DISSERTATION

EXPORT-LED GROWTH AND CROWDING-OUT EFFECT CASE STUDY: A COINTEGRATION APPROACH

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY TRUNG QUANG NGO ENTITLED "EXPORT-LED GROWTH AND CROWDING-OUT EFFECT CASE STUDY: A COINTEGRATION APPROACH" BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

EXPORT-LED GROWTH AND CROWDING-OUT EFFECT CASE STUDY:
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During last three decades, development policies have major shifted from what is known as import-substitution to export-led growth in which many developing countries have focused on reducing their dependence on primary commodity export and increasing their manufactured exports. The important motivation supports for export-led growth policy is the vision of growing market which lead to increase specialization and division of labor. Developing countries can move up to the development ladder by specializing in exporting low-technology products to industrialized countries. In addition, with abundance of cheap and unskilled labor, developing countries will gain from international trade. These gains would allow them to graduate to the rank of middle or higher income countries by exporting more technologically sophisticated, skill-intensive products.

While, export-led growth has been increasingly applied around the world, the deterioration in economic still occurred and created a new challenge for export-led growth model. In facts, it faces a fallacy of composition where exporters rely on growth of demand in export markets. Developing countries sell most of their export manufactured to industrialized countries markets. However, export markets demand does not grow fast enough to support the growth of export expansion of all developing country exporters. As a result, trade barriers and macroeconomic policies will be applied. If consider developing countries as a group, the problem of export-led growth can be described as export displacement or crowding-out effect. This means when one country tries to increase its export; it may displace the export shares of another.

This study analyzes whether export-led growth exists in Vietnam and the crowding-out effect occurs among ASEAN countries. The approach in this study is the use of cointegration in a multi-equations model which allows us to examine the long-run relationship between exports and economic growth in Vietnam and the connection within ASEAN countries for export manufactured goods. The results lead to policy recommendation for Vietnam's export in particular and ASEAN's export in general to improve their economic growth and export benefits.

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Công cha như núi Thái Sơn
Nghĩa mẹ như nước trong nguồn chảy ra.
Một lòng thờ mẹ kính cha,
Cho tròn chữ hiếu mới là đạo con.
Ngày nào con bé cỏn con
Bây giờ con đã lớn khôn thế này.
Cơm cha, áo mẹ, công thầy,
Lo sao cho đáng những ngày ước mong.

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CHAPTER I

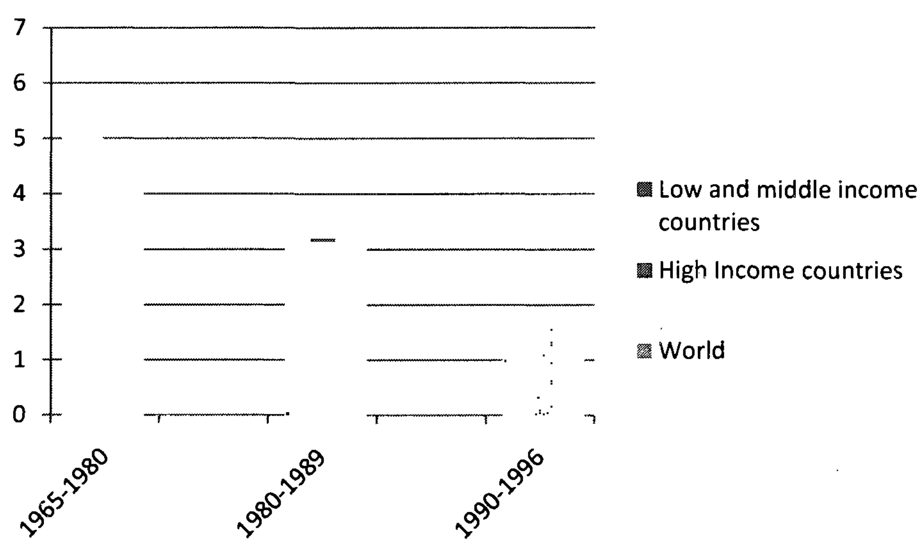
Introduction

One of the fundamental economic questions is how countries can achieve economic growth. The answer to this question lies in part in the export-led growth hypothesis which postulates that export expansion is a key factor in promoting economic growth. This dissertation extends the study on the export-led growth issue by analyzing export at the disaggregate level using the cointegration methodology. A Vietnam case study is used for this research. This analysis has three distinctive features which are not examined in other empirical analyses on export-led growth. First, I examine the relationship between exports and economic growth by constructing an eight-variable VECM for the Vietnamese economy. While many studies have looked at total export and total import, this analysis observes disaggregate level of exports and imports. Exports are divided into five different categories: electronic, seafood, agriculture, energy, and textile manufacturing. Second, imports are broken up into automobile parts and textile materials. Third, the total industrial output is used to approximate GDP growth to avoid the income identity problem between GDP and export. The findings show that some export sectors have positively and significantly impacted the total industrial output in Vietnam.

Although the export-led growth model has been adopted widely, low and middle income countries experienced slow economic growth (see Figure 1.1) as indicated by a decline in the average annual percent GDP growth from 5.9% in 1965-1980 to 1.9% in

1990-1996. This is further supported by the average global economic growth in the same period of approximately 4.1% and 1.8% respectively. Due to this deterioration, the export promotion policy was facing a new challenge, which arguably was suffering from the "fallacy of composition". Therefore, another issue that will be examined is the crowding-out effect. While many empirical studies use the dynamic panel data approach, I propose a new technique based on a cointegration analysis that allows examination of long-run relationships. Export of manufactured products in ASEAN countries have been selected for this study. The results indicate that countries with high-tech intensive manufacturing crowd out low-tech countries for high-technology products. Conversely, high-tech countries will be crowded out by low-tech countries for low-technology products. Also, results imply that low and mid-income countries compete with each other for low-technology products.

Figure 1.1. Average Annual Percent Growth GDP for Developing Regions and the Industrialized Countries



Source: UNCTAD (2005) and Singh (1999)

Chapter II presents a literature review of export-led growth hypothesis and crowding-out effect studies. Early studies of export-led growth used a cross-section analysis which tests the simple correlation between exports and economic growth. Recent studies have focused on country-specific analyses which use a time series analysis to examine the connection between export performance and economic growth in particular nations. The literature of crowding-out effect studies summarizes empirical tests of "fallacy of composition". The reason for this test is that export countries rely on the growth of demand in export markets. The fallacy of composition does not occur if one or a few countries pursue export-led growth. However, when all countries apply this policy, there will be a global shortage on demand and a surplus on supply (Palley, 2003a). Therefore, the result is that export countries compete with each other, and crowding-out occurs between export countries.

Chapter III summarizes the theoretical reviews. First is the presentation of a simple export-led growth model which indicates that faster growth rates of productivity will result in a faster growth rate of exports. Second is the flying geese paradigm and product life cycle, which explain why countries grow together and how they can become exporters. Also, innovation and technology transfer would increase world output. Third is the illustration of the crowding-out effect, which is in the context of "immiserizing growth". Economic expansion might lead to a level of deterioration in terms-of-trade which would offset the beneficial effect of expansion.

Chapter IV describes the Vietnam and ASEAN data which is used for this analysis. Also, it develops the cointegration methodology which applies the Vector Autoregressive model (VAR). VAR can be transformed into the Vector Error Correction model (VECM) if cointegration exists. From the VECM, the Maximum Likelihood procedure of the Johansen multivariate cointegration technique is discussed. This allows us to estimate the cointegration relationships, as well as the number of cointegrating vectors that exist. Then speed of adjustment can be applied to analyze movements within the cointegrated vectors. Additional discussion included in this chapter is the VAR lag order selection criterion which indicates the choice of optimal lag length. It is very helpful since the estimated cointegration relationships are very sensitive to the number of lags included in the VAR model.

Chapter V reports the empirical approach and results obtained from using cointegration technique. This chapter presents the unit root test, the VAR lag order selection criterion, the trace and max-eigenvalue test, cointegrated systems and speed of adjustment. In detail, cointegrated system of export-led growth is set up with five vectors, while cointegrated system of crowding-out effect is created with two vectors for each SITC product. Later, speed of adjustment is performed in both case studies.

Chapter VI presents a discussion of conclusions on export-led growth in Vietnam as well as the crowding-out effect within ASEAN countries. Based on the empirical results obtained, the success of the approach will be used to evaluate as compared to other studies. This should open ways for future researches in this field of study.

CHAPTER II

Literature Review

This chapter presents a survey of the literature on two economic hypotheses. The first section deals with export-led growth, and the second reviews the crowding-out effect.

2.1. Export-led Growth

The relationship between exports and economic growth has been fully studied in numerous empirical papers. Some studies supported the causal relationship between exports and economic growth, while others failed to support a fundamental connection between these two variables. Therefore, the evidence of this causal relationship is rather mixed. There are two types of empirical literature on the export-led growth hypothesis: cross-section and country-specific analyses.

2.1.1 Cross Section Analysis

The first type of research uses cross-country data to test the simple correlation between exports and economic growth. This kind simply uses a production function framework, OLS and the Spearman Rank correlation econometric technique to examine the different form of exports and the effects of exports on economic growth in comparison to the effects of other sources, such as capital, labor and investment.

Emery (1967), Michaely (1977), Balassa (1978), Tyler (1981), Feder (1983), Kavoussi (1984), and Ram (1987) found support from empirical literature on the export-led growth hypothesis and the threshold effect. Their studies stated that a high level of export growth was significantly associated with a high level of economic growth, leading them to conclude that export growth promoted economic growth.

The first empirical work of this nature was by Emery (1967), who investigated the relationship between export growth and GNP growth. He used the OLS econometric technique with annual data from 1953-1963 for 50 developed and developing countries. The results indicated that a higher rate of export is associated with a higher rate of economic growth. Emery found a significant relationship between GNP and exports with high F value and a high correlation between GNP and current account. Emery also showed that most countries with a low rate of export have a low rate of economic growth. Therefore, the author concluded that low export rate countries should adapt a policy which would stimulate exports or at least not promote import substitution.

Michaely (1977) used a production function framework to test the hypothesis that the rapid growth of exports accelerates per capital GNP growth. He conducted his research on 41 less developed countries (LDCs) from 1950-1973. In his study, the rate of change of per capita GNP was used as a measure of economic growth, and the proportion of exports in the gross national product was used as a measure of export performance. This study concluded that there is a positive correlation between the growth rate of exports and the rate of economic growth.

Another researcher, Balassa (1978), used three measures which were also based on the production function framework to estimate the relationship between real GNP growth and real export growth for 11 developing countries. The three measures are: growth of export versus growth of output; growth of export versus growth of output in net export (i.e. EX-IM); and average ratio of exports to output versus growth of output. Annual data from 1960-1973 was used for this analysis. The result indicated that export expansion affects the economic growth rate. Besides, this study provided evidence as to the benefits of export-orientation as compared to policies oriented toward import substitution.

Tyler (1981) used a sample of 55 middle income developing countries from 1960-1977 to show a significant positive relationship between GDP growth and export growth. By using a bivariate technique, he examined economic growth in relationship to various economic variables such as investment, manufacturing output growth, aggregate exports and manufacturing exports. The results showed that export performance along with capital formation was significant in determining the inter-country differences in GDP growth rate. He also found that using the growth rate of manufactured exports yields similar results to those obtained using the growth rate of total export.

Feder (1983), Kavoussi (1984), and Ram (1987) studied the relationship between real GDP growth and real export growth and found support for the export growth hypothesis. Feder used a 32 country sample from 1964-1973, Kavoussi used 73 low and middle-income LDCs from 1960-1978, while Ram used two sub-periods from 1960-1972 and 1973-1982 for 88 low and middle-income LDCs. The differences between them were the variables included in each model. Feder's study examined labor force growth and the ratio of investment to output in his analysis, Kavoussi analysed labor growth and capital growth, while Ram used government size, GDI/GDP and labor growth.

Feder used an alternative formulation of the export variable that basically weights the export effect by its size in GNP. He differentiated between productivity in the export and non-export sectors. His result also showed that "marginal factor productivities are significantly higher in the export sector". Kavoussi found that although export expansion does not affect factor productivity in mid-income countries (industry-oriented middle income countries), growth rate of exports and GNP were positively correlated. If primary exports contribute to economic growth in more advanced developing countries, they will accelerate the rate of capital formation. Ram also concluded that the size and significance of export variable coefficients are not affected much by including or excluding the government size variable.

In sum, cross-section empirical investigations can explain to some extent why growth differs across countries. However, this type of cross-section analysis has an insufficiency which casts doubt on the reliability and validity of the findings. In these studies, countries with similar stages of development are grouped together, basically assuming a common economic structure and similar production technology. Thus the results in these studies are vulnerable to criticism. Moreover, cross-section analysis ignores the shifts in the relationship between variables over time within a country. Exports and economic growth is a long-run phenomenon that cannot be fully captured by a cross-sectional analysis.

2.1.2. Country-Specific Analysis

Another type of empirical study is the country-specific analysis, which uses time series data to examine the connection between export performance and economic growth in particular nations. Recent studies from time series analysis such as Jung and Marshall (1985), Chow (1987), Bahmani-Oskooee, Mohtahdi and Shabsign (1991), Dorado (1993), Love (1994) used Granger (1969) causality tests and Sims' (1972) procedure to test causality, which provided a variety of conclusions on the export-led growth hypothesis.

Jung and Marshall (1985) used Granger causality to analyze the relationship between export growth and economic growth. They also performed F-tests on the bivariate autoregressive process and found that export-led growth was supported in 4 of 37 countries studied, which are Indonesia, Egypt, Costa Rica and Ecuador. However, the authors did not perform stationary and cointegration tests throughout the process. In their conclusion, Iran, Kenya and Thailand support the growth-led export hypothesis. Greece and Israel support the growth reducing exports hypothesis because of the negative sign of the growth variable in the export equation. Most famous countries with rapid growth rate such as Korea, Taiwan and Brazil provide no statistical support for the export promotion hypothesis.

Chow (1987) used Sims' (1972) procedure to investigate the issue of causality between export growth and manufactured output growth in a sample of eight industrialized countries (NICs). He found a strong bidirectional or two-way causality from export growth to output growth in the case of Brazil, Hong Kong, Israel, Singapore, Taiwan and Korea. He also found one-way causality from export growth to output growth in the case of Mexico, and no causality for Argentina. Note that Sims' procedure has the disadvantage that it uses up more degrees of freedom as compared to the Granger test since it includes lead values of variable in the model.

Bahmani et al (1991) combined Granger causality with Akaike's Final Prediction Error and obtained some support for the export-led growth hypothesis although the evidence is inconclusive. Dorado (1993) investigated the issue of Granger causality of 87 countries and found very weak support for the hypothesis that export growth promotes GDP growth, and the alternative that GDP growth promotes export growth also was weak. Love (1994) also used the Granger causality concept combined with Akaike's Final Prediction Error to test the growth hypothesis of exports as an engine of growth. He found weak support for exports as an engine of growth and little evidence of on government as an engine of export.

Overall, the traditional causality studies based on the Granger (1969) test and Sims' (1972) procedure do not check the cointegrating properties of time series variables such as exports and GDP. Therefore, if the time series are cointegrated (Granger 1988), the traditional causality test will miss some forecasting and may reach incorrect conclusions about causality. Besides, some bivariate approaches (based on the Granger-Sims test or the Engle-Granger two-step approach) are likely suffer from the misspecification bias as other relevant variables are excluded from the model. The other popular method to test the export-led growth hypothesis is Johansen's multivariate framework, which uses the vector autoregressive technique and vector error correction technique.

2.1.2.1. Vector Autoregressive Model

Other studies which applied cointegrating properties of time series for developed countries and NIEs did support the export-led growth hypothesis. Afxentiou and Serletis

(1991) examined the export-led growth hypothesis for 16 countries classified as industrial countries. The authors tested the null hypothesis on export-led growth versus the alternative hypothesis of growth-led export using VAR to test for Granger causality. Since there is no cointegration between GDP and export, Granger causality was tested using different data (e.g. growth rate). They found that bidirectional causality is supported in the United States and Norway, while growth-led export was found in Canada and Japan. In general, two of 16 countries found statistical support for either export-led growth or growth-led export. These results indicate that export promoting policies have no stimulation effect on GNP growth or the other way around.

Kugler (1991) investigated the existence of short run and long run relationship in 6 developed countries (US, Japan, Switzerland, Germany, the UK and France) using quarterly data from 1970-1987. This study tested the theory proposed by Johansen (1988) in which the cointegration, long-run relationship between GDP, consumption, investment and export are determined. The variables were found to be *I(1)* by using Augmented Dickey Fuller test. Applying Johansen's procedure to test for a cointegrating relationship, the author found that exports cannot be excluded from the cointegrating relationship in only Germany and France, while UK found no cointegrating relationship. In conclusion, only weak evidence to support export-led growth was found.

Serletis (1992) tested the export-led growth hypothesis for Canada using GNP, export and import variables. The author tested time series property for stationary and then checked for cointegration. He used the Phillips-Perron approach to test for stationary and found these variables were integrated of order one. However, no cointegration was detected among variables. This implies that Granger causality can be tested by using *I(0)* variables (this can be achieved by using the growth rates of the variables). Granger causality was found from export growth to GNP growth except for the period after the Second World War. The period from 1870-1985 and 1870-1944 supported export-led growth, while period from 1945-1985 found no evidence. Therefore, the conclusion that export expansion promoted national income expansion in Canada was depended on period of study.

Jin (1995) examined the export-led growth hypothesis for the Four Little Dragons (Hong Kong, Singapore, South Korea and Taiwan) using quarterly data from 1973-1993. He used a five-variable VAR model, and the relationship between exports and economic growth was analyzed though Variance Decomposition (VDC's), Impulse Response Function (IRF's) and cointegration. All variables were found to be *I(1)* and since there was no existing cointegration, no error correction terms needed to be included in the VAR model. The VDC's indicated that exports have a significant effect on the growth of the economy for all 4 countries, and a bidirectional relationship from economic growth to export growth was found significant in all these countries except Taiwan. IRF's also provided feedback from export growth to economic growth and vice versa in all four countries. Therefore, the results supported for the export-led growth hypothesis.

Henriques and Sadorsky (1996) examined the export-led growth hypothesis for Canada using exports, terms-of-trade and GDP variables for the VAR model to test Granger causality and found no evidence supporting export-led growth; however, the growth-led export hypothesis was found. The series were tested with Augmented Dickey-Fuller (ADF) method and the Phillips-Perron (PP) method for stationary. Cointegration was found between the three variables using the Johansen method. This implies an existing long run relationship between exports, term of trade and GDP.

Riezman et al. (1996) have pointed out the importance of the import variable in detecting export-led growth using Granger causality. It will produce misleading results if imports are not included. In their study of 9 countries and subsequently 126 countries, they found that "imports may play the role of confounding variable in causal ordering i.e., imports affect both income and exports". Omitting the import variable may result in a spurious rejection and on detection of the export-led growth hypothesis.

Al-Yousif (1997) examined the relationship between exports and economic growth with annual data from 1973-1993 in four Arab Gulf countries. The two models used for this analysis were the production-type framework and the model proposed by Feder (1982), which reflects the "externality effect" of the export sector toward the non-export sector. The production-type framework is a model where the level of exports, government expenditures, and terms-of-trade are considered as "input" to the production process. The Feder model consists of export sector and non-export sector. Output in the export sector is produced with labor and capital, while output in the non-export sector is produced with labor, capital and the externality effect stemming from the export sector. The author found no long-run relationship between exports and economic growth in the four countries. However, the results indicated that exports have a positive and significant effect on economic growth.

Shan and Sun (1998a) tested the hypothesis for China from 1987-1996 using monthly data. By using a six-variable VAR model (total industrial output, export, import value, labor force, total investment and energy input), they avoid the possibility of specification errors which go beyond the traditional two-variable relationship. They also controlled the growth of imports to avoid producing a spurious causality result and test the sensibility of causality using different lag lengths as well as optimal lag. They used modified the Wald test procedure (MWALD) because it has an asymptotic chi-squares distribution and it is compatible with the size and power of the Likelihood test and the Wald test when the correct number of lags has been estimated. However they used MWALD in Seemingly Unrelated Regression (SUR), thus they didn't establish short run or long run causality. This is because this method is just Granger non-causality testing as it doesn't require cointegration properties in the equation system. Toda and Yamamoto technique[1] was used for testing Granger non-causality between export and economic growth. The results showed bidirectional causality between export and real industrial output in China. Therefore, the export-led growth hypothesis, which is defined as a unidirectional causality from export to output was not supported by this analysis.

Shan and Sun (1998b) used a similar methodology to the one above and a six-variable VAR model (export, import, industrial output, total personnel employed, energy consumption and gross fixed capital expenditure) to investigate the causality link between export growth and industrial output growth for the Little Dragon (Hong Kong, Korea and Taiwan) with quarterly time series data. The empirical results showed export-led growth was supported in the case of Taiwan. Two-way Granger causality between manufacturing output and export was found in Hong Kong and Korea. Therefore, in

[1] This technique has the ability to overcome many shortcomings of alternative econometric procedures (such as studies that have applied cointegration technique by Johahsen and Juselius (1990)). However, this method requires transforming the suggested relationship into error correlation model and identifies the parameter associated with the causality. If the case involves more than two cointegration vectors, this is not practical.

further testing for export-led growth hypothesis, the model must be selected with care as well as the variables to be included or omitted.

More recent country-specific studies have provided a mix and a conflicting picture of the direction of the causal relationship between export growth and economic growth through different econometric methodologies. However, these empirical results can help us to determine an appropriate model and which variables lead to strong support for the export-led growth hypothesis.

Fountas (2000) tested the export-led growth hypothesis for Ireland using two different types of data, annual data from 1950-1990 and monthly data from 1981-1994. There was no long run relationship found in the period of 1950-1990 between real GDP and export volume, thus this case did not support the export-led growth hypothesis. However, a strong evidence of long-run relationship was found between industrial production and export volume, and Granger causality run from export to output in the period of 1981-1994. These results supported the export-led growth hypothesis through monthly data analysis in Ireland.

Balaguer and Cantavella (2001) tried to test export-led growth hypothesis for Spain using domestic income and export variable. The sample is divided into two different periods, the autarkic policy period and the openness trade liberalization policy period. They found an interesting result of a unidirectional causality running from income to export for the entire sample examination. However, the export-led growth hypothesis was supported during the economic liberalization, while in protectionist and autarkic period, neither a short run nor long run relationship was found.

Phan et al. (2003) examined the long-term relationship between exports and growth in Vietnam using annual data from 1975-2001 and found no econometric evidence to support the theory that export expansion has made a dynamic contribution to other sectors of the economy. This study first used a bivariate correlation test to examine the relationship between export and GDP growth. Then the Balassa (1978), Feder (1982), and Sheehey (1992) approach was employed to test the export hypothesis. Finally, the Granger causality test was applied to verify the results of the growth models. In order to determine the direction of causal relationship, the authors took the sum sign of coefficients and based on its character to establish a positive or negative consequence between exports and economic growth. The import variable was omitted from the model.

Awokuse's study (2005b) concentrated on the causal relationship between export and GDP growth using the Direct Acyclic Graphs (DAG)[2] technique, which allows us to examine both contemporaneous and dynamic causal linkages between exports and the productivity nexus. He examined the export-productivity nexus for Japan by testing for Granger causality using the augmented VAR procedure introduced by Toda and Yamamoto. To complete the Granger causality tests, he also examined the contemporaneous causal structure of innovation in VAR model via DAG algorithms. Their results showed causality linkage between exports and GDP growth in Japan to be bidirectional. Furthermore, capital and foreign output are also significant in determining the productivity growth in Japan.

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[2] DAG is proposed by Spirtes et al. (2000) and Pearl (1995,2000). This is a non-time sequence asymmetry in causal relations; and an alternative and more comprehensive approach for investigating causal relationships. DAG allows for making inference about causation and non-causation by accounting for impacts of conditional dependencies and independencies found in observation data. Spirtes et al. (2000) have developed algorithms that can be used to construct maps between graphical representations of causal relationship and the multivariate probability distributions of economic variables.

Siliverstovs and Herzer (2006) in their study support the empirical results shown by the export-led growth hypothesis for Chile by introducing Granger causality into the Toda and Yamamoto technique. This technique allows us to conduct the standard statistical inference in the VAR model with integrated and possibility cointegrated variables. This study went beyond the two-variable framework and did not focus only on total export but decomposed Chile exports into its main export categories: primary and manufactured goods. This helps to uncover the important differences between various types of export goods in their relation to output. The main results showed unidirectional Granger causality running from manufactured exports to the net-of-exports GDP. The study also indicated the failure of Granger causality running from the primary exports to output. Hence, there was a differentiated impact of manufactured and primary exports on the economic growth. Therefore, the idea that while testing the export-led growth hypothesis, it is important to differentiate between the various types of exports.

Halicioglu (2007) also attempted to prove the validity of the export-led growth hypothesis using quarterly data from 1980-2005 for Turkey. The methodology used to test causal linkage between industrial production, export and terms of trade was the bounds test created by Pesaran et al. (2001)[3] which test the existence of a cointegration relationship among variables. The Pesaran et al. (2001) test uses the autoregressive distributed lag (ARDL) model to estimate the existence of long-run relationships between variables, which allows a mixture of *I(1)* and *I(0)* variables as regressors. This technique can avoid the endogeneity problem and inability to test the hypothesis on coefficients associated with the Engle-Granger method in the long-run. Long-run and

[3] Persaran use ARDL model for the estimation of level relationship because model suggests that since order of ARDL has been identified; relationship can be estimated by OLS. Besides, bounds test allows mix of *I(1)* and *I(0)* variables. This technique is appropriate for small or finite sample size.

short-run parameters are estimated simultaneously, and it is appropriate for a small or a finite sample size. The empirical results from the bounds test to cointegration indicate that a long-run relationship exists among variables in which the industrial production index is a dependent variable. In addition, augmented Granger causality suggested unidirectional causality from exports to industrial production. A change in export and terms of trade through the error correction will change the industrial production index in the long-run.

In sum, these studies use cointegration and causality methods to investigate the relationship between economic growth and export, along with other explanatory variables. The advantages for using cointegration methods to test economic variables are that with cointegration tests, the long-run relationship between growth and export can be estimated instead of simply a dynamic connection between two variables. Stationary of time series has important implications for the proper estimation of the long-run relationship. Because, few studies that use times series data do not test for stationary. Therefore, another introduction to advance technique which estimate this long-run relationship structural equation or VAR containing non-stationary variables so call vector autoregressive model (VECM).

2.1.2.2. Vector Error Correction Model

Islam (1998) developed a multivariate error correction model (ECM) to test Granger causality between export and economic growth in 15 Asian countries. The goals of this analysis were to include the third variable influence on the export-growth relationship, estimate the model along with the common stochastic trend in the data, provide definitions of export expansion and economic growth, and then re-examine the issue of a causal link between exports and growth. The results showed that ECM suggests that export expansion caused economic growth in all of the countries where a cointegrating relationship was found. Bidirectional causation was found in several countries, but it had a negative effect. In general, with the multivariate VAR model, evidence supported that exports caused economic growth in 11 out of 15 countries analyzed.

Baharumshah and Rashid (1999) examined the relationship between export and income growth in Malaysia using quarterly data. They included imports into the system equation in order to explain Malaysia's economic growth and used the Johansen procedure (1988) and vector error correction model (VECM). Exports were cataloged as manufacturing and agricultural exports. The authors tested the long run relationship between export, import and GDP as a result of multivariate cointegration. VECM also suggests that export causes economic growth, especially manufacturing exports. The hypothesis that growth in exports doesn't Granger cause growth in GDP is rejected for both agriculture and manufacture exports. In addition, the hypothesis that growth in output doesn't Granger cause exports also is rejected. Hence, the results have a two-way Granger causality relationship between growth rate of export and growth rate of output. Granger causality also rejected non-causality from exports to imports as well as imports to exports. This means that there is a feedback relationship between all categories of exports and imports in the long run.

Abual-Foul (2004) examined the export-led growth hypothesis in Jordan by using three bivariate models of VAR-L (vector autoregressive in levels), VAR-D (vector autoregressive in first differences) and the ECM (error correction model). The empirical results indicated unidirectional causality from exports to output. It also supported the export-oriented growth strategy pursued by Jordan, of attracting foreign investment and boosting exports to promote a faster growing economy.

Mamun and Nath (2005) investigated the link between exports and economic growth in Bangladesh using quarterly data on the industrial production index, exports of goods, and exports of goods and services for the period 1976-2003. The results from the ECM suggested that there was a positive long-run equilibrium relationship between exports and industrial production; however, there was no evidence in the short-run of a causal relationship between these variables. Their results indicated that long-run causality seems to run from exports to industrial production.

Awokuse (2005a) re-examined the relationship between exports and output growth in South Korea and tested whether either the export-led growth or growth-led export hypothesis holds in this country. This analysis focused on the dynamic causal relationship between exports, output growth, capital/investment, terms of trade, and foreign output shock using quarterly data from 1963–2001. Two alternative methodology procedures for testing Granger causality were used in this analysis such as VECM and an augmented level of VAR. Empirical results from both alternative methods indicated that the causal link between export and GDP is bidirectional. This means that South Korea simultaneously experienced economic growth as export-led and that Korean export was growth driven.

Love and Chandra (2005) tested the relationship between export growth and income growth for South Asia as a region using the cointegration and error correction model (ECM). Variety data was collected from the 1950s to 2000, depending on each country. The empirical results were rather mixed. Export-led growth was supported in India, Maldives and Nepal. On the other hand, growth-led export was found in Bangladesh and Bhutan. In Pakistan and Sri Lanka no causality was found. Moreover, these findings of export-led growth, i.e. India as a large internal market, imply that a country with large size may not be important for this strategy. The countries characterized by inward-oriented planning, which dominate to import substitution over export promotion and open up its economies to other countries of the region could gain economic growth in entire region.

2.2. Crowding-out Effect

Bhagwati (1958) presented the possibility of "immiserizing growth" in an orthodox neoclassical trade model which explained the negative effect of export promotion polices for a country caused by an adverse terms-of-trade effect. He showed that an increase in exports might result in an export price deterioration that could reduce economic welfare. An analysis of the welfare impact may be reasonable for a typical small developing country, but it may not be as useful for a group of developing countries exporting similar primary products. Also, Sapsford and Singer (1998) explain the declining commodity terms-of-trade. This means that developing countries pursuing manufactured export primarily experienced falling commodities prices. In the terms-of-trade framework, attempts by a small country to increase exports may have little impact on commodity prices. However, when a group of countries tries to increase exports, this generates general equilibrium impacts that lower commodity prices.

Sarkar and Singer (1991) confirmed the sign of weakness rather than improvement of the developing countries' terms-of-trade in manufactured products. Their barter terms-of-trade in manufactured failed to reflect respective productivity trends. Hence, it led to deterioration in terms-of-trade. They estimated the ratio of manufactured exports from the periphery and the center over the period 1970-1987 and studied its exponential trend, which was fitted in each case.

Kaplinsky's (1993) examination of the performance of export processing zones in the Dominican Republic has shown that by specializing in unskilled labor-intensive products, the Dominican Republic experienced "immiserizing" employment growth, that is "employment growth which is contingent upon wages falling in international purchasing power". Therefore, many developing countries which have specialized in unskilled labor-intensive products tend to keep their prices low through wage cuts in order to remain competitive. Under this view, unskilled labor-intensive manufactured products are considered as primary products, which also experience declining terms-of-trade.

Walmsley and Hertel (2001) investigated the effect of China's accession into the WTO over the period 1995-2020 using the Global Trade Analysis Project model applied to 19 regions and 22 commodities. They found that while the world could benefit from China's accession, its competitors in labor-intensive products (such as South Asian countries) would experience significant losses in real income and welfare as a result of the competitive pressure which has led to declining terms-of-trade.

On the crowding-out effect, Cline (1982) concluded that the export-led growth model of East Asian (South Korea, Taiwan, Hong Kong and Singapore) cannot be generalized because it would result in protectionist responses from industrialized countries. He calculated the level of manufactured product exports from developing countries that would have been affected in 1976 if all developing countries had shared East Asian success in increasing their export intensities. This study also did not take into account the possible change in terms-of-trade as the developing countries simultaneously try to export to industrialized countries.

Palley (2003b) tested the export-displacement hypothesis by analyzing the pattern of US import during the period 1978-1999. He found significant results on the cross country crowding-out effect, where China significantly crowded out exports from the four East Asian Tigers. This study also suggested that Mexico's export displaced Japan export to the US in the latter of half of the period. He also argued that the entry of China into the global economy would make it difficult for other developing countries to grow with export-led growth policies. Furthermore, Bhattacharya et al. (2001), who investigated the emergence of China's manufactured exports compared to South Asian and Southeast Asian's found that they were negatively affected by the rise of China. Using a panel data approach, this study suggested that China's increases in the world export market share statistically reduced other Asian countries export market shares from the period of 1994-1996 ,but not before 1994.

Ghani (2006) examined whether developing countries specializing in manufactured export compete and crowd-out one another's export. The results of fixed-effect panel estimation for 19 countries during 1990-2000 indicated that developing countries were not crowding-out one another's export. Instead, they were crowding out Western European countries' export of manufactured products. In contrast, Razmi and

Blecker's (2008) study suggested that most developing countries compete with one another in export rather than with industrialized producers. They found instead that a small number of industrialized exporters which have higher expenditure elasticity for their exports compete with other industrialized producers. This means that the fallacy of composition has been applied to a group of low-technology export countries. This paper analyzed the demand for exports of 18 developing countries that specialized in manufactured products to 10 of the largest industrialized countries.

Another study (Razmi, 2007) investigated the presence of the crowding-out effect emerging from intra-developing country competition in export markets for manufactured products during the period 1984-2004. He estimated the export equation for a panel of 22 developing countries which were exporting manufactured products to 13 high income countries. Razmi also constructed the trade-weighted price and quantity indices based on exports of these 22 developing countries. He found that crowding out occurred in all 22 countries in the sample. This crowding-out effect happened during the period 1994-2004 when the sample was divided into two halves.

CHAPTER III

Theoretical Review

This chapter summarizes the theoretical framework of export-led growth and the crowding-out effect. First, I present an empirical work of Kaldor (1970) which developed a simple export-led growth model. This study emphasized the role of the growth rate of foreign demand on output growth. The results showed that the higher the rate of output growth, the faster the growth rate of productivity, and the faster the growth rate of productivity, the lower the rate of increase in unit costs, and so the faster the rate of export growth. Second, I explain why countries grow together and how they can become exporters through flying geese paradigm and production life cycle theory. The flying geese paradigm was introduced by Akamatsu (1933), describes how a new product is introduced to the less developed countries via imports, and how the less developed countries acquire the necessary production technique and become exporters. Then, a simple model by Krugman (1979) illustrated the effect of the world outcome since rates of innovation and technology transfer changed. This model is based on the phenomenon of North-South modeling of product life cycle theory. Third, I introduce an analysis of Bhagwati (1958) that demonstrates the crowding-out effect, which is economic expansion that can lead to deterioration in terms-of-trade.

3.1. Export-led Growth

The theoretical and empirical connections between trade and economic growth have been studied for a long time. However, questions still persist regarding the exact relationship between these two elements. The classical school of economic thought, led by Ricardian, proposed the theory of comparative advantage. According to this theory, countries that open up can be assured the benefits of welfare gains. Welfare gains can be achieved by specializing in producing goods which a country has a comparative advantage (Findlay 1984).

Later, trade and economic growth linkages were examined using the endogenous growth theory which focused more on different variables such as degree of openness, real exchange rate, tariffs, and export performance. These aspects help to verify the hypothesis that open economies grow more rapidly than those that are closed (Edwards 1998). In another theoretical vein, the Post Keynesian theory of trade and economic growth highlighted the importance of balance of payment constraints and investments for long run economic growth. They found the starting point to explain the relationship between trade, growth and balance of payments constraints through the Kaldor export-led growth model.

According to Jayme (2001), Kaldor (1970) developed an export-led growth model built on the notion of cumulative causation, which takes into account the fact that exports are the main component of demand. In detail, he defined:

Output growth: $$g = \emptyset x \quad (1)$$

where g is the growth rate of output, x is the growth rate of exports and $\emptyset$ is the Hicks supermultiplier (i.e. the elasticity of output growth with respect to export growth).

Export function: $$X = K\left(\frac{P_d}{EP_f}\right)^{\mu} Z^{\varepsilon} \quad (2)$$

where X is export, K is any constant, P_d is domestic prices of export, P_f is foreign price, Z is world income, E is domestic price for foreign currency, μ is the price elasticity of demand for exports, ε is income elasticity of demand for exports.

Export growth rate: $$x = \mu(p_d - p_f - e) + \varepsilon Z \quad (3)$$

Domestic inflation can be derived from the traditional mark-up pricing equation that relates wages, prices and labor-output ratio (productivity). In logarithmic form and with respect to time we have

$$p_d = \tau - w - l \quad (4)$$

where w is growth rate of nominal wage rate, l is growth rate of labor productivity and τ is mark-up on unit labor costs.

Also, the Kaldor model assumes growth rate of labor productivity is a function of the rate of output growth (following Verdoorn's Law). This can be presented as

$$l = l_a + vg \quad (5)$$

where l_a is the rate of autonomous productivity growth, and v is the Verdoorn coefficient.

Combining equation (1), (3), (4) and (5) and solving for growth rate of output, we obtain:

$$g = \frac{\emptyset[\mu(w - l_a + \tau - p_f - e) + \varepsilon Z]}{1 + \emptyset\mu v} \quad (6)$$

This equation emphasizes the role of growth rate of foreign demand (Z) in output growth. This model explains that demand policies have cumulative effects. It demonstrates that the higher the rate of output growth, the faster the growth rate of productivity, and the faster growth rate of productivity, the lower the rate of increase in unit costs, and thus the faster rate of export growth.

3.1.1. Flying Geese Paradigm

Export-led growth literature stated that trade was the main engine of economic growth in Newly Industrializing Economies (NIEs) such as Hong Kong, Taiwan, Singapore and Korea have been successful in achieving high and sustained rates of economic growth since the early 1960s because of their free market, increased exports and outward-oriented economies (World Bank, 1993). Their success can be demonstrated not only by the close association between changes in industrial structure and trade structure, but also by economic development transfer from Japan. Therefore, the linkages between the economic growth and their success can be described by flying geese paradigm. This theory, which apples to NIEs, was first proposed by Akamatsu (1935). It describes how a new product is introduced to the less developed countries via imports and how the less developed countries acquire the necessary production technique and become exporters. This theory is similar to the product cycle theory developed by Vernon (1966)[4]. In summary, this theory is based on the state of economic development in Asian countries, which can be divided into three groups: Japan is the lead country (senshinkoku), followed by the NIEs (shinkookoku) and ASEAN-4 as follower countries (kooshinkoku). The theory starts with the introduction of some new products via imports from the lead country and ends when domestic production loses its comparative

[4] The product cycle theory describes how a new product is invented and developed in its first stage, moves to the exporting stage and then finally to its declining stage. The differences between product cycle and flying geese paradigm are the exporting stage is new product that is introduced to less developed countries via imports; and the declining stage is that how the less developed countries acquire the production technique to become exporters.

advantage and relocates to other less developed countries. The various stages of development are explained as follows.

(i). The first stage of development introduces some new products from industrialized countries to kooshikoku. Consumer demand will increase and demand induces domestic production starts. However, domestic production cannot compete with foreign imports because of their high quality and high production costs. Therefore, imports still remain high.

(ii). The second stage is to substitute domestic production for foreign imports which is a result of increasing domestic demand. At this stage, tariff and import restriction will apply to protect the domestic industry from foreign competition. This action will help domestic products replace foreign imports as product quality improves and price becomes competitive. Low inward FDI may occur since the country still experiences low income per capita or undeveloped or inappropriate commercial and legal framework, inadequate transport and communication facilities (Dunning 1981).

(iii). In the third stage, domestic demand growth slows and the product starts to be exported. Production will be kept at a high level for export. Foreign import of the product will be eliminated, whereas strong exports help the country to import capital goods for continued expansion of production. This stage will significantly increase FDI flow since the country experiences the loss of comparative advantage in senshikoku.

(iv). As the country becomes senshikoku, they will face increasing costs and intensified competition from late-starting countries, which slows down production. As a result, exports may be decrease, and domestic demand become sluggish. The FDI also falls since foreign investors prefer the late-starting countries.

(v). The last stage happens when wages and other costs of productions become so high that domestic production loses its comparative advantage. The industry will have to relocate and the other kooshinkoku will start.

According to Dowling and Cheang (2000), technological spillover will play a major role in expansion of the industry. The learning-by-doing will affect both consumption and production at the first stage. At the shinkookoku level, a country can acquire the necessary technology know-how and capital goods to improve the quality of production and reduce costs. Also, less developed countries will specialize in labor-intensive goods, whereas advanced countries will focus on capital-intensive goods.

3.1.2. Product Life Cycle Theory

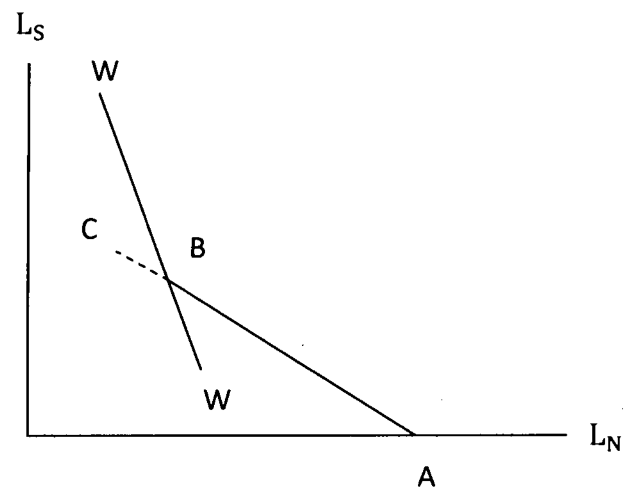
The flying geese paradigm is developed in a manner whereby exporting ability gets transferred across countries. This theory emphasizes that lower production costs allow a country to enter into the production and exporting of a particular good. A related theory, the product cycle theory, which states that transferring of technology allows a country to start producing and exporting a good. In a sense, it is the flying geese paradigm and the product cycle theory that explain how new countries are able to enter the exporting business.

In detail, the product life cycle theory, introduced by Vernon (1966), concentrates on the trade pattern of new products over their life cycle. This product life cycle features prominently in trade between the Northern developed economies and the Southern newly industrializing economies. Vernon emphasized that developed countries spend more on product development than less developed countries and tend to develop high income or labor-saving products. At first, the manufacture of a new product will stay in the innovating country. When the products become mature[5], their manufacture will then relocate to less developed countries since the cost of production is too high in the original country. In the latter stage of this cycle, the innovating country becomes an importer of the product originated by that country's firms.

According to Grossman and Helpman (1991), the first attempt at formal modeling of this phenomenon was carried out by Krugman (1979). Krugman presented a model of two countries: innovating North and non-innovating South. New products are first developed in the innovating North and then the technology of production becomes available to the South. He found that this technological lag gives rise to trade with the North exporting new products and importing old products. In depth, he assumed there are two kinds of goods: old goods and new goods, where new goods are produced in developed countries (Northern countries). Now consider the effect of changes in rates of innovation and technology transfer. It would alter the number of goods produced and the relocation of production. Therefore this change affects the world productivity, also the distribution of world income between North and South. To see this effect, consider figure 2.1 which compares different combinations of Northern and Southern labor, which could be used to produce a given basket of goods.

[5] The products reach a degree of standardization which is characterized by an increase of competition and consequently the price elasticity of demand increases.

Figure 2.1. Effect of Changes in Rates of Innovation and Technology Transfer



Source: Krugman (1979)

As long as both North and South are producing old goods, both Northern and Southern labor can be substituted for one another, as illustrated by the line segment AB. Assume that the world is at a corner solution and that relative wages (WW) are such that North and South specialize in new and old goods respectively, as at point B. A transfer of technology (turning some new goods to old goods) makes it possible to substitute Southern labor for Northern in the production of a given basket of goods as shown by the extension of AB to C. At initial prices, this would reduce production cost, which indicates that production possibilities have been expanded. Therefore, both innovation and technology transfer increase world output.

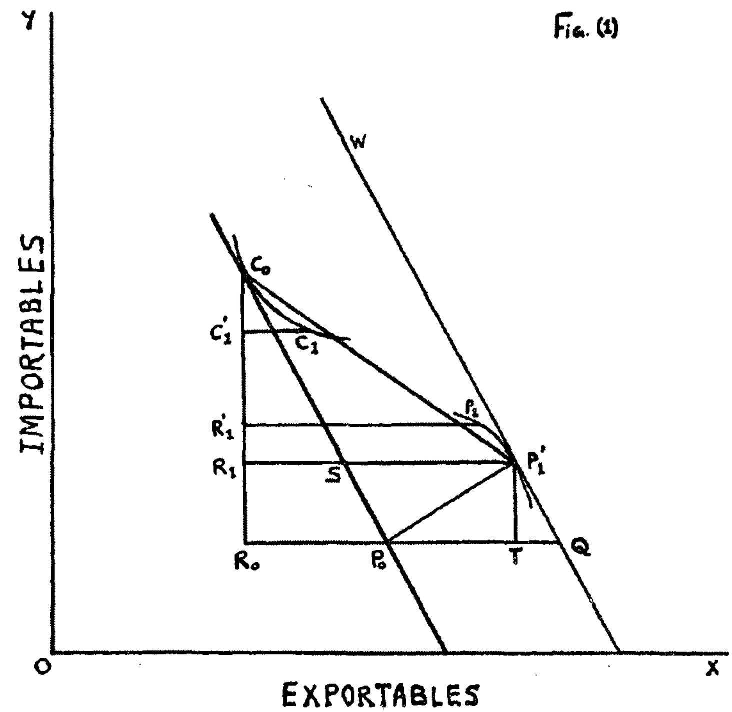
3.3. Crowding-out effect

Although, export-led growth has been increasingly applied around the world, the deterioration in economies continues to occur and create a new challenge for the export-led growth model. In fact, it faces a fallacy of composition, which relies on growth of demand in export markets. The foundation of this economic model is that supported export-led growth policy is restricted to a small market with few competitors. Once many countries simultaneously rely on this policy, however, the export markets will exceed their limit, which will lead to a global shortage of demand and supply surplus.

In this view, developing countries will export most of their manufactured products to industrialized countries. Access to these industrialized markets can be viewed as "external" source of demand for individual developing countries (Razmi and Blecker, 2008); however, this external source of demand does not grow fast enough to support the growth of export expansion of all developing country exporters. As a result, trade barriers and macroeconomic policies will become predominant. If we consider developing countries as a group, the problem of export-led growth will be described as export displacement or crowding-out effect. Thus, as one country tries to increase its export, it may displace the export shares of another.

To illustrate for the crowding-out effect, let's review the Bhagwati (1958) study, which was the first to discuss the context of "immiserizing growth" where economic expansion might lead to a sufficient deterioration in terms-of-trade to offset the beneficial effect of expansion and reduce the real income of the growing country. Consider the two-country case where full employment always obtains. Assume that growth is confined to a single country so that the other (i.e. the rest of the world) does not experience any growth in output.

Figure 2.2. Geometrical Criterion for Immiserizing Growth



Source: Bhagwati (1958)

Figure 2.2 shows the growing economy. P_0C_0 is the pre-expansion terms-of-trade. C_0R_0 is the import of Y into the country and R_0P_0 is the export of Y from the country. The production-possibility curve tangential to P_0C_0 has not been drawn. The indifferent curve through C_0 is tangential to P_0C_0 at C_0. Consider now growth (at constant terms-of-trade) which pushes the production-possibility curve outwards, which would bring production from P_0 to P_1'. Now assume that the terms-of-trade are changed just enough to offset indifference and the new production-possilibity cure. Also, assume that C_1P_1 coincides C_0P_1'.

The effect of expansion and compensating adjustment of the terms-of-trade will reduce the demand for import from C_0R_0 to $C_1'R_1'$ as follows

$$\left(M\frac{\delta Y}{\delta K}+\frac{\delta Y}{\delta p}-\frac{\delta C}{\delta p}\right)dp$$

This expression shows that the decrease in demand for imports is offset by an adverse movement of the terms-of-trade due to the effect of real income growth. This expression is a combination of three effects (i), (ii),(iii).

(i). Economic expansion will increase the production of importables.

The change in the production of importables is

$$R_0R_1 = P_1^{'}T = \frac{\delta Y}{\delta K}P_0Q = \frac{\delta Y}{\delta K}SP_1^{'}$$

where K is country's productive capacity, Y is domestic output of importabes. Then we have

$$R_0R_1 = C_0R_1\frac{\delta Y}{\delta K}(p_1 - p_0)$$

Since $C_0R_1 = C_0R_0$, we have

$$R_0R_1 = M\frac{\delta Y}{\delta K}dp$$

where M is the quantity of imports. This equation tells us that the change in production of importables is due to economic expansion. Normally, this expression is positive. However, in an abnormal case where this expression is negative (output of importables falls as economy expands), it suggests an increase in demand for import.

(ii). Price changes will decrease consumption of importables.

Price changes from p_0 to p_1 will shift consumption along the indifferent curve to C_1. Then we can have the consumption of importable as

$$C_0C_1^{'} = -\frac{\delta C}{\delta p}dp$$

(iii). Price changes will increase the production of importables.

Price changes from p_0 to p_1 will shift production along the production possibility curve to P_1. Then production of importables is increased by

$$R_1R_1' = \frac{\delta Y}{\delta p}dp$$

For further discussion, I would like to introduce the "fallacy of composition", which can be divided into two effects (Ghani 2006). The first is terms-of-trade effect or price effect, which occurs when increases in exports by a group of developing countries will decrease the export price which in turn would reduce its' economic welfare. Thus, to make up for the decrease in export price, export countries will tend to increase their volume of export. This action, however, will lower the export price shifting the supply curve. The second is the crowding-out effect which takes place when the lack of demand in industrialized countries would induce the displacement of export shares amongst the developing countries. The lack of demand from industrialized countries would induce protectionist measures such as trade barriers and macroeconomic policies to prevent the high export surplus from developing countries. Consequently, export-led growth policy only shifts the composition without raising overall economic growth.

While an export-led growth strategy faces fallacy of composition in which not all developing countries can pursue it simultaneously, the supporters of the export promotion strategy argue that this should not cause alarm because the market is unforeseen and new development will benefit this strategy. They see the export-led growth strategy as the best option for most developing Asian countries (Felipe 2003) because many countries within this region still require some form of export-led growth to achieve their economic goals.

In addition, the export-led growth is not simply about exporting, but exporting in the context of a development strategy based on upgrading.

According to Ghani (2006), the classical model of trade and economic growth are based on the idea of reciprocal demand, which will ease any capacity constraint and that technology spillover will help shift developing countries' comparative advantage. This shift in comparative advantage will change a country's trade composition, thereby creating new directions for imports and export from developing countries which are less technological; this is the core of the flying geese paradigm.

As an example, suppose small countries face a perfect elastic demand curve for its export. Then they act as price taker in international markets. In this case, demand side constraint does not play a major role in determining export success. However, countries which emphasize the different characteristics of manufactured products as compared to primary export products will take a more advantageous approach. Producing manufactured products could help them escape the declining terms-of-trade typically associated with primary products. In addition, this would assist and improve technological progress and product efficiency (Razmi, 2007). Further, developing countries, which form the core of the flying geese paradigm, can successfully increase their level of economic development by stepping onto a higher rung of the technological ladder, which will change countries' trade composition. Thus they create room for new imports and exports for less technologically advanced countries. Indeed, they become a source of demand for their own exports. Cutler at al. (2003) and Dowling and Cheang (2000) provide evidence supporting the sequential patterns of changes in comparative advantage for East Asian exports and show that there is economic development transfer from Japan to the NIEs and the ASEAN-4. For that reason, countries with initial export success will crowd-out the less developed countries. In addition, trade emerges as a growth-growth situation would occur by given these perspectives.

CHAPTER IV

Data and Econometric Techniques

This chapter describes the Vietnam and ASEAN data which is used for this analysis. Also, it develops the cointegration methodology. Additional discussion included in this chapter is the VAR lag order selection criterion.

4.1. Data description

4.1.1. Export-led Growth: Vietnam case study

The model is estimated using monthly data. It is in logarithms and real terms over the period 1999:1 - 2007:6. The data set was collected from Monthly Statistical Information issued by the General Statistics Office of Vietnam. The analysis variables are export, import, and total industrial output.

Over the period 1999:1 - 2007:6, the growth of the private sector was a significant feature of Vietnam's economic development. It accounted for 27.9 percent of total industrial output (IND), while the state sector, known as SOEs, contributed over one-third of the total industrial output at 35.1 percent (Table 4.1). Output from foreign invested enterprises, which increased to a level of more than one quarter of total industrial output by 1995 and continues to grow faster than state sector output, accounted for 35.5 percent in 2000[6] and 37.0 percent in the period of study. Therefore, foreign invested enterprises made a significant contribution to the expansion of Vietnam's

[6] Data is collected from Arkadie, V. B. and Mallon, R. (2003)

industrial output. In addition, the private businesses have enjoyed strong encouragement for development. As a result, the proportion of SOEs in total industrial output decreased from 40.1 percent in 1991 to 35.1 percent during 1999:1 - 2007:6.

An example of structure change in industrial output of foreign invested enterprise is the petroleum sector. This sector is one of the major foreign investment sectors in Vietnam, and in 1995 it comprised 41.7 percent of output of foreign invested enterprises compared to the manufacturing sector, which contributed 58.2 percent of output of foreign invested enterprises. By 2000, petroleum activities accounted for 31.8 percent of total industrial output in foreign invested enterprises, while manufacturing activities contributed 66.7 percent of total industrial output in foreign invested enterprises. This proportion had changed to 22.1 percent in the petroleum sector and 77.2 percent in the manufacturing sector by 2004.

Table 4.1. Industrial Output Performance by Sector, 1999:1 - 2007:6

Industrial Indicator	Total (VND billion)	Share of Total Industrial Output
Total Industrial Output	2,827,888	-
- State sector	992,537	35.1
- Non-state sector	790,079	27.9
- Foreign invested enterprises	1,045,272	37.0

Source: General Statistics Office of Vietnam and calculated by author

The exports in this study are divided into 5 main groups of commodities: electronics, seafood, agriculture, energy, and textile manufacture.

Electronics (ELEC) is the field of electronic appliances and PCs & components. Although electronics only accounted for 4.3 percent of total export, its export value has significantly increased from US$42 million in January 1999 to US$170 million in June 2007. A similar major improvement is in the seafood sector (SEA), which includes aqua and marine products, which comprised 9.5 percent of total export; however, its export value has improved from US$50 million in January 1999 to US$330 million in June 2007.

Agriculture (AGR), which consists of some main products such as peanuts, latex, coffee, tea, rice, cashews and black pepper, is also an important sector in Vietnam export. Agriculture related to unprocessed products, and it contributed to 11 percent of total export, whose value has increased from US$116 million in January 1999 to US$457 million in June 2007.

Textile manufacture (MANU) and energy (ENE) are the most important elements in Vietnam's export economy, and they accounted for 25.4 percent and 22.7 percent of total export respectively. Textile manufacture includes footwear and textiles & garments. The energy sector is the total export of crude oil and coal. They have dramatically risen in export value from US$180 million and US$242 million in January 1999 to US$1,060 million and US$741 million in June 2007 respectively.

This statistics indicate that Vietnam's export made impressive changes in structure from the period 1999:1 - 2007:6. The contribution of the agriculture sector dropped from 38.7 percent in 1990 to 11 percent during the period of study, while energy and textile manufacture continued to have the highest proportion of export. In fact, Vietnam's oil and gas industry is currently the country's biggest foreign currency earner, with 21.3 percent of total export (Table 4.2). This is a major source of imported technology.

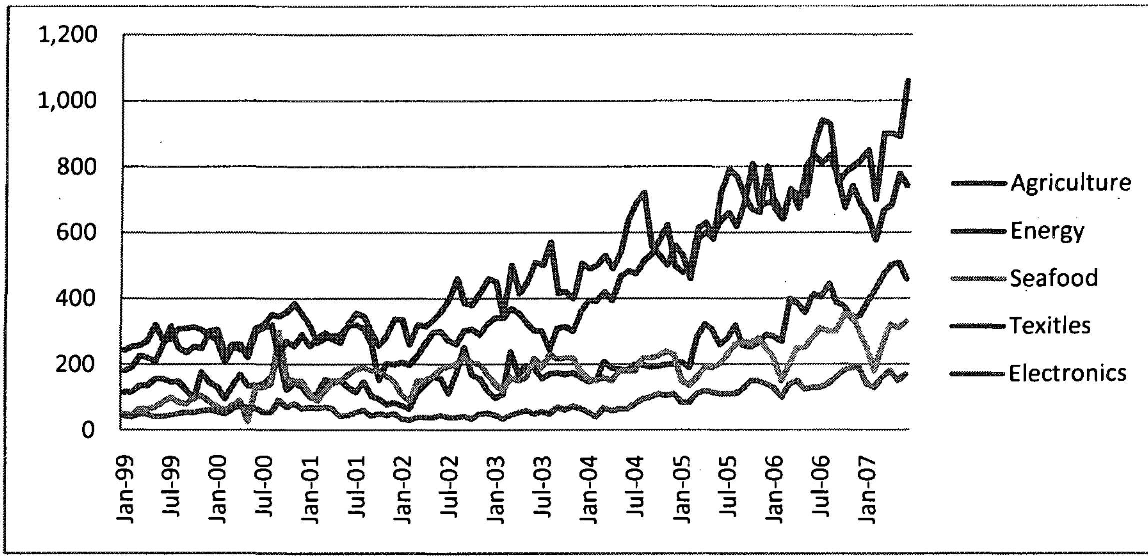
Table 4.2. Total Export by Main Commodity, 1999:1 - 2007:6

Selected items	Total (US$ million)		Share of Total export (%)	
Exports	192,677		-	
Agriculture	21,124.6		11.0	
- Peanuts		296.0		0.2
- Latex		4,083.4		2.1
- Coffee		5,195.9		2.7
- Tea		627.9		0.3
- Rice		7,272.5		3.8
- Cashew		2,449.3		1.3
- Black Pepper		1,199.5		0.6
Energy	43,693.1		22.7	
- Crude Oil		40,989.1		21.3
- Coal		2,704.1		1.4
Seafood Sector	18,277		9.5	
Textiles Manufacture	48,884		25.4	
- Textiles & Garments		29,602		15.4
- Footwear		19,282		10.0
Electronic, PCs & components	8,268		4.3	

Source: General Statistics Office of Vietnam and calculated by author

During the period of study, combination of manufactured products such as textile manufacture and electronic PC components accounted for 29.7 percent as compared to 11 percent of agriculture product and 9.5 percent of seafood production. This structure reflects the rise in processing and manufactured products and decline in unprocessed products. Within manufactured exports, dominance of clothing and footwear indicates Vietnam's strong comparative advantage in these traditional labor-intensive products. Vietnam also diversified its exports into new labor-intensive products such as electronic appliances, plastic production and other miscellaneous products that other developing countries exported in great abundance when they were at stage of development comparative to Vietnam today.

Figure 4.1. Export Performance by Main Commodity, 1999:1 - 2007:6



Source: General Statistics Office of Vietnam

The import sector is separated into capital goods and consumer goods. Capital goods are automobile manufacture and machinery, while consumer goods includes industrial raw materials (petroleum) and some other intermediate inputs such as plastic, steel, fertilizer, chemicals, pharmaceuticals and textile materials. However, this analysis focuses on automobile manufacture import and textile material import.

Automobile import (AUTM) includes automobile parts and motorbike kit imports, which accounted for only 4.0 percent of total import. While textile material import (TEXM), which consists of cotton, yarn, textiles, garment material, and parts, contributed 8.7 percent of total import value (Table 4.3).

Table 4.3. Total Import by Main Commodity, 1999:1 - 2007:6

Selected items	Total (US$ million)	Share of Total Import (%)
Imports	218,193	-
- Auto Manufacture	8,797	4.0
- Machinery & spare parts	3,5365	16.2
- Steel & steel billets	15,250	7.0
- Fertilizer	4,679	2.1
- Petroleum	2,6974	12.4
- Chemicals	4,898	2.2
- Pharmaceuticals	3,266	1.5
- Plastic in primary form	8,119	3.7
- Textile materials	19,105	8.7

Source: General Statistics Office of Vietnam and calculated by author

The commodity composition of imports reflects Vietnam's low level of industrial development. At the current level of development, Vietnam is not internationally competitive in most capital goods (machinery and transport equipment), which account for 20.2 percent of total import; and industrial raw material (petroleum) which accounted for 12.4 percent. Therefore, Vietnam's economy is heavily reliant on import of these categories of goods.

4.1.2. Crowding-out Effect: ASEAN case study

My sample monthly data is collected from the EUROSTAT website. Data is in logarithms and real terms over period 1996:1 – 2007:12 for export of selected ASEAN countries to Europe. The selected ASEAN countries are Singapore, Malaysia, Thailand, Indonesia, the Philippines and Vietnam. Singapore is classified as a high-income country, while Malaysia is an upper mid-income country. Thailand, Indonesia and Philippines are lower mid-income countries. Vietnam is a low-income country. All exports of manufactured products fall under Standard International Trade Classification (SITC) groups 5-8. Groups 5 and 7 are considered as high-technology products, and groups 6 and 8 are low-technology products[7].

Table 4.4. Average Percentage Share of Selected ASEAN Countries Merchandise Export to Europe during 1996:1 – 2007:12

	Chemicals	Manufactured goods	Machinery and transport equipment	Miscellaneous manufactured
Indonesia	6.9	37.4	5.0	24.6
Malaysia	8.3	15.8	30.8	13.2
Philippines	0.7	3.7	14.1	5.8
Singapore	78.1	5.7	31.9	6.2
Thailand	5.6	29.7	17.3	20.5
Vietnam	0.5	7.4	0.8	23.1

Chemicals and related products: SITC5
Manufacture goods classified chiefly by material: SITC6
Machinery and transport equipment: SITC7
Miscellaneous manufactured articles: SITC8
Source: EUROSTAT and calculated by author

Table 4.4 provides a breakout of share of selected ASEAN countries merchandise export to European countries over the period of January 1996 to December 2007. Each country's export share is calculated by its export over the total export of ASEAN to European. For instance, Indonesia occupies 6.9% total export market share of chemicals and related products in Europe, whereas Singapore holds 78.1% of the total of chemical product export market share.

Over the period of 1996:1 – 2007:12, Singapore showed the highest export share in the group, with 78.1% and 31.9% export market share for chemical products (SITC5) and machinery and transport equipment (SITC7) to Europe respectively; whereas their market shares for manufactured goods (SITC6) and miscellaneous manufactured (SITC8)

[7] SITC5 includes organic chemical (51), medicinal & pharmaceutical products (54). SITC6 includes textile yarn (65), leather (61), and rubber manufactures (62). SITC7 includes office machinery (75), telecommunication (76), electrical machinery and applicants (77). SITC8 includes clothing, apparel accessories (84), furniture (82) and footwear (85). Source: ASEAN Statistical Pocketbook 2006.

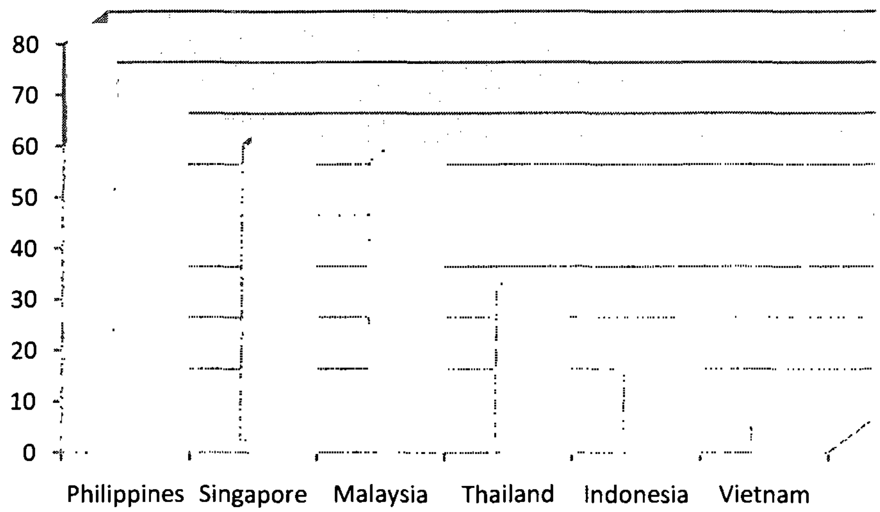
are very small at 5.7% and 6.2% respectively. This reflects the commodity structure from high-technology products to low-technology products. In detail, this shifts chemical products and office machines, telecommunication, electrical machinery to textile, leather, clothing and footwear production (see footnote 7).

In contrast, Indonesia is highest export market shares were for manufactured goods (SITC6) and miscellaneous manufactured (SITC8) at 37.4% and 24.6% respectively, but they have a small share of chemical products (SITC5), machinery and transport equipment (SITC7) with 6.9% and 5.0% respectively.

Vietnam has insignificant statistics for chemical products, machinery and transport equipment with 0.5% and 0.8% export market share respectively. Likewise, the Philippines has a statistically insignificant export market share for chemical products of 0.7%. In summary, the breakout of the merchandise export market share suggests the fact that high-income countries like Singapore focus on producing high-technology products such as chemicals, machinery and transport equipment, while low-income countries like Vietnam tend to produce low-technology products such as manufactured goods and miscellaneous manufactured articles.

This analysis also separates the selected ASEAN countries into 2 groups. The first group consists of a combination of high-tech intensive manufacturers such as the Philippines (PHI), Singapore (SIN), and Malaysia (MAL). The second group is composed of countries with low-tech intensive manufacturing such as Vietnam (VIE), Indonesia (INDO), and Thailand (THAI). The rationale for these categories is based on their ratio of high-technology export to the total manufactured exports.

Figure 4.2. Percentage High-Tech Export for Selected ASEAN



Source: World Development Indicator and calculated by author

The important feature of this analysis is its specification of the decreasing export market share in each country. This study used Vector Error Correction Model (VECM), where variables are arranged based on their ranking on market share. Since we know that increasing exports from one country may have negative impacts on exports from a rival, this means that as one country tries to increase its export, it may displace the export shares of another. A country with a high market share would have more power to displace a country with small market share. Hence, the crowding-out effect among selected ASEAN countries will depend on the corresponding size of their market share. In contrast, a small export market share in Europe may apply the full crowding-out effect or nothing, since its market share is insignificant. Thus, if the crowding-out effect hypothesis holds, the coefficient should be statistically significant and positive.

4.2. Methodology - Multivariate Cointegration Analysis and Error Correction Model

Prior to testing for a causal relationship between the time series, the first step is to determine the stationarity of variables which are used as regressors in these models. This will verify whether the series had a stationary trend. In addition, if the series are non-stationary, then the next step is establishing orders of integration, which can be accomplished by applying the Augmented Dickey-Fuller (ADF) test.

In the ADF method, if the absolute calculated statistic is greater than its critical value, then X is said to be stationary or integrated to the order zero, i.e. *I(0)*. If this is not the case, then the ADF test is performed on the first differential of X (i.e. DX). If DX is found to be stationary, then X is integrated to the order one *I(1)*. Eviews is used to perform this test in practice, which also gives the critical value of the ADF statistic. The test is based on the estimate of the following regression:

$$\Delta X_t = a_0 + a_1 t + \delta X_{t-1} + \sum_{j=1}^{\rho} \alpha_j \, \Delta X_{t-j} + \varepsilon_t$$

where ε_t is the pure white noise error term, t is the time or trend variable, ρ is a large enough lag length to ensure that ε_t is a white noise process, a_0 is a drift. The null hypothesis that the variable X_t is non-stationary ($H_0: \delta = 0$) is rejected if δ is significantly negative.

If all the variables in a multivariate model are integrated to the order one, i.e. *I(1)*, then the second step is to determine whether they are cointegrated using Johansen's approach (Johansen, 1988), (Johansen & Juselius, 1992). Cointegration is a technique which estimates the relationship between non-stationary time series variables. Suppose X_t and Y_t are cointegrated in such a linear vector of coefficient as $a_1 X_t - a_2 Y_t = \varepsilon_t$, where ε_t (the disequilibrium residual) has to be stationary, X_t and Y_t are non-stationary. ε_t

represents the connection of X_t and Y_t from its equilibrium relationship. When $\varepsilon_t = 0$, either X_t has to rise and Y_t has to fall, or a combination of both in order to achieve long run equilibrium.

The Johansen reduced rank regression approach is one of the most popular techniques for jointly estimating a group of cointegraing relationships. To examine the process, consider an unrestricted VAR model up to k lags in which the process X_t is defined by

$$X_t = \mu + \Pi_1 X_{t-1} + \cdots + \Pi_k X_{t-k} + \varepsilon_t \qquad t = 1,2,\ldots,T$$

where ε_t is i.i.d ρ - dimensional Gaussian error term with mean zero and variance Λ. X_t is a vector of *I(1)* variables and μ is a vector of constants. Since X_t is non-stationary, the above equation can be expressed in first differenced vector error correction model (VMEC), known as Johansen reduced rank regression:

$$\Delta X_t = \mu + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \varepsilon_t$$

This equation is expressed as a traditional first difference VAR model except for the term ΠX_{t-k}. The $\Gamma_i \Delta X_{t-i}$ term represents for stationary variations related to the past history of system variables. The coefficient matrix Π contains the information about the long-run relationships between variables. There are three cases. If the rank of Π equals to ρ then the matrix Π is considered full rank, then the vector process X_t is stationary in levels and VAR in levels is an appropriate model. If the rank of Π equals to 0, the matrix Π is null. A matrix and the above equation is a traditional first differences VAR model (where variables are not cointegrated and there is no long-run relationship). If $0 < r < \rho$, then theoretically $\Pi = \alpha\beta'$, where β matrix contains the coefficient of the r distinct long-run cointegrated vectors that make $\beta' X_t$ stationary. And α matrix describes the short-run speed adjustment coefficient for the equations in the system.

According to Enders (1995), Johansen's methodology requires the estimation of VAR equation above, and then the residuals are used to compute two likelihood ratio (LR) test statistics that can be used in determination of the cointegrated vectors of X_t. Briefly, the step of the Johansen approach is to difference X_t and regress ΔX_t on $\Delta X_{t-1}, \Delta X_{t-2}, \dots, \Delta X_{t-k-1}$ and Z_t. The residual vector u is then saved. X_{t-k} is then regressed on future $\Delta X_{t-1}, \Delta X_{t-2}, \dots, \Delta X_{t-k-1}$ and Z_t and the residual v is also saved. This later vector is non-stationary and contains the elements of the cointergrated vectors. Using reduced rank regression techniques, the covariance matrix cointegrated vectors.

In detail, the first step in the process of applying cointegration is to establish whether the series are non-stationary by using Augemented Dickey-fuller (ADF) approach. Via VAR lag order selected criterion, I am able to establish the optimal lag length in second step. Third step is to determine if the data support the predicted number of cointegrating vectors, I used Trace and Max-Eigenvalue test to find out the number of cointegrating vectors.

Trace test examines the hypothesis that the rank of Π is less than or equal to r cointegrated vectors is given by:

$$\lambda_{trace}\ (r) = -T \sum_{i=r+1}^{n} \ln (1 - \hat{\lambda}_i)$$

Max-Eigenvalue test examines whether the null hypothesis of r is cointegrated vectors against the alternative of $r+1$

$$\lambda_{max}\ (r, r+1) = -T ln(1 - \hat{\lambda}_{r+1})$$

4.3. VAR Lag Order Selection Criterion

The estimated cointegration relationships are very sensitive to the number of lags included in the VAR model. As a result, depending on the choice of lag length, estimation of a long run cointegration relationship will be affected by using the Johansen estimation procedure (Emerson, 2007). Five different selection criteria to make decisions regarding the optimal lag order for VAR are: sequential modified Likelihood Ratio test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn information criterion (HQ).

4.3.1. Likelihood Ratio (LR) test statistic

The Likelihood Ratio (LR) test estimates results of the unrestricted model under the alternative; if the equations of unrestricted model contain different regressors, then the LR statistic is computed as:

$$LR = (T\text{-}c)(\ln|\textstyle\sum_r| - \ln|\textstyle\sum_u|)$$

where $\sum_r$, $\sum_u$ are the variance/covariance matrix of restricted and unrestricted residual system respectively. T is the number of observations. c is the maximum number of regressors contained in the longest equation. The LR test statistic has a χ^2distribution with degree of freedom equal to the number of restrictions in the system. For instance, if we want to test whether 8 lags are appropriate versus 12 lags, then $\sum_8$ is the variance/covariance matrix of the restricted residual and $\sum_{12}$ is unrestricted residual. If the calculated value of statistic is less than χ^2 at perspective significant level, we cannot reject the null hypothesis of 8 lags.

4.3.2. Final Prediction Error (FPE)

The Final Prediction Error also known as Akaike's Final Prediction Error, which is closely related with the Akaike Information Criterion, provides a measure of model quality by simulating different outcomes of the model under different data sets. According to the Akaike theory, the model which has the smallest FPE is the most accurate.

The Final Prediction Error is defined as following equation:

$$\mathrm{FPE} = \mathrm{V}*\left(\frac{T+N}{T-N}\right)$$

where V is the loss command, T is the number of observations and N is number of estimated parameters.

The loss function V is defined by the following equation:

$$\mathrm{V} = \det\left|\frac{1}{\mathrm{T}}\sum_{1}^{\mathrm{T}} \varepsilon(\mathrm{i}, \theta_{\mathrm{T}})\left(\varepsilon(\mathrm{i}, \theta_{\mathrm{T}})\right)^{\mathrm{I}}\right|$$

where θ_T is the estimated parameters

4.3.3. Akaike information criterion (AIC)

The Likelihood Ratio test, which is based on asymptotic theory, may not be applicable for small time series samples. This test is only useful when one model is restricted versus another. The other test criteria which determines the appropriate lag length is the Akaike information criterion, which is computed as:

$$\mathrm{AIC} = \mathrm{T}*\ln|\Sigma| + 2\mathrm{N}$$

where $|\Sigma|$is the determinant of the variance/covariance matrix of the residuals, T is the number of usable observations, and N is the total number of parameters estimated in all equations. Therefore, if each equation in an n-variable VAR has p lags and a constant term, then N = n^2p + n and each of n equations has *np* lagged regressors and a constant term.

4.3.4. Schwarz information criterion (SC)

Similar to the Akaike information criterion, the Schwarz information criterion criterion is defined as:

$$SC = T^* \ln|\Sigma| + N^*\ln T$$

In this model, as one can see, increasing the additional regressor in N will reduce ln|∑|. In comparing two or more models, the model with the lowest value of Akaike information criterion and Schwarz information criterion are preferred. The advantage of the Akaike information criterion and the Schwarz information criterion is that it has been used to determine the lag length in the VAR model. They also can be used to compare in-sample or out-of-sample to forecast performance of a regression model. In addition, the Akaike information criterion is useful for both nested and non-nested models.

4.3.5. Hannan-Quinn information criterion (HQ)

An alternative to the Akaike information criterion is the Hannan-Quinn information criterion, defined as:

$$HQ = T^* \ln|\Sigma| + 2N^*\ln(\ln T)$$

To summarize, the information criteria in this model are used to determine lag length for the VAR model which may result in a better fit by including additional lags in the model. This, however, would cause the loss of degrees of freedom. These common criteria used in determining optimal lag length are the Akaike information criterion, the

Schwarz information criterion and the Hannan-Quinn information criterion. According to Weinhagen (2006), the Akaike information criterion is the least strict in term of causing loss in degrees of freedom, while the Schwarz information criterion is the strictest. The Hannan-Quinn information criterion falls between the Akaike information criterion and the Schwarz information criterion in terms of strictness. The Hannan-Quinn information criterion suggests that a VAR whose equations have one lag is optimal, hence a one lag specification was chosen, and the unrestricted VAR will be estimated with ordinary least squares.

CHAPTER V

Empirical Results

This chapter presents the empirical approach and results obtained from using the cointegration technique. Also, the unit root test, the VAR lag order selection criterion, the trace and max-eigenvalue test, cointegrated systems and speed of adjustment are reported in detail.

5.1. Export-led Growth Empirical Results

5.1.1. Unit Root Test

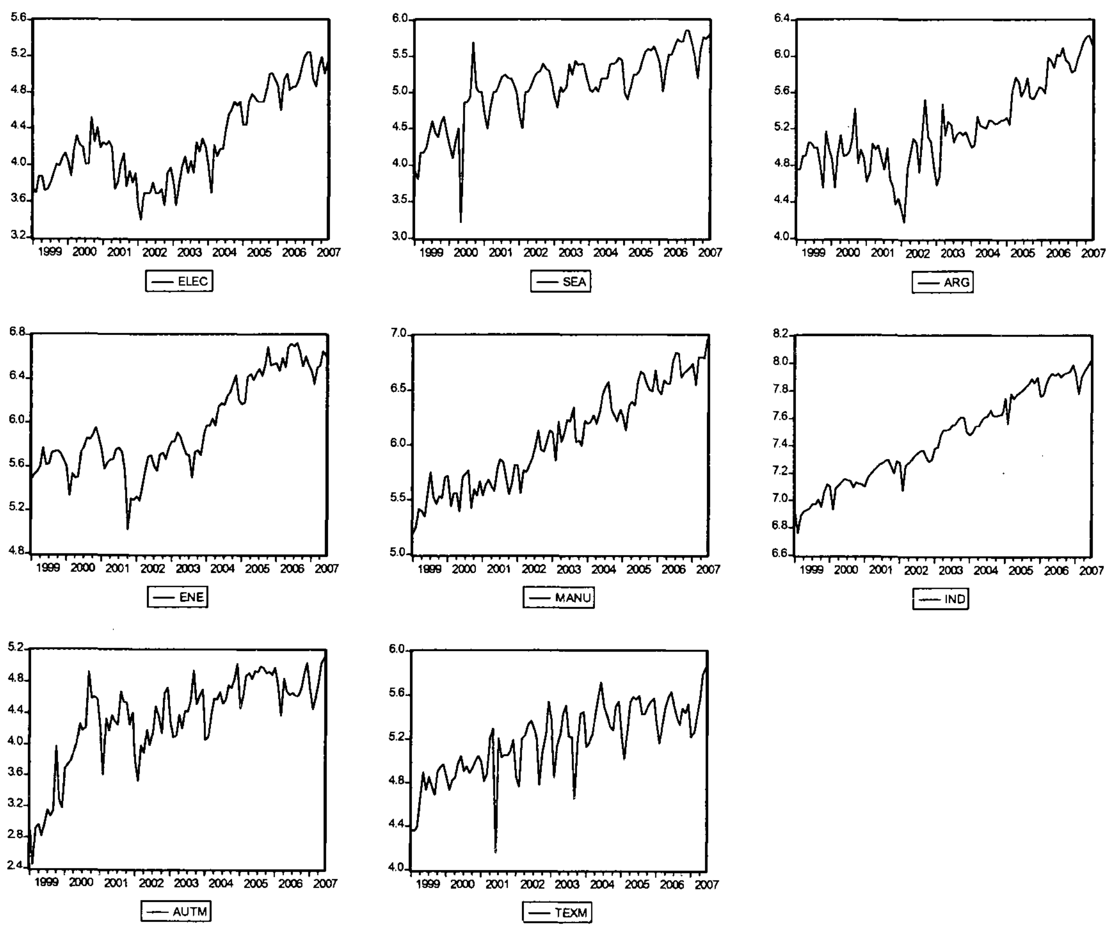
Prior to testing for a causality relationship between time series variables, it is necessary to test for their order of integration and establish that they are integrated of the same order. To accomplish this, the Dickey-Fuller test (ADF) is used on the time series in level form, where the number of lags included was determined using AIC and SIC, and the default lag is 9. Table 5.1 suggested that all time series are *I(1)* variables at the 95 percent confidence level. In addition, Figure 5.1 also demonstrates that all series are non-stationary.

Table 5.1. Unit Root Tests for Export-led Growth Model

Variable	ADF: Intercept	ADF: None
ELEC	-0.25	1.45
SEA	-1.51	1.02
ARG	0.95	0.46
ENE	-1.21	0.85
MANU	1.03	1.80
IND	-0.84	2.60
AUTM	-2.63	1.08
TEXM	-1.59	1.91
Critical Values	1%: -3.49	1%: -2.59
	5%: -2.89	5%: -1.94
	10%: -2.58	10%: -1.61

Note: The order of integration for each variable is *I(1)*at 5% level of significance

Figure 5.1. Export-led Growth Series' Graph



5.1.2. Trace and Max-Eigenvalue Test

Following Johansen's methodology, the results show that observation variables are non-stationary at the 95 percent level of confidence. In short, at first difference form, all variables are stationary [*I(0)*], or they are *I(1)* at level form. The next step is to determine whether the variables are cointegrated.

To test for the number of cointegrating vectors, Trace and Maximum Eignvalue test are used. The results from Table 5.2 indicate six cointegrating equations at 5 percent level of significance.

Table 5.2. Trace and Max-Eigenvalue Test for Export-led Growth Model

Null	Alternative	Trace	Max-Eigenvalue
$r = 0$	$r = 1$	647.15 (159.35)	210.19 (52.36)
$r \leq 1$	$r = 2$	436.97 (125.62)	139.44 (46.23)
$r \leq 2$	$r = 3$	297.53 (95.75)	121.91 (40.08)
$r \leq 3$	$r = 4$	175.62 (69.82)	85.23 (33.88)
$r \leq 4$	$r = 5$	90.39 (47.86)	45.15 (27.58)
$r \leq 5$	$r = 6$	45.24 (29.80)	41.04 (21.13)
$r \leq 6$	$r = 7$	4.20 (15.49)	4.06 (14.26)

Note: *r* is the number of cointegrating vectors. Figures in parentheses are the 5% critical values of the respective test statistics

Table 5.2 shows that the null hypothesis of no cointegration vector is rejected. However, the null hypothesis of at most six cointegrating vectors cannot be rejected in case of $r = 7$. Thus the test supports that six cointegrating vectors in an eight-variable system are cointegrated and follow common long-run relationships.

5.1.3. Cointegrated System

The Johansen Cointegration Test indicates six cointegrating vectors in an eight-variable system, of which five export variables are electronic, seafood, agriculture, energy, and textile manufacturing. The other two import variables are automobile and textile material; and the last one is total industrial output. Since I am interested in examining how exports change could affect total industrial output and imports, five cointegrated vectors system is conducted. In addition, IND, AUTM, and TEXM are common variables of which all appear in each equation from (1) to (5). This system tells us how the coefficient of IND, AUTM and TEXM variables respond as the export sector alters.

As we know, the purpose for this analysis is to examine the impact of each export sector on total industrial output and domestic import sectors. Automobile parts and motorbike kit imports are an important factor in the relationship between industrial output increase and the response of the import market. As automobile manufacture in Vietnam is at the assembly level, the import quantity will create a major effect on the economy growth. A similar story can be used to explain the case of the textile material imports. Textile manufacture export is one of the biggest shares of total national export. It requires many materials as input. Therefore, textile import material can tell us whether the domestic suppliers are able to support the manufacture instead of relying upon foreign import which results from export growth.

According to the export-led growth hypothesis, export growth may lead to economic growth. However, it would have an unknown effect on import growth depending upon the country's policy. In discussing trade strategies, the hypothesis of interest is that growth in real exports tends to cause growth in real output. There are several reasons to hold this hypothesis. First, export growth may result in enhanced efficiency and then may lead to greater output. Second, export growth may represent an increase in demand for the country's output and in this way the real output can be increased. Third, increase in exports may loosen a binding foreign exchange constraint and allow an increase in productive intermediate imports and thus result in the growth of output. Fourth, if the exports increase, this can determine the specialization in type of export products and an increase of the productivity in this sector.

For developing countries, trade deficits occur regularly every year, and their policy is to reduce this trade deficit. A good policy will bring export growth along with economic growth and import reduction. The Vietnam case study is similar. Vietnam has faced trade deficits commonly since the Doi Moi[8]. For example, the trade deficit of US$ 5.12 billion in 2003 (about 25.7 percent of export revenue) was the biggest deficit in the last 5 years. The deficit in the domestic sector was US$ 6.41 billion while FDI (including crude oil) had an export surplus of US$ 1.29 billion. Excluding the revenue from crude oil, the FDI deficit was US$ 2.49 billion. In 2005, the trade deficit was US$ 4.7 billion. Although the export revenue has increased over time since Doi Moi, Vietnam has continuously faced trade deficit situations. The policy attempt to decrease the trade deficit every year implies that imports should be reduced.

Therefore, whether export growth affects industrial output or domestic imports, it is absolutely based on how we construct the system (9 lags are used for this study). The normalized cointegrating estimated system is created as follows:

[8] Doi Moi (means renovation) is the economic reform program which was launched by the Vietnamese Government since 1986.

$$1.0\ \text{ELEC} - 24.63\ \text{IND} - 8.06\ \text{AUTM} + 44.93\ \text{TEXM} = \varepsilon_{ELEC(t)} \quad (1)$$

$$(4.28)^{***} \quad (2.21)^{***} \quad (8.41)^{***}$$

$$1.0\ \text{SEA} + 8.99\ \text{IND} + 3.34\ \text{AUTM} - 19.20\ \text{TEXM} = \varepsilon_{SEA(t)} \quad (2)$$

$$(1.70)^{***} \quad (0.88)^{***} \quad (3.35)^{***}$$

$$1.0\ \text{ARG} - 8.09\ \text{IND} - 1.83\ \text{AUTM} + 12.48\ \text{TEXM} = \varepsilon_{ARG(t)} \quad (3)$$

$$(1.08)^{***} \quad (0.56)^{***} \quad (2.13)^{***}$$

$$1.0\ \text{ENE} - 17.72\ \text{IND} - 5.34\ \text{AUTM} + 31.06\ \text{TEXM} = \varepsilon_{ENE(t)} \quad (4)$$

$$(3.05)^{***} \quad (1.58)^{***} \quad (6.00)^{***}$$

$$1.0\ \text{MANU} + 0.46\ \text{IND} + 0.82\ \text{AUTM} - 3.85\ \text{TEXM} = \varepsilon_{MANU(t)} \quad (5)$$

$$(0.34) \quad (0.17)^{***} \quad (0.67)^{***}$$

Note: The numbers in parentheses are the standard errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level. I chose the 5 cointegrating vectors in order to explain how five export sectors impact industrial output and import sectors.

Equation 1 to 5 describe the picture of Vietnam's economy based on the dynamic relationship between exports, imports and industrial output. This system allows us to analyze the relationship of non-basic sectors (export sectors: ELEC, SEA, ARG, ENE and MANU) and basic sectors (IND and import sectors: AUTM and TEXM). For example, consider the first equation, ELEC vector, which describes how electronic appliance export impacts total industrial output and import sectors. The ELEC variable respectively relates to the negative sign of IND, AUTM and positive sign of TEXM. The result is supported by significant statistics.

The negative sign reflects the inverse relationship between electronic exports and total industrial output and automobile imports. It means that growth in exports will lead to the total industrial output growth, which follows export-led growth hypothesis. Meanwhile, it also promotes automobile imports.

Since the economy is enlarged by the export sector expansion, textile material imports have shrunk. The reduction in TEXM would suggest that the domestic market is good enough to support itself for textile materials instead of importing them. This implies that electronic export expansion has a negative effect on textile imports.

Similar dynamic consequences are also represented in the equation (3) and (4). An increase in the agriculture (AGR) and energy (ENE) export sector will enhance total industrial output and automobile imports. However, both of these exports have negative effects on textile material imports. In general, export expansion in electronic, agriculture and energy promotes industrial output and automobile imports. It, however, reduces textile material imports.

The five-vector system above also indicates a contrasting expectation which is showed in equation (2) and (5). Let us consider equation (5) where exports in textile manufacture (MANU) is followed by a positive sign of IND and AUTM and a negative sign with TEXM. Textile manufacture export expansion will promote textile material imports but reduce the total industrial output and automobile import. Intuitionally, textile manufacture expansion requires additional materials as input; therefore, it increases textile imports and raises total industrial output. This result shows contrasting expectation for total industrial output although it is supported by an insignificant statistic.

The equation (5) also indicates reduction of automobile imports. Therefore, export expansion could not promote industrial output growth and have a negative impact on automobile imports. A similar explanation can be applied for equation (2) where export growth in the seafood sector could not promote economic growth and automobile imports. However, the results support textile material import at a significant statistic.

5.1.4. Speed of Adjustment

For further discussion, I am interested in market response in long-run relationships between variables, which can be examined by the vector error correction model. The variable ε is the error correction term which presents the time series pattern of disequilibrium in the market. The relationship among variables in the system and the disequilibrium response to the market is reported in the table 5.3.

Table 5.3. Speeds of Adjustment for Export-led Growth Model

Variable	$\varepsilon_{ELEC(t-1)}$	$\varepsilon_{SEA(t-1)}$	$\varepsilon_{ARG(t-1)}$	$\varepsilon_{ENE(t-1)}$	$\varepsilon_{MANU(t-1)}$
ΔELEC	-1.03**				
	(0.48)				
ΔSEA		-1.17**			
		(0.53)			
ΔARG			0.43		
			(0.57)		
ΔENE				0.11	
				(0.62)	
ΔMANU					-1.33*
					(0.76)
ΔIND	-0.28	-0.05	0.13	0.35	0.39
	(0.15)	(0.11)	(0.14)	(0.21)	(0.33)
ΔAUTM	2.13***	-0.11	0.25	-2.86***	2.49**
	(0.52)	(0.39)	(0.48)	(0.71)	(1.14)
ΔTEXM	-0.06	0.55	-1.60***	1.07	1.22
	(0.50)	(0.37)	(0.46)	(0.68)	(1.09)

Note: Standard errors are in parentheses. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. For instance, the error correction term $\varepsilon_{ELEC(t-1)}$ indicates the disequilibrium residual in electronic exports with total industrial output, automobile manufactured imports and textile material import relationship.

Table 5.3 shows the relationship among variables in the system and the disequilibrium response to the market. These results indicate that ELEC, SEA and MANU seem to respond as the theory predicted. This is verified by the significance of the estimates along the main diagonal of upper 5x5 cells within the table 5.3. ELEC, SEA and MANU are significant at at least 10 percent level, while ARG and ENE are insignificant. The coefficients of the VECM not only have to be significant to reveal the proper movement to reequilibrium of their cointegrating vectors, but they also need to have the opposite sign than what is determined in the cointegrated system. In detail, five local sectors (ELEC, SEA, AGR, LENE and MANU) come in with positive sign in the cointegrated system but only 3 have negative sign within the VECM; therefore the system could not fully predict for long-run relationships.

In deep, the three unique variables IND, AUTM and TEXM have some significant coefficients, implying some responsiveness to disequilibrium. IND and AUTM entered the cointegrated system with a negative sign in vector (1), (3), (4) and positive sign in (2) and (5). So to clear a vector, it must come in positive and negative respectively. AUTM are positive in the ELEC and MANU vectors. This means that AUTM clears the first and fifth vectors and causes further disqulilibrium in the second, third and fourth vectors. IND is insignificant in all vectors, so IND does not respond to disequlibrium with these vectors. This means export promotion does not increase total industrial output. Therefore, export-led growth hypothesis does not exist in this study.

TEXM entered the cointegrated system with negative sign in vector (2), (5) and a positive sign in (1), (3) and (4). To clear a vector, it must come in positive and negative respectively. However, a positive sign in the VECM does not match with positive sign in the cointegrated system ($\varepsilon_{ARG(t-1)}$ and $\varepsilon_{ENE(t-1)}$). Therefore, a long-run relationship could not be predicted since it does not pass both levels of the test.

In summary, this analysis indicates the causality relationship between export and industrial output run both ways. Export expansion may lead economic growth or the other way around. Besides, long-run estimated relationships did not hold export-led growth hypothesis (the speed of adjustment estimate for ΔIND are all insignificant). However, this study support Kaldor's approach which demonstrates that the higher the rate of output growth, the faster the growth rate of productivity, and the faster growth rate of productivity, the lower the rate of increase in unit costs, and thus the faster rate of export growth.

5.2. Crowding-out Effect Empirical Results

5.2.1. Unit Root Test

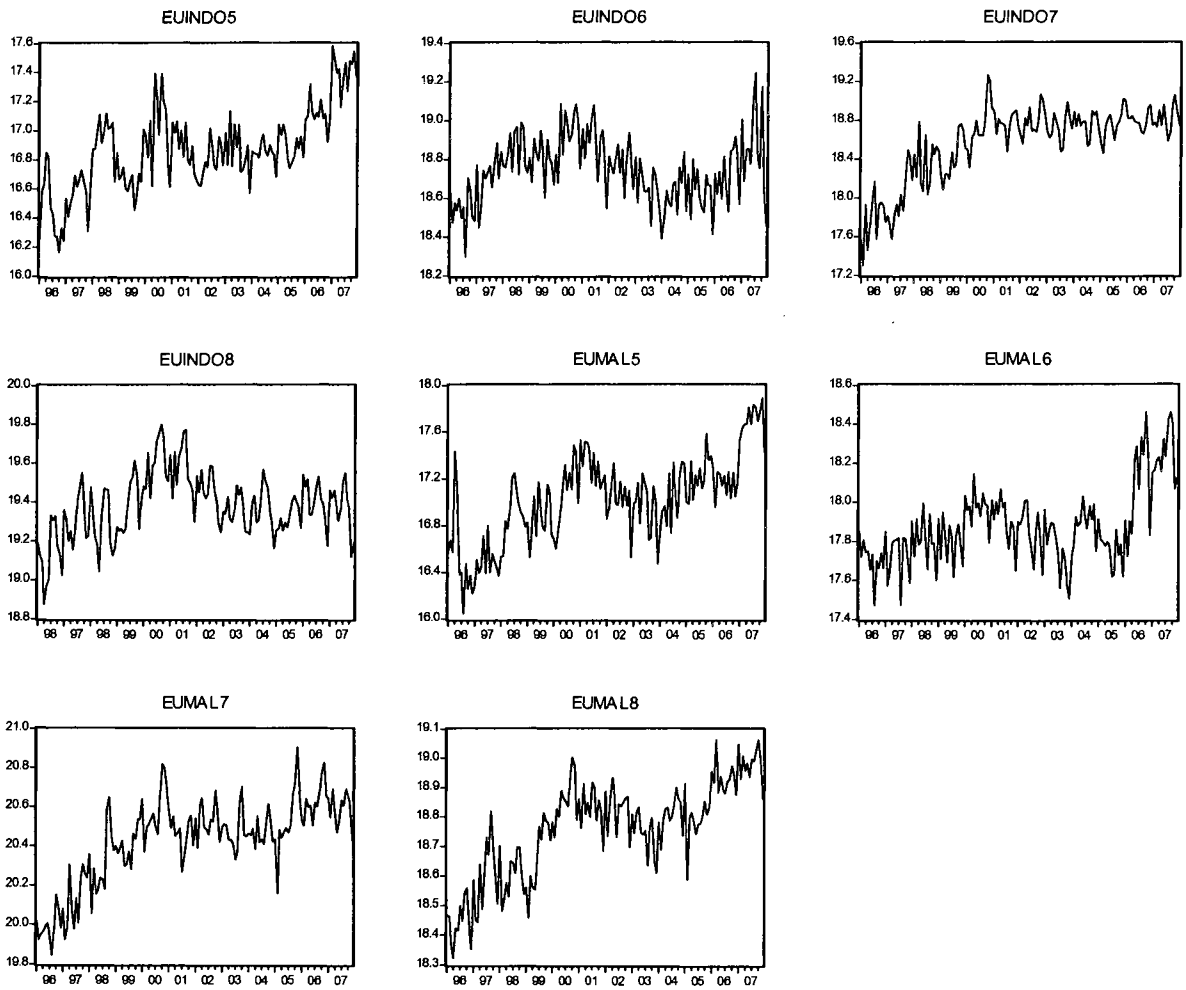
Prior to testing for a causality relationship between time series variables, it is necessary to test for their order of integration and establish that they are integrated of the same order. To accomplish this, the Dickey-Fuller test (ADF) is used on the time series in level and difference forms, where the number of lags included was determined using AIC and SC, and the default lag is 8. To ensure white noise, a few variables require number of lags to deviate from 8. The test suggested that time series are *I(1)* variables at the 99 percent confidence level (see Table 5.4). Also, Figure 5.2 illustrates all series are non-stationary.

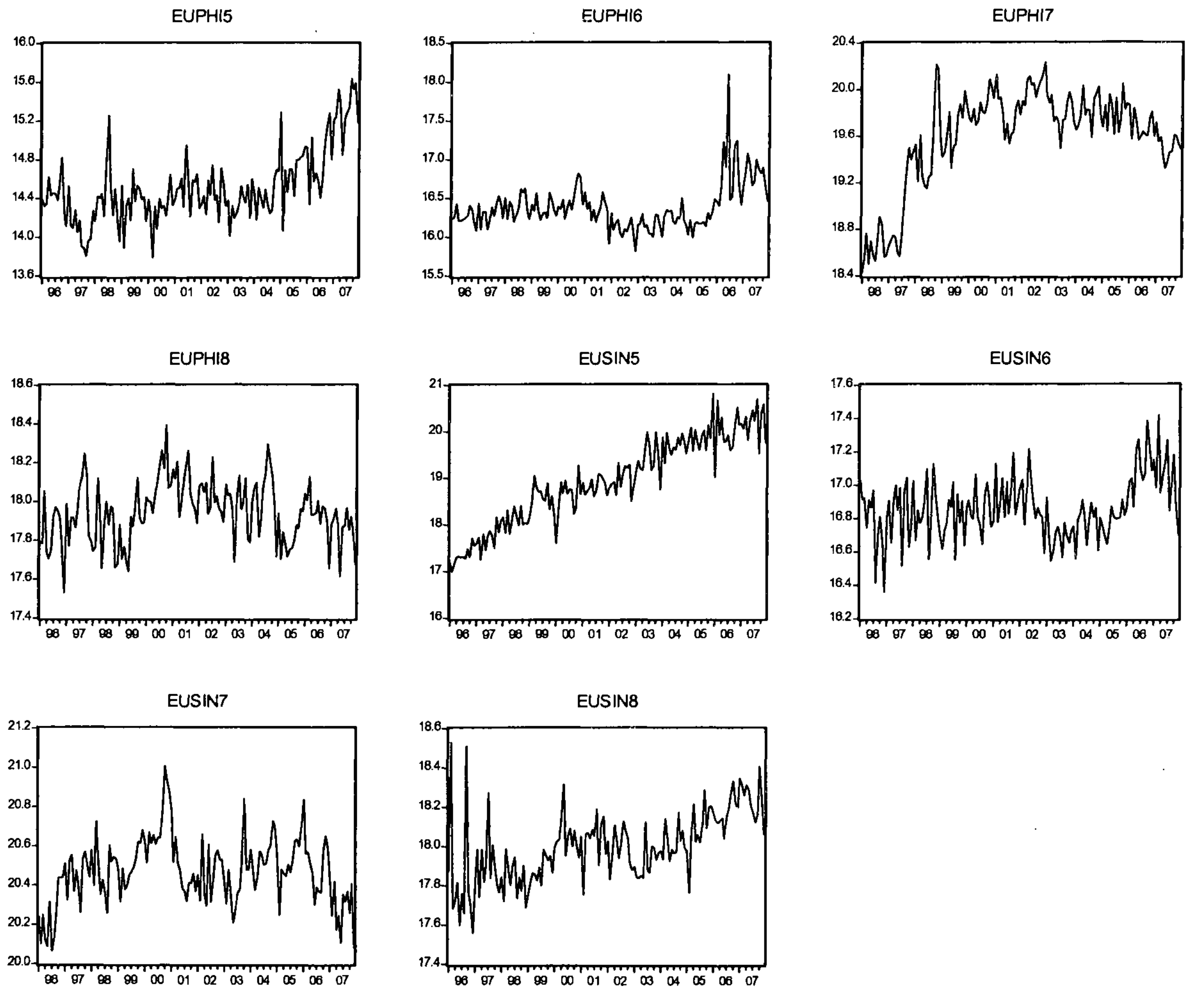
Table 5.4. Unit Root Tests for Crowding-out Effect Analysis

Variable	ADF: Intercept	ADF: Intercept &Trend	ADF: None
INDO5	-2.60	-3.78	0.61
INDO6	-2.17	-2.59	0.25
INDO7	-2.51	-2.19	1.12
INDO8	-2.79	-1.97	0.29
MAL5	-1.54	-3.58	0.56
MAL6	-1.71	-1.89	0.88
MAL7	-2.34	-2.81	0.43
MAL8	-2.14	-2.39	0.96
PHI5	-1.62	-2.99	0.64
PHI6	-2.32	-2.56	0.26
PHI7	-2.55	-1.77	0.77
PHI8	-2.08	-2.47	0.002
SIN5	-1.58	-1.16	1.44
SIN6	-2.29	-2.28	0.04
SIN7	-2.15	-2.80	0.04
SIN8	-1.97	-2.95	0.19
THAI5	-0.83	-3.40	1.12
THAI6	-1.80	-2.66	0.97
THAI7	-2.08	-2.01	1.24
THAI8	-1.78	-2.34	0.49
VIE5	-1.19	-1.72	0.50
VIE6	-2.48	-2.35	1.11
VIE7	-2.78	-3.18	1.12
VIE8	-2.87	-2.49	0.66
Critical Values	1%: -3.48 5%: -2.88 10%: -2.57	1%: -4.02 5%: -3.44 10%: -3.15	1%: -2.58 5% :-1.94 10%: -1.61

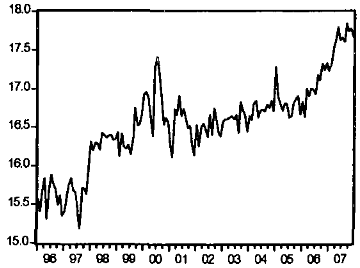
Notes: The order of integration for each variable is *I(1)*at 1% level of significance.

Figure 5.2. Crowding-out Effect Series' Graph

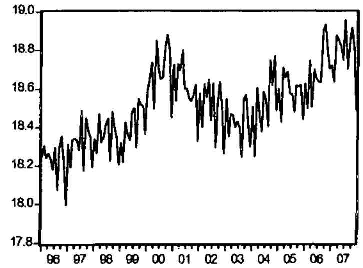



EUPHI5
16.0
15.6
15.2
14.8
14.4
14.0
13.6
EUPHI6
18.5
18.0
17.5
17.0
16.5
16.0
15.5
EUPHI7
20.4
20.0
19.6
19.2
18.8
18.4
EUPHI8
18.6
18.4
18.2
18.0
17.8
17.6
17.4
EUSIN5
21
20
19
18
17
16
EUSIN6
17.6
17.4
17.2
17.0
16.8
16.6
16.4
16.2
EUSIN7
21.2
21.0
20.8
20.6
20.4
20.2
20.0
EUSIN8
18.6
18.4
18.2
18.0
17.8
17.6
17.4
96 97 98 99 00 01 02 03 04 05 06 07

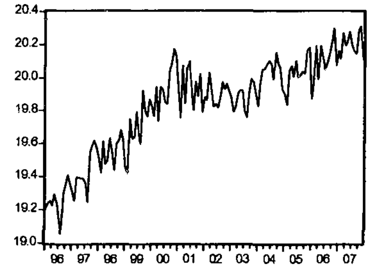
EUTHAI5



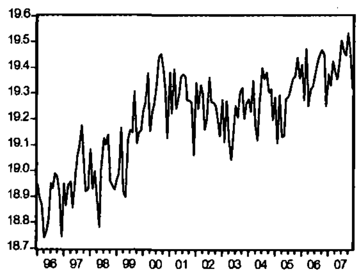
EUTHAI6



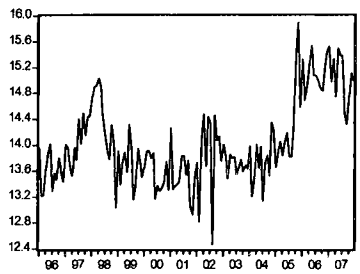
EUTHAI7



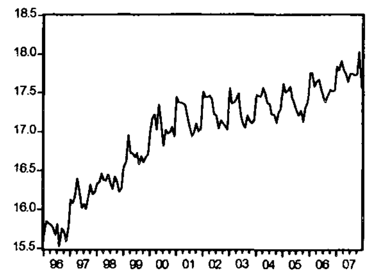
EUTHAI8



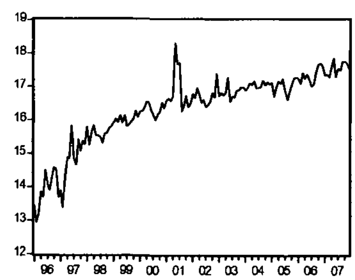
EUVIE5



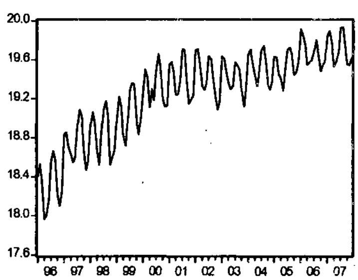
EUVIE6



EUVIE7



EUVIE8



5.2.2. VAR Lag Order Selection Criterion

Table 5.5. VAR Lag Order Selection Criterion for Chemicals – SITC5

Lag specification	LR	FPE	AIC	SC	HQ
2	2	2	2	1	2
3	3	2	2	1	2
4	3	2	2	1	2
5	5	2	2	1	2
6	3	2	2	1	2
7	3	2	2	1	2
8	8	2	2	1	2
9	8	2	2	1	2
10	8	2	2	1	2
11	8	2	2	1	2
12	12	2	2	1	2

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The result of tests determining the appropriate lag order for chemicals (SITC5) is reported in Table 5.5. The first column specifies the maximum number of lags to be included in the testing procedure, while the rest of the columns report the optimal lag order chosen by each of the five lag selection criteria. As we can see, the LR criterion, which is the most sensitive to the choice of the maximum number of lags, was tested. The optimum lag indicated by LR criterion ranges from two to twelve (2, 3, 5, 8 and 12). FPE, AIC and HQ criteria indicate including two lags in the underlying VAR regardless of the maximum number of lags tested (up to 12 lags); whereas the SC criterion suggests one lag in the underlying VAR.

Table 5.6. VAR Lag Order Selection Criterion for Manufactured Goods Classified Chiefly by Material – SITC6

Lag specification	LR	FPE	AIC	SC	HQ
2	2	2	2	1	2
3	3	3	3	1	2
4	4	4	4	1	2
5	4	4	4	1	2
6	6	4	4	1	2
7	7	4	7	1	2
8	7	7	7	1	2
9	7	4	9	1	2
10	10	10	10	1	2
11	10	10	11	1	2
12	10	10	12	1	2

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5.6 shows the appropriate lag order for manufactured goods classified chiefly by material (SITC6). We can see that LR, FPE and AIC criteria are very sensitive to the choice of the maximum number of lags to be tested. The optimal lag order indicated by LR and FPE criteria ranges from two to ten (2, 3, 4, 6, 7 and 10); whereas AIC criterion indicated lag order ranges from two to twelve (2, 3, 4, 7, 9, 10, 11 and 12). The HQ criterion indicates including two lags in the underlying VAR regardless of the maximum number of lags tested (up to 12 lags), whereas the SC criterion suggests one lag in the underlying VAR.

Table 5.7. VAR Lag Order Selection Criterion for Machinery and Transport Equipment – SITC7

Lag specification	LR	FPE	AIC	SC	HQ
2	2	2	2	1	1
3	3	3	3	1	1
4	3	3	3	1	1
5	5	3	3	1	1
6	5	1	3	1	1
7	6	1	1	1	1
8	6	1	3	1	1
9	6	3	3	1	1
10	6	3	3	1	1
11	6	3	3	1	1
12	6	3	3	1	1

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

This table tests the appropriate lag order for machinery and transport equipment (SITC7). As shown, the LR criterion most sensitive to the choice of maximum number of lags was tested. The optimal lag order indicated by LR criterion ranges from two to six (2, 3, 5 and 6). The FPE and AIC criteria indicate including three lags in the underlying VAR except when the maximum number of lags tested is restricted to be two or one. SC and HQ criteria indicate including one lag in the underlying VAR regardless of the maximum number of lags tested (up to 12 lags).

Table 5.8. VAR Lag Order Selection Criterion for Miscellaneous Manufactured Articles – SITC8

Lag specification	LR	FPE	AIC	SC	HQ
2	2	2	2	2	2
3	3	3	3	2	2
4	4	4	4	2	4
5	5	5	5	2	4
6	6	6	6	2	2
7	6	6	6	2	2
8	6	6	6	2	2
9	8	6	6	2	2
10	10	10	10	2	2
11	11	11	11	2	2
12	11	11	11	2	2

LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 5.8 represents the optimal lag order for miscellaneous manufactured articles (SITC8). This result shows that LR, FPE and AIC criteria are very sensitive to the choice of the maximum number of lags, indicating that these variables are to be tested. The optimal lag order indicated by AIC and FPE criteria ranges from two to eleven (2, 3, 4, 5, 6, 10 and 11), whereas LR criterion also indicated lag order ranges from two to eleven (2, 3, 4, 5, 6, 8, 10 and 11). The HQ criterion indicate including four lags in the underlying VAR except when the maximum number of lags tested is restricted to be two. The SC criterion indicates including two lags in the underlying VAR regardless of the maximum number of lags tested (up to 12 lags).

5.2.3. Trace and Max-Eigenvalue Test Statistic

The trace and max-eigenvalue test statistics are used to determine the number of long run cointegration relationships. The trace statistic examines the null hypothesis by verifying whether the number of cointegrated vectors is less than or equal to *r* against a general alternative hypothesis; whereas the eigenvalue statistic tests the null hypothesis, which is the number of cointegrated vector *r* against the alternative of $r + 1$ cointegrated vectors. These tests are defined as:

$$\lambda_{trace}\ (r) = -T\sum_{i=r+1}^{n} \ln\left(1 - \hat{\lambda}_i\right)$$

$$\lambda_{max}\ (r, r+1) = -T ln\left(1 - \hat{\lambda}_{r+1}\right)$$

where $\hat{\lambda}_i$ = estimated values of the characteristic roots (also call eigenvalues)

T = number of observations

Based on the optimal lag indicated by VAR lag order selection criteria, the cointegration relationship for each commodity will be performed by Trace and Max-eigenvalue test statistic.

Table 5.9. Trace and Max-Eigenvalue Test for Chemicals – SITC5

Optimal lag order	Trace	Max-Eigenvalue
1	3	2
2	1	1
3	2	1
5	1	1
8	2	3
12	2	1

As shown, Lag 1, 2, 3, 5, 8 and 12 are the optimal lags which resulted from VAR lag order selection criteria of chemicals (SITC5). Trace and Max-Eigenvalue test statistics indicate that the number of cointegration relationships varies from one to three.

Two cointegrated vectors are chosen in this case since the average number of cointegrated [9] is around two. Hence, the optimal lag choices used for long-run cointegration relationships are 1, 3, 8 and 12. Cointegrated systems are presented in section 5.2.4.

Specifying the optimal lags of manufactured goods classified chiefly by material (SITC6) are 1, 2, 3, 4, 6, 7, 9, 10, 11 and 12. Trace and Max-Eigenvalue statistics test show that the cointegration relationship changes from zero to five. On average, a two vector system will be chosen for long-run cointegration relationships. As a result, the optimal lag choices are 1, 2, 9, 10, 11 and 12. Results are the following:

Table 5.10. Trace and Max-Eigenvalue Test for Manufactured Goods Classified Chiefly by Material - SITC6

Optimal lag order	Trace	Max-Eigenvalue
1	5	3
2	2	0
3	1	1
4	1	1
6	0	0
7	1	1
9	2	2
10	4	3
11	3	2
12	3	2

Table 5.10 indicates that a cointegration relationship changes from zero to four for machinery and transport equipment (SITC7). In sum, the optimal lag choices are 1, 2, 3, 5 and 6 with the option of two cointegrated vectors since the average cointegration relationship is also around two.

[9] This is the average cointegrating vectors calculated by total number of trace and max-eigenvalue test.

Table 5.11. Trace and Max-Eigenvalue Test for Machinery and Transport Equipment - SITC7

Optimal lag order	Trace	Max-Eigenvalue
1	4	3
2	2	2
3	2	2
5	2	0
6	2	0

VAR lag order selection criteria of miscellaneous manufactured articles (SITC8) suggest 2, 3, 4, 5, 6, 8, 10 and 11 as optimal lag order. Further, the Trace and Max-Eigenvalue statistics test confirm that the cointegration relationship changes from zero to four. Two cointegrated vectors will be chosen since the average number of cointegrated is about two. Hence, the optimal lag choices used for long run cointegration relationships are 2, 3, 4, 5, 6, 10 and 11. Cointergrated systems are discussed in the next section.

Table 5.12. Trace and Max-Eigenvalue Test Miscellaneous Manufactured Articles – SITC8

Optimal lag order	Trace	Max-Eigenvalue
2	4	4
3	3	2
4	2	0
5	2	2
6	2	2
8	1	1
10	2	2
11	2	2

5.2.4. Cointegrated System

This section presents the empirical results from the Johansen multivariate cointegration technique, which requires a normalization process to be conducted in order to estimate the system. This requirement forces the cointegrated system to have a unique variable in each of the cointegrating vector to enable an analysis of the individual relationships. The results of estimated system are following.

5.2.4.1. Chemicals and related products - SITC5

To construct the cointegrated system, the unconstrained cointegrating vectors created a 6x2 matrix and identification required at least one unique variable in each vector. Within these listed chemicals and related products – SITC5, there are two aggregated sectors which represent non-basic sectors. In addition, there are two cointegrating vectors identified by the Trace and Max-Eigenvalue Tests (see section 5.2.3.). Non-basic sectors are determined as SIN5 (Singapore) and MAL5 (Malaysia), and basic sectors are defined as INDO5 (Indonesia), THAI5 (Thailand), PHI5 (the Philippines) and VIE5 (Vietnam).

In this case, the unique variables are Singapore and Malaysia. As we know, Singapore holds the largest market share for chemical products exported to European market, whereas Malaysia holds second place. Their market shares may dominate exports from other countries such as Indonesia, Thailand, the Philippines or Vietnam. Since two cointegrated systems are used for this case, the first vector will describe the export relationship between Singapore and other four countries. The second vector will determine the correlation between Malaysia's exports versus other four countries. Therefore, the estimated system can explain the crowding-out effect within ASEAN countries.

The results from four different lags found in section 5.2.3. are very similar and robust (see Appendix Table A). The first cointegrating vector (SIN5) shows three of the four cases are the same for Indonesia, with positive signs. All cases are the same for Thailand and Vietnam with negative signs. In the second cointegrating vector (MAL5), only Vietnam had the same positive sign in three of the four cases. In sum, Vietnam was the only significant variable which appeared in both vectors. As a result, 12 lags will be chosen to construct the cointegrated system for chemicals and related products – SITC5. The estimated system is the following:

$$\begin{array}{l} 1.0\ \text{SIN5} + \underset{(1.75)^{***}}{12.87}\ \text{INDO5} - \underset{(0.68)^{***}}{4.96}\ \text{THAI5} - \underset{(0.92)}{1.09}\ \text{PHI5} - \underset{(0.41)^{**}}{1.11}\ \text{VIE5} = \varepsilon_{SIN5(t)} \\ 1.0\ \text{MAL5} - \underset{(0.61)^{***}}{3.60}\ \text{INDO5} + \underset{(0.23)^{**}}{0.41}\ \text{THAI5} + \underset{(0.32)}{0.12}\ \text{PHI5} + \underset{(0.14)^{**}}{0.31}\ \text{VIE5} = \varepsilon_{MAL5(t)} \end{array}$$

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. SIN5 is Singapore export for chemicals and related products (SITC5) to Europe. Same definition for MAL5 (Malaysia), INDO5 (Indonesia), THAI5 (Thailand), PHI5 (the Philippines), VIE5 (Vietnam).

The system above allows us to analyze the relationships between non-basic sectors (SIN5 and MAL5) and basic sectors (INDO5, THAI5, PHI5 and VIE5). For illustration, consider the first vector (SIN5), which describes how Singapore chemical product exports related to four other ASEAN countries' exports to the European market. The Indonesia variable comes in with a positive sign. This positive sign reflects the inverse relationship between the export value from Indonesia to Europe and the export value from Singapore to Europe. The rising number of value exports in Singapore causes a loss of exports in Indonesia. In other words, this finding indicates a reverse relationship between market shares of Singapore's chemical products and the market shares of Indonesia. An increase in the Singapore market share results in a decrease in the

Indonesian market. Hence, export chemical products in Indonesia are displaced by Singapore. This provides empirical support of the crowding-out effect. If the crowding-out effect hypothesis hold, this positive sign will be statistically significant.

Further, first cointegrating vector also indicates that Thailand and Vietnam variables come with a negative sign and are statistically significant. A negative sign means that a country's export is matched by its rival countries. Therefore, this negative sign tells us that a rising value exports in Singapore simultaneously causes the rise in value of exports in Thailand and Vietnam, hence their market shares to Europe would grow together. This case seems appropriate to Vietnam and Thailand since both countries are more competitive in producing labor-intensive goods[10] compared to Singapore. The variable $\varepsilon_{SIN5(t)}$ represents the time series pattern of disequilibrium in this market. In other words, as SIN5 fell, then $\varepsilon_{SIN5(t)}$ would start to fall. However, the rising value for INDO5, and decrease value for THAI5 and VIE5 would offset the fall in $\varepsilon_{SIN5(t)}$. These offsetting impacts result in $\varepsilon_{SIN5(t)}$ being stationary. In general, to maintain the stationary of the disequilibrium residual, growth in one country requires a decline in the other. The interpretation of this relationship is that export chemical products from a high-income country as Singapore will crowd-out exports from a low-income country like Indonesia.

Second cointegrating vector (MAL5) represents similar explanation as first cointegrating vector. This finding suggests that Thailand and Vietnam's chemical exports are crowded out by Malaysia, which is indicated by a statistically significant positive sign. Since Vietnam and Thailand have lower market share for chemical exports (0.5% and

[10] Based on GDP per capita in ASEAN in 2007: Singapore US$35,206.01; Malaysia US$6,880.20; Thailand US$3,740.10; Indonesia US$1,919.60; Philippines US$1,652.80 and Vietnam US$836.70. Since Vietnam has the least GDP per capita in ASEAN, it suggests the wage rate in Vietnam is also the lowest. Therefore, Vietnam possibly will have the most competitiveness in labor cost compared to others.

5.6% respectively) to Europe compared to 8.3% for Malaysia (see Table 4.4). Likewise, Vietnam and Thailand are low-tech intensive manufacturing countries compare to Malaysia. Therefore, Vietnam and Thailand are likely crowed out by Malaysia's exports. Meanwhile, Indonesia's exports are matched by its rival countries; thus, rising export value in Malaysia simultaneously causes the rise in export value in Indonesia.

In sum, Vietnam and Thailand are crowded out by Malaysia but not Singapore, while Indonesia's exports are displaced by Singapore. This finding indicates that high-tech intensive manufacturing countries such as Singapore and Malaysia crowd out exports from low-tech intensive manufacturing countries such as Vietnam, Thailand and Indonesia.

5.2.4.2. Manufactured Goods Classified Chiefly by Material – SITC6

With the similar explanation as in Section 5.2.4.1, the unique variables in this case are Indonesia and Thailand since they hold the first and second biggest market share for manufactured goods in the European market with 37.4% and 29.7% respectively.

The results from six different lags, shown in section 5.2.3, are also similar and robust. The first cointegrating vector indicates that Vietnam and the Philippines have the same positive coefficient signs in all cases. Meanwhile Malaysia shows all negative signs in both cointegrating vectors. Vietnam and the Philippines both have positive coefficient signs in four of the six cases through the second vector. Singapore is insignificant and has different sign in both cointegrating vectors (see Appendix Table B). In this case, 11 lags choice is used to construct the cointegrated system for manufactured goods – SITC6. The estimated system is as follow:

$$1.0\ INDO6 - 4.54\ MAL6 + 1.00\ VIE6 - 0.85\ SIN6 + 1.49\ PHI6 \quad = \varepsilon_{INDO6(t)}$$
$$(0.96)^{***} \quad (0.15)^{***} \quad (0.58) \quad (0.43)^{**}$$
$$1.0\ THAI6 - 2.76\ MAL6 + 0.25\ VIE6 - 0.64\ SIN6 + 1.06\ PHI6 \quad = \varepsilon_{THAI6(t)}$$
$$(0.54)^{***} \quad (0.08)^{**} \quad (0.32)^{**} \quad (0.24)^{**}$$

Note: The numbers in parentheses are the standard errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. SIN6 is Singapore export for manufactured goods (SITC6) to Europe. Same definition for MAL6 (Malaysia), INDO6 (Indonesia), THAI6 (Thailand), PHI6 (the Philippines), VIE6 (Vietnam).

The system above allows us to analyze the relationships of non-basic sectors (INDO6 and THAI6) and basic sectors (MAL6, VIE6, SIN6 and PHI6). With same situation as in section 5.2.4.1, consider the first vector, the INDO6 vector, which describes how Indonesia's manufactured goods related to the other four ASEAN countries' export to the European market. The crowding-out effect occurs in this case where Indonesia displaces Vietnam and the Philippines in manufactured goods exports. This is represented by a statistically significant positive sign; meanwhile, Malaysia's exports simultaneously grow with Indonesia's.

Second cointegrating vector indicates that Vietnam and the Philippines are displaced by Thailand, while Malaysia and Singapore's exports are matched by Thailand. In general, from both of the equations, Vietnam and the Philippines are losing their market share to both Indonesia and Thailand, while Malaysia is gaining market share along with Indonesia and Thailand for manufactured goods.

Since, Vietnam and the Philippines hold very small market share for manufactured goods exports compared to Indonesia and Thailand (see Table 4.4), theoretically, they are easily displaced by dominant markets. Therefore, this finding determines that developing countries compete with each other in low-technology products to European market. The only exception is the Philippines which has been classified as a high-tech intensive manufacturing country. The Philippines is crowded out by Indonesia. This can be explained as the Philippines has an insignificant market (3.7%) compared to Indonesia (37.4%).

In sum, low-tech intensive manufacturing countries (Indonesia and Thailand) crowd out export from high-tech intensive manufacturing country (the Philippines) for low-technology products. Also, low-tech intensive manufacturing countries (Indonesia, Thailand, and Vietnam) compete each other for low-technology products.

5.2.4.3. Machinery and Transport Equipment – SITC7

The unique variables in the case of machinery and transport equipment are Singapore and Malaysia. The optimal lags length test, which can be used to estimate long-run relationships, indicated 5 optional lags for both countries (see Section 5.2.3). All cases are the same for Thailand and Vietnam as well with negative and positive signs respectively in the first cointegrating vector. The second cointegrating vector shows that three of the five cases have the same negative sign for Thailand, the Philippines and Vietnam, whereas Indonesia has a positive sign (see Appendix Table C). This case will use 3 lags to estimate the cointegrated system for machinery and transport equipment – SITC7, the estimated system is as follow:

$$\underset{}{1.0\,\text{SIN7}} - \underset{(0.80)^{*}}{1.58\,\text{THAI7}} + \underset{(0.39)}{0.10\,\text{PHI7}} - \underset{(0.77)^{**}}{2.62\,\text{INDO7}} + \underset{(0.21)^{***}}{1.20\,\text{VIE7}} = \varepsilon_{SIN7(t)}$$

$$\underset{}{1.0\,\text{MAL7}} - \underset{(1.33)^{*}}{2.60\,\text{THAI7}} - \underset{(0.59)^{**}}{1.89\,\text{PHI7}} + \underset{(1.16)^{***}}{6.02\,\text{INDO7}} - \underset{(0.31)^{*}}{0.76\,\text{VIE7}} = \varepsilon_{MAL7(t)}$$

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. SIN7 is Singapore export for machinery and transport equipment (SITC7) to Europe. Same definition for MAL7 (Malaysia), INDO7 (Indonesia), THAI7 (Thailand), PHI7 (the Philippines), VIE7 (Vietnam).

The above system tells us the relationship between non-basic sectors (SIN7, MAL7) and basic sectors (THAI7, PHI7, INDO7 and VIE7). Consider the first vector, where Singapore displaces Vietnam's export to the European market while Thailand and Indonesia match Singapore's exports. Once again, Vietnam holds an insignificant market share (0.8%) in machinery and transport equipment compared to Singapore's (31.9%). This will help to explain the crowding-out effect between Singapore and Vietnam.

The second vector indicates that Thailand, the Philippines and Vietnam's machinery and transport equipment exports, gain along with Malaysia, whereas Indonesia is displaced by Malaysia. The reason behind this crowding-out between Indonesia and Malaysia is because Indonesia holds a very small market share with only 5.0% compared to its rival which holds 30.8%. In sum, countries with low-tech intensive manufacturing such as Vietnam and Indonesia are simply crowed out by countries with high-tech intensive manufacturing such as Singapore and Malaysia (see Figure 4.4).

5.2.4.4. Miscellaneous Manufactured Articles – SITC8

In the case of miscellaneous manufactured articles, Indonesia and Vietnam are unique variables. Five lags length is used to set up the cointegrated system which results in section 5.2.3. Also, tests from seven different lags provide similar results (see Appendix Table D). In detail, Malaysia has all the same negative signs in all lags. Thailand and the Philippines have six of the seven same positive and negative signs respectively. Singapore has a positive sign in five of the seven cases. The second vector shows the same results for all lags in Thailand and Philippines with negative and positive sign respectively, while Malaysia has five of the seven cases with the same positive sign. Following is cointegrated system:

$$1.0\ \text{INDO8} + 1.11\ \text{THAI8} - 2.74\ \text{MAL8} + 0.94\ \text{SIN8} - 1.09\ \text{PHI8} = \varepsilon_{INDO8(t)}$$
$$(0.51)^{*} \quad (0.59)^{***} \quad (0.36)^{*} \quad (0.23)^{**}$$
$$1.0\ \text{VIE8} - 4.08\ \text{THAI8} + 1.41\ \text{MAL8} + 1.03\ \text{SIN8} + 1.13\ \text{PHI8} = \varepsilon_{VIE8(t)}$$
$$(0.55)^{***} \quad (0.63)^{*} \quad (0.39)^{*} \quad (0.25)^{**}$$

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. SIN8 is Singapore export for miscellaneous manufactured articles (SITC8) to Europe. Same definition for MAL8 (Malaysia), INDO8 (Indonesia), THAI8 (Thailand), PHI8 (the Philippines), VIE8 (Vietnam).

The system above allows us to analyze the relationships of non-basic sectors (INDO8 and VIE8) and basic sectors (THAI8, MAL8, SIN8 and PHI8). With the same situation as in section 5.2.4.1, consider the first vector, the INDO8 vector, which describes how Indonesia's miscellaneous manufactured products related to the other four ASEAN countries' exports to the European market. The crowding-out effect occurs in this case where Indonesia displaces Thailand and Singapore in miscellaneous manufactured exports. This is showed by a statistically significant positive sign. Meanwhile, the export of Malaysia and the Philippines's grows simultaneously with those of Indonesia.

The second vector indicated that Vietnam displaces exports from Malaysia, Singapore and the Philippines, while it grows along with Thailand. This is due to lower labor cost in Vietnam than in the Philippines, Malaysia and Singapore. In this case, country with low-income such as Vietnam would crowd out other countries with mid-income or high-income such as Singapore, Malaysia and Philippines (see footnote 10). According to the flying geese paradigm, rising wages in Singapore, Malaysia or the Philippines would cause a loss of competitiveness in producing labor intensive goods.

Consequently, these markets would transfer to a group of countries with low wages such as Vietnam. Hence, Singapore, Malaysia and Philippines would focus on export high-tech products instead of low-tech products (see Appendix Table E).

In general, low-tech intensive manufactures countries (Indonesia, Vietnam) will displace high-tech intensive manufacturing countries (Singapore, Malaysia, and the Philippines). Besides, low-tech intensive manufactures countries (Indonesia and Thailand) crowd out each other.

5.2.5. Speed of Adjustment

The robustness of the derived cointegrated system can be verified by the speed of adjustment which indicates that the basic and non-basic sectors move as the theory would predict. It means that non-basic sectors should adjust to clear their markets when a state of disequilibrium exists. Also, the basic sector should be responded to disequilibrium conditions, as they are determined exogenously.

Now I am interested in how the markets have been relayed from the crowding-out effect. To answer this question, the vector error correction model (VECM) represented in the estimated cointegrated system can be examined.

Illustrated in the VECM for chemicals and related products (SITC5), only MAL5 seems to respond as the theory predict. This is verified by the significance of the estimates along the main diagonal of the upper 2x2 cells within Table 5.13. MAL5 is significant at the 1 percent level, while SIN5 is insignificant. The coefficients of the VECM not only have to be significant to reveal the proper movement to reequilibrium of their cointegrated vectors, but they also need to have the opposite sign than what is determined in the cointegrated system.

Table 5.13. Speed of Adjustment for Chemicals and Related Products – SITC5

Variable	$\varepsilon_{SIN5(t-1)}$	$\varepsilon_{MAL5(t-1)}$
ΔSIN5	0.13	
	(0.09)	
ΔMAL5		-0.84***
		(0.24)
ΔINDO5	-0.19***	-0.36**
	(0.04)	(0.16)
ΔTHAI5	-0.02	0.14
	(0.06)	(0.22)
ΔPHI5	0.02	-0.48*
	(0.07)	(0.26)
ΔVIE5	-0.005	0.39
	(0.14)	(0.52)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

Three export sectors INDO5, THAI5 and VIE5 have significant coefficients, implying some responsiveness to disequilibrium. INDO5 entered the cointegrated system with a positive and negative sign in the first and second vector respectively. So to clear a vector, it must come in negatively and positively; however, INDO5 is negative in both vectors ($\varepsilon_{SIN5(t-1)}$ and $\varepsilon_{MAL5(t-1)}$). This means that INDO5 clears the first vector but not the second.

In sum, only non-basic sector MAL5 come in with a positive sign in the cointegrated system and negative sign within the VECM. Besides, there is no basic sector respond correctly to disequilibrium in the second vector. Therefore, crowding-out effect does not occur in this case. However, growth-growth situation, which is countries both grow together, is supported by significant statistically for case of Malaysia and Indonesia.

Table 5.14 shows the sectors in manufactured goods (SITC6) are similar to those in chemical products (SITC5). Both INDO6 and THAI6 are significant at the 5 percent level and 10 percent level. These values are seen along the main diagonal in the upper 2x2 cells in the table above. However, THAI6 comes with the wrong sign (positive) since it entered the cointegrated system with positive sign. To explain the long-run relationships, the sign of THAI6 which come from VECM should be negative.

Table 5.14. Speed of Adjustment for Manufactured Goods Classified Chiefly by Material – SITC6

Variable	$\varepsilon_{INDO6(t-1)}$	$\varepsilon_{THAI6(t-1)}$
ΔINDO6	-0.37**	
	(0.11)	
ΔTHAI6		0.36*
		(0.17)
ΔMAL6	-0.01	0.20
	(0.09)	(0.17)
ΔVIE6	-0.39**	0.36*
	(0.10)	(0.19)
ΔSIN6	-0.49***	1.17***
	(0.11)	(0.21)
ΔPHI6	-0.03	0.59
	(0.21)	(0.41)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

From the cointegrated system, four export sectors MAL6, VIE6, SIN6 and PHI6 have some significant coefficients, which imply some responsiveness to disequilibrium. VIE6 entered the cointegrated system with a positive sign in both vectors. So to clear a vector, it must be negative in VECM; however, VIE6 is negative and positive in the first and second vector ($\varepsilon_{INDO6(t-1)}$ and $\varepsilon_{THAI6(t-1)}$). This means that VIE6 clears the first vector but not the second. A similar explanation is seen for SIN6, which cleared the second vector but not the first since SIN6 coming from the cointegrated system is insignificant. The rest of the coefficients in Table 5.14 are insignificant.

Therefore, only Vietnam responds to disequilibrium in the first vector in long-run. This implies Vietnam is crowded out by Indonesia. This means low-tech intensive manufacturing countries compete each other for low-tech product.

In the instance of the VECM of machinery and transport equipment (SITC7), the significant estimated numbers along the diagonal of the upper 2x2 in table 5.15 tells us that all sectors seem to respond as predicted. SIN7 and MAL7 are both significant at the 5 percent level. Since these coefficients of VECM come with the opposite sign with what existed in the cointegrated system, it means that two of SIN7 and MAL7 have positive signs in the cointegrated system and negative signs in VECM. Therefore, it perfectly explains the long-run relationship between the variables.

Table 5.15. Speed of Adjustment for Machinery and Transport Equipment – SITC7

Variable	$\varepsilon_{SIN7(t-1)}$	$\varepsilon_{MAL7(t-1)}$
ΔSIN7	-0.12**	
	(0.04)	
ΔMAL7		-0.07**
		(0.02)
ΔTHAI7	0.07**	0.01
	(0.03)	(0.02)
ΔPHI7	0.08	0.006
	(0.06)	(0.04)
ΔINDO7	-0.04	-0.17***
	(0.06)	(0.04)
ΔVIE7	-0.47**	-0.22*
	(0.12)	(0.08)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

As we see, the four export variables THAI7, PHI7, INDO7 and VIE7 have some significant coefficients, which imply some response to disequilibrium. THAI7 entered the first cointegrated vector with a negative sign, so it clears first vector since it has a positive sign in VECM. The same situation is seen for VIE7, where it clears the first vector and causes further disequilibrium in the second vector. In sum, both THAI7 and VIE7 will move to reequilibrium and cause further disequilibrium in the second vector.

INDO7 will clear the second vector since it has the opposite sign between the cointegrated system and VECM. In response to the disequilibrium in the second vector, INDO7 will move to re-equilibrate and clear the vector. The rest of the coefficients in Table 5.15 are insignificant.

This finding indicates in the long-run, Singapore crowds out Vietnam in the first vector, and Malaysia displaces Indonesia in the second vector. This tells us that high-tech intensive manufacturing countries crowd out low-tech intensive manufacturing countries for high-tech products. Furthermore, export from Singapore and Thailand is growing together in first vector. Second vector confirms Malaysia export and Vietnam export rise simultaneously. This finding is supported by significant statistically.

Table 5.16 tells us both variables INDO8 and VIE8 are significant at the 10 percent level. It may respond as the theory predicts; however, INDO8 comes with a positive sign in both VECM and the cointegrated system. Therefore, this system does not perfectly explain the long-run relationships among variables.

Table 5.16. Speed of Adjustment for Miscellaneous Manufactured Articles – SITC8

Variable	$\varepsilon_{INDO8(t-1)}$	$\varepsilon_{VIE8(t-1)}$
ΔINDO8	0.18*	
	(0.08)	
ΔVIE8		-0.16*
		(0.07)
ΔTHAI8	0.25***	0.14**
	(0.06)	(0.05)
ΔMAL8	0.24**	0.06
	(0.05)	(0.06)
ΔSIN8	-0.14	-0.24*
	(0.12)	(0.10)
ΔPHI8	0.37**	0.18*
	(0.99)	(0.08)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

THAI8, MAL8, SIN8 and PHI8 are all significant at at least the 5 percent level. This tells us these variables cause further disequilibrium in the second vector. However, only MAL8 and PHI8 clear the vector since their signs in VECM are opposite in the cointegrated system. A similar explanation applies for the second vector where THAI8, SIN8 and PHI8 cause disequilibrium; however, THAI8 and SIN8 move to reequilibrium and clear the vector. Both THAI8 and SIN8 have opposite signs in the cointegrated system and VECM. The rest of the coefficients in this table are insignificant.

This finding confirms some responds in long-run relationships within ASEAN countries for miscellaneous exports. Vietnam crowds out export from Singapore for low-tech products. This implies low-tech intensive manufacturing country displace high-tech intensive manufacturing country for low-tech products. Also, growth-growth situation is found for Vietnam –Thailand case.

5.2.6. Crowding-out Effect Discussion

For crowding-out effect further discussion, I introduce another export destination, which has similar characteristic with European, is the U.S. market. My purpose of examination another market is to determine whether the crowding-out effect results are similar and robust in the different market. Since the U.S. has similar export characteristics with European, it was chosen for this analysis. Both the U.S. and European have the same market share in the total ASEAN's export which accounted for 9% and 11% respectively (ASEAN Statistical Pocketbook 2006). All exports of manufactured products are under SITC group 5-8. The monthly data is in logarithms and the real term over the period January 1996 to December 2007. The data set is collected from US International Trade Commission. All the procedures are performed as same as Europe analysis. The unit root test indicates all variables are non-stationary. Then, the VAR lag order selection criterion test is used to determine the optimal lag length. Trace and Max-Eigenvalue is performed to check number of cointegrating vector. Lastly, cointegrated system and speed of adjustment indicate similar results compare to Europe's results.

In detail, crowding-out effect does not occur within ASEAN countries for chemical products (SITC5). Consider the Table 5.17.

Table 5.17. Cointegrated System and Speed of Adjustment for ASEAN Export to US Market under SITC5

$$1.0\ USIN5 - \underset{(0.79)^{*}}{1.60}\ UINDO5 - \underset{(0.65)^{*}}{1.29}\ UTHAI5 - \underset{(0.89)^{***}}{6.85}\ UPHI5 + \underset{(0.20)^{***}}{1.84}\ UVIE5 = \varepsilon_{USIN5(t)}$$

$$1.0\ UMAL5 - \underset{(0.14)^{**}}{0.50}\ UINDO5 + \underset{(0.12)}{0.07}\ UTHAI5 + \underset{(0.16)}{0.09}\ UPHI5 + \underset{(0.04)}{0.03}\ UVIE5 = \varepsilon_{UMAL5(t)}$$

Variable	$\varepsilon_{USIN5(t-1)}$	$\varepsilon_{UMAL5(t-1)}$
ΔUSIN5	-0.02	
	(0.03)	
ΔUMAL5		-0.68***
		(0.13)
ΔUINDO5	0.003	-0.01
	(0.01)	(0.12)
ΔUTHAI5	0.01	-0.03
	(0.01)	(0.11)
ΔUPHI5	0.01	-0.24*
	(0.01)	(0.10)
ΔUVIE5	-0.51***	-0.42
	(0.05)	(0.55)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. USIN5 is Singapore export for chemicals and related products (SITC5) to the U.S. Same definition for UMAL5 (Malaysia), UINDO5 (Indonesia), UTHAI5 (Thailand), UPHI5 (the Philippines), UVIE5 (Vietnam).

Cointegrated system indicates Singapore displaces export of chemical products to the U.S. from Vietnam. Also, Indonesia, Thailand and the Philippines grow together with Singapore in first vector. Second vector shows Malaysia and Indonesia simultaneously rise together. However, speed of adjustment confirms crowding-out effect does not exist, and there is no growth-growth situation since coefficients in both cointegrated system and VECM are insignificant or do not respond correctly.

In the case of European market, crowding-out effect did not take place. However, growth-growth situation, which is countries both grow together, is supported by significant statistically for case of Malaysia and Indonesia.

The cointegrated system and the speed of adjustment for low-technology product, manufactured goods (SITC6), shows no growth-growth situation in long-run and export from Indonesia displaces export from Vietnam. These findings are same in European's market. Statistic results are in Table 5.18.

Table 5.18. Cointegrated System and Speed of Adjustment for ASEAN Export to US Market under SITC6

$$1.0\ UTHAI6 - \underset{(0.24)^{***}}{1.49}\ UMAL6 - \underset{(0.25)^{***}}{0.88}\ USPHI6 + \underset{(0.17)}{0.23}\ USIN6 + \underset{(0.26)}{0.02}\ UVIE6 = \varepsilon_{UTHAI6(t)}$$

$$1.0\ UINDO6 - \underset{(0.32)^{***}}{1.40}\ UMAL6 + \underset{(0.33)}{0.12}\ UPHI6 + \underset{(0.22)}{0.29}\ USIN6 + \underset{(0.03)^{***}}{0.10}\ UVIE6 = \varepsilon_{UINDO6(t)}$$

Variable	$\varepsilon_{UINDO6(t-1)}$	$\varepsilon_{UTHAI6(t-1)}$
ΔUTHAI6	-0.14	
	(0.10)	
ΔUINDO6		-0.16*
		(0.08)
ΔUMAL6	0.52**	-0.22
	(0.18)	(0.18)
ΔUPHI6	-0.13	0.04
	(0.14)	(0.13)
ΔUSIN6	0.22	-0.46*
	(0.25)	(0.23)
ΔUVIE6	-0.71**	-0.53*
	(0.25)	(0.23)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. USIN6 is Singapore export for manufacture goods classified chiefly by material (SITC6) to the U.S. Same definition for UMAL6 (Malaysia), UINDO6 (Indonesia), UTHAI6 (Thailand), UPHI6 (the Philippines), UVIE6 (Vietnam).

Another test for machinery and transport equipment (SITC7) indicates Malaysia crowds out export from the Philippines, and Singapore displaces export from Vietnam. This finding is similar to European market where Singapore crowds out Vietnam in the first vector. However, Malaysia displaces Indonesia instead of the Philippines in the second vector. Besides, the test failed to determine the growth-growth situation in the U.S. market among ASEAN countries. In detail, see table 5.19.

Table 5.19. Cointegrated System and Speed of Adjustment for ASEAN Export to US Market under SITC7

$$1.0\ UMAL7 + \underset{(0.39)^{*}}{0.76}\ UTHAI7 + \underset{(0.36)^{**}}{0.95}\ UPHI7 - \underset{(0.67)^{***}}{2.64}\ UINDO7 - \underset{(0.04)^{**}}{0.10}\ UVIE7 = \varepsilon_{UMAL7(t)}$$

$$1.0\ USIN7 - \underset{(0.22)^{***}}{1.16}\ UTHAI7 - \underset{(0.20)^{***}}{0.62}\ UPHI7 + \underset{(0.36)^{***}}{1.69}\ UINDO7 + \underset{(0.02)^{***}}{0.12}\ UVIE7 = \varepsilon_{USIN7(t)}$$

Variable	$\varepsilon_{USIN7(t-1)}$	$\varepsilon_{UMAL7(t-1)}$
ΔUMAL7	-0.22**	
	(0.06)	
ΔUSIN7		-0.25*
		(0.12)
ΔUTHAI7	-0.09	-0.16
	(0.07)	(0.12)
ΔUPHI7	-0.18*	-0.39**
	(0.07)	(0.13)
ΔUINDO7	0.03	-0.23
	(0.09)	(0.16)
ΔUVIE7	-2.96***	-6.53***
	(0.88)	(1.50)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. USIN7 is Singapore export for machinery and transport equipment (SITC7) to Europe. Same definition for UMAL7 (Malaysia), UINDO7 (Indonesia), UTHAI7 (Thailand), UPHI7 (the Philippines), UVIE7 (Vietnam).

For the miscellaneous manufactured articles (SITC8), cointegrated system and speed of adjustment verifies that export form Indonesia displaces export from Singapore, while Singapore is crowded out by Vietnam in European market. In addition, no growth-growth situation is supported by statistic. Results are showed in table 5.20.

Table 5.20. Cointegrated System and Speed of Adjustment for ASEAN Export to US Market under SITC8

$$1.0\ UTHAI8 - \underset{(0.25)}{0.43}\ UPHI8 + \underset{(0.13)^{***}}{0.63}\ UMAL8 - \underset{(0.02)^{***}}{0.09}\ UVIE8 - \underset{(0.16)^{***}}{1.03}\ USIN8 = \varepsilon_{UTHAI8(t)}$$

$$1.0\ UINDO8 - \underset{(0.31)^{**}}{0.70}\ UPHI8 - \underset{(0.16)^{*}}{0.33}\ UMAL8 + \underset{(0.02)}{0.007}\ UVIE8 + \underset{(0.20)^{***}}{0.98}\ USIN8 = \varepsilon_{UINDO8(t)}$$

Variable	$\varepsilon_{UINDO8(t-1)}$	$\varepsilon_{UVIE8(t-1)}$
ΔUINDO8	-0.03	
	(0.13)	
ΔUVIE8		-0.29**
		(0.11)
ΔUTHAI8	-0.001	-0.02
	(0.17)	(0.12)
ΔUMAL8	-0.46**	0.17
	(0.19)	(0.14)
ΔUSIN8	0.21	0.37
	(0.31)	(0.22)
ΔUPHI8	0.22	-0.23*
	(0.15)	(0.11)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level. USIN8 is Singapore export for miscellaneous manufactured articles (SITC8) to the U.S. Same definition for UMAL8 (Malaysia), UINDO8 (Indonesia), UTHAI8 (Thailand), UPHI8 (the Philippines), UVIE8 (Vietnam).

In summary, these findings confirm that high-tech intensive manufacturing country such as Singapore will crowd out export from low-tech intensive manufacturing country such as Vietnam for high-technology products (SITC7), and vise verse for low-tech products (Indonesia vs. Singapore for SITC8). Another conclusions are low-tech intensive manufacturing countries compete each other for low-technology products (Indonesia vs. Vietnam for SITC6), and high-tech intensive manufacturing countries also fight each other (Malaysia vs. the Philippines for SITC7) which does not occur in Europe market.

With the empirical results obtained from both European and the U.S. markets, I conclude this analysis can be divided into three effects which are the pattern effect, the opposite effect, and the isolated effect. First issue is the pattern effect which tells the same consequences occur in both markets. There are two pairs of pattern between Singapore-Vietnam and Indonesia-Vietnam. For the first pair, in both the U.S. and European markets for high-technology products (SITC7), Singapore crowds out export from Vietnam for machinery and transport equipment. Singapore has 26.0% and 31.9% market share in the U.S. and European respectively while Vietnam hold 0.3% and 0.8% market share in both markets. For the second pair, Indonesia displaces Vietnam export for manufactured goods (SITC6) in both markets. Once again, market share dominance takes place between Indonesia and Vietnam. While Vietnam occupies 2.9% and 7.4% market share in the U.S. and European respectively, Indonesia holds 29.2% and 37.4% market share in both markets. These pair pattern effects indicate a country with high market share would have more power to displace a country with small market share. Therefore, crowding-out effect depends on the corresponding size of its market share. These finding also suggest that high-tech intensive manufacturing country displaces export from low-tech intensive manufacturing country for high-tech products. Moreover, there is a competition between low-tech intensive manufacturing countries for low-technology products.

Second issue is the opposite effect which reflects the inverse response between different products in same market. Consider export cases from Malaysia and Indonesia to European market for high-technology products which includes both chemicals (SITC5) and machinery/transport equipment (SITC7) products, Malaysia displaces export from Indonesia for machinery and transport equipment. On the other hand, they grow together for chemical products at European market. This result can be explained by market possession in Europe. Malaysia holds 30.8% market share for export machinery/transport equipment products and 8.3% market share for chemical products while Indonesia only keep 5.0% and 6.9% market share for both products respectively. This situation indicates that one country could have power to dominate others for its main product, whereas other products may have no effect or just grow together. Again, this finding implies the same crowding out effect occurs for high-tech products.

Another case supported this effect is Singapore - Vietnam export of high-tech and low-tech products into European market. Dominance market share Singapore with 31.9% for machinery/transport equipment products crowds out export from Vietnam, which have insignificant market share with 0.8%. Conversely, Singapore is displaced by Vietnam for miscellaneous export products, which Vietnam and Singapore accounted for 23.1% and 6.2% respectively. This finding confirms that whichever country holds the larger market share will displace export from the smaller one. Furthermore, low-tech intensive manufacturing countries crowd out export from high-tech intensive manufacturing countries for low-technology products and alternatively.

Third issue is isolated effect which occurs randomly for any product and/or any market. Consider Malaysia – Indonesia, Malaysia – Vietnam export to European's market and Malaysia – the Philippines export to the U.S., Malaysia displaces export from Indonesia and the Philippines, but raise together with Vietnam export. The reason again is explained that dominated market share will displace export from the smaller one.

Hence, the final conclusion shows as high-tech intensive manufacturing countries will crowd out export from low-tech intensive manufacturing countries for high-technology products and vice versa for low-technology products. Also, high-tech manufacturing countries compete each other for high-technology products in the U.S.'s market. This result is different in European's market where low-tech manufacturing countries fight each other for low-technology products is found. Another important finding is country with the larger market share will have power to crowd out export from country with the lower market share.

CHAPTER VI

Concluding Remarks

This chapter presents a discussion of conclusions on export-led growth in Vietnam as well as the crowding-out effect within ASEAN countries.

6.1. Export-led Growth

This analysis has examined the role of exports in the economic growth of Vietnam for the period of 1999:1 – 2007:6. The empirical results have shown that the export-led growth hypothesis cannot be verified in this particular case. However, this analysis supported Kaldor's approach and showed the causality relationship between export and industrial output run both ways. This study brings out some facts that need to be considered as an economic growth model for developing countries in short-run. First, the empirical evidence suggests that each export sector expansion strategy can contribute to a country's growth in total industrial output. Second, the role of growth rate of import categories cannot be ignored when examining the relationship between export growth and industrial output growth.

The underlying series are tested as non-stationary in levels but stationary in first differences. This analysis differs from other studies on export-led growth that instead of considering exports as a whole, they are divided into five groups. Likewise, rather than analyzing imports as a whole, this study divides them into two groups. Therefore, this contribution will hopefully result in a deeper understanding of the export-led growth theory.

The empirical results indicate that export expansion has positively and significantly impacted on total industrial output in Vietnam only in short-run. Exports are found to cause industrial output growth in electronic, agriculture and the energy sector, while seafood sector has a negatively affect on industrial output and vice versa. Also, in short-run, export expansion has positively and significantly impacted automobile imports, but has had a negative effect on textile material imports.

This analysis also represents the long-run equilibrium relationship of the cointegrated process. However, results indicated that the model did not deviate from its long-run relationship with electronic, agriculture and textile manufactured exports.

In summary, cointegration has been used to disaggregate level of exports and imports, test the export-led growth theory, and analyze Vietnam economy. My findings are similar with the results of Phan et al. (2003), who found no econometric evidence to support the theory that export expansion has made a dynamic contribution to other sectors of the Vietnam's economy in long-run. Nevertheless, my study supported Kaldor's approach which demonstrates that the higher the rate of output growth, the faster the growth rate of productivity, and the faster growth rate of productivity, the lower the rate of increase in unit costs, and thus the faster rate of export growth.

6.2. Crowding-out Effect

Critics of the export-led growth policy point out the fallacy of composition where developing countries specializing in the export of manufactured products compete with one another in industrialized markets. They argue that export-led growth policies take a zero sum dimension when adopted simultaneously by many developing countries. Conversely, supporters of export-led growth assert that developing countries which climb up the technological ladder will open their market for lower technology products by shifting the comparative advantage that helps to ease any capacity constraint.

The estimated results draw mixed conclusions on the crowding-out effect, which states that some ASEAN developing countries compete against each other depending on export SITC categories. SITC5 and SITC7 are considered as high-technology products. Also, SITC6 and SITC8 are low-technology products. In detail,

- Malaysia crowds out export from Indonesia for machinery and transport equipment (SITC7) in European market. Singapore exports displace Vietnam export for machinery and transport equipment in both markets. This result indicates that countries which have high-tech intensive manufacturing exports will crowd out countries with low-tech manufacturing.
- Vietnam exports make a remarkable crowd out for miscellaneous manufactured (SITC8) from Singapore export at European market, while Indonesia also displaces export from Singapore with same product at U.S. market. This indicates that countries with low-tech intensive manufacturing export will crowd out countries with a high-tech intensive manufacturing.

These two findings suggest that countries with larger market share in export will dominate smaller one. Countries that have significant market shares for high-technology products (SITC5 and SITC7) will have insignificant market shares for low-technology products (SITC6 and SITC8) (see Table 4.4 and Appendix Table F). As a result, these countries of high-tech intensive manufacturing will displace low-tech countries for high-technology products. Conversely, they will be crowded out in low-technology products.

- For countries with low-tech intensive manufacturing exports, Indonesia displaces Vietnam exports for manufactured goods (SITC6) in both European and U.S. market. This implies developing countries compete against each other for low-technology products.
- Export from Malaysia displaces export from the Philippines for machinery and transport equipment (SITC7) in the U.S. market. This suggests that high-tech manufacturing countries fight each other for high-technology products.

These results once again confirmed that countries with larger market share in export crowd out smaller one. Developing countries compete against each other for low-technology products and high-tech manufacturing countries fight each other for high-technology products.

In summary, cointegration technique has been proposed to test the crowding-out effect among countries. My findings indicate high-tech intensive manufacturing countries crowded out low-tech intensive manufacturing countries for low-technology products. As well, low-tech intensive manufacturing countries compete with each other for low-technology products. These findings are similar to Razmi and Blecker (2008), who found crowding-out effect occur mainly to the larger group of countries exporting low-technology products. My results, however, differ from the finding of Ghani (2006), who found developing countries are not crowding one another out. Instead, they are crowding out industrialized countries' exports of manufactured products.

Another important issue is that country with larger market share will have power to crowd out export from country with lower market share within ASEAN countries. These findings should help policy makers to improve their export benefits and economic growth in Vietnam particularly and in ASEAN generally. Future research work needs more data to examine export-led growth hypothesis in Vietnam. VECM can be extended for crowding-out effect study by adding more export destinations such as intra-ASEAN, Japan, and China.

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APPENDIX

Appendix Table A: Different Lag Length Tests for SITC5

1 Lag

SIN5	MAL5	INDO5	THAI5	PHI5	VIE5
1		6.49***	-4.12***	0.67	-0.71**
		(0.90)	(0.44)	0.55	(0.26)
	1	-0.33	-0.27**	-0.65***	0.28***
		0.21	(0.10)	(0.13)	(0.06)

3 Lags

SIN5	MAL5	INDO5	THAI5	PHI5	VIE5
1		7.43***	-5.36***	3.88***	-2.39***
		(1.53)	(0.72)	(0.86)	(0.40)
	1	-1.18**	-0.19	0.05	0.05
		(0.34)	0.16	0.19	0.09

8 Lags

SIN5	MAL5	INDO5	THAI5	PHI5	VIE5
1		-5.03	-8.28**	18.95***	-6.15**
		9.68	(4.26)	(4.90)	(2.43)
	1	-0.48	0.58	-2.30***	0.77**
		1.00	0.44	(0.50)	(0.25)

12 Lags

SIN5	MAL5	INDO5	THAI5	PHI5	VIE5
1		12.87***	-4.95***	-1.08	-1.10**
		(1.75)	(0.68)	0.92	(0.41)
	1	-3.60**	0.41*	0.11	0.31*
		(0.60)	(0.23)	0.32	(0.14)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

Appendix Table B: Different Lag Length Tests for SITC6

1 Lag

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-2.63***	0.41**	-2.63***	2.36***
		(0.63)	(0.13)	(0.58)	(0.34)
	1	-0.89*	-0.21**	2.51***	-0.82***
		(0.40)	(0.08)	(0.37)	(0.22)

2 Lags

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-4.44***	0.60***	-0.99	2.62***
		(0.84)	(0.16)	0.82	(0.48)
	1	-1.86***	-0.06	1.72***	-0.04
		(0.41)	0.07	(0.40)	0.23

9 Lags

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-8.46***	1.64***	-0.11	2.34**
		(1.96)	(0.28)	1.30	(0.94)
	1	-4.29***	0.45***	0.23	1.21***
		(0.82)	(0.11)	0.54	(0.39)

10 Lags

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-6.62***	1.33***	-0.14	1.81**
		(1.33)	(0.19)	0.84	(0.62)
	1	-3.18***	0.24**	-0.14	1.04***
		(0.54)	(0.08)	0.34	(0.25)

11 Lags

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-4.55***	1.00***	-0.85	1.48**
		(0.96)	(0.15)	0.58	(0.43)
	1	-2.76***	0.25**	-0.64*	1.05***
		(0.54)	(0.08)	(0.33)	(0.24)

12 Lags

INDO6	THAI6	MAL6	VIE6	SIN6	PHI6
1		-5.19***	1.17***	-0.57	1.25*
		(1.15)	(0.18)	0.67	(0.52)
	1	-2.97***	0.33**	-0.63*	0.96***
		(0.61)	(0.10)	(0.36)	(0.28)

Appendix Table C: Different Lag Length Tests for SITC7

1 Lag

SIN7	MAL7	THAI7	PHI7	INDO7	VIE7
1		-4.02***	-2.10***	4.03***	0.45**
		(0.67)	(0.29)	(0.53)	(0.16)
	1	-1.18***	-0.61***	1.06***	-0.01
		(0.21)	(0.09)	(0.16)	0.05

2 Lags

SIN7	MAL7	THAI7	PHI7	INDO7	VIE7
1		-2.17***	-0.53*	-0.29	0.86***
		(0.53)	(0.23)	0.45	(0.12)
	1	-2.89**	-1.97***	4.85***	-0.35
		(1.01)	(0.44)	(0.85)	0.23

3 Lags

SIN7	MAL7	THAI7	PHI7	INDO7	VIE7
1		-1.59*	0.10	-2.61***	1.20***
		(0.88)	0.39	(0.77)	(0.21)
	1	-2.59*	-1.88**	6.02***	-0.75**
		(1.33)	(0.59)	(1.16)	(0.31)

5 Lags

SIN7	MAL7	THAI7	PHI7	INDO7	VIE7
1		-5.03***	-1.29**	1.45	1.33***
		(0.93)	(0.38)	0.80	(0.22)
	1	2.40***	0.43	-0.99*	-0.70***
		(0.64)	0.26	(0.50)	(0.15)

6 Lags

SIN7	MAL7	THAI7	PHI7	INDO7	VIE7
1		-5.28**	-0.54	-0.47	1.98***
		(1.52)	0.59	1.25	(0.36)
	1	2.82**	-0.012	0.28	-1.18***
		(1.06)	0.415	0.87	(0.25)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

Appendix Table D: Different Lag Length Tests for SITC8

2 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		6.14*** (1.11)	-4.42*** (1.23)	-3.04*** (0.76)	-1.09* (0.56)
	1	-8.09*** (1.25)	1.468 1.39	5.23*** (0.85)	1.78** (0.63)

3 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		3.44*** (0.76)	-5.35*** (0.85)	1.20** (0.53)	-0.50 0.36
	1	-5.06*** (0.69)	1.00 0.76	2.12*** (0.48)	1.11*** (0.33)

4 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		2.52*** (0.73)	-3.62*** (0.84)	0.22 0.52	-1.39*** (0.33)
	1	-5.37*** (0.74)	2.01** (0.84)	1.62** (0.52)	1.16*** (0.34)

5 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		1.10** (0.51)	-2.74*** (0.59)	0.94** (0.36)	-1.08*** (0.23)
	1	-4.07*** (0.55)	1.40** (0.63)	1.03** (0.39)	1.13*** (0.25)

6 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		0.84** (0.44)	-2.08*** (0.52)	0.63** (0.31)	-1.14*** (0.20)
	1	-3.46*** (0.53)	1.23** (0.63)	0.55 0.38	1.05*** (0.24)

10 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		0.42 0.44	-2.54*** (0.58)	1.61*** (0.35)	-0.75*** (0.21)
	1	-3.15*** (0.36)	1.78*** (0.47)	-0.39 0.28	0.71*** (0.17)

11 Lags

INDO8	VIE8	THAI8	MAL8	SIN8	PHI8
1		0.91** (0.36)	-2.47*** (0.49)	0.96*** (0.30)	-1.02*** (0.18)
	1	-3.27*** (0.33)	1.59*** (0.45)	0.07 0.28	0.89*** (0.17)

Note: The numbers in parentheses are the standards errors. The symbol *** refer to a 1% significant level, a ** refers to a 5% significant level and a * refers to a 10% significant level.

Appendix Table E: Scientific and Technical Indicator for ASEAN Countries

High-Tech export (% of manufactured exports)	Singapore	Vietnam	Indonesia	Philippines	Thailand	Malaysia
1996	55.5	..	8.8	58.4	29.0	44.4
1997	56.8	2.2	11.4	66.4	30.7	49.0
1998	58.8	1.7	10.1	71.9	34.3	54.9
1999	60.7	1.4	10.2	75.0	32.3	58.9
2000	62.6	11.0	16.2	72.6	33.3	59.5
2001	60.7	8.4	14.0	71.9	31.4	58.1
2002	60.3	5.9	16.4	74.1	30.7	58.2
2003	56.3	5.6	14.5	73.6	30.2	58.9
2004	56.6	4.5	16.1	72.6	28.1	55.6
2005	56.6	5.3	16.3	70.7	26.6	54.7
2006	57.8	..	13.2	67.6	27.3	53.8

Source: World Development Indicators

Appendix Table F: Average Percentage Share of Selected ASEAN Countries Merchandise Export to the U.S. during 1996:1 – 2007:12

	Chemicals	Manufactured goods	Machinery and transport equipment	Miscellaneous manufactured
Indonesia	9.3	29.2	4.4	22.6
Malaysia	12.9	16.7	41.5	13.1
Philippines	1.8	7.2	13.2	14.5
Singapore	66.1	3.2	26.0	6.6
Thailand	9.3	40.4	14.6	23.4
Vietnam	0.4	2.9	0.3	11.4

Chemicals and related products: SITC5
Manufacture goods classified chiefly by material: SITC6
Machinery and transport equipment: SITC7
Miscellaneous manufactured articles: SITC8
Source: US International Trade Commission and calculated by author