$	**-0.98**	***	**-1.21**	***	**-1.31**	***
	(-9.46)		(-12.30)		(-14.28)	
ln REM_i	**0.08**		**0.30**	**	**0.52**	***
	(0.65)		(2.52)		(4.74)	
ln REM_j	**-0.01**		**-0.16**	*	**0.14**	
	(-0.14)		(-1.67)		(1.33)	
$D_{ADJACENT}$	**0.62**	***	**0.22**		**0.58**	***
	(2.60)		(0.96)		(3.01)	
D_{ASEAN}	**0.23**		**-0.74**	**	**-0.67**	**
	(0.51)		(-2.06)		(-1.87)	
D^{ex}_{ASEAN}	**0.21**		**1.05**	***	**0.76**	***
	(0.95)		(5.20)		(3.74)	
D^{im}_{ASEAN}	**0.03**		**0.26**		**-0.05**	
	(0.15)		(1.17)		(-0.27)	
D_{EA}	**0.14**		**0.39**		**0.16**	
	(0.34)		(1.55)		(0.81)	
D^{ex}_{EA}	**0.71**	***	**0.84**	***	**0.17**	
	(2.83)		(3.70)		(0.75)	
D^{im}_{EA}	**0.91**	***	**-0.04**		**-0.23**	
	(3.88)		(-0.17)		(-1.11)	
D_{EU}	**1.28**	***	**0.58**	*	**0.47**	
	(4.08)		(1.73)		(1.59)	
D^{ex}_{EU}	**-0.15**		**-0.10**		**-0.40**	**
	(-0.67)		(-0.47)		(-2.04)	
D^{im}_{EU}	**0.54**	**	**-0.16**		**0.48**	**
	(2.40)		(-0.71)		(2.43)	
D_{EFTA}	**0.67**	**	**0.25**		**0.26**	
	(-1.80)		(-3.14)		(-4.88)	
D^{ex}_{EFTA}	**-0.46**	*	**-0.80**	***	**-1.10**	***
	(-1.80)		(-3.14)		(-4.88)	
D^{im}_{EFTA}	**-0.07**		**-0.47**	**	**0.32**	
	(-0.30)		(-1.98)		(1.48)	
D_{NAFTA}	**1.48**	***	**0.44**		**1.24**	***
	(4.11)		(0.64)		(2.99)	
D^{ex}_{NAFTA}	**0.85**	***	**0.63**	**	**0.90**	***
	(2.83)		(2.24)		(3.87)	
D^{im}_{NAFTA}	**-0.13**		**-0.89**	***	**-0.45**	*
	(-0.41)		(-3.10)		(-1.71)	
R^2	**0.38**		**0.40**		**0.44**	
Adjusted R^2	**0.37**		**0.39**		**0.43**	
F-Value	34.86	***	43.35	***	51.76	***

Notes: See Table 5.7

TABLE 5.97 Estimation results of Sector 18: Primary metal industries: Nonferrous
Dependent Variable: ln $X18_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1471		1660		1709	
C	**-21.02**	***	**-26.60**	***	**-30.02**	***
	(-10.34)		(-14.80)		(-14.67)	
ln GDP_i	**0.74**	***	**0.83**	***	**0.92**	***
	(11.78)		(14.84)		(16.24)	
ln GDP_j	**0.85**	***	**0.94**	***	**1.00**	***
	(11.92)		(15.35)		(14.94)	
ln POP_i	**-0.11**	***	**-0.17**	***	**-0.23**	***
	(-1.93)		(-3.25)		(-4.41)	
ln POP_j	**-0.39**	***	**-0.33**	***	**-0.23**	***
	(-5.75)		(-6.02)		(-4.19)	
ln $DIST_{ij}$	**-0.99**	***	**-1.06**	***	**-1.24**	***
	(-10.66)		(-13.40)		(-14.01)	
ln REM_i	**0.23**	**	**0.28**	***	**0.24**	**
	(2.53)		(3.18)		(2.46)	
ln REM_j	**0.33**	***	**0.44**	***	**0.51**	***
	(4.56)		(6.56)		(7.68)	
$D_{ADJACENT}$	**0.61**	***	**0.79**	***	**0.73**	***
	(2.62)		(3.71)		(3.62)	
D_{ASEAN}	**0.28**		**-0.31**		**-0.71**	**
	(0.58)		(-0.80)		(-1.90)	
D^{ex}_{ASEAN}	**0.62**	***	**1.13**	***	**1.09**	***
	(2.87)		(5.88)		(6.11)	
D^{im}_{ASEAN}	**-0.46**	**	**-0.42**	**	**-0.70**	***
	(-2.33)		(-2.09)		(-3.74)	
D_{EA}	**0.31**		**0.29**		**0.20**	
	(0.93)		(0.98)		(0.76)	
D^{ex}_{EA}	**1.21**	***	**1.31**	***	**1.09**	***
	(5.58)		(6.33)		(5.16)	
D^{im}_{EA}	**0.71**	***	**0.27**	*	**0.30**	*
	(3.76)		(1.60)		(1.61)	
D_{EU}	**0.65**	**	**0.58**	**	**0.17**	
	(2.15)		(2.07)		(0.61)	
D^{ex}_{EU}	**0.13**		**0.54**	***	**0.17**	
	(0.61)		(2.78)		(0.88)	
D^{im}_{EU}	**-0.09**		**-0.16**		**0.16**	
	(-0.46)		(-0.86)		(0.94)	
D_{EFTA}	**0.63**	**	**0.32**		**0.14**	
	(-1.76)		(-1.39)		(-2.74)	
D^{ex}_{EFTA}	**-0.40**	*	**-0.29**		**-0.62**	***
	(-1.76)		(-1.39)		(-2.74)	
D^{im}_{EFTA}	**-0.28**		**-0.37**	*	**0.07**	
	(-1.36)		(-1.88)		(0.37)	
D_{NAFTA}	**2.13**	***	**2.25**	***	**2.36**	***
	(4.03)		(4.00)		(3.72)	
D^{ex}_{NAFTA}	**0.30**		**0.16**		**0.29**	
	(1.16)		(0.65)		(1.25)	
D^{im}_{NAFTA}	**0.88**	***	**0.55**	**	**0.34**	
	(3.12)		(1.93)		(1.36)	
R^2	**0.43**		**0.48**		**0.48**	
Adjusted R^2	**0.42**		**0.48**		**0.48**	
F-Value	47.65	***	66.54	***	68.35	***

Notes: See Table 5.7

TABLE 5.30 Estimation results of Sector 19: Fabricated metal products
Dependent Variable: ln $X19_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1523		1710		1505	
C	**-16.18**	***	**-23.50**	***	**-29.86**	***
	(-8.05)		(-13.07)		(-15.19)	
ln GDP_i	**0.63**	***	**0.74**	***	**0.88**	***
	(10.09)		(14.84)		(15.00)	
ln GDP_j	**0.89**	***	**0.90**	***	**0.89**	***
	(12.62)		(14.38)		(13.87)	
ln POP_i	**-0.26**	***	**-0.24**	***	**-0.25**	***
	(-4.47)		(-5.10)		(-4.51)	
ln POP_j	**-0.41**	***	**-0.22**	***	**-0.10**	**
	(-6.38)		(-4.32)		(-1.89)	
ln $DIST_{ij}$	**-0.86**	***	**-1.07**	***	**-1.15**	***
	(-10.86)		(-14.27)		(-13.61)	
ln REM_i	**0.10**		**0.26**	***	**0.24**	**
	(1.08)		(2.94)		(2.39)	
ln REM_j	**0.21**	***	**0.33**	***	**0.52**	***
	(2.60)		(5.41)		(8.18)	
$D_{ADJACENT}$	**0.99**	***	**0.72**	***	**0.76**	***
	(3.96)		(3.45)		(3.71)	
D_{ASEAN}	**0.55**		**0.37**		**0.23**	
	(1.29)		(1.03)		(0.55)	
D^{ex}_{ASEAN}	**0.44**	**	**0.70**	***	**0.77**	***
	(2.17)		(3.84)		(4.59)	
D^{im}_{ASEAN}	**0.37**	**	**0.15**		**-0.31**	**
	(2.11)		(0.98)		(-2.06)	
D_{EA}	**0.32**		**0.30**		**0.10**	
	(0.80)		(1.01)		(0.65)	
D^{ex}_{EA}	**0.23**		**0.08**		**-0.64**	**
	(0.97)		(0.41)		(-2.54)	
D^{im}_{EA}	**1.89**	***	**1.66**	***	**1.85**	***
	(10.48)		(10.62)		(11.70)	
D_{EU}	**1.74**	***	**1.51**	***	**1.03**	***
	(6.15)		(5.70)		(3.72)	
D^{ex}_{EU}	**0.08**		**0.36**	**	**-0.11**	
	(0.46)		(2.20)		(-0.67)	
D^{im}_{EU}	**1.21**	***	**1.08**	***	**1.53**	***
	(6.11)		(5.94)		(8.23)	
D_{EFTA}	**1.19**	***	**1.01**	***	**0.62**	**
	(-2.52)		(-2.38)		(-4.85)	
D^{ex}_{EFTA}	**-0.53**	**	**-0.43**	**	**-0.93**	***
	(-2.52)		(-2.38)		(-4.85)	
D^{im}_{EFTA}	**0.31**		**0.66**	***	**1.05**	***
	(1.43)		(3.61)		(6.05)	
D_{NAFTA}	**2.08**	***	**2.07**	***	**2.20**	***
	(6.96)		(4.71)		(5.00)	
D^{ex}_{NAFTA}	**0.89**	***	**0.82**	***	**0.02**	
	(3.49)		(3.97)		(0.10)	
D^{im}_{NAFTA}	**0.29**		**0.18**		**0.84**	***
	(1.02)		(0.70)		(3.63)	
R^2	**0.47**		**0.55**		**0.61**	
Adjusted R^2	**0.46**		**0.54**		**0.60**	
F-Value	57.48	***	88.98	***	98.73	***

Notes: See Table 5.7

TABLE 5.31 Estimation results of Sector 20: Farm and garden machinery
Dependent Variable: ln $X20_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	905		1002		1110	
C	**-13.52**	***	**-16.95**	***	**-22.98**	***
	(-5.24)		(-8.27)		(-10.55)	
ln GDP_i	**0.36**	***	**0.44**	***	**0.61**	***
	(4.85)		(6.99)		(9.52)	
ln GDP_j	**1.04**	***	**0.92**	***	**1.05**	***
	(9.72)		(12.33)		(13.75)	
ln POP_i	**-0.06**	***	**-0.03**	***	**-0.05**	***
	(-0.94)		(-0.48)		(-0.88)	
ln POP_j	**-0.62**		**-0.40**		**-0.42**	
	(-5.85)		(-5.48)		(-6.24)	
ln $DIST_{ij}$	**-0.94**	***	**-0.86**	***	**-1.11**	***
	(-8.55)		(-9.64)		(-12.90)	
ln REM_i	**0.02**		**0.10**		**0.18**	
	(0.19)		(1.04)		(1.48)	
ln REM_j	**0.22**	**	**0.05**		**0.08**	
	(2.26)		(0.62)		(0.91)	
$D_{ADJACENT}$	**1.28**	***	**1.19**		**0.79**	***
	(4.80)		(5.65)		(3.71)	
D_{ASEAN}	**-0.27**		**-0.76**	***	**0.09**	
	(-0.55)		(-1.63)		(0.29)	
D^{ex}_{ASEAN}	**0.06**		**0.28**	*	**0.12**	
	(0.25)		(1.31)		(0.63)	
D^{im}_{ASEAN}	**0.14**		**0.22**		**0.27**	
	(0.57)		(0.94)		(1.23)	
D_{EA}	**-0.33**	***	**0.15**		**-0.08**	
	(-3.69)		(0.29)		(-0.84)	
D^{ex}_{EA}	**0.25**		**0.32**		**-0.34**	
	(0.93)		(1.28)		(-1.59)	
D^{im}_{EA}	**0.47**	*	**0.07**		**-0.37**	*
	(1.66)		(0.30)		(-1.81)	
D_{EU}	**1.33**	***	**1.97**		**1.20**	***
	(3.61)		(6.44)		(3.71)	
D^{ex}_{EU}	**0.23**		**0.54**	***	**0.29**	
	(0.91)		(2.59)		(1.49)	
D^{im}_{EU}	**0.86**	***	**1.31**	***	**1.56**	***
	(3.56)		(6.37)		(8.06)	
D_{EFTA}	**-0.20**		**0.40**	***	**0.31**	
	(-0.71)		(-1.18)		(-2.60)	
D^{ex}_{EFTA}	**-0.20**		**-0.28**		**-0.61**	***
	(-0.71)		(-1.18)		(-2.60)	
D^{im}_{EFTA}	**0.01**		**0.09**		**-0.09**	
	(0.03)		(0.38)		(-0.38)	
D_{NAFTA}	**2.36**	***	**1.71**		**1.56**	***
	(4.73)		(2.68)		(2.74)	
D^{ex}_{NAFTA}	**1.04**	***	**0.87**	***	**0.45**	*
	(3.34)		(3.65)		(1.85)	
D^{im}_{NAFTA}	**0.81**	**	**1.12**	***	**1.15**	***
	(2.37)		(3.84)		(4.15)	
R^2	**0.46**		**0.54**		**0.55**	
Adjusted R^2	**0.45**		**0.52**		**0.54**	
F-Value	33.26	***	49.07	***	58.20	***

Notes: See Table 5.7

TABLE 5.32 Estimation results of Sector 21: Construction, mining and materials handling machinery
Dependent Variable: ln $X21_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1315		1463		1598	
C	**-20.39**	***	**-23.31**	***	**-26.94**	***
	(-9.07)		(-12.14)		(-14.14)	
ln GDP_i	**0.46**	***	**0.55**	***	**0.76**	***
	(6.82)		(10.14)		(13.94)	
ln GDP_j	**1.25**	***	**1.30**	***	**1.24**	***
	(15.26)		(19.95)		(18.34)	
ln POP_i	**-0.04**		**-0.07**		**-0.22**	***
	(-0.65)		(-1.35)		(-4.52)	
ln POP_j	**-0.66**	***	**-0.55**	***	**-0.46**	***
	(-8.53)		(-9.59)		(-8.39)	
ln $DIST_{ij}$	**-0.77**	***	**-0.93**	***	**-0.98**	***
	(-9.01)		(-11.94)		(-13.86)	
ln REM_i	**0.13**		**0.21**	**	**0.27**	***
	(1.32)		(2.36)		(3.15)	
ln REM_j	**0.07**		**-0.10**		**-0.07**	
	(0.87)		(-1.30)		(-0.85)	
$D_{ADJACENT}$	**0.81**	***	**0.66**	***	**0.85**	***
	(2.77)		(2.83)		(4.43)	
D_{ASEAN}	**1.91**	***	**1.04**	***	**1.08**	***
	(4.29)		(2.67)		(3.12)	
D^{ex}_{ASEAN}	**-0.14**		**0.26**		**0.62**	***
	(-0.71)		(1.36)		(3.43)	
D^{im}_{ASEAN}	**-0.02**		**0.02**		**0.26**	
	(-0.08)		(0.11)		(1.49)	
D_{EA}	**0.11**		**0.17**		**0.06**	
	(0.56)		(0.75)		(0.31)	
D^{ex}_{EA}	**0.14**		**0.54**	***	**-0.11**	
	(0.59)		(2.73)		(-0.53)	
D^{im}_{EA}	**0.66**	***	**0.93**	***	**1.03**	***
	(3.01)		(5.06)		(5.23)	
D_{EU}	**1.08**	***	**0.53**	*	**0.64**	**
	(3.56)		(1.66)		(2.27)	
D^{ex}_{EU}	**0.12**		**0.00**		**-0.53**	***
	(0.59)		(-0.01)		(-3.15)	
D^{im}_{EU}	**0.57**	***	**0.66**	***	**1.30**	***
	(2.72)		(3.23)		(6.98)	
D_{EFTA}	**0.89**	***	**0.26**		**0.19**	
	(-1.54)		(-3.83)		(-5.78)	
D^{ex}_{EFTA}	**-0.37**		**-0.80**	***	**-1.18**	***
	(-1.54)		(-3.83)		(-5.78)	
D^{im}_{EFTA}	**0.13**		**0.37**	*	**1.01**	***
	(0.59)		(1.84)		(5.16)	
D_{NAFTA}	**1.29**	*	**1.54**	***	**1.41**	***
	(1.73)		(3.57)		(4.18)	
D^{ex}_{NAFTA}	**0.69**	**	**0.61**	***	**0.34**	*
	(2.31)		(2.64)		(1.70)	
D^{im}_{NAFTA}	**0.69**	***	**0.33**		**0.72**	***
	(2.79)		(1.28)		(2.87)	
R^2	**0.46**		**0.52**		**0.54**	
Adjusted R^2	**0.45**		**0.52**		**0.53**	
F-Value	48.24	***	68.76	***	79.03	***

Notes: See Table 5.7

TABLE 5.33 Estimation results of Sector 22: Computers and office equipment
Dependent Variable: ln $X22_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1320		1499		1636	
C	**-26.70**	***	**-32.81**	***	**-33.00**	***
	(-11.64)		(-16.05)		(-14.54)	
ln GDP_i	**0.74**	***	**1.00**	***	**1.00**	***
	(10.02)		(15.89)		(14.66)	
ln GDP_j	**1.28**	***	**1.24**	***	**0.98**	***
	(14.72)		(15.99)		(12.13)	
ln POP_i	**-0.30**	***	**-0.45**	***	**-0.41**	***
	(-4.54)		(-8.04)		(-6.56)	
ln POP_j	**-0.87**	***	**-0.78**	***	**-0.44**	***
	(-9.69)		(-10.96)		(-6.25)	
ln $DIST_{ij}$	**-0.72**	***	**-0.67**	***	**-0.80**	***
	(-8.13)		(-7.82)		(-8.85)	
ln REM_i	**0.21**	**	**0.21**	**	**0.24**	**
	(2.15)		(2.14)		(2.09)	
ln REM_j	**0.69**	***	**0.82**	***	**0.93**	***
	(7.89)		(11.64)		(11.02)	
$D_{ADJACENT}$	**0.62**	**	**0.58**	**	**0.30**	
	(2.05)		(2.11)		(1.09)	
D_{ASEAN}	**0.98**		**1.69**	***	**1.94**	***
	(1.50)		(3.13)		(3.85)	
D^{ex}_{ASEAN}	**-0.03**		**-0.12**		**-0.12**	
	(-0.13)		(-0.58)		(-0.59)	
D^{im}_{ASEAN}	**0.21**		**-0.36**	**	**-0.65**	***
	(0.98)		(-1.89)		(-3.03)	
D_{EA}	**0.46**		**0.39**		**0.49**	
	(1.05)		(1.02)		(0.97)	
D^{ex}_{EA}	**0.73**	***	**0.10**		**0.24**	
	(2.88)		(0.42)		(0.88)	
D^{im}_{EA}	**1.66**	***	**1.66**	***	**2.49**	***
	(7.42)		(8.58)		(12.02)	
D_{EU}	**2.40**	***	**1.44**	***	**2.16**	***
	(6.07)		(3.83)		(6.01)	
D^{ex}_{EU}	**0.63**	***	**0.17**		**0.34**	
	(2.67)		(0.76)		(1.47)	
D^{im}_{EU}	**0.87**	***	**0.59**	**	**1.57**	***
	(3.53)		(2.48)		(6.87)	
D_{EFTA}	**0.34**		**-0.60**	*	**0.02**	
	(0.43)		(-2.75)		(-2.48)	
D^{ex}_{EFTA}	**0.11**		**-0.71**	***	**-0.65**	**
	(0.43)		(-2.75)		(-2.48)	
D^{im}_{EFTA}	**-0.51**	*	**-0.95**	***	**0.16**	
	(-1.84)		(-3.78)		(0.67)	
D_{NAFTA}	**3.30**	***	**2.75**	***	**4.12**	***
	(6.04)		(4.39)		(7.26)	
D^{ex}_{NAFTA}	**1.22**	***	**0.43**		**0.54**	*
	(4.06)		(1.43)		(1.87)	
D^{im}_{NAFTA}	**1.56**	***	**1.61**	***	**2.06**	***
	(5.53)		(6.05)		(7.21)	
R^2	**0.47**		**0.49**		**0.45**	
Adjusted R^2	**0.46**		**0.49**		**0.44**	
F-Value	50.33	***	62.77	***	57.03	***

Notes: See Table 5.7

TABLE 5.34 Estimation results of Sector 23: Other non-electrical machinery
Dependent Variable: ln $X23_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1665		1791		1886	
C	**-28.12**	***	**-31.92**	***	**-34.65**	***
	(-14.06)		(-18.08)		(-18.82)	
ln GDP_i	**0.60**	***	**0.69**	***	**0.77**	***
	(10.25)		(13.50)		(15.17)	
ln GDP_j	**1.34**	***	**1.36**	***	**1.30**	***
	(19.48)		(21.66)		(21.72)	
ln POP_i	**-0.02**		**-0.05**		**-0.06**	
	(-0.37)		(-1.10)		(-1.31)	
ln POP_j	**-0.63**	***	**-0.53**	***	**-0.42**	***
	(-9.82)		(-9.76)		(-8.25)	
ln $DIST_{ij}$	**-0.97**	***	**-1.02**	***	**-1.11**	***
	(-12.42)		(-13.59)		(-15.17)	
ln REM_i	**0.33**	***	**0.28**	***	**0.35**	***
	(3.71)		(3.31)		(4.13)	
ln REM_j	**0.37**	***	**0.35**	***	**0.38**	***
	(4.75)		(5.74)		(6.53)	
$D_{ADJACENT}$	**0.49**	**	**0.31**		**0.44**	**
	(2.03)		(1.36)		(2.45)	
D_{ASEAN}	**1.09**	**	**0.96**	***	**0.58**	*
	(2.52)		(2.75)		(1.74)	
D^{ex}_{ASEAN}	**-0.22**		**0.25**		**0.29**	*
	(-1.16)		(1.40)		(1.76)	
D^{im}_{ASEAN}	**-0.13**		**-0.18**		**-0.02**	
	(-0.76)		(-1.13)		(-0.10)	
D_{EA}	**0.29**		**0.32**		**0.27**	
	(1.08)		(1.11)		(1.28)	
D^{ex}_{EA}	**0.49**	**	**0.30**		**-0.13**	
	(2.24)		(1.49)		(-0.62)	
D^{im}_{EA}	**1.34**	***	**1.47**	***	**1.50**	***
	(7.63)		(9.39)		(10.02)	
D_{EU}	**1.47**	***	**1.37**	***	**1.20**	***
	(5.26)		(4.82)		(4.67)	
D^{ex}_{EU}	**0.16**		**0.18**		**0.03**	
	(0.88)		(1.02)		(0.16)	
D^{im}_{EU}	**1.23**	***	**1.35**	***	**1.81**	***
	(6.41)		(6.97)		(10.35)	
D_{EFTA}	**1.08**	***	**0.93**	***	**0.92**	***
	(-1.70)		(-3.37)		(-4.80)	
D^{ex}_{EFTA}	**-0.35**	*	**-0.65**	***	**-0.88**	***
	(-1.70)		(-3.37)		(-4.80)	
D^{im}_{EFTA}	**0.72**	***	**0.99**	***	**1.36**	***
	(3.45)		(4.96)		(7.31)	
D_{NAFTA}	**1.42**	***	**1.99**	**	**1.95**	***
	(3.71)		(4.87)		(5.62)	
D^{ex}_{NAFTA}	**0.52**	**	**0.52**	*	**0.28**	
	(2.24)		(2.34)		(1.33)	
D^{im}_{NAFTA}	**0.34**		**0.44**	***	**0.90**	***
	(1.44)		(1.77)		(4.47)	
R^2	**0.56**		**0.60**		**0.62**	
Adjusted R^2	**0.55**		**0.60**		**0.61**	
F-Value	90.02	***	115.65	***	129.51	***

Notes: See Table 5.7

TABLE 5.35 Estimation results of Sector 24: Household appliances
Dependent Variable: ln $X24_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1222		1452		1523	
C	**-23.86**	***	**-22.48**	***	**-23.42**	***
	(-11.71)		(-13.35)		(-12.31)	
ln GDP_i	**0.77**	***	**0.80**	***	**0.89**	***
	(11.81)		(15.57)		(15.94)	
ln GDP_j	**1.23**	***	**1.02**	***	**0.87**	***
	(16.14)		(15.26)		(12.52)	
ln POP_i	**-0.44**	***	**-0.35**	***	**-0.39**	***
	(-7.40)		(-7.17)		(-7.75)	
ln POP_j	**-0.69**	***	**-0.49**	***	**-0.30**	***
	(-9.50)		(-8.81)		(-5.24)	
ln $DIST_{ij}$	**-0.83**	***	**-0.89**	***	**-1.00**	***
	(-10.50)		(-12.50)		(-13.04)	
ln REM_i	**0.20**	*	**0.20**	**	**0.21**	**
	(1.85)		(2.31)		(2.35)	
ln REM_j	**0.41**	***	**0.27**	***	**0.33**	***
	(5.40)		(4.40)		(4.79)	
$D_{ADJACENT}$	**0.86**	***	**0.80**	***	**0.67**	***
	(3.49)		(3.71)		(3.12)	
D_{ASEAN}	**0.92**	**	**0.99**	***	**0.90**	**
	(2.44)		(2.76)		(2.40)	
D^{ex}_{ASEAN}	**0.13**		**-0.36**	**	**-0.37**	**
	(0.62)		(-2.04)		(-2.10)	
D^{im}_{ASEAN}	**0.30**		**0.23**		**-0.20**	
	(1.46)		(1.37)		(-1.13)	
D_{EA}	**0.28**		**0.30**		**0.24**	
	(0.71)		(0.91)		(0.77)	
D^{ex}_{EA}	**0.24**		**-0.10**		**-0.26**	
	(1.05)		(-0.55)		(-1.26)	
D^{im}_{EA}	**1.86**	***	**1.95**	***	**2.24**	***
	(9.91)		(11.93)		(12.94)	
D_{EU}	**1.12**	***	**0.75**	***	**0.77**	***
	(3.83)		(2.61)		(2.89)	
D^{ex}_{EU}	**0.20**		**0.14**		**-0.31**	*
	(0.98)		(0.76)		(-1.75)	
D^{im}_{EU}	**0.15**		**0.34**	*	**0.95**	***
	(0.70)		(1.74)		(5.19)	
D_{EFTA}	**0.14**		**-0.50**	*	**-0.42**	
	(-1.38)		(-3.97)		(-4.32)	
D^{ex}_{EFTA}	**-0.32**		**-0.77**	***	**-0.89**	***
	(-1.38)		(-3.97)		(-4.32)	
D^{im}_{EFTA}	**-1.04**	***	**-0.97**	***	**-0.44**	**
	(-4.40)		(-4.55)		(-2.10)	
D_{NAFTA}	**-0.94**		**1.14**	*	**1.98**	***
	(-0.85)		(1.71)		(3.33)	
D^{ex}_{NAFTA}	**0.86**	***	**0.36**		**-0.18**	
	(2.84)		(1.48)		(-0.71)	
D^{im}_{NAFTA}	**-0.91**	***	**-0.68**	***	**-0.14**	
	(-3.27)		(-2.67)		(-0.58)	
R^2	**0.51**		**0.55**		**0.51**	
Adjusted R^2	**0.50**		**0.54**		**0.51**	
F-Value	54.20	***	76.10	***	68.57	***

Notes: See Table 5.7

TABLE 5.36 Estimation results of Sector 25: Household audio, video and communications equipment
Dependent Variable: ln $X25_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1502		1676		1778	
C	**-23.76**	***	**-27.49**	***	**-29.09**	***
	(-10.81)		(-14.10)		(-13.13)	
ln GDP_i	**0.63**	***	**0.72**	***	**0.88**	***
	(9.23)		(11.53)		(14.79)	
ln GDP_j	**1.22**	***	**1.11**	***	**0.96**	***
	(15.06)		(15.29)		(13.53)	
ln POP_i	**-0.16**	***	**-0.13**	**	**-0.27**	***
	(-2.63)		(-2.33)		(-4.96)	
ln POP_j	**-0.85**	***	**-0.61**	***	**-0.32**	***
	(-11.48)		(-9.55)		(-5.29)	
ln $DIST_{ij}$	**-0.61**	***	**-0.65**	***	**-0.82**	***
	(-7.31)		(-8.15)		(-9.18)	
ln REM_i	**0.26**	***	**0.32**	***	**0.22**	**
	(2.77)		(3.34)		(1.97)	
ln REM_j	**0.42**	***	**0.39**	***	**0.51**	***
	(4.76)		(5.21)		(6.91)	
$D_{ADJACENT}$	**0.67**	**	**0.15**		**0.24**	
	(2.20)		(0.55)		(1.01)	
D_{ASEAN}	**1.94**	***	**1.18**	**	**1.31**	***
	(4.15)		(2.54)		(3.07)	
D^{ex}_{ASEAN}	**-0.01**		**0.01**		**-0.05**	
	(-0.07)		(0.07)		(-0.27)	
D^{im}_{ASEAN}	**0.28**		**-0.47**	**	**-1.08**	***
	(1.38)		(-2.52)		(-5.67)	
D_{EA}	**0.50**		**0.52**		**0.45**	
	(0.88)		(0.90)		(0.90)	
D^{ex}_{EA}	**0.24**		**-0.10**		**-0.05**	
	(0.92)		(-0.40)		(-0.20)	
D^{im}_{EA}	**2.52**	***	**2.54**	***	**2.52**	***
	(12.05)		(13.62)		(14.23)	
D_{EU}	**1.65**	***	**1.76**	***	**1.58**	***
	(4.66)		(5.30)		(4.97)	
D^{ex}_{EU}	**0.34**		**0.61**	***	**0.25**	
	(1.57)		(2.89)		(1.26)	
D^{im}_{EU}	**0.69**	***	**0.74**	***	**1.34**	***
	(2.97)		(3.24)		(6.37)	
D_{EFTA}	**0.93**	***	**0.99**	***	**0.97**	***
	(0.08)		(-0.02)		(-1.69)	
D^{ex}_{EFTA}	**0.02**		**-0.01**		**-0.37**	*
	(0.08)		(-0.02)		(-1.69)	
D^{im}_{EFTA}	**-0.06**		**0.29**		**1.40**	***
	(-0.24)		(1.22)		(6.37)	
D_{NAFTA}	**1.63**	**	**3.64**	***	**3.87**	***
	(2.25)		(5.73)		(5.88)	
D^{ex}_{NAFTA}	**0.60**	**	**0.34**		**0.24**	
	(2.14)		(1.18)		(0.90)	
D^{im}_{NAFTA}	**0.91**	***	**0.85**	***	**1.40**	***
	(3.04)		(2.97)		(5.28)	
R^2	**0.43**		**0.47**		**0.47**	
Adjusted R^2	**0.43**		**0.47**		**0.46**	
F-Value	49.33	***	64.33	***	67.85	***

Notes: See Table 5.7

TABLE 5.37 Estimation results of Sector 26: Electronic components

Dependent Variable: ln $X26_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1109		1247		1418	
C	**-18.36**	***	**-26.56**	***	**-30.73**	***
	(-5.87)		(-9.67)		(-10.22)	
ln GDP_i	**0.70**	***	**0.84**	***	**0.95**	***
	(7.12)		(9.52)		(10.64)	
ln GDP_j	**0.80**	***	**1.04**	***	**0.96**	***
	(6.79)		(11.01)		(9.49)	
ln POP_i	**-0.31**	***	**-0.37**	***	**-0.29**	***
	(-3.63)		(-4.89)		(-3.75)	
ln POP_j	**-0.60**	***	**-0.63**	***	**-0.51**	***
	(-5.27)		(-7.81)		(-6.32)	
ln $DIST_{ij}$	**-0.61**	***	**-0.72**	***	**-0.89**	***
	(-5.28)		(-6.46)		(-7.64)	
ln REM_i	**0.46**	***	**0.45**	***	**0.36**	**
	(3.12)		(3.64)		(2.37)	
ln REM_j	**0.40**	***	**0.45**	***	**0.70**	***
	(3.66)		(4.61)		(6.56)	
$D_{ADJACENT}$	**1.04**	***	**0.79**	**	**0.03**	
	(3.01)		(2.49)		(0.07)	
D_{ASEAN}	**1.26**		**1.03**	*	**1.60**	***
	(1.54)		(1.65)		(2.60)	
D^{ex}_{ASEAN}	**0.43**		**1.18**	***	**1.08**	***
	(1.36)		(4.25)		(3.79)	
D^{im}_{ASEAN}	**-0.11**		**0.15**		**0.10**	
	(-0.38)		(0.57)		(0.38)	
D_{EA}	**0.57**		**0.70**		**0.69**	
	(1.05)		(1.16)		(1.03)	
D^{ex}_{EA}	**0.77**	**	**1.37**	***	**1.42**	***
	(2.32)		(4.67)		(4.63)	
D^{im}_{EA}	**1.27**	***	**1.45**	***	**1.75**	***
	(4.39)		(5.49)		(6.51)	
D_{EU}	**0.51**		**0.10**		**1.26**	***
	(1.10)		(0.23)		(2.74)	
D^{ex}_{EU}	**0.04**		**0.28**		**0.24**	
	(0.14)		(0.97)		(0.85)	
D^{im}_{EU}	**-0.44**		**-0.44**		**0.46**	*
	(-1.45)		(-1.50)		(1.68)	
D_{EFTA}	**-1.79**	***	**-1.38**	***	**-0.68**	
	(-0.25)		(-0.74)		(-0.44)	
D^{ex}_{EFTA}	**-0.08**		**-0.24**		**-0.14**	
	(-0.25)		(-0.74)		(-0.44)	
D^{im}_{EFTA}	**-1.57**	***	**-1.92**	***	**-0.89**	***
	(-4.59)		(-6.18)		(-2.98)	
D_{NAFTA}	**1.04**		**2.32**	**	**3.57**	***
	(0.99)		(2.42)		(5.44)	
D^{ex}_{NAFTA}	**0.52**		**0.72**	**	**0.58**	*
	(1.32)		(1.94)		(1.70)	
D^{im}_{NAFTA}	**0.67**		**0.31**		**0.86**	**
	(1.58)		(0.81)		(2.39)	
R^2	**0.25**		**0.34**		**0.33**	
Adjusted R^2	**0.24**		**0.33**		**0.32**	
F-Value	15.81	***	27.93	***	30.18	***

Notes: See Table 5.7

TABLE 5.38 Estimation results of Sector 27: Other electrical machinery
Dependent Variable: ln $X27_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1533		1700		1833	
C	**-23.69**	***	**-29.09**	***	**-28.24**	***
	(-11.43)		(-16.62)		(-14.80)	
ln GDP_i	**0.67**	***	**0.79**	***	**0.75**	***
	(11.02)		(14.55)		(13.92)	
ln GDP_j	**1.19**	***	**1.09**	***	**0.91**	***
	(16.98)		(17.57)		(13.21)	
ln POP_i	**-0.21**	***	**-0.22**	***	**-0.15**	***
	(-3.76)		(-4.49)		(-3.09)	
ln POP_j	**-0.70**	***	**-0.43**	***	**-0.18**	***
	(-10.69)		(-8.21)		(-3.31)	
ln $DIST_{ij}$	**-0.85**	***	**-0.90**	***	**-1.01**	***
	(-10.80)		(-11.97)		(-13.09)	
ln REM_i	**0.34**	***	**0.39**	***	**0.34**	***
	(3.55)		(4.36)		(3.26)	
ln REM_j	**0.34**	***	**0.41**	***	**0.49**	***
	(4.15)		(6.43)		(7.54)	
$D_{ADJACENT}$	**0.66**	***	**0.39**	*	**0.34**	
	(2.60)		(1.64)		(1.56)	
D_{ASEAN}	**0.89**	**	**0.61**		**0.61**	
	(2.04)		(1.51)		(1.47)	
D^{ex}_{ASEAN}	**0.24**		**0.57**	***	**0.26**	
	(1.26)		(3.21)		(1.45)	
D^{im}_{ASEAN}	**-0.02**		**-0.50**	***	**-0.44**	***
	(-0.09)		(-3.02)		(-2.66)	
D_{EA}	**0.32**		**0.43**		**0.46**	
	(0.75)		(1.07)		(1.11)	
D^{ex}_{EA}	**0.12**		**0.03**		**0.05**	
	(0.54)		(0.12)		(0.22)	
D^{im}_{EA}	**1.51**	***	**1.63**	***	**2.12**	***
	(8.23)		(10.12)		(13.03)	
D_{EU}	**1.14**	***	**1.15**	***	**1.50**	***
	(3.85)		(3.85)		(5.41)	
D^{ex}_{EU}	**0.04**		**0.29**	*	**0.24**	
	(0.24)		(1.67)		(1.38)	
D^{im}_{EU}	**0.70**	***	**0.80**	***	**1.56**	***
	(3.45)		(4.10)		(8.22)	
D_{EFTA}	**0.43**		**0.72**	**	**1.00**	***
	(-2.80)		(-2.09)		(-3.13)	
D^{ex}_{EFTA}	**-0.59**	***	**-0.41**	**	**-0.63**	***
	(-2.80)		(-2.09)		(-3.13)	
D^{im}_{EFTA}	**-0.01**		**0.25**		**1.25**	***
	(-0.05)		(1.23)		(6.45)	
D_{NAFTA}	**1.08**		**2.82**	***	**3.14**	***
	(1.52)		(4.42)		(5.24)	
D^{ex}_{NAFTA}	**0.38**		**0.48**	**	**0.19**	
	(1.48)		(1.96)		(0.76)	
D^{im}_{NAFTA}	**-0.06**		**0.46**	**	**0.69**	***
	(-0.25)		(1.93)		(2.92)	
R^2	**0.49**		**0.53**		**0.51**	
Adjusted R^2	**0.48**		**0.53**		**0.50**	
F-Value	62.07	***	83.10	***	81.62	***

Notes: See Table 5.7

TABLE 5.39 Estimation results of Sector 28: Motor vehicles and equipment
Dependent Variable: ln $X28_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1449		1613		1754	
C	**-28.75**	***	**-27.26**	***	**-29.40**	***
	(-11.52)		(-12.80)		(-13.18)	
ln GDP_i	**0.61**	***	**0.66**	***	**0.78**	***
	(9.15)		(11.24)		(13.79)	
ln GDP_j	**1.62**	***	**1.61**	***	**1.42**	***
	(18.93)		(21.73)		(19.39)	
ln POP_i	**-0.28**	***	**-0.23**	***	**-0.22**	***
	(-4.47)		(-4.05)		(-4.28)	
ln POP_j	**-0.72**	***	**-0.60**	***	**-0.42**	***
	(-10.17)		(-10.11)		(-7.24)	
ln $DIST_{ij}$	**-1.02**	***	**-1.17**	***	**-1.31**	***
	(-9.95)		(-12.28)		(-14.35)	
ln REM_i	**0.31**	**	**0.16**		**0.29**	**
	(2.36)		(1.39)		(2.54)	
ln REM_j	**0.16**	**	**-0.17**	**	**-0.08**	
	(1.99)		(-2.34)		(-1.10)	
$D_{ADJACENT}$	**1.08**	***	**0.87**	***	**0.75**	***
	(3.72)		(3.38)		(3.18)	
D_{ASEAN}	**0.43**		**1.03**	***	**0.66**	*
	(0.94)		(2.59)		(1.81)	
D^{ex}_{ASEAN}	**0.04**		**-0.11**		**0.01**	
	(0.19)		(-0.56)		(0.04)	
D^{im}_{ASEAN}	**0.47**	**	**0.71**	***	**0.63**	***
	(2.37)		(3.51)		(3.27)	
D_{EA}	**-0.13**		**-0.09**		**-0.19**	**
	(-0.77)		(-0.54)		(-2.20)	
D^{ex}_{EA}	**0.33**		**0.54**	**	**-0.14**	
	(1.25)		(2.36)		(-0.62)	
D^{im}_{EA}	**0.99**	***	**1.29**	***	**1.16**	***
	(4.33)		(6.43)		(5.46)	
D_{EU}	**1.40**	***	**1.03**	***	**0.82**	**
	(3.64)		(2.81)		(2.35)	
D^{ex}_{EU}	**0.27**		**0.16**		**-0.15**	
	(1.22)		(0.80)		(-0.76)	
D^{im}_{EU}	**0.65**	***	**0.33**		**0.98**	***
	(2.76)		(1.45)		(4.60)	
D_{EFTA}	**0.08**		**-0.65**	*	**-0.64**	*
	(-2.94)		(-3.97)		(-4.63)	
D^{ex}_{EFTA}	**-0.75**	***	**-0.92**	***	**-1.02**	***
	(-2.94)		(-3.97)		(-4.63)	
D^{im}_{EFTA}	**-0.42**	*	**-0.28**		**-0.14**	
	(-1.68)		(-1.22)		(-0.66)	
D_{NAFTA}	**3.29**	***	**2.70**	***	**2.81**	***
	(5.08)		(4.87)		(5.12)	
D^{ex}_{NAFTA}	**1.26**	***	**0.50**	*	**0.25**	
	(4.24)		(1.69)		(0.96)	
D^{im}_{NAFTA}	**-0.05**		**-0.44**		**0.23**	
	(-0.17)		(-1.58)		(0.93)	
R^2	**0.52**		**0.56**		**0.53**	
Adjusted R^2	**0.51**		**0.55**		**0.52**	
F-Value	66.31	***	87.05	***	84.66	***

Notes: See Table 5.7

TABLE 5.40 Estimation results of Sector 29: Other transportation equipment
Dependent Variable: ln $X29_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1288		1482		1632	
C	**-25.30**	***	**-29.21**	***	**-35.84**	***
	(-10.53)		(-12.95)		(-15.26)	
ln GDP_i	**0.54**	***	**0.62**	***	**0.85**	***
	(7.01)		(9.56)		(13.62)	
ln GDP_j	**1.24**	***	**1.12**	***	**1.12**	***
	(14.77)		(15.29)		(15.16)	
ln POP_i	**-0.13**	*	**-0.04**		**-0.24**	***
	(-1.82)		(-0.62)		(-4.06)	
ln POP_j	**-0.70**	***	**-0.38**	***	**-0.26**	***
	(-9.14)		(-6.49)		(-4.50)	
ln $DIST_{ij}$	**-0.62**	***	**-0.75**	***	**-0.86**	***
	(-6.43)		(-8.14)		(-9.41)	
ln REM_i	**0.28**	**	**0.22**	*	**0.18**	
	(2.38)		(1.85)		(1.49)	
ln REM_j	**0.43**	***	**0.33**	***	**0.68**	***
	(5.27)		(4.50)		(9.05)	
$D_{ADJACENT}$	**1.15**	***	**1.03**	***	**0.95**	***
	(3.76)		(4.13)		(4.25)	
D_{ASEAN}	**2.05**	***	**1.25**	***	**1.26**	***
	(3.77)		(2.82)		(2.87)	
D^{ex}_{ASEAN}	**0.11**		**0.80**	***	**0.51**	**
	(0.39)		(3.29)		(2.38)	
D^{im}_{ASEAN}	**0.33**		**-0.01**		**-0.45**	**
	(1.44)		(-0.07)		(-2.15)	
D_{EA}	**0.34**		**0.45**	*	**0.29**	
	(1.30)		(1.87)		(1.26)	
D^{ex}_{EA}	**-0.01**		**0.55**	**	**-0.27**	
	(-0.05)		(2.14)		(-1.10)	
D^{im}_{EA}	**0.74**	***	**1.10**	***	**1.06**	***
	(2.83)		(5.47)		(5.16)	
D_{EU}	**1.36**	***	**1.52**	***	**1.08**	***
	(3.90)		(4.49)		(3.33)	
D^{ex}_{EU}	**0.58**	**	**1.02**	***	**0.14**	
	(2.39)		(4.79)		(0.68)	
D^{im}_{EU}	**0.64**	***	**0.62**	**	**1.13**	***
	(2.64)		(2.58)		(5.24)	
D_{EFTA}	**0.24**		**0.51**		**0.78**	**
	(-1.13)		(-0.33)		(-1.64)	
D^{ex}_{EFTA}	**-0.33**		**-0.09**		**-0.39**	*
	(-1.13)		(-0.33)		(-1.64)	
D^{im}_{EFTA}	**-0.78**	***	**-0.49**	**	**0.49**	**
	(-3.00)		(-2.05)		(2.30)	
D_{NAFTA}	**1.86**	***	**1.58**	**	**1.47**	***
	(4.00)		(2.44)		(3.37)	
D^{ex}_{NAFTA}	**0.84**	***	**1.05**	***	**0.16**	
	(2.74)		(3.77)		(0.66)	
D^{im}_{NAFTA}	**0.72**	**	**0.94**	***	**1.26**	***
	(2.20)		(2.74)		(3.82)	
R^2	**0.37**		**0.44**		**0.45**	
Adjusted R^2	**0.36**		**0.43**		**0.44**	
F-Value	32.87	***	49.36	***	57.53	***

Notes: See Table 5.7

TABLE 5.41 Estimation results of Sector 30: Lumber, wood, furniture and fixtures
Dependent Variable: ln $X30_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1416		1654		1790	
C	**-14.80**	***	**-22.68**	***	**-27.34**	***
	(-6.55)		(-11.77)		(-14.34)	
ln GDP_i	**0.94**	***	**0.96**	***	**0.97**	***
	(12.24)		(15.66)		(18.10)	
ln GDP_j	**0.47**	***	**0.60**	***	**0.56**	***
	(6.12)		(9.60)		(8.43)	
ln POP_i	**-0.65**	***	**-0.51**	***	**-0.44**	***
	(-9.68)		(-8.59)		(-8.88)	
ln POP_j	**-0.03**		**-0.03**		**0.20**	***
	(-0.48)		(-0.62)		(3.73)	
ln $DIST_{ij}$	**-0.96**	***	**-1.08**	***	**-1.15**	***
	(-11.09)		(-13.54)		(-14.75)	
ln REM_i	**0.02**		**0.08**		**0.07**	
	(0.21)		(0.76)		(0.70)	
ln REM_j	**0.66**	***	**0.84**	***	**0.89**	***
	(7.26)		(11.48)		(12.94)	
$D_{ADJACENT}$	**1.40**	***	**1.01**	***	**1.08**	***
	(4.90)		(3.89)		(4.66)	
D_{ASEAN}	**0.17**		**0.62**		**0.43**	
	(0.36)		(1.51)		(1.19)	
D^{ex}_{ASEAN}	**0.04**		**0.01**		**0.24**	
	(0.17)		(0.07)		(1.42)	
D^{im}_{ASEAN}	**-1.41**	***	**-1.76**	***	**-1.32**	***
	(-7.01)		(-9.73)		(-8.00)	
D_{EA}	**0.20**		**0.25**		**0.19**	
	(0.76)		(1.14)		(0.97)	
D^{ex}_{EA}	**1.34**	***	**0.77**	***	**1.14**	***
	(4.78)		(3.24)		(5.30)	
D^{im}_{EA}	**-0.37**	*	**-0.21**		**-0.23**	
	(-1.86)		(-1.18)		(-1.31)	
D_{EU}	**0.45**		**0.78**	***	**0.96**	***
	(1.36)		(2.66)		(3.50)	
D^{ex}_{EU}	**0.52**	**	**0.88**	***	**0.73**	***
	(2.43)		(4.64)		(4.37)	
D^{im}_{EU}	**0.06**		**0.32**		**1.00**	***
	(0.25)		(1.58)		(5.49)	
D_{EFTA}	**0.35**		**0.52**		**0.83**	**
	(-1.81)		(-1.78)		(-2.51)	
D^{ex}_{EFTA}	**-0.42**	*	**-0.37**	*	**-0.47**	**
	(-1.81)		(-1.78)		(-2.51)	
D^{im}_{EFTA}	**-0.34**		**-0.01**		**1.03**	***
	(-1.29)		(-0.07)		(5.39)	
D_{NAFTA}	**1.28**		**2.93**	***	**3.17**	***
	(0.93)		(3.52)		(6.29)	
D^{ex}_{NAFTA}	**0.88**	***	**0.83**	***	**0.59**	***
	(2.84)		(3.42)		(2.62)	
D^{im}_{NAFTA}	**1.16**	***	**1.38**	***	**1.54**	***
	(3.26)		(4.55)		(6.39)	
R^2	**0.40**		**0.51**		**0.52**	
Adjusted R^2	**0.39**		**0.50**		**0.51**	
F-Value	40.93	***	72.66	***	83.12	***

Notes: See Table 5.7

TABLE 5.42 Estimation results of Sector 31: Glass products

Dependent Variable: ln $X31_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1264		1498		1588	
C	**-16.41**	***	**-21.20**	***	**-23.40**	***
	(-7.76)		(-11.26)		(-11.49)	
ln GDP_i	**0.76**	***	**0.70**	***	**0.81**	***
	(12.41)		(13.23)		(14.29)	
ln GDP_j	**0.65**	***	**0.78**	***	**0.75**	***
	(8.82)		(12.57)		(11.41)	
ln POP_i	**-0.38**	***	**-0.25**	***	**-0.24**	***
	(-6.99)		(-5.18)		(-4.82)	
ln POP_j	**-0.21**	***	**-0.17**	***	**-0.05**	
	(-3.26)		(-3.35)		(-0.96)	
ln $DIST_{ij}$	**-0.90**	***	**-1.03**	***	**-1.18**	***
	(-9.45)		(-11.66)		(-13.63)	
ln REM_i	**0.13**		**0.23**	**	**0.19**	**
	(1.30)		(2.36)		(1.96)	
ln REM_j	**0.38**	***	**0.36**	***	**0.29**	***
	(5.78)		(5.72)		(4.68)	
$D_{ADJACENT}$	**0.75**	***	**0.57**	**	**0.53**	**
	(3.07)		(2.41)		(2.39)	
D_{ASEAN}	**0.55**		**0.39**		**0.17**	
	(1.35)		(0.97)		(0.44)	
D^{ex}_{ASEAN}	**0.17**		**0.32**	*	**0.53**	***
	(0.83)		(1.72)		(2.95)	
D^{im}_{ASEAN}	**-0.24**		**-0.46**	***	**-0.26**	*
	(-1.25)		(-2.88)		(-1.72)	
D_{EA}	**0.25**		**0.25**		**0.22**	
	(0.92)		(0.96)		(0.89)	
D^{ex}_{EA}	**0.23**		**0.61**	***	**0.46**	**
	(0.99)		(3.01)		(2.28)	
D^{im}_{EA}	**0.67**	***	**0.53**	***	**0.97**	***
	(3.74)		(3.23)		(5.86)	
D_{EU}	**0.88**	***	**0.81**	**	**0.58**	**
	(2.74)		(2.51)		(1.89)	
D^{ex}_{EU}	**-0.27**		**0.19**		**-0.13**	
	(-1.42)		(1.07)		(-0.76)	
D^{im}_{EU}	**0.72**	***	**0.50**	***	**0.93**	***
	(3.68)		(2.67)		(5.11)	
D_{EFTA}	**-0.46**		**-0.54**		**-0.33**	
	(-4.10)		(-4.40)		(-5.90)	
D^{ex}_{EFTA}	**-0.90**	***	**-0.87**	***	**-1.08**	***
	(-4.10)		(-4.40)		(-5.90)	
D^{im}_{EFTA}	**-0.17**		**-0.30**		**0.15**	
	(-0.75)		(-1.47)		(0.75)	
D_{NAFTA}	**1.47**	**	**2.09**	***	**2.28**	***
	(2.07)		(3.01)		(5.28)	
D^{ex}_{NAFTA}	**0.47**	*	**0.69**	***	**0.36**	
	(1.81)		(2.84)		(1.50)	
D^{im}_{NAFTA}	**0.31**		**0.35**		**0.56**	***
	(1.05)		(1.52)		(2.62)	
R^2	**0.42**		**0.47**		**0.49**	
Adjusted R^2	**0.41**		**0.46**		**0.48**	
F-Value	38.50	***	57.36	***	64.99	***

Notes: See Table 5.7

TABLE 5.43 Estimation results of Sector 32: Stone, clay and other non-metallic mineral products
Dependent Variable: ln $X32_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1404		1635		1682	
C	**-21.48**	***	**-25.98**	***	**-25.17**	***
	(-10.44)		(-15.42)		(-13.86)	
ln GDP_i	**0.81**	***	**0.84**	***	**0.82**	***
	(14.00)		(17.13)		(15.65)	
ln GDP_j	**0.69**	***	**0.69**	***	**0.59**	***
	(10.30)		(12.79)		(9.60)	
ln POP_i	**-0.35**	***	**-0.36**	***	**-0.29**	***
	(-6.48)		(-7.84)		(-6.54)	
ln POP_j	**-0.07**		**0.10**	**	**0.21**	***
	(-1.22)		(2.20)		(4.54)	
ln $DIST_{ij}$	**-0.94**	***	**-1.01**	***	**-1.08**	***
	(-11.17)		(-13.38)		(-14.26)	
ln REM_i	**0.09**		**0.28**	***	**0.27**	***
	(0.96)		(3.43)		(2.94)	
ln REM_j	**0.40**	***	**0.40**	***	**0.37**	***
	(4.91)		(6.42)		(6.01)	
$D_{ADJACENT}$	**1.01**	***	**0.64**	***	**0.81**	***
	(4.46)		(2.91)		(3.87)	
D_{ASEAN}	**0.87**	**	**0.22**		**0.92**	**
	(2.11)		(0.61)		(2.46)	
D^{ex}_{ASEAN}	**0.42**	**	**0.93**	***	**0.50**	***
	(2.13)		(5.68)		(2.94)	
D^{im}_{ASEAN}	**0.04**		**-0.65**	***	**-0.56**	***
	(0.27)		(-4.52)		(-3.97)	
D_{EA}	**0.33**		**0.38**		**0.29**	
	(0.99)		(1.21)		(0.91)	
D^{ex}_{EA}	**0.26**		**0.25**		**0.34**	*
	(1.27)		(1.35)		(1.88)	
D^{im}_{EA}	**1.54**	***	**1.00**	***	**1.54**	***
	(8.56)		(6.34)		(10.04)	
D_{EU}	**1.66**	***	**1.66**	***	**1.68**	***
	(6.21)		(6.14)		(6.21)	
D^{ex}_{EU}	**-0.33**	*	**0.30**	*	**0.29**	*
	(-1.88)		(1.82)		(1.80)	
D^{im}_{EU}	**1.61**	***	**1.40**	***	**1.98**	***
	(8.70)		(8.08)		(12.33)	
D_{EFTA}	**0.67**	**	**0.66**	**	**0.72**	***
	(-5.38)		(-4.22)		(-4.77)	
D^{ex}_{EFTA}	**-1.04**	***	**-0.74**	***	**-0.88**	***
	(-5.38)		(-4.22)		(-4.77)	
D^{im}_{EFTA}	**0.64**	***	**0.37**	**	**0.62**	***
	(3.13)		(2.06)		(3.47)	
D_{NAFTA}	**1.56**	***	**1.71**	***	**2.40**	***
	(3.11)		(2.78)		(5.17)	
D^{ex}_{NAFTA}	**0.51**	**	**0.79**	***	**0.60**	***
	(2.17)		(3.77)		(2.98)	
D^{im}_{NAFTA}	**0.20**		**0.15**		**0.84**	***
	(0.82)		(0.69)		(3.90)	
R^2	**0.51**		**0.56**		**0.55**	
Adjusted R^2	**0.50**		**0.55**		**0.54**	
F-Value	62.98	***	88.26	***	86.96	***

Notes: See Table 5.7

TABLE 5.44 Estimation results of Sector 33: Instruments and apparatus
Dependent Variable: ln $X33_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1608		1735		1790	
C	**-23.07**	***	**-29.27**	***	**-28.90**	***
	(-12.13)		(-16.87)		(-15.42)	
ln GDP_i	**0.77**	***	**0.83**	***	**0.85**	***
	(13.12)		(16.11)		(16.96)	
ln GDP_j	**1.21**	***	**1.26**	***	**1.14**	***
	(18.14)		(20.82)		(18.15)	
ln POP_i	**-0.27**	***	**-0.28**	***	**-0.22**	***
	(-5.16)		(-5.46)		(-4.69)	
ln POP_j	**-0.76**	***	**-0.65**	***	**-0.53**	***
	(-12.12)		(-12.42)		(-9.82)	
ln $DIST_{ij}$	**-0.67**	***	**-0.65**	***	**-0.74**	***
	(-9.04)		(-9.47)		(-10.47)	
ln REM_i	**0.10**		**0.19**	**	**0.22**	**
	(1.01)		(2.13)		(2.19)	
ln REM_j	**0.22**	***	**0.26**	***	**0.21**	***
	(2.94)		(4.25)		(3.05)	
$D_{ADJACENT}$	**0.50**	**	**0.48**	**	**0.42**	**
	(1.90)		(2.12)		(2.04)	
D_{ASEAN}	**0.94**	**	**1.67**	***	**1.70**	***
	(2.18)		(4.45)		(4.82)	
D^{ex}_{ASEAN}	**-0.08**		**-0.24**		**-0.19**	
	(-0.44)		(-1.35)		(-1.18)	
D^{im}_{ASEAN}	**0.21**		**-0.02**		**0.00**	
	(1.22)		(-0.10)		(-0.02)	
D_{EA}	**0.46**		**0.49**		**0.54**	
	(0.92)		(1.07)		(1.08)	
D^{ex}_{EA}	**0.31**		**0.19**		**0.17**	
	(1.37)		(0.88)		(0.85)	
D^{im}_{EA}	**2.10**	***	**1.94**	***	**2.38**	***
	(12.54)		(12.56)		(14.96)	
D_{EU}	**1.44**	***	**1.51**	***	**1.74**	***
	(4.63)		(5.16)		(5.98)	
D^{ex}_{EU}	**0.07**		**0.14**		**0.34**	**
	(0.36)		(0.78)		(1.93)	
D^{im}_{EU}	**1.09**	***	**0.99**	***	**1.67**	***
	(5.66)		(5.02)		(9.41)	
D_{EFTA}	**0.43**		**0.43**		**0.72**	**
	(-2.26)		(-3.03)		(-3.29)	
D^{ex}_{EFTA}	**-0.49**	**	**-0.61**	***	**-0.66**	***
	(-2.26)		(-3.03)		(-3.29)	
D^{im}_{EFTA}	**0.38**	*	**0.46**	**	**1.12**	***
	(1.85)		(2.36)		(6.02)	
D_{NAFTA}	**1.48**	**	**1.84**	***	**2.62**	***
	(2.46)		(3.19)		(5.89)	
D^{ex}_{NAFTA}	**0.35**		**0.35**	*	**0.16**	
	(1.43)		(1.63)		(0.75)	
D^{im}_{NAFTA}	**0.67**	**	**0.44**	*	**1.02**	***
	(2.53)		(1.72)		(4.50)	
R^2	**0.53**		**0.57**		**0.58**	
Adjusted R^2	**0.52**		**0.57**		**0.58**	
F-Value	77.08	***	99.91	***	106.39	***

Notes: See Table 5.7

TABLE 5.45 Estimation results of Sector 34: Other manufacturing
Dependent Variable: ln $X34_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1583		1734		1765	
C	**-19.65**	***	**-25.27**	***	**-24.01**	***
	(-9.91)		(-14.02)		(-12.22)	
ln GDP_i	**1.04**	***	**1.05**	***	**1.04**	***
	(16.52)		(19.02)		(18.99)	
ln GDP_j	**0.62**	***	**0.65**	***	**0.59**	***
	(9.31)		(10.70)		(9.72)	
ln POP_i	**-0.64**	***	**-0.53**	***	**-0.46**	***
	(-10.72)		(-9.43)		(-8.21)	
ln POP_j	**-0.16**	**	**-0.09**	*	**0.02**	
	(-2.45)		(-1.71)		(0.30)	
ln $DIST_{ij}$	**-0.66**	***	**-0.71**	***	**-0.87**	***
	(-8.80)		(-9.77)		(-11.48)	
ln REM_i	**-0.09**		**0.10**		**-0.01**	
	(-0.87)		(1.29)		(-0.08)	
ln REM_j	**0.40**	***	**0.45**	***	**0.41**	***
	(4.83)		(7.32)		(6.25)	
$D_{ADJACENT}$	**0.56**	**	**0.38**	*	**0.56**	***
	(2.45)		(1.61)		(2.83)	
D_{ASEAN}	**0.74**	**	**0.86**	**	**0.39**	
	(1.91)		(2.34)		(1.07)	
D^{ex}_{ASEAN}	**0.66**	***	**0.33**	*	**0.20**	
	(3.27)		(1.65)		(1.01)	
D^{im}_{ASEAN}	**0.31**	*	**0.23**		**0.19**	
	(1.70)		(1.50)		(1.10)	
D_{EA}	**0.53**		**0.51**		**0.40**	
	(0.93)		(0.93)		(0.83)	
D^{ex}_{EA}	**0.85**	***	**0.64**	***	**0.30**	
	(3.74)		(3.12)		(1.40)	
D^{im}_{EA}	**2.33**	***	**2.33**	***	**2.46**	***
	(12.68)		(13.31)		(14.14)	
D_{EU}	**1.87**	***	**1.66**	***	**1.31**	***
	(6.45)		(5.79)		(4.66)	
D^{ex}_{EU}	**0.54**	***	**0.49**	***	**0.33**	*
	(2.85)		(2.71)		(1.76)	
D^{im}_{EU}	**1.13**	***	**1.21**	***	**1.36**	***
	(5.73)		(6.25)		(7.52)	
D_{EFTA}	**0.85**	***	**0.58**	**	**0.20**	
	(-0.84)		(-1.84)		(-3.20)	
D^{ex}_{EFTA}	**-0.18**		**-0.36**	*	**-0.62**	***
	(-0.84)		(-1.84)		(-3.20)	
D^{im}_{EFTA}	**0.31**		**0.31**		**0.23**	
	(1.44)		(1.50)		(1.14)	
D_{NAFTA}	**1.29**	***	**1.79**	***	**1.99**	***
	(3.07)		(3.03)		(4.19)	
D^{ex}_{NAFTA}	**0.80**	***	**0.58**	**	**0.38**	*
	(3.14)		(2.50)		(1.83)	
D^{im}_{NAFTA}	**0.08**		**0.11**		**0.48**	**
	(0.32)		(0.44)		(2.22)	
R^2	**0.46**		**0.52**		**0.50**	
Adjusted R^2	**0.45**		**0.51**		**0.49**	
F-Value	58.29	***	80.10	***	75.71	***

Notes: See Table 5.7

TABLE 5.46 Estimation results of Sector 35: Non-manufacturing
Dependent Variable: ln $X35_{ij}$

Variable	Coefficient Value					
	1987		1992		1997	
No. of Obs	1893		1988		2016	
C	**-22.84**	***	**-25.45**	***	**-30.78**	***
	(-12.52)		(-13.60)		(-16.81)	
ln GDP_i	**0.95**	***	**0.80**	***	**0.92**	***
	(16.35)		(14.45)		(17.68)	
ln GDP_j	**0.97**	***	**0.89**	***	**0.84**	***
	(16.01)		(14.00)		(15.33)	
ln POP_i	**-0.25**	***	**-0.06**		**-0.11**	**
	(-4.71)		(-1.14)		(-2.27)	
ln POP_j	**-0.36**	***	**-0.15**	***	**0.05**	
	(-5.63)		(-2.70)		(1.02)	
ln $DIST_{ij}$	**-1.01**	***	**-1.04**	***	**-1.03**	***
	(-14.19)		(-14.49)		(-14.79)	
ln REM_i	**0.03**		**0.17**	**	**0.15**	*
	(0.37)		(2.22)		(1.76)	
ln REM_j	**0.29**	***	**0.27**	***	**0.38**	***
	(3.57)		(3.09)		(3.69)	
$D_{ADJACENT}$	**0.47**	**	**0.66**	***	**0.79**	***
	(2.11)		(3.32)		(4.36)	
D_{ASEAN}	**0.83**	*	**0.95**	**	**0.95**	***
	(1.88)		(2.43)		(2.83)	
D^{ex}_{ASEAN}	**0.07**		**0.15**		**0.22**	
	(0.32)		(0.76)		(1.21)	
D^{im}_{ASEAN}	**-0.01**		**-0.25**		**-0.55**	***
	(-0.04)		(-1.49)		(-3.44)	
D_{EA}	**0.01**		**-0.03**		**-0.19**	
	(0.09)		(-0.21)		(-1.52)	
D^{ex}_{EA}	**1.32**	***	**0.81**	***	**0.91**	***
	(6.51)		(3.83)		(4.71)	
D^{im}_{EA}	**-1.20**	***	**-1.01**	***	**-0.98**	***
	(-5.95)		(-5.50)		(-5.81)	
D_{EU}	**-0.02**		**0.46**	*	**0.44**	*
	(-0.08)		(1.69)		(1.67)	
D^{ex}_{EU}	**0.53**	***	**0.66**	***	**0.45**	**
	(3.00)		(3.53)		(2.50)	
D^{im}_{EU}	**-1.28**	***	**-0.58**	***	**-0.26**	
	(-7.08)		(-2.90)		(-1.50)	
D_{EFTA}	**-1.91**	***	**-1.07**	***	**-0.69**	**
	(-2.27)		(0.15)		(-2.17)	
D^{ex}_{EFTA}	**-0.45**	**	**0.03**		**-0.43**	**
	(-2.27)		(0.15)		(-2.17)	
D^{im}_{EFTA}	**-3.06**	***	**-1.96**	***	**-0.65**	***
	(-14.48)		(-8.59)		(-3.06)	
D_{NAFTA}	**1.18**	***	**1.31**	***	**1.41**	***
	(3.22)		(3.44)		(3.69)	
D^{ex}_{NAFTA}	**0.26**		**0.40**	*	**0.14**	
	(1.07)		(1.67)		(0.60)	
D^{im}_{NAFTA}	**-0.03**		**0.04**		**0.31**	
	(-0.12)		(0.15)		(1.41)	
R^2	**0.52**		**0.46**		**0.51**	
Adjusted R^2	**0.51**		**0.46**		**0.50**	
F-Value	86.71	***	74.13	***	88.48	***

Notes: See Table 5.7

TABLE 5.47 Summaries of the values of GDP parameters based on modified model (equation 5.3)

Categories		1987		1992		1997	
		Exporter	Importer	Exporter	Importer	Exporter	Importer
00	Aggregate model	1.26	0.99	1.05	0.86	1.02	0.89
01	Grain mill and bakery products	0.48	0.43	0.53	0.42	0.18	…
02	Beverages	0.85	0.52	0.72	0.42	0.75	0.63
03	Tobacco products	…	0.29	0.32	0.34	0.29	0.61
04	Other food and kindred products	0.91	0.40	0.87	0.53	0.76	0.66
05	Textile products and apparel	0.97	0.32	0.92	0.35	0.95	0.27
06	Leather and leather products	0.97	0.36	0.89	0.31	0.87	0.17
07	Pulp, paper and board mills	0.44	0.87	0.39	0.89	0.51	1.03
08	Other paper and allied products	0.59	0.89	0.56	0.74	0.61	0.56
09	Printing and publishing	0.71	1.05	0.69	0.94	0.68	0.97
10	Drugs	0.58	0.80	0.58	0.84	0.62	0.83
11	Soaps, cleaners and toilet goods	0.76	0.94	0.74	0.74	0.76	0.85
12	Agriculture chemicals	0.16	0.92	0.15	0.66	0.28	0.63
13	Industrial chemicals and synthetics	0.59	1.09	0.67	0.96	0.80	0.95
14	Other chemicals	0.58	0.77	0.76	0.86	0.75	0.96
15	Rubber products	0.70	0.88	0.64	0.85	0.66	0.86
16	Miscellaneous plastic products	0.81	0.73	0.83	0.80	0.85	0.63
17	Primary metal industries, ferrous	0.48	0.76	0.53	0.93	0.60	0.83
18	Primary metal industries, nonferrous	0.74	0.85	0.83	0.94	0.92	1.00
19	Fabricated metal products	0.63	0.89	0.74	0.90	0.88	0.89
20	Farm and garden machinery	0.36	1.04	0.44	0.92	0.61	1.05
21	Construction, Mining, etc.	0.46	1.25	0.55	1.30	0.76	1.24
22	Computer and office equipment	0.74	1.28	1.00	1.24	1.00	0.98
23	Other non-electric machinery	0.60	1.34	0.69	1.36	0.77	1.30
24	Household appliances	0.77	1.23	0.80	1.02	0.89	0.87
.25	Household audio, video, etc.	0.63	1.22	0.72	1.11	0.88	0.96
26	Electronic components	0.70	0.80	0.84	1.04	0.95	0.96
27	Other electrical machinery	0.67	1.19	0.79	1.09	0.75	0.91
28	Motor vehicles and equipment	0.61	1.62	0.66	1.61	0.78	1.42
29	Other transportation equipment	0.54	1.24	0.62	1.12	0.85	1.12
30	Lumber, wood, furniture, etc.	0.94	0.47	0.96	0.60	0.97	0.56
31	Glass products	0.76	0.65	0.70	0.78	0.81	0.75
32	Stone, clay, concrete, gypsum, etc.	0.81	0.69	0.84	0.69	0.82	0.59
33	Instrument and apparatus	0.77	1.21	0.83	1.26	0.85	1.14
34	Other manufacturing	1.04	0.62	1.05	0.65	1.04	0.59
35	Non-manufacturing	0.95	0.97	0.80	0.89	0.92	0.84

Note: … denotes not significant at 10 per cent level.

TABLE 5.48 Summaries of the values of distance parameters based on modified model (equation 5.3)

Categories		1987	1992	1997
00	Aggregate model	-0.95	-0.95	-1.00
01	Grain mill and bakery products	-0.80	-0.86	-0.42
02	Beverages	-0.59	-0.64	-0.71
03	Tobacco products	-0.53	-0.78	-0.98
04	Other food and kindred products	-0.63	-0.73	-0.81
05	Textile products and apparel	-1.07	-1.07	-1.21
06	Leather and leather products	-0.65	-0.72	-0.89
07	Pulp, paper and board mills	-0.84	-0.99	-1.14
08	Other paper and allied products	-0.94	-1.03	-1.23
09	Printing and publishing	-0.96	-0.98	-1.13
10	Drugs	-0.84	-0.91	-0.96
11	Soaps, cleaners and toilet goods	-1.06	-1.05	-1.26
12	Agriculture chemicals	-0.92	-0.72	-0.88
13	Industrial chemicals and synthetics	-1.11	-1.12	-1.13
14	Other chemicals	-0.96	-0.95	-1.08
15	Rubber products	-0.75	-0.83	-1.01
16	Miscellaneous plastic products	-0.80	-0.93	-1.10
17	Primary metal industries, ferrous	-0.98	-1.21	-1.31
18	Primary metal industries, nonferrous	-0.99	-1.06	-1.24
19	Fabricated metal products	-0.86	-1.07	-1.15
20	Farm and garden machinery	-0.94	-0.86	-1.11
21	Construction, Mining, etc.	-0.77	-0.93	-0.98
22	Computer and office equipment	-0.72	-0.67	-0.80
23	Other non-electric machinery	-0.97	-1.02	-1.11
24	Household appliances	-0.83	-0.89	-1.00
25	Household audio, video, etc.	-0.61	-0.65	-0.82
26	Electronic components	-0.61	-0.72	-0.89
27	Other electrical machinery	-0.85	-0.90	-1.01
28	Motor vehicles and equipment	-1.02	-1.17	-1.31
29	Other transportation equipment	-0.62	-0.75	-0.86
30	Lumber, wood, furniture, etc.	-0.96	-1.08	-1.15
31	Glass products	-0.90	-1.03	-1.18
32	Stone, clay, concrete, gypsum, etc.	-0.94	-1.01	-1.08
33	Instrument and apparatus	-0.67	-0.65	-0.74
34	Other manufacturing	-0.66	-0.71	-0.87
35	Non-manufacturing	-1.01	-1.04	-1.03

TABLE 5.49 Summaries of the values of Remoteness parameters based on modified model (equation 5.3)

Categories		1987		1992		1997	
		Exporter	Importer	Exporter	Importer	Exporter	Importer
00	Aggregate model	0.16	0.23	0.27	0.23	0.35	0.25
01	Grain mill and bakery products	…	0.18	0.18	0.19	…	…
02	Beverages	…	-0.19	…	…	0.18	…
03	Tobacco products	…	-0.92	…	…	…	-0.87
04	Other food and kindred products	…	0.42	…	0.30	0.01	…
05	Textile products and apparel	…	0.19	0.16	0.31	…	…
06	Leather and leather products	0.00	0.48	0.12	…	…	0.58
07	Pulp, paper and board mills	0.32	…	0.41	0.14	0.41	0.21
08	Other paper and allied products	…	0.26	0.27	0.35	0.42	0.38
09	Printing and publishing	…	…	0.19	0.26	0.31	0.19
10	Drugs	0.24	-0.25	0.21	-0.35	0.33	-0.35
11	Soaps, cleaners and toilet goods	…	0.40	…	0.40	0.44	0.43
12	Agriculture chemicals	0.25	…	…	-0.21	0.18	-0.18
13	Industrial chemicals and synthetics	0.33	0.15	0.41	…	0.38	0.20
14	Other chemicals	0.25	0.16	0.36	0.28	0.38	0.34
15	Rubber products	…	0.25	0.32	0.33	0.33	0.30
16	Miscellaneous plastic products	0.03	…	0.22	0.60	0.22	0.69
17	Primary metal industries, ferrous	…	…	0.30	-0.16	0.52	…
18	Primary metal industries, nonferrous	0.23	0.33	0.28	0.44	0.24	0.51
19	Fabricated metal products	…	0.21	0.26	0.33	0.24	0.52
20	Farm and garden machinery	…	0.22	…	…	…	…
21	Construction, Mining, etc.	…	…	0.21	…	0.27	…
22	Computer and office equipment	0.21	0.69	0.21	0.82	0.24	0.93
23	Other non-electric machinery	0.33	0.37	0.28	0.35	0.35	0.38
24	Household appliances	0.20	0.41	0.20	0.27	0.21	0.33
25	Household audio, video, etc.	0.26	0.42	0.32	0.39	0.22	0.51
26	Electronic components	0.46	0.40	0.45	0.45	0.36	0.70
27	Other electrical machinery	0.34	0.34	0.39	0.41	0.34	0.49
28	Motor vehicles and equipment	0.31	0.16	…	-0.17	0.29	…
29	Other transportation equipment	0.28	0.43	0.22	0.33	…	0.68
30	Lumber, wood, furniture, etc.	…	0.66	…	0.84	…	0.89
31	Glass products	…	0.38	0.23	0.36	0.19	0.29
32	Stone, clay, concrete, gypsum, etc.	…	0.40	0.28	0.40	0.27	0.37
33	Instrument and apparatus	…	0.22	0.19	0.26	0.22	0.21
34	Other manufacturing	...	0.40	…	0.45	…	0.41
35	Non-manufacturing	…	0.29	0.17	0.27	0.15	0.38

Note: … denotes not significant at 10 per cent level.

TABLE 5.50 Summaries of the values of ASEAN parameters based on modified model (equation 5.3)

Categories		1987			1992			1997		
		ASEAN	exASEAN	imASEAN	ASEAN	exASEAN	imASEAN	ASEAN	exASEAN	imASEAN
00	Aggregate model	1.35	0.62	…	0.81	0.34	…	0.65	0.50	…
01	Grain mill and bakery products	…	0.49	…	0.88	…	…	…	…	…
02	Beverages	…	0.65	…	0.93	0.62	-0.69	0.78	0.70	…
03	Tobacco products	1.49	…	0.92	…	0.78	0.64	1.32	0.59	0.80
04	Other food and kindred products	…	0.43	-0.60	…	0.52	-0.57	…	0.33	-0.78
05	Textile products and apparel	…	…	0.37	1.15	…	…	…	…	…
06	Leather and leather products	…	…	0.93	…	…	0.51	…	…	…
07	Pulp, paper and board mills	…	0.69	…	-0.93	0.76	-0.36	…	0.35	-0.78
08	Other paper and allied products	…	0.61	0.51	-0.32	0.52	-0.28	…	…	-0.42
09	Printing and publishing	…	…	…	…	…	0.60	…	…	…
10	Drugs	…	…	…	…	…	…	…	…	…
11	Soaps, cleaners and toilet goods	…	…	…	0.71	…	…	0.16	…	-0.36
12	Agriculture chemicals	…	0.68	…	0.44	…	…	0.80	…	…
13	Industrial chemicals and synthetics	…	0.66	…	0.63	042	0.38	…	…	0.44
14	Other chemicals	…	0.40	…	1.01	…	…	0.87	…	…
15	Rubber products	1.38	…	…	1.14	-0.29	…	0.91	-0.61	…
16	Miscellaneous plastic products	1.29	-0.13	…	1.39	…	-0.33	0.96	-0.36	-0.82
17	Primary metal industries, ferrous	…	…	…	-0.74	1.05	…	-0.67	0.76	…
18	Primary metal industries, nonferrous	…	0.62	-0.46	…	1.13	-0.42	-0.71	1.09	-0.70
19	Fabricated metal products	…	0.44	0.37	…	0.70	…	…	0.77	-0.31

(Continue)

TABLE 5.50 (Continued) Summaries of the values of ASEAN parameters based on modified model

Categories		1987			1992			1997		
		ASEAN	exASEAN	imASEAN	ASEAN	exASEAN	imASEAN	ASEAN	exASEAN	imASEAN
20	Farm and garden machinery	…	…	…	-0.76	0.28	…	…	…	…
21	Construction, Mining, etc.	1.91	…	…	1.04	…	…	1.08	0.62	…
22	Computer and office equipment	…	…	…	1.69	…	-0.36	1.94	…	-0.65
23	Other non-electric machinery	1.09	…	…	0.96	…	…	0.58	0.29	…
24	Household appliances	0.92	…	…	0.99	-0.36	…	0.90	-0.37	…
25	Household audio, video, etc.	1.94	…	…	1.18	…	-0.47	0.31	…	-1.08
26	Electronic components	…	…	…	1.03	1.18	…	1.60	1.08	…
27	Other electrical machinery	0.89	…	…	…	0.57	-0.50	…	…	-0.44
28	Motor vehicles and equipment	…	…	0.47	1.03	…	0.71	0.66	…	0.63
29	Other transportation equipment	2.05	…	…	1.25	0.80	…	1.26	0.51	-0.45
30	Lumber, wood, furniture, etc.	…	…	-1.41	…	…	-1.76	…	…	-1.32
31	Glass products	…	…	…	…	0.32	-0.46	…	0.53	-0.26
32	Stone, clay, concrete, gypsum, etc.	0.87	0.42	…	…	0.93	-0.65	0.92	0.50	-0.56
33	Instrument and apparatus	0.94	…	…	1.67	…	…	1.70	…	…
34	Other manufacturing	0.74	0.66	0.31	0.86	0.33	…	…	…	…
35	Non-manufacturing	0.83	…	…	0.95	…	…	0.95	…	-0.55

Note: … denotes not significant at 10 per cent level.

TABLE 5.51 Sectors categorised by ease of transport: for the definition of dummy variable I in section 5.10

Category 1: More inconvenient to transport (I=1)	
05	Textile products and apparel
06	Leather and leather products
07	Pulp, paper and board mills
08	Other paper and allied products
09	Printing and publishing
11	Soaps, cleaners and toilet goods
15	Rubber products
16	Miscellaneous plastic products
17	Primary metal industries, Ferrous
18	Primary metal industries, Non-ferrous
19	Fabricated metal products
20	Farm and garden machinery
21	Construction and mining and material handling machinery
23	Other non-electrical machinery
24	Household appliances
27	Other electrical machinery
28	Motor vehicles and equipment
29	Other transportation equipment
30	Lumber, wood, furniture and fixtures
31	Glass products
32	Stone, clay and other non-metallic mineral products
Category 2: More convenient to transport (I=0)	
01	Grain mill and bakery products
02	Beverages
03	Tobacco products
04	Other food and kindred products
10	Drugs
12	Agricultural chemicals
13	Industrial chemicals and synthetics
14	Other chemicals
22	Computers and office equipment
25	Household audio, video and communication equipment
26	Electronic components and accessories
33	Instruments and related products

TABLE 5.52 Estimation results of distance parameter on the ease-of-transport dummy variable

$M_i = \alpha + \beta I_i$

Year	α	β	$\mathbf{R^2}$	**F-stat**
1997	0.85*** (19.60)	0.26*** (4.84)	0.43	23.47***
1992	0.78*** (20.29)	0.19*** (4.09)	0.35	16.73***
1987	0.75*** (18.03)	0.14** (2.73)	0.19	7.47**

Note:
M_i is the absolute value of distance coefficient from estimation results in Table 5.48
I_i is a dummy variable which has the value of 1 if the product is inconvenient to transport (category 1) and has the value of 0 otherwise (category 2)
t-statistics are in parentheses.
*** denotes Significant at 0.99 level of confident.
** denotes Significant at 0.95 level of confident.

CHAPTER 6

THE DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN ASEAN: EVIDENCE FROM SECTORAL PATTERNS

6.1 Introduction

Although there is a great deal of discussion on FDI in ASEAN, there is a less studied aspect, that of sectoral patterns of the FDI in the region. This is due to the lack of sufficient data at the industry level. Most FDI figures available are based on balance of payment data which do not allow the sectoral and geographical dimension. The primary contribution of this chapter is to examine the determinants of bilateral FDI flows, with a specific focus on geography and to disaggregate bilateral flows into a sectoral level in order to compare the differences or similarities between different groups of FDI flows. The final goal is to understand whether and to what extent FDI in different sectors reacts to the same characteristics of the source and host countries.

We employ data on FDI flows from 16 market economies, namely, Japan, the USA, the European Union, the Republic of Korea (South Korea), Hong Kong, China and 9 ASEAN countries, i.e., ASEAN-10 excluding Myanmar) into 8 ASEAN countries (ASEAN-10 excluding Singapore and Myanmar) from 1999 to 2003. We include variables to capture the proximity and economic factors in describing the characteristics of the source and host countries, following the literature in using proxy variables such as geographical distance, GDP and market size.

The rest of the chapter is structured as follows. The chapter first presents summaries of the FDI trend in ASEAN, focusing on the period studied. Section 3 reviews the theoretical

background of the determinants of FDI from the perspective of the host country. Section 4 explains the role of regional integration arrangements on FDI. Section 5 illustrates the empirical specification and describes the data employed in this study. The empirical results are discussed in section 6. The final section provides some conclusions and remarks.

6.2 FDI in ASEAN and its Sectoral Pattern

Foreign Direct Investment (FDI) can be defined as the acquisition of assets by one country in another country (called the home and host country, respectively) of domestic structures, equipment and organisations. The International Monetary Fund (IMF) broadly defines FDI as the establishment of substantial ownership of an enterprise in a foreign country; and in a narrower sense, as enterprises in which non-residents hold 25 per cent or more of the voting share capital. What distinguishes FDI from portfolio investment is the intent to manage the acquired asset. Since the flow of FDI stems mainly from investors' long-term interest in a country's production activities, it has become an important source of external finance for developing countries. One can distinguish between two types of FDI, vertical and horizontal. When a multinational firm fragments its production process internationally, locating each stage of production in a country where it can be done at the lowest cost, it is referred to as vertical-FDI. In its simplest form, this could involve a firm producing a good in a labour-abundant economy for different markets – domestic, source and international. Horizontal-FDI, however, occurs when a multinational firm undertakes the same production activities in several countries. In some cases, horizontal flows are motivated by trade barriers. This is the case when these act as a substitute for international trade, in an effort to supply protected markets.

FDI can also be of two kinds: greenfield investment, which involves the creation of productive assets by foreigners; and acquisitions, mergers and takeovers, which include the purchase of existing assets by foreigners. Because of its stability, compared to other forms of capital flows, either private or public, foreign direct investment can serve as an important source of capital, technology and skill transfer for the host country, allowing higher levels of economic development and better integration with the world economy. Foreign firms are also an important source of intangible assets such as technological skills. Technological innovation has been found to be critical in creating and sustaining a competitive advantage in global markets and, not surprisingly, industrialised countries spend large amounts of resources on research and development (R&D) activities. There is, however, an important qualification: keeping in mind the growing importance of international patent agreements and technology licensing laws, the extent of the benefits to the host country depend upon how freely foreign technology spreads to domestic firms. International capital flows can also represent a potentially effective instrument in bringing about a net improvement in welfare in the host economy by increasing competition and raising domestic output, leading to a reduction in domestic prices.

In sum, foreign direct investment (FDI) is recognised to contribute to the benefits of economic and social development. In addition, it is also a channel allowing countries with different characteristics to deal with one another. The developing country governments attempt to promote investment and create a sound investment climate which attracts foreign investors to their countries. As a result, FDI inflows are regarded as vital complements to development efforts. ASEAN, too, takes it into account to conduct investment cooperation agreements for ASEAN to function as an attractive investment destination and to contribute

special conditions for multinational enterprises (MNEs) in order to stimulate the surge of FDI into this region.

As discussed in Chapter 2, over the past decade, ASEAN's FDI inflows continually fluctuated. After the Asian financial crisis of 1997, the ASEAN's FDI inflows recovered at a remarkable rate until the year 2000 and then, gradually declined until 2002 on account of the signs of economic slowdown in US and Europe and recession in Japan. ASEAN's FDI recovered again in 2003, with 14,848.34 US million dollars being invested, which is equivalent to an increase of 48.24 per cent on the previous year (Tables 6.1 and 6.2) This recovery is mainly the result of upward trends of extra-ASEAN FDI indicating a welcome return of foreign investor confidence in this region.

The largest sources for ASEAN's FDI are Japan, USA and the European Union. In 2000, Japan was the biggest investor in the region, with an FDI inflow of 7,674.08 million US dollars, accounting for 39.35 per cent of the total FDI in ASEAN in that year. During the recession in Japan, the FDI flow from Japan to ASEAN decreased and the EU became the biggest investor in 2003, with FDI investment of 3,281.49 million US dollars.

The pattern and sources of FDI into ASEAN remained largely unchanged during the period 1999 to 2003. In 2003, the share of FDI inflows of the main investors in ASEAN as a proportion of total FDI inflow was as follows; EU (22.10 per cent), Japan (19.46 per cent) and US (7.92 per cent); while the proportion of intra-ASEAN FDI to total FDI inflows in 2003 was 6.77 per cent; over one-half of this amount was the inflow from Singapore. We observed that Singapore was playing a significant role in intra-ASEAN FDI. In 1999, the FDI inflow from Singapore to ASEAN was 800.34 million US dollars, while the total intra-ASEAN FDI was 1174.92 million US dollars. The proportion of FDI from Singapore to the total intra-ASEAN FDI inflow in 1999 is therefore 68.12 per cent. This share increased to 78.76 per cent

in 2001, but decreased to 55.74 per cent in 2003 These statistics indicate that other ASEAN countries – in particular Indonesia, Malaysia, the Philippines and Thailand – started to recover from the financial crisis, perhaps due to the effect of the ASEAN Investment Area Agreement[30] (AIA).

In addition to the effectiveness in engaging the establishment of a free trade area (AFTA) and the AIA scheme, the rate of expansion and the pursuit of deeper economic integration are important factors which have encouraged investors and will influence future FDI inflows to this region. That is to say, the greater the progress in advancing ASEAN's schemes, the higher the increase of incentives for FDI inflow to ASEAN.

According to ASEAN's Secretariat, the cumulative economic sectoral distribution of FDI inflows for 1999 and 2003 were 30 per cent for the manufacturing sector, 16 per cent for the financial intermediation and service sector, 11 per cent for the mining and quarrying sector, 12 per cent for the trade commerce sector, 5 per cent for the service sector, 4 per cent for the real estate sector, 1 per cent for the agriculture, fishery and forestry sector and construction sector and 21 per cent for all the other sectors.

The main reason that FDI in manufacturing accounted for the largest share of total investment in 1999-2003 was the continued success of schemes which fostered industrial cooperation. In particular, the ASEAN industrial cooperation (AICO) scheme focuses on greater industrialisation, expansion in trade and investment and the promotion of resource-sharing among ASEAN member countries including the increase in regional production

[30] The ASEAN Investment Area (AIA) agreement signed in October 1998 was regarded as a significant milestone to stimulate the surge of FDI into ASEAN member countries. The AIA aims to enhance both the FDI inflow from intra- and extra-ASEAN sources by making ASEAN into a competitive and attractive region for investment and business operations.

networks. The top five FDI in manufacturing sectors in 2000 are (1) radio, television and communication equipment, (2) rubber and plastic products, (3) coke refined petroleum products and nuclear fuel, (4) chemicals and chemicals products and (5) basic metals.

In brief, although there is some fluctuation of FDI in ASEAN there is an upward trend now that the countries in the region have recovered from the impact of the financial crisis and the investor countries have recovered from the economic slow down. The greater FDI inflow is also driven by the continual schemes pursued under ASEAN cooperation agreements with the aim of becoming a globally attractive destination for FDI. Therefore, in the face of competing alternative production locations, ASEAN is challenged to be an investment area which is not only competitive in production costs but also accessible to a customer base.

6.3 The Theoretical Determinants of FDI

Given the many aspects of FDI, a wide range of economists has become involved in the research; from trade economists, studying the close relationship between trade and FDI and development and growth economists, studying its effects on the host economy, to regional economists, studying its implications for RIAs and industrial economists studying its impact on industrial restructuring. In this section, however, we are mainly concerned with the theories explain the determinants of FDI.

The traditional theory of FDI tries to explain why firms produce abroad instead of simply servicing the markets via exports. In spite of everything, multinational companies (MNCs) experience additional costs in producing abroad, such as higher costs in placing personnel abroad, communication costs (international phone calls, travel expenses for executives or even time costs due to mail delays), language and cultural differences

(Markusen, 1995), information costs to discover local tax laws and regulations, costs of being outside domestic networks; they also incur higher risks, such as the risks of exchange rate changes or even of expropriation by the host country.

According to the traditional method for modelling multinational enterprises (MNEs), international production location choice depends on several sets of factors, some external and some internal to firms. A multinational enterprise decides to produce in a foreign market instead of serving it through exports if it possesses some special advantage – such as a superior technology or lower costs due to economies of scale (Hymer, 1976) – over local firms, in such a way that this advantage is greater than the costs of being present in a foreign market.

To identify the advantages of FDI and the conditions under which it occurs, Dunning (1977, 1981) proposed an organising framework, known as the OLI paradigm. This considers FDI as determined by the Ownership, Location and Internalisation advantages which the MNC holds over the foreign producer; when these advantages outweigh the costs, FDI occurs.

To put it more accurately, the OLI paradigm states that a firm will undertake foreign direct investment only if three conditions simultaneously occur:

(1) A firm must possess net 'ownership' advantages (O) over firms of other nationalities in serving specific markets. Ownership advantages come in several forms, all based on the concept of knowledge-based firm-specific assets. They involve patents, trade secrets, trademarks, human capital, management and reputation for quality. These firm-specific tangible and intangible assets confer cost advantages and market power sufficient to overcome the costs to the firm of producing abroad. In other words, the ownership advantage includes a product or a production process to which other firms do not have access.

(2) It must be more beneficial for the firm possessing O-type advantages to utilise such advantages in a foreign rather than in a domestic location. 'Location' advantages (L) are external to the firm and depend on the host country's economic characteristics, such as low factor prices or customer access, together with trade barriers or transport costs which make FDI more profitable than exporting. Foreign markets may become convenient when they possess abundant and cheaper factors of production, not only labour but also specific factors allowing firms to increase efficiency; gains may also be achieved through the exploitation of economies of scale in a large market. Another easy way to identify Location advantages is to think of motivations for FDI; for example, high growth rates may sound attractive to firms looking for new opportunities of doing business. Foreign locations may be motivated also by the need to develop or secure market shares while obstructing competitors from doing the same. FDI is sometimes needed to overcome existing or expected barriers to entry into a foreign market, such as tariff and non-tariff barriers, industry standards and market procedures.

(3) Assuming that both of the above conditions are satisfied, it must be more beneficial for the firm possessing these advantages to exploit them 'internally' and directly rather than to exchange them on the market through licensing or co-operation agreements with an independent foreign firm. The internalisation advantage (I) is a more abstract concept to explain why licensing may not be practised. It derives from the firm's interest in maintaining its knowledge assets (such as highly skilled workers who know the firm's technology) internally. This avoids "defection" once the licensee has come to understand the technology and sets up his own firm in competition with the MNC. Informational asymmetries may also

push MNCs to prefer foreign production to licensing, such as better knowledge of the domestic market by the licensee. The fear of being replaced by direct production in the presence of highly selling markets would provide an incentive for the licensee to under-declare the potential absorption capacity of a market. Finally, the advantages derive from the reduction of transaction costs (for contracting, quality assurance, etc.) which arise in the case of licensing. From a theoretical point of view, these kinds of advantage come from market failures, due to asymmetric information and incomplete contracting, as well as non-excludability.

To summarise, according to the Dunning paradigm, FDI depends on the extent and the form of ownership advantages in a firm and on how convenient it is to exploit those advantages internally and in a foreign location rather than in a domestic one. Of course, the nature and the significance of the OLI advantages are country-, industry- and firm-specific. This implies that FDI needs to be studied at a disaggregate level.

The main problem of the OLI framework is that although it does explain the existence of MNCs, it has difficulty in explaining the recent trends in FDI, namely their surge among similar countries, i.e., horizontal FDI.

Subsequently, there is the so-called "New Theory of FDI", which refers mainly to the 'ownership' and 'location' advantage and introduces MNCs in general equilibrium models, where they arise endogenously. Helpman (1984) and Helpman and Krugman (1985) derive the activity of MNCs when they try to explain intra-firm trade as an additional component of international trade. The models are based on two main assumptions: (1) that there is product differentiation and economies of scale; and (2) that there are some firm inputs which behave like public goods. In addition, it is assumed that transport costs are zero and the MNCs will split their production process between a 'headquarters' activity, often skill- or capital-

intensive and the plant production abroad. In other terms, the factor proportions in the two activities of an MNE differ, which is the rationale for multinational activity to be chosen. This is recognisable as 'vertical-FDI', also called 'efficiency-seeking' FDI, since firms separate their production process in order to take advantage of factor price differentials across countries. The implications of these models for a potential derivation of the gravity model are that only differences in relative factor endowments across countries (often proxied by GDP per capita) matter for the location of MNCs abroad. This also implies that the 'type' of FDI which can be derived from the theory is limited to vertical-FDI.

However, in the case of developed countries, it has been observed that the pattern of foreign investment is mainly horizontal FDI, because similar types of production activities, owned by MNCs, take place in different countries, for example, in the car industry. Brainard's (1993) and Markusen and Venables's (1998) models account for this type of FDI and they arrive at an empirically testable hypothesis about the activity of MNCs. Their studies start from the observation that most FDI is indeed motivated for "market-access" reasons, rather than by differences in factor prices. The main idea is that a firm faces a trade-off between the advantages of proximity (to the foreign market) and the advantages of concentration (of the plant), given the presence of firm-level economies of scale in special inputs such as R&D, management, as well as the usual plant-level economies of scale. With transport costs, whenever the former advantage outweighs the latter, a firm will choose to invest, i.e., replace exports with FDI.

In Brainard's (1993) model, three types of equilibrium can arise: (1) a pure multinational equilibrium, i.e., when the proximity advantages are greater than the concentration advantages; (2) a pure trade equilibrium, i.e., when the opposite is true; and (3) a 'mixed equilibrium' when the two advantages are equal and MNCs coexist with single-plant,

single-country firms. It is important to note at this stage that the model assumes the symmetry of factor endowments, which is the reason why in this model, in contrast to the Helpman-Krugman model, 'vertical MNCs' cannot arise.

Brainard's empirical hypotheses are derived from the cost structure of the firms, which face additional variable costs in exporting and additional fixed costs of opening up a plant abroad. For example, the number of firms which will export increases with the fixed plant cost (because then they can benefit from economies of scale by concentrating production) and decreases with the level of transport costs and trade barriers. Strictly speaking, the theoretical model can be derived only from those variables which are linked to plant-level as opposed to firm-level economies of scale, plus the 'trade costs' variables. This implies the presence of distance (a proxy for transport costs) or trade costs (tariffs). However, Brainard's empirical work (Brainard, 1997), in addition to the variables mentioned above, introduces the 'income per-worker differential', justified as a control variable for factor-proportions differences and the host country GDP, because this variable is more likely to be an important determinant of the presence of MNCs.

In the model of Markusen and Venables (1998), MNCs arise endogenously in a general equilibrium framework. Even though their focus is only on horizontal direct investment, the model includes two countries, two homogeneous goods and two factors. Firms in each country can be of two types: national or multinational, which gives four types in total. From the firms' different cost structures and with the assumption of Cournot competition and free entry, the model can explicitly solve for 'production regimes', i.e., the combination of firm types which operate in equilibrium. Again, the key variables for determining the presence of MNCs are transport costs, plant- and firm-level economies of scale and market size. The asymmetry of countries in terms of relative factor endowments

does not lead to vertical MNCs, since they are assumed to be excluded. In contrast, the general result is that MNCs become more and more important as countries become more similar in size, relative endowments and as world income grows.

In addition to the above theories, there are other theoretical approaches which help to explain location decisions, though they do not necessarily apply to FDI. The most promising approaches are the location theory and the gravity approach.

The location theory incorporates three different theories, i.e., international trade, industrial organisation and the chaos theory. The first two belong to the economic field, while the third has been borrowed from mathematics and physics. Traditionally, explanations for the spatial concentration of firms have been dominated by classical sources of comparative advantages, such as differences in factor endowments, technologies and market access conditions (Jones, 1965), but these "classic" (or static) variables already have a role in the OLI paradigm (Kravis and Lipsey,1982).

More recent approaches, however, stressing the importance of the agglomeration economies, try to explain location choice in more dynamic terms. The key elements of these models are, on the one hand, the presence of externalities, both technological and pecuniary, which act as a centripetal force and, on the other, the stronger competition generated by the presence of many firms which acts as a centrifugal force. This approach has been applied to analyse why firms tend to be located together and why regions with similar characteristics may show very different patterns of development.

Finally, the gravity approach, as discussed in the previous chapter, explains different types of bilateral flow, such as migration, commuting, tourism and commodity shipping (Bergstrand, 1985). Traditionally, the log-linear equation specifies a bilateral flow from an origin *i* to a destination *j* as dependent, first of all, on the economic forces working in *i* and *j*

and, second, on the economic forces able either to promote or to resist the flow's movement from the origin to the destination. Our empirical evidence in the previous chapter, as well as the results in many other studies, found that trade flows between two countries depend positively on market size (approximated by income and population) and negatively on distance. The reference to FDI, however, is implicit. On the one hand, if countries are very far from each other, it is better to produce directly in the foreign country rather than serving it through exports. The reason is that as distance increases, transport costs increase, making exports less convenient. On the other hand, when the countries are very far from each other, the higher the information costs of investing in a foreign country, so firms may not wish to invest in a foreign market.

The gravity approach seems to be consistent with the part of the OLI paradigm which emphasises the importance of market characteristics as potential determinants of FDI. There are some empirical researches confirm this hypothesis, at least at the aggregate level (Eaton and Tamura, 1994; Brainard, 1997; Brenton and Di Mauro, 1998).

On a final note, borrowing the gravity model of international trade in this study to explain FDI flows can be based on one of two observations. First, countries with relatively high bilateral trade shares tend to have relatively high bilateral FDI shares. Goldstein and Razin (2003) suggest that there are some fixed set-up costs to investing directly, such as the costs of acquiring information. Bilateral trade linkages may reduce such costs for direct investment. Second, there is the common observation that familiarity causes investors to favour nearby countries with similar characteristics and legal systems over more distant and institutionally different countries. Senior (1850), in his 'Political Economy', stresses the importance of familiarity with customs; and Cairnes (1874) emphasizes geographical distance, differences in political institutions, language, religion and social customs as barriers to capital

flows. As the distance to the host country increases, familiarity may decline, with the exception of countries sharing a common historical past, i.e., colonial ties.

Another effect of distance specific to FDI is in relation to control. Distance can reduce investors' control. FDI is defined as capital invested with long-lasting interest in an enterprise. Therefore, the concept of control is inherent in this type of investment. In the case of FDI, distance would play a significant role in determining which host countries receive the majority of bilateral FDI flows. Still, international investors might choose FDI over other forms of investment, on the basis that it gives them control. In this case, investment in more distant locations through FDI may be preferable to, for example, portfolio investment. By being closer to the market, investors' control is maximized and information asymmetries are minimised.

The direction of the impact of distance on FDI, based on these arguments, is unclear. In the international trade literature, the distance variable is used to proxy for transport costs, implying reduced trade with increased distance. In the study of bilateral FDI flows, we propose that, for FDI flows, distance may be a proxy for information costs, rather than transport costs. The cost of information gathering would probably increase with distance, as familiarity with the host country's investment opportunities, customs and culture decreases. FDI also generates the transfer of human capital, which may in turn be negatively affected by distance, as various studies on international migration find that distance affects the cost of migration through increased travel costs, the difficulty of returning home and increased cultural and linguistic differences (Ximena et al 2002).

6.4 FDI and Regional Integration Arrangement

A difficulty in assessing the role of regional integration agreements on FDI is that there are many channels through which RIAs could potentially have an impact on the location of FDI. The impact of regional integration, for example, depends on whether or not the source country is a member of the RIA. The same is true of whether or not the host country is a member of the RIA. In addition, the impact of RIAs will likely be a function of specific characteristics of the host countries that make them relatively more or less attractive than their RIA partners as a potential location of foreign investment.

Another important consideration that will affect the impact of RIAs on the location of foreign investment is the predominant driver of FDI. For instance, a firm may invest abroad in order to serve, through sales of a foreign affiliate, a protected market that it could otherwise serve only at a high cost through trade. In this case, integration could make the market less protected and thus weaken the firm's motive for this type of FDI, which is known in the literature as "horizontal". Alternatively, the firm may invest abroad in order to exploit different countries' comparative advantages for the various stages of production of a good. After some stages the good will cross national boundaries and incur tariff costs; integration reduces such costs and so strengthens the firm's motive for "vertical" FDI. Depending on the motive for foreign investment, therefore, the relaxation of trade barriers implicit in an RIA may have completely different implications for the location of FDI.

Then, there is also an issue of FDI creation and FDI diversion as a result of an RIA. Equivalent to trade creation, FDI creation can be said to occur when investment shifts from an inefficient location to an efficient location following a RIA. On the other hand, FDI diversion occurs when investment shifts from a relatively efficient location to an inefficient location.

The analysis is usually explained in terms of three countries: the home country, the partner country and a third country outside the region. Following a RIA the home country may switch its sourcing of products from the home base to a cheaper partner country. If the factors of production released in the home country are relocated in the partner country both the volume of FDI and its efficiency are likely to increase. The volume of FDI increases by definition as the home country would own the resources invested in the efficient partner country. However, if resources owned by third countries are shifted from the home country to the partner country, there is no new FDI but its efficiency may increase, to the extent that both sorts of FDI result in lower costs and prices and serve to increase consumer surplus in the home country, FDI creation can be said to occur.

6.5 The Empirical Setting and Research Method

We aim to analyse the sectoral pattern of FDI in ASEAN to find the differences and similarities across manufacturing sectors, since geographical distribution may suggest differences in investors' preferences for certain characteristics in the source and host locations, depending on their sector of activity.

Although the basic gravity model has its limitation; it takes no account of host countries characteristics other than the levels of income and population. As we had discussed, however, the locational advantages possessed by potential hose countries constitute of the major determinants of FDI flows. It is not easy matter to satisfactorily capture econometrically the various elements that combine to form the locational advantages of any

particular potential host countries. Nevertheless, as a first step in this direction, we will later extend the basic gravity model by the inclusion of various dummy variables.

According to traditional FDI theory, the market size of source countries contributes to the decision of a firm to invest in a foreign market. GDP and the population of a source country have also been used as proxies for actual demand and absolute market size of source countries, respectively. The expected sign is negative for both variables.

The market size of host countries is also an important factor of inward FDI. Most FDI has been undertaken in scale-intensive and traditional sectors, where market size considerations are significant. As well as a large market to serve, a larger economy may present more diverse opportunities for investment. In addition, some firms invest to find new market opportunities for their products, regardless of the type of business. Following the theoretical background of the gravity model, GDP and population have been used as proxies for actual demand and absolute market size of the host country, respectively. The expected sign is positive for both variables.

To measure the magnitude of proximity, the geographical distance between source and host countries was integrated in our model. The empirical evidence suggests that proximity to the country of origin is relevant as a determinant of FDI. While trade is clearly impeded by the distance of partner countries, for FDI, distance can be an impediment as well as an incentive. It is an impediment to the extent that coordination and other transaction costs should normally increase with distance. Yet distance can be an incentive for FDI which aims to avoid transportation costs or overcome other trade barriers by producing locally. Such investments will be made as long as the advantages of proximity to the respective market exceed the costs of operating at a distance and as long as alternative exporting from concentrated production in the home country is less profitable.

In other words, foreign investment can be used by firms as a means of overtaking the higher costs of transporting the home produced goods to the foreign market (horizontal-FDI), i.e., FDI is substitution for exporting. If this is so, we would expect a greater amount of flows accruing to more distant countries and therefore the expected sign of distance variable would be positive. If, however, the acquisition of direct ownership of capital in a foreign country were directed at the vertical integration of production as an MNC spreads its plants over various countries in order to take advantage of low production costs in different locations (vertical-FDI), we would expect investment to flow more abundantly towards nearer countries with the same intent of reducing the cost of transportation, but with the opposite result on the expected relationship between distance and FDI, i.e., the expected sign is negative. Note that this type of FDI will also create intra-industry trade; therefore vertical-FDI is complementary to trade. According to an alternative interpretation, geographical distance could capture the information costs involved in information gathering, affecting negatively the long-term investment choices of investors in more distant countries. Clearly, the role of distance in determining FDI flows remains an elusive issue.

Our model specifications are as follow:

(1) The basic gravity model

Firstly, we base the empirical analysis on a standard gravity model, which explains bilateral trade or FDI flows by relative and absolute factor endowments and transaction costs (Bergstrand, 1989, Brenton et al, 1999). In terms of the covariates, we use the standard specification with the GDPs and the population sizes of the home and the host country and construct the following model to formulate one-way FDI inflows. It is estimated by OLS on pooled time-series cross-section data.

$$\ln FDI_{ijt} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln DIST_{ij} + \sum_t \gamma_t Y_t + e_{ij} \quad (6.1)$$

Where;

α : Constant term

FDI_{ijt} : Gross bilateral FDI inflows from source country i to host Country j at time t

GDP_{it} : Gross Domestic Product of country i at time t

POP_{it} : Population of country i at time t

$DIST_{ij}$: Distance between i and j

Y_t : Time dummies in order to control the effect of common global events.

e : Remainder error term.

Substantial Hypotheses:

In keeping with our discussion given earlier, we hypothesise that

(1) For all commodity groups, the regression coefficient β_1 and β_3 of the source countries' GDP and population, respectively, will be significantly negative. The higher the GDP and population of sources, the higher the actual demand and absolute market size of source countries, leading to the greater tendency toward self-sufficiency and the loss of incentive to invest abroad.

(2) For all commodity groups, the regression coefficient β_2 and β_4 of the host countries' GDP and population, respectively, will be significantly positive. The higher the GDP and population of hosts, the larger the economy and labour market; hence, the higher the incentive to invest in these countries.

(3) The sign of the regression coefficient β_5 of the distance variable depends on the nature of the FDI pattern. If it is horizontal-FDI, the expected sign is positive. If it is vertical-FDI, the expected sign is negative. Note that in most sectors, FDI in ASEAN are vertical-FDI; therefore, according to our samples, we should expect a negative sign.

To test the above hypotheses, we applied a panel dataset of bilateral flows of foreign direct investment from individual sources to host economies from 1999 to 2003, to analyse empirically the determinants of inward FDI to ASEAN by focusing on the characteristics of proximity and the economy. We also explore whether ASEAN membership is an important determinant of FDI, since economic integration has a direct effect on internationalisation by reducing transaction costs and information costs contribute to transaction costs.

(2) The modified model

We will try to add these variables in to the basic gravity model.

1. ASEAN-10 Dummy variable (D_{A10}); has the value of 1 when both i and j ASEAN-10 countries or 0 otherwise.

2. Remoteness Variables (REM)

3. Slope dummy on distance term (= D_{A10}*ln $DIST_{ij}$)

4. Dummy variable for Adjacency (D_{ADJ})

5. Dummy variable for common official language (D_{LANG})

6. Dummy variable for a pair of countries that have colonial ties ($D_{COLONIAL}$)

7. Dummy variable for a pair of countries that have common coloniser ($D_{COLONISE}$)

8. Dummy variable for each host country to capture each location's characteristic

9. Dummy variable that capture FDI flow into ASEAN-5 ($D^{A10}{}_{A5}$ and $D^{EX}{}_{A5}$) and Dummy variable that capture FDI flow into new ASEAN members ($D^{A10}{}_{NEW}$ and $D^{EX}{}_{NEW}$)

6.6 Descriptions of Data

The bilateral FDI data were obtained from the Statistics of Foreign Direct Investment in ASEAN, 7th edition (ASEAN Secretariat, 2005). Each observation point constitutes an FDI flow in US dollars (millions) between source countries, i, i.e., the US, Japan, the merged EU-15, South Korea, Hong Kong, China, Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand or Vietnam) and a recipient country j, i.e., Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand, Vietnam[31], as summarised in Table 6.3. Our potential observations are, therefore, 134 samples per year or 670 samples in 5-year pooled samples. However, each estimated equation might not contain all observations, since we need to exclude zero value data due to the logarithm in the model. Note that the selected source countries are the major suppliers of FDI flow in ASEAN and contributed 97.34 per cent of the total FDI inward flow into ASEAN in 2000.

FDI data obtained from the ASEAN Secretariat is disaggregated according to the ISIC code (ISIC Rev. 3.1) into 24 manufacturing sectors. However, our estimations are limited to 6 sectors as these are the only sectors that provided sufficient observations. These comprise:

ISIC 15: Manufacture of food products and beverages

[31] Data for FDI inward to Singapore is not available, since Singapore did not identify individual countries and investors.

ISIC 18: Manufacture of wearing apparel; dressing and dyeing of fur

ISIC 25: Manufacture of rubber and plastic products

ISIC 26: Manufacture of other non-metallic mineral products

ISIC 28: Manufacture of machinery and equipment n.e.c.

ISIC 31: Manufacture of radio, television and communication equipment and apparatus

As in the previous chapter, the source of GDPs and population data is the World Bank Development Database. GDPs are expressed in current US dollars (thousands) and population is expressed in millions. Distance data are calculated using Great Circle distance between capital cities, except for the US and China, where we use Chicago and Shanghai, respectively.

6.7 The Empirical Results

The estimation results are shown in Table 6.4 and 6.5.

6.7.1 Aggregate Model

For basic gravity model, all of the scale variables are significant at one per cent level except the population of host countries. All the explanatory variables have the expected sign. Adjusted R^2 shows that our model explains 49-53 per cent of the FDI inflows in ASEAN. At 1 per cent level, the F-statistics is statistically significant. We can therefore reject the hypothesis that the coefficients of all variables in the regression, except the intercept, are jointly zero. That is, taken jointly as a set, the variables included in the model have predictive value. The estimations also have been applied with White's heteroscedasticity corrected standard error to avoid misspecification.

We found that the GDPs of both source and host countries have a positive effect on FDI inflows. The positive sign of a coefficient of a source country's GDP contradicts our hypothesis that a larger GDP of a source country implies a larger home market, which in turn leads to less incentive to invest abroad. Our results, instead, imply that a source country's GDP is, in fact, is a proxy of the potential for growth and the capacity to supply. Note that the GDP of the source country has a dominant effect. This implies that the potential for growth and the capacity to supply have a dominant effect on product demand.

Again, for all estimations, the coefficients of population for both source and host countries have negative signs. The negative effect of a host country's population contradicts our prediction. However, this may be due to the fact that the population, both in source and host countries, is a proxy of the sufficiency of the home market. Therefore, if the population of a source country is large enough, a firm in a source country may prefer to invest domestically, whereas if the population of a host country is large enough, a firm in a host country may be able to afford greater production and therefore does not have to rely on foreign investment.

The coefficients of distance have a negative sign, which implies that distance is a proxy of information cost; it suggests that a firm prefers to invest in a country which it is familiar. It is also implied that the pattern of FDI in ASEAN is vertical-FDI.

For modified specifications, coefficients of dummy for adjacency, common language, colonial-ties, common coloniser and host country fixed effect are all insignificant. The remoteness variables are also insignificant. These may be due to our data are limited the ASEAN's FDI inflow. Therefore, we did not include these variables in our model. Finally, we estimate three more specification. For all estimations, the coefficients for each quantitative explanatory variable have similar value.

When only dummy variable for ASEAN-10 is included in the model, it has negative sign, implying that ASEAN-10 invested in the region less that hypothetical level predicted by the gravity variables. However, when we also include the slope dummy on the distance term, the ASEAN-10 dummy coefficient becomes significantly positive, while the coefficient of slope dummy variable is significantly negative. These results imply that the net effect of membership upon the FDI flow is determined by the magnitude of distance variable for the particular member to member flow in question. Whenever the distance between capital cities is less than 1085.72 kilometres [Antilog (6.36/0.91)], membership of the RIA will result in an increase in the magnitude of the FDI flow, while for distances greater than this, it will result in a diminished flow.

In addition, as discussed in chapter 2, when we look in the economic development level of ASEAN-10 countries, we can subdivide them into two groups, namely, ASEAN-5 and New members. To approximately capture the differences in location characteristics between these two groups, we, thus, replace the ASEAN-10 dummy variables with a new set of dummy variables to capture extra- and intra- region FDI flow, i.e.,

(1) FDI flow from Intra-ASEAN to ASEAN-5 (D^{A10}_{A5})

(2) FDI flow from Intra-ASEAN to New members (D^{A10}_{NEW})

(3) FDI flow from Extra-ASEAN to ASEAN-5 (D^{EX}_{A5})

(4) FDI flow from Extra-ASEAN to New members (D^{EX}_{NEW})

The results show that coefficients of all of above dummy variables are significantly positive and the coefficients of flow into the new members have higher positive value than those into ASEAN-5. This means that the FDI inflow into new ASEAN members is higher than hypothetically predicted by gravity variables.

6.7.2 Disaggregate model

Next, we look more closely at FDI allocation as disaggregated by sectors. We estimated 3 specifications for each sectors: (1) a basic gravity model with ASEAN-10 dummy, (2) a basic gravity model with ASEAN-10 dummy and slope dummy on distance term, and (3) a basic gravity model with intra- and extra-ASEAN FDI flow dummy variables. All 6 sectors have acceptable R^2 and F-statistics. The remaining estimations can be discussed as follows.

For all specifications, all but one of the coefficients of the source country's GDP are significant. The exception is the manufacture of wearing apparel. Thus, we may deduce that, in this sector, a source country's income is not a significant factor. For the other sectors, all of the source country's GDP coefficients have a positive sign, as hypothesised. The sectors in which FDI inflows is most affected by the source country's income are those for the manufacture of radio, and television equipment, the manufacture of rubber and plastics. Note that these are technology-based sectors where the inflows are more likely to come from a more advanced economy and possibly reflected in a high GDP.

When we look at the coefficients of the host country's GDP, they are all significant and have a positive sign, apart from the manufacture of radio, television and communication equipment, where the coefficients are insignificant. The sectors whose FDI inflows were most affected by the host country's income are those for the manufacture of machinery.

All of the coefficients of both the source's and the host's populations have a negative sign, a result which is similar to the aggregate model.

Now let us turn to proximity variables. In all cases, the coefficients have a negative sign; this is evidence, therefore, that distance is the proxy of information cost. The sectors which have the highest distance effect are those for the manufacture of radio, television and communication equipment.

Note that the coefficient of distance variable for the manufacturing of mineral is not significant. This may be due to the fact that the mineral industry is based on natural resource and therefore an investor will choose the location that is well-endowed in a specific mineral and the distance has no significant effect to the decision of the investor.

Concerning the ASEAN-10 dummy variable, the coefficient of intra-ASEAN-10 FDI are negative for the manufacture of wearing apparel and machinery but are positive for manufacture of food and beverages and rubber and plastic products. The coefficients of intra-ASEAN-10 FDI for the rest of the sectors are insignificant.

For the model that include a slope dummy for distance term, the coefficients of this variable are negative and significant for only 3 sectors, namely, food and beverages, wearing apparel and rubber and plastic products.

The model that we replace the ASEAN dummy variables with a set of dummy variables that capture the characteristics of 2 ASEAN's sub-groups shows an interesting result. For both food and beverages and rubber and plastic products sectors, the coefficients that capture the FDI inflows to ASEAN-5 are significantly negative while those that capture the inflows to new members are significantly positive. This implies that ASEAN-5 countries are not the preferred location of FDI in these sectors.

For the manufacture of wearing apparel, only the coefficients of dummy variables for extra-region FDI inflows to new members are significantly positive, implying that countries outside the region do invest in the new ASEAN countries more than hypothetically predicted by gravity variables; possibly to take advantages of their low wages unskilled labour.

Regarding manufacture of mineral products and radio, television and communication equipments, all of coefficients of regional dummy variables are positive. It implies that for these 2 sectors, ASEAN has indeed promoted both intra- and extra-region FDI inflows.

Finally, the machinery sector, coefficient of dummy variables for FDI inflows to ASEAN-5 have negative sign, while those for FDI inflows to new members have positive sign. This means that both intra- and extra-region FDI inflows to these new member countries are higher than hypothetically predicted by basic gravity variables.

6.8 Conclusions and Remarks

The purpose of this chapter is to identify the factors determining the decision of multinational firms to establish new foreign affiliates in ASEAN region. Empirical results, to some extent, appear to validate the hypothesis that the gravity-type variables are important determinants of FDI flows. However, these results must be viewed as no more than preliminary and accordingly be approached with considerable caution. Nevertheless, they provide a starting point, from which more detailed investigations might proceed.

Summing up, the results of empirical research using gravity model indicate that a higher GDP in both host and source country leads to higher FDI inflows. However, in contradiction of expectations, a larger population does not always lead to larger FDI inflows. Smaller countries invest more and also receive more investment. Greater distance between source and host countries limits FDI flows implying that distance is an impediment of FDI since coordination and other transaction costs increase with distance.

The results of our disaggregate model are supported by the discussion in Chapter 2 that FDI in this region has a pattern of vertical-FDI, i.e., the investors invest in the region because of its low production costs, not because of its market potential. The results also imply that these are investments in intermediate products which will be exported out of the host country to generate both intra-industry trade and trade in final goods. This, together with the

negative sign of the proximity coefficient, also implies that FDI and trade in this region are complementary to each other.

These results have some practical implications for ASEAN countries and businesses making investment decisions. ASEAN can be advantaged by encouraging extra-ASEAN investors to invest in the region, at the same time as promoting investment within the region, since FDI in this region complements its trade. ASEAN should also working toward supporting member countries to get their basic economic factors right, because these are the main trigger for FDI in the region. ASEAN firms should consider investing within the region, in particular in new member countries, in order to take advantage of their close proximity and low costs of production. This in turn will generate the trade volume in the region and all the members will be advantaged, bringing prosperity to the region as a whole.

TABLE 6.1 Total and Intra-ASEAN FDI in each member of ASEAN

Unit: million US dollars

country/Year		1999	2000	2001	2002	2003
Brunei	Total	8.72	1.37	2.96	…	…
	Intra-FDI	7.29	1.20	2.24		
Cambodia	Total	119.68	51.50	76.56	106.72	78.20
	Intra-FDI	7.36	9.99	4.36	1.37	14.33
Indonesia	Total	3419.84	7612.94	4102.03	2412.90	4427.30
	Intra-FDI	498.56	262.98	807.04	128.30	145.30
Laos	Total	2.38	10.22	4.65	68.84	15.41
	Intra-FDI	1.43	3.10	3.23	10.64	6.05
Malaysia	Total	3229.92	5223.38	4975.57	3048.34	4115.89
	Intra-FDI	245.79	489.77	623.93	275.01	413.44
Myanmar	Total	26.91	67.02	29.61	1.82	…
	Intra-FDI	5.17	11.03	6.53	…	…
Philippines	Total	1998.98	1634.88	612.40	943.54	3748.74
	Intra-FDI	138.19	86.82	28.80	4.81	1.78
Thailand	Total	2425.28	3869.93	2859.41	1634.46	3675.08
	Intra-FDI	130.85	385.27	302.28	289.78	186.20
Vietnam	Total	…	650.97	1265.81	1799.71	2156.72
	Intra-FDI		33.23	86.65	188.16	238.32
Total intra-ASEAN FDI		1174.92	1553.77	1862.82	898.07	1005.42
Total extra-ASEAN FDI		9186.11	17820.65	12063.22	10016.33	14848.34
Total FDI in ASEAN		10361.03	19374.42	13926.04	9118.26	13842.92

Note: (1) … = not available or not applicable.
(2) Singapore did not provide data of the FDI in Singapore to the ASEAN Secretariat.

Source: ASEAN Secretariat, 2005

TABLE 6.2 Source of FDI in ASEAN

Unit: million US dollars

Source /Year	**1999**	**2000**	**2001**	**2002**	**2003**
USA	2561.38	2784.45	1653.46	1044.21	1175.62
EU	1618.16	5310.51	1597.21	2038.07	3281.49
Japan	1528.18	7624.08	3266.52	1589.21	21888.92
China	39.93	98.12	1025.26	283.79	978.85
Hong Kong	138.39	223.09	107.94	1879.36	315.58
Taiwan	1729.90	827.44	959.83	809.67	1238.49
South Korea	252.52	436.97	876.46	764.40	670.06
Singapore	800.34	1042.24	1467.16	626.17	560.40
ASEAN	1174.92	1553.77	1862.82	898.07	1005.42

Source: ASEAN Secretariat, 2005

TABLE 6.3 List of countries chosen for the empirical studies

Regional Groups		Source Countries	Host Countries
ASEAN-10	ASEAN-5	Brunei	Brunei
		Indonesia Malaysia Philippines Singapore Thailand	Indonesia Malaysia Philippines Thailand
	New Members	Cambodia Laos Myanmar Vietnam	Cambodia Laos Vietnam
Extra-ASEAN		US Japan EU-15 South Korea Hong Kong China	

TABLE 6.4 Estimated results of FDI flows: Aggregate model
Dependent Variable: ln FDI_{ij}

Variable	Coefficient Value			
	(1)	(2)	(3)	(4)
No. of Obs	355	355	355	355
C	**-2.11** ***	**-33.29** ***	**-32.20** ***	**-13.99** ***
	(-18.39)	(-13.77)	(-13.01)	(-13.46)
ln GDP_i	**1.22** ***	**1.16** ***	**0.97** ***	**1.12** ***
	(12.24)	(11.15)	(6.97)	(11.03)
ln GDP_j	**0.91** ***	**0.91** ***	**0.88** ***	**1.95** ***
	(-9.76)	(9.81)	(9.36)	(9.35)
ln POP_i	**-0.50** ***	**-0.48** ***	**-0.45** ***	**-0.49** ***
	(-6.94)	(-6.81)	(-6.29)	(-7.01)
ln POP_j	**-0.02**	**-0.03**	**0.02**	**-0.77** ***
	(-0.21)	(-0.23)	(0.14)	(-4.03)
ln $DIST_{ij}$	**-0.99** ***	**-1.00** ***	**-0.56** **	**-0.93** ***
	(-5.50)	(-5.41)	(-1.87)	(-5.36)
D_{A10}		**-0.26**	**6.39** **	
		(-0.87)	(2.24)	
DD_{ij}			**-0.92** **	
			(-2.34)	
D^{A10}_{A5}				**0.99** ***
				(1.17)
D^{A10}_{NEW}				**3.86** ***
				(4.12)
D^{EX}_{A5}				**1.73** ***
				(2.18)
D^{EX}_{NEW}				**3.80** ***
				(4.09)
Y_{00}	**-0.12**	**-0.12**	**-0.10**	**-0.32** ***
	(-0.36)	(-0.37)	(-0.29)	(-0.95)
Y_{01}	**0.16**	**0.16**	**0.18**	**0.03** ***
	(0.50)	(0.49)	(0.56)	(-0.10)
Y_{02}	**-0.03**	**-0.03**	**0.00**	**-0.36** ***
	(-0.08)	(-0.10)	(-0.01)	(-0.99)
Y_{03}	**0.02**	**0.02**	**0.08**	**-0.41** ***
	(0.06)	(0.07)	(0.24)	(-1.18)
R^2	**0.50**	**0.50**	**0.51**	**0.55**
Adjusted R^2	**0.49**	**0.49**	**0.50**	**0.53**
F-Value	(38.88) ***	(35.04) ***	(32.65)	(32.18) ***

Notes: *t*-statistic are in parentheses where,
* denotes Significant at 0.90 level,
** denotes Significant at 0.95 level,
*** denotes Significant at 0.99 level.

TABLE 6.5 Estimated results of FDI flows: Disaggregate model
Dependent Variable: ln FDI_{ij}

Variable	Coefficient Value											
	Food and Beverages						Wearing Apparel					
	(1)		(2)		(3)		(1)		(2)		(3)	
No. of Obs	190		190		190		195		195		195	
C	**-17.96**	***	**-15.98**	***	**-34.35**	***	**8.78**	***	**10.34**	***	**-6.37**	*
	(-3.93)		(-3.38)		(-5.57)		(-3.23)		(3.66)		(-1.63)	
ln GDP_i	**0.64**	***	**0.36**		**0.64**	***	**0.16**		**-0.04**		**0.17**	
	(-3.46)		(1.40)		(-3.40)		(-1.07)		(-0.21)		(-0.16)	
ln GDP_j	**0.31**	**	**0.25**	*	**1.51**	***	**-0.50**	***	**-0.53**	***	**0.34**	
	(-2.28)		(1.74)		(-4.43)		(-4.13)		(-4.23)		(-1.24)	
ln POP_i	**-0.28**	**	**-0.22**	*	**-0.31**	***	**-0.13**		**-0.08**		**-0.11**	
	(-0.29)		(-1.62)		(-2.61)		(-1.16)		(-0.66)		(-0.91)	
ln POP_j	**0.19**		**0.25**		**-0.42**		**0.47**	***	**0.52**	***	**0.22**	
	(-1.13)		(1.43)		(-1.57)		(-3.24)		(3.28)		(-0.88)	
ln $DIST_{ij}$	**-0.58**	*	**0.02**		**-0.52**		**-0.76**	***	**-0.37**		**-0.78**	***
	(-1.64)		(0.03)		(-1.47)		(-3.01)		(-1.08)		(-3.14)	
D_{A10}	**0.92**	**	**9.65**	*			**-1.22**	***	**4.91**			
	(-2.02)		(1.82)				(-3.47)		(1.40)			
DD_{ij}			**-1.21**	*			**-0.92**	**	**-0.85**	*		
			(-1.64)				(-2.34)		(-1.74)			
D^{A10}_{A5}					**-2.04**	**					**-3.33**	***
					(-2.27)						(-4.12)	
D^{A10}_{NEW}					**0.74**						**-0.85**	
					(-0.65)						(-0.86)	
D^{EX}_{A5}					**-0.29**	***					**-1.86**	**
					(-3.13)						(-2.31)	
D^{EX}_{NEW}					**-0.14**						**0.35**	
					(-0.12)						(-0.35)	
Y_{00}	**0.08**		**0.08**		**-0.29**		**-0.44**		**-0.44**		**-0.66**	*
	(-0.18)		(0.17)		(-0.60)		(-1.23)		(-1.26)		(-1.83)	
Y_{01}	**-0.63**		**-0.64**		**-0.84**		**-0.61**	*	**-0.60**	*	**-0.90**	***
	(-1.11)		(-1.16)		(-1.48)		(-1.81)		(-1.80)		(-2.76)	
Y_{02}	**-0.05**		**-0.01**		**-0.35**		**0.08**		**0.06**		**-0.36**	
	(-0.12)		(-0.03)		(-0.79)		(-0.19)		(0.14)		(-0.84)	
Y_{03}	**0.13**		**0.16**		**-0.49**		**-0.04**		**-0.02**		**-0.54**	
	(-0.28)		(0.34)		(-1.04)		(-0.09)		(-0.06)		(-1.34)	
R^2	**0.14**		**0.16**		**0.23**		**0.20**		**0.21**		**0.29**	
Adjusted R^2	**0.09**		**0.10**		**0.17**		**0.15**		**0.16**		**0.24**	
F-Value	(2.93)	***	(3.01)	***	(3.96)	***	(4.47)	***	(4.33)		(5.81)	***

(Continue)

TABLE 6.5 (Continued) Estimated results of FDI flows: Disaggregate model
Dependent Variable: ln FDI_{ij}

Variable	Coefficient Value																	
	Rubber and Plastic									Mineral								
	(1)			(2)			(3)			(1)			(2)			(3)		
No. of Obs	188			188			188			128			128			128		
C	**-24.37**	***		**-23.08**	***		**-47.71**	***		**-2.11**			**-1.96**			**-22.30**	***	
	(-5.77)			(-5.31)			(-6.73)			(-0.35)			(-0.31)			(-2.63)		
ln GDP_i	**1.12**	***		**0.94**	***		**1.07**	***		**0.59**	***		**0.58**	**		**0.58**	**	
	(-6.26)			(4.30)			(-5.80)			(-2.64)			(1.97)			(-2.59)		
ln GDP_j	**0.56**	***		**0.50**	***		**1.98**	***		**0.38**			**0.38**			**1.51**	***	
	(-3.88)			(3.37)			(-5.78)			(-1.60)			(1.41)			(-3.31)		
ln POP_i	**-0.63**	***		**-0.60**	***		**-0.57**	***		**-0.45**	***		**-0.45**	**		**-0.47**	***	
	(-5.42)			(-5.17)			(-5.41)			(-2.63)			(-2.56)			(-2.75)		
ln POP_j	**-0.12**			**-0.06**			**-0.76**	***		**-0.60**	***		**-0.60**	**		**-1.24**	***	
	(-0.73)			(-0.35)			(-3.08)			(-2.69)			(-2.48)			(-3.76)		
ln $DIST_{ij}$	**-0.77**	***		**-0.36**			**-0.75**	**		**-0.54**			**-0.51**			**-0.33**		
	(-2.62)			(-0.87)			(-2.59)			(-1.53)			(-0.89)			(-0.89)		
D_{A10}	**0.77**	*		**6.84**	**					**-1.29**	**		**-0.90**					
	(-1.77)			(1.83)						(-2.35)			(-0.17)					
DD_{ij}				**-0.84**	*								**-0.05**					
				(-1.61)									(-0.07)					
D^{A10}_{A5}							**-0.10**									**0.81**		
							(-0.07)									(-0.61)		
D^{A10}_{NEW}							**3.56**									**3.29**	**	
							(-2.61)									(-2.20)		
D^{EX}_{A5}							**-0.84**	***								**1.77**		
							(-0.60)									(-1.35)		
D^{EX}_{NEW}							**2.03**									**4.25**	***	
							(-1.38)									(-2.97)		
Y_{00}	**0.41**			**0.47**			**0.23**	***		**0.53**			**0.53**			**0.38**		
	(-0.86)			(1.00)			(-0.49)			(-0.91)			(0.91)			(-0.67)		
Y_{01}	**0.41**			**0.42**			**0.30**			**0.74**			**0.74**			**0.57**		
	(-0.97)			(1.00)			(-0.73)			(-1.32)			(1.31)			(-1.00)		
Y_{02}	**0.62**			**0.66**	*		**0.08**			**0.69**			**0.69**			**0.36**		
	(-1.56)			(1.68)			(-0.21)			(-1.19)			(1.19)			(-0.58)		
Y_{03}	**0.71**	*		**0.77**	*		**0.05**			**1.23**			**1.23**	**		**0.45**		
	(-1.72)			(1.86)			(-0.12)			(-1.99)			(1.95)			(-0.64)		
R^2	**0.28**			**0.29**			**0.36**			**0.20**			**0.20**			**0.26**		
Adjusted R^2	**0.24**			**0.25**			**0.31**			**0.14**			**0.13**			**0.18**		
F-Value	(6.90)	***		(6.52)			(7.58)	***		(3.01)	***		(2.71)			(3.13)	***	

(Continue)

TABLE 6.5 (Continued) Estimated results of FDI flows: Disaggregate model
Dependent Variable: ln FDI_{ij}

Variable	Coefficient Value											
	Machinery						Radio, TV. Etc.					
	(1)		(2)		(3)		(1)		(2)		(3)	
No. of Obs	170		170		170		133		133		133	
C	**-5.37**		**-5.29**		**-34.78**	***	**-3.24**		**-1.88**		**-17.86**	
	(-0.96)		(-0.92)		(-5.93)		(-0.35)		(-0.21)		(-1.40)	
ln GDP_i	**0.84**	***	**0.83**	***	**0.77**	***	**1.22**	***	**1.10**	***	**1.23**	***
	(-5.31)		(4.50)		(-4.81)		(-5.57)		(4.30)		(-5.70)	
ln GDP_j	**0.38**	*	**0.37**	*	**2.13**	***	**-0.33**		**-0.42**		**0.52**	
	(-1.79)		(1.65)		(-6.79)		(-1.25)		(-1.47)		(-0.85)	
ln POP_i	**-0.68**	***	**-0.68**	***	**-0.57**	***	**-0.58**	**	**-0.56**	**	**-0.55**	**
	(-4.79)		(-4.79)		(-4.48)		(-2.60)		(-2.51)		(-2.62)	
ln POP_j	**-0.49**	***	**-0.48**	***	**-1.28**	***	**-0.11**		**-0.03**		**-0.87**	***
	(-3.00)		(-2.78)		(-5.64)		(-0.36)		(-0.08)		(-2.80)	
ln $DIST_{ij}$	**-0.70**	***	**-0.68**	*	**-0.65**	**	**-1.05**	***	**-0.78**	*	**-1.00**	***
	(-2.67)		(-1.61)		(-2.56)		(-3.81)		(-1.82)		(-3.09)	
D_{A10}	**-0.48**		**-0.11**				**-0.25**		**3.96**			
	(-0.96)		(-0.03)				(-0.48)		(0.93)			
DD_{ij}			**-0.05**						**-0.59**			
			(-0.09)						(-0.98)			
D^{A10}_{A5}					**-1.40**						**5.01**	***
					(-1.56)						(-2.72)	
D^{A10}_{NEW}					**2.21**	**					**7.05**	***
					(-2.25)						(-4.33)	
D^{EX}_{A5}					**-1.06**	*					**5.23**	***
					(-1.09)						(-3.06)	
D^{EX}_{NEW}					**2.58**						**6.95**	***
					(-2.37)						(-4.68)	
Y_{00}	**0.50**		**0.50**		**0.21**	**	**0.22**		**0.25**		**0.08**	
	(-1.10)		(1.08)		(-0.49)		(-0.46)		(0.51)		(-0.18)	
Y_{01}	**0.55**		**0.54**		**0.30**		**-0.12**		**-0.12**		**-0.21**	
	(-1.31)		(1.30)		(-0.78)		(-0.22)		(-0.22)		(-0.41)	
Y_{02}	**0.82**	*	**0.82**	**	**0.40**		**0.71**		**0.69**		**0.41**	
	(-2.09)		(2.10)		(-1.10)		(-1.58)		(1.52)		(-0.87)	
Y_{03}	**0.56**		**0.56**		**-0.30**		**-0.49**		**-0.48**		**-0.94**	
	(-1.33)		(1.33)		(-0.74)		(-0.99)		(-0.96)		(-1.90)	
R^2	**0.24**		**0.24**		**0.40**		**0.30**		**0.30**		**0.37**	
Adjusted R^2	**0.20**		**0.19**		**0.35**		**0.24**		**0.24**		**0.30**	
F-Value	(5.13)	***	(4.63)	***	(7.93)	***	(5.18)	***	(4.75)	***	(5.39)	**

Notes: See Table 6.4.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 Summary

This research provides an analysis of trade and foreign direct investment in Southeast Asian region both at the aggregate and disaggregate levels with particular focus on the Association of Southeast Asian Nations (ASEAN) and the establishment of the ASEAN Free Trade Area (AFTA).

The main purpose of this study is to assess whether ASEAN has been successful. The theoretical and empirical focus was on the effects of the geographical scope and regional integration on bilateral trade and FDI flows, to find whether these effects change over time, given the shifts in the economic environment in the ASEAN region and whether there are different impacts upon each group of commodities.

We employed the gravity trade model to analyse the determinants of bilateral trade flows and foreign direct investment of ASEAN countries. The gravity model has been widely used in empirical trade and FDI analysis. Although the theoretical foundations mostly refer to trade flows and are much less clearly established for gravity models on bilateral FDI, this framework is still useful to use as a base model this framework.

Chapter-by-chapter summary of the main results is as follows.

In chapter 1, we have described the motivation and importance of the study. Due to its economic importance, its natural resources and its location, it seems essential to investigate the pattern of trade and investment of ASEAN. The focus of the ASEAN-10 study group

seemed to be fully justified, since ASEAN has functioned as a viable regional group and the future of the association is bound to have a major impact on the future of Asian regional order, as well as on the international community as a whole. Our main objective is to assess whether ASEAN has been successful, i.e. whether there is a trade creation effect as a result of ASEAN and whether ASEAN has been attracting FDI into the region higher than its hypothetical level as indicated by each member's income and distance between source and host countries. We are also aim to explore whether there are different impacts of each variable upon various commodity groups. The scope of our study for the bilateral trade are included 50 sample countries and 6 different years, namely, 1982, 1987, 1992, 1997, 2002 and 2005. For the analysis of bilateral FDI, our samples are pool panel data of FDI flows from 16 sources into 8 ASEAN countries, over the period 1999 to 2003.

The purpose of chapter 2 is to illustrate the background of ASEAN. It was founded in 1967, by five countries, namely, Indonesia, Malaysia, the Philippines, Singapore and Thailand. Brunei later joined in 1984. Vietnam, Laos, Myanmar and Cambodia are the new members that joined in late 1990s. At the initial stage, their economic cooperation was minimal. In 1992, ASEAN, therefore, decided to launch a scheme to build ASEAN Free Trade Area (AFTA) with the aim to reduce the tariffs on locally produced manufactured goods in intra-ASEAN trade to be under 5 per cent. Regarding its trade performance, ASEAN-6 have been prominent world supplier of raw materials and manufactured goods. As for the new members, although their economic growth rates are not as high as some former members, they are at satisfactory level. Since the implement of AFTA, intra-ASEAN trade, from 1993 to 2002, has increased 92 per cent. However, the impressive record of trade levels and development sustained by ASEAN came to a sudden halt as a result of the 1997 financial crisis. Nevertheless, ASEAN trade performance is now getting back to its prosperous course.

ASEAN region also has been a major recipient of FDI. The attractiveness of ASEAN as an investment destination is based on its strategic geographical position include an abundance of raw materials, low production costs, generous investment incentives, a skilled and hard working labour force and improved infrastructure. Although the trend of substantial FDI flows to ASEAN began more than twenty years ago, only recently have the new members stimulated a considerable FDI inflows and became to capture a substantial amount of intra-ASEAN FDI flows. Finally, we conclude that ASEAN countries are strongly influenced by regional and global market forces, thus, the role of ASEAN as an organisation is to provide an efficient regional institutional arrangement which is consistent with the export oriented market-driven economy of ASEAN. The region's economic integration is to be further enhanced by the rapid growth of intra-regional trade and investment. ASEAN needs to position its on regional integration to be inter-connected with the world economy in order to advance its lever of economic development and sustain its competitive advantage in the global market.

In chapter 3, we surveyed the literatures relevant to the issues examined in the thesis. Begin with the review of theoretical structure which has been proposed to underpin the gravity model, we then investigates the significant empirical works which have applied the gravity trade model to investigate international trade flows and the works which have use the gravity-type model to analyse foreign direct investment. The basic gravity model originally developed by Tinbergen (1962) and Linnemann (1966) states that the size of trade flow between two countries is determined by supply conditions at the origin, demand conditions at the destination and stimulating or restraining forces relating to specific flow between countries. The main variables in basic gravity trade model are income and population of trading partners and the geographical distance between them. Income of exporting country is

expected to have a positive effect on trade flow because a high level of income in the exporting country indicates a high level of production, which increases the availability of goods for export. A high level of income in the importing country suggests higher imports, thus, it is also expected to have a positive effect on trade flow. The impact of exporter's population is ambiguous. It depend on whether the country exports less when it is big (absorption effect) or whether a big country exports more than a small country (economies of scale). The impact of the importer population is also ambiguous for similar reasons. The distance coefficient is expected to be negative since it is a proxy of all possible trade costs. There are a huge number of empirical applications in the literature on international trade which have contributed to the improvement of the performance of the gravity equation. These studies contributed to the refinement of the explanatory variables considered in the analysis and to the addition of new variables. These variables include price index, commodity composition, remoteness and various dummy variables, such as common border, language and colonial linkage. Nevertheless, among these numbers of studies, there is still the gap in the research. There is no exploration of bilateral trade and investment pattern in industry level. As we has discussed previously, there is a justification to investigate trade an investment pattern in industry level due to the differences in details of preferential trading arrangements and investment promoting policies in ASEAN.

Regarding the theoretical foundation of gravity trade model, theoretical support for the model was originally very poor, but since the second half of the 1970s several theoretical developments have appeared in support of the gravity model. Anderson (1979) made the first formal attempt to derive the gravity equation from a model that assumed product differentiation. Bergstrand (1985, 1989) also explored the theoretical determination of bilateral trade in a series of papers, in which gravity equations were associated with simple

monopolistic competition models. Helpman (1987) used a differentiated product framework with increasing returns to scale to justify the gravity model. More recently, Deardorff [1995] has proven that the gravity equation characterizes many models and can be justified from standard trade theories. The differences in these theories help to explain the various specifications and some diversity in the results of the empirical applications. Our theoretical approach to the gravity model in chapter 4 confirm the validity of the argument by many authors which states that the presence of gravity in international trade can be derived from several trade theories. The gravity trade model works in diverse conditions and can coexist with the incomplete specialisation and trade in both differentiated and homogeneous goods.

Our empirical investigation of bilateral trade is demonstrated in chapter 5. The results from estimating the gravity equation for the years 1982, 1987, 1992, 1997, 2002 and 2005 show that income elasticities of both exporting and importing countries are positive, while the population elasticities of both exporting and importing countries are negative. Moreover, the proximity variables, both distance and adjacency are indeed have significant effect. When we introduced the common language and colonial dummy variables into the model, however, the adjacency variable become insignificant. This may be because the common language and colonial dummy variables absorb the effect of adjacency.

Regarding trade creation and trade diversion issue, ASEAN has indeed a trade creation effect. Although there is also a trade diversion effect in the importing activities, i.e. non-members' welfare is decreased, the negative effect of its trade diversion is outweighed by the positive effect of its trade creation. In comparison to other regional trading blocs in our studies, ASEAN has the strongest trade creation effect, follow by the EU. Countries in East Asia region, however, show no evidence of trade creation within its region, but they are indeed trade more with countries from outside the region. Their extra-region dummy variables,

both for their export and import activities, have the highest value among regional groups in our study.

The results from the disaggregate model show that the distance variable has a significant effect in every sector. Note that, theoretically, most researchers expect that the important of transaction costs have decreased in the recent decades. Still, in our empirical studies show that the impact of distance does not follow a diminishing trend at all. We also found that for the type of goods that are considered to be more difficult to transport, distance has indeed higher impact on trade flows than the opposite group. In addition, we also found that cultural factors, i.e., language and colonial linkage, are also important factors of bilateral trade flow.

With regard to Foreign Direct Investment inflows into ASEAN countries, the empirical results in chapter 6 seem to validate the hypothesis that the gravity-type variables are significant determinants of FDI flows. The main finding is that distance has a negative effect on FDI inflows, suggesting that information costs are higher than can be recouped by the advantage of being close to the market. In other words, the investors consider investing in ASEAN because of its low cost of production rather than its market potential. This also implies that FDI in ASEAN has a pattern of vertical-FDI and FDI is complementary to trade.

On the whole, our conclusion is that the region can benefit more from ASEAN. The challenge to ASEAN is to continue to facilitate trade and capital movements among members, and by this means reducing the cost of doing business, increasing investments and aggregating the economic activity of its members.

7.2 Limitation of the study

In the analysis of determinants of trade, we faced a trade-off between broadening the sample to include more countries and risking incorrect inferences as a result of the inappropriate aggregating of countries which are structurally different. In this study we broadened our sample as much as possible. Even so, the analysis of longer time-series or a wider range of countries in the cross-section analysis might have produced more accurate results. Note that we choose to simply use the OLS estimation method, i.e., omitted the data with zero trade flow. We, also did the Tobit estimation in aggregate trade model, but found that the results are similar to those of OLS. Nevertheless, future study could fully apply Tobit method in order to take into the account of zero trade flows. Note that, in Tobit estimations, the interpretation of the results is not as straightforward. While, in OLS, the coefficient of a quantitative explanatory variable is simply an elasticity, we can only assess the impact of a change of one standard deviation unit in the value of the explanatory variable on the trade flow.

Our gravity model of the determination of FDI is analogous to the standard one for trade. The issue of the correct specification for a gravity model of FDI is still a matter of open debate. The solutions adopted by previous studies seem to depend on the goal of an analysis. Because of limitations of data, we can only introduce some dummy variables into the model. The results presented are, therefore, should be viewed only as preliminary since many of the possible determinants that have been identified in the literature on FDI have been omitted. Nevertheless, they provide a starting point from which more detailed investigations might proceed.

Additionally, again, because of lack of bilateral FDI data in ASEAN, our FDI inflow is observed only for a restricted set of sample countries. There may be a sample selection biased. This problem can be deal better by including wider data set when more information becomes available.

Finally, there are some cautions in interpreting our model regarding endogeneity issue. We assume that membership of a regional trading arrangement is not correlated to how much they trade with each other, thus, we can proceed to estimate our model using OLS estimation. However, if we concern that the membership status is endogenous since a regional reading arrangement arises when there are high volume of bilateral trade among such group of countries, then, we have an issue of endogeneity to bear in mind. To overcome this issue, we can use the methods of two-stage least squares and simultaneous estimate trade and RIA functions.

7.3 Directions for further studies

First of all, concerning our theoretical foundation of gravity trade model, further research could also attempt to include the transportation cost explicitly, instead of embedded it in the gravity coefficient.

Regarding the study of bilateral trade, further study can include additional variables to capture the fluctuation of bilateral trade or base the estimation on a dynamic model. We can also update our empirical study at industry level, when more data at disaggregate level become available.

For the gravity model of the determination of FDI, the next step would be to include factor of endowments (e.g., ratios of capital to labour and of land to labour and schooling

level) instead of a simple set of dummy variables, to capture the model of FDI where source countries searching for cheap inputs, unskilled labour and natural resources at the locations in Southeast Asia. There are numerous additional factors that can be introduced to the model to identify the main driver of locational choice, for example, relative wages, unemployment rate, population density, employment density, investment density, openness, macroeconomic stability, number of skill workers, and extended market size (destination location's GDP plus its neighbours' GDPs).

Further research could also estimated a complete system consisting of bilateral export equations and bilateral FDI equations side by side as both trade and FDI seem to depend on the same set of variables. However, we should also bear in mind the simultaneous causality between the two.

In conclusion, there is certainly more research to be done, especially when more statistic data become more available. Nevertheless, we believe that this thesis has made a useful contribution to the study of determinant of trade and investment in ASEAN.

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DATA APPENDIX

Variables	Definition	Unit	Source of data
X_{ij}	Total Export from i to j (FOB basis), current price	Thousand US Dollars	Data for 1982, 1987, 1992 and 1997 (both aggregate and disaggregate) are from World Trade Flows Database CD-Rom (Centre for International Data, Institute of Government Affairs, University of California and the National Bureau of Economic Research) Data for 2002 and 2005 are from UN Comtrade Database. (http://comtrade.un.org/)
$X01_{ij}$, $X02_{ij}$, …, $X35_{ij}$	Export of sector 1,2,…35 from i to j (FOB basis), current price	Thousand US Dollars	World Trade Flows Database CD-Rom
GDP_i	Gross Domestic Product of country i, current price	Thousand US Dollars	World Bank Development (WDI) Database (http://web.worldbank.org)
POP_i	Number of population of country i	Million	World Bank Development (WDI) Database (http://web.worldbank.org)
$DIST_{ij}$	Great circle distance from between country i's and country j' capital cities	Kilometres	Author's calculation. Calculated from each location latitude and longitude which are obtained from CIA's World Factbook (https://www.cia.gov/library/publications/the-world-factbook/) The formula applied to calculate the Great Circle distance (D) is as follows: $\cos(D) = Sin(a)Sin(b) + Cos(a)Cos(b)Cos(\lvert c \rvert)$

Variables	Definition	Unit	Source of data
REM_i	Remoteness of country i		Author's calculation $REM_i = \sum_j w_j D_{ij}$, where $w_j = \frac{GDP_j}{\sum_i GDP_i}$ for any $i \neq j$.
FDI_{ij}	Foreign Direct Investment flows from i to j, current price	Thousand US Dollars	ASEAN secretariat's Statistics of Foreign Direct Investment in ASEAN Seventh Edition (http://www.aseansec.org)

Dummy Variables		
Preferential Dummy Variables		Membership information from CIA's World Factbook (https://www.cia.gov/library/publications/the-world-factbook/) EA is the exception as it is not official trade bloc, the countries included in this group are based on their geographical locations, these are China, Hong Kong, Japan, South Korea and Taiwan.
D_{ASEAN}	Association of South East Asian Nations	Takes the value of 1 where both countries i and j are members of ASEAN, or 0 otherwise
D_{EA}	East Asian countries	Takes the value of 1 where both countries i and j are members of EA, or 0 otherwise
D_{EU}	European Union	Takes the value of 1 where both countries i and j are members of EU, or 0 otherwise
D_{EFTA}	European Free Trade Area	Takes the value of 1 where both countries i and j are members of EFTA, or 0 otherwise
D_{NAFTA}	North American Free Trade Area	Takes the value of 1 where both countries i and j are members of NAFTA, or 0 otherwise
D^{EX}_{ASEAN}	Extra-ASEAN Export	Takes the value of 1 where i is member of ASEAN and j is the rest of the world, or 0 otherwise
D^{EX}_{EA}	Extra-EA Export	Takes the value of 1 where i is member of EA and j is the rest of the world, or 0 otherwise
D^{EX}_{EU}	Extra-EU Export	Takes the value of 1 where i is member of EU and j is the rest of the world, or 0 otherwise
D^{EX}_{EFTA}	Extra-EFTA Export	Takes the value of 1 where i is member of EFTA and j is the rest of the world, or 0 otherwise

Dummy Variables		
D^{IM}_{ASEAN}	Extra-ASEAN Import	Takes the value of 1 where j is member of ASEAN and i is the rest of the world, or 0 otherwise
D^{IM}_{EA}	Extra-EA Import	Takes the value of 1 where j is member of EA and i is the rest of the world, or 0 otherwise
D^{IM}_{EU}	Extra-EU Import	Takes the value of 1 where j is member of EU and i is the rest of the world, or 0 otherwise
D^{IM}_{EFTA}	Extra-EFTA Import	Takes the value of 1 where j is member of EFTA and i is the rest of the world, or 0 otherwise
D^{IM}_{NAFTA}	Extra-NAFTA Import	Takes the value of 1 where j is member of NAFTA and i is the rest of the world, or 0 otherwise
DD_{ij}	Slope dummy on distance term	(= D_{A10}*ln $DIST_{ij}$)
D_{A10}	ASEAN-10 Dummy variable	Takes the value of 1 when both i and j ASEAN-10 countries or 0 otherwise
D^{A10}_{A5}	FDI flow from Intra-ASEAN to ASEAN-5	Takes the value of 1 when i is ASEAN-10 and j is ASEAN-5, or 0 otherwise
D^{A10}_{NEW}	FDI flow from Intra-ASEAN to New members	Takes the value of 1 when i is ASEAN-10 and j is new members, or 0 otherwise
D^{EX}_{A5}	FDI flow from Extra-ASEAN to ASEAN-5	Takes the value of 1 when i is non-ASEAN and j is ASEAN-5, or 0 otherwise
D^{EX}_{NEW}	FDI flow from Extra-ASEAN to New members	Takes the value of 1 when i is non-ASEAN and j is ASEAN-5, or 0 otherwise

Other Dummy Variables		
$D_{ADJACENTij}$	Dummy variable which takes the value of 1 where countries i and j are adjacent and takes the value of 0 otherwise.	CIA's World Factbook
D_{LANGij}	Dummy variable which takes the value of 1 where countries i and j are share common official language and takes the value of 0 otherwise.	CEPII (French research centre in International Economics) (http://www.cepii.fr/anglaisgraph/bdd/distances.htm)
$D_{COLONIAL}$	Dummy variable which takes the value of 1 where countries i and j are having colonial ties (such as UK and India, and vice versa) and takes the value of 0 otherwise.	
$D_{COLONISER}$	Dummy variable which takes the value of 1 where countries i and j share common coloniser (such as Hong Kong and India, and vice versa) and takes the value of 0 otherwise.	