THE IMPACT OF TERMS OF TRADE AND ITS VOLATILITY ON ECONOMIC GROWTH: A CASE OF ASEAN COUNTRIES

Miss Patcharaporn Banchorndhevakul

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ผลกระทบของระดับและความผันผวนของอัตราการค้าต่อการเจริญเติบโตทางเศรษฐกิจ: กรณีศึกษาของประเทศในกลุ่มอาเซียน

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By	Miss Patcharaporn Banchorndhevakul
Field of Study	International Economics and Finance
Thesis Advisor	Assistant Professor Ph.D. June Charoenseang
Thesis Co-Advisor	Ph.D. Danupon Ariyasajjakorn

Accepted by the Faculty of Economics, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the Faculty of Economics

(Associate Professor Ph.D. Chayodom Sabhasri)

THESIS COMMITTEE

.....Chairman

(Associate Professor Ph.D. Sothitorn Mallikamas)

.....Thesis Advisor

(Assistant Professor Ph.D. June Charoenseang)

.....Thesis Co-Advisor

(Ph.D. Danupon Ariyasajjakorn)

.....External Examiner

(Associate Professor Ph.D. Somchai Rattanakomut)

พัชรพร บัญชรเทวกุล : ผลกระทบของระดับและความผันผวนของอัตราการค้าต่อการเจริญเติบโตทางเศรษฐกิจ: กรณีศึกษาของประเทศในกลุ่มอาเซียน (THE IMPACT OF TERMS OF TRADE AND ITS VOLATILITY ON ECONOMIC GROWTH: A CASE OF ASEAN COUNTRIES) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร. จูน เจริญเสียง, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: อ. ดร. ดนุพล อริยสัจจากร, 143 หน้า.

วัตถุประสงค์ของการศึกษาวิทยานิพนธ์ฉบับนี้คือ การวิเคราะห์ความสัมพันธ์ระหว่างอัตราการค้าและความผันผวนของอัตราการค้าที่มีต่อการเจริญเติบโตทางเศรษฐกิจ โดยพิจารณาอัตราการค้าแลกเปลี่ยนสินค้าสุทธิ (Net barter terms of trade), อัตราการค้าจากรายได้ (Income terms of trade) รวมถึงความผันผวนของอัตราการค้าทั้งสองประเภทเป็นหนึ่งในปัจจัยสำคัญที่กำหนดอัตราการเจริญเติบโต โดยมีขอบเขตการศึกษาเป็นข้อมูลรายปีของประเทศในภูมิภาคอาเซียน (ASEAN) กล่าวคือ ประเทศเศรษฐกิจเกิดใหม่ทั้ง 4 ประเทศ ในช่วงเวลาปีคศ. 1981 จนถึงปีคศ. 2010 โดยใช้วิธีการทดสอบความนิ่ง (Unit root test), การทดสอบความสัมพันธ์เชิงระยะยาวหรือโจแฮนสันโคอินทิเกรชั่น (Johansen cointegration test), การทดสอบความสัมพันธ์เชิงระยะสั้นตามแบบจำลองเอเรอร์คอเรคชั่น (Vector error correction model) และการวิเคราะห์ปฏิกิริยาตอบสนองต่อความแปรปรวน (Impulse response function) ซึ่งจะอภิปรายผลสำเร็จในการศึกษานี้ จากการศึกษาพบความสัมพันธ์ในระยะยาวระหว่างผลผลิตมวลรวมภายในประเทศต่อบุคคลที่มีต่ออัตราการค้าและความผันผวนของอัตราการค้าในประเทศในกลุ่มภูมิภาคอาเซียน ผลการศึกษาพบว่าอัตราการค้าแลกเปลี่ยนสินค้าสุทธิและอัตราการค้าจากรายได้ รวมถึงความผันผวนของตัวแปรทั้งสองในประเทศอินโดนีเซียและประเทศฟิลิปปินส์ ซึ่งเป็นประเทศที่เน้นการบริโภคภายในประเทศมีการส่งผ่านผลกระทบไปที่การเจริญเติบโตทางเศรษฐกิจในทิศทางที่ไม่ชัดเจน ในขณะที่ประเทศมาเลเซียและประเทศไทย ทั้งสองประเทศนี้เน้นอัตราการค้าระหว่างประเทศ ทำให้ระดับและความผันผวนของอัตราการค้าแลกเปลี่ยนสินค้าสุทธิและของอัตราการค้าจากรายได้เป็นองค์ประกอบหนึ่งที่ส่งผลกระทบต่อการเจริญเติบโตทางเศรษฐกิจอย่างชัดเจนและมีทิศทางสนับสนุนต่อการเจริญเติบโตทางเศรษฐกิจ

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ปีการศึกษา 2557 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

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PATCHARAPORN BANCHORNDHEVAKUL: THE IMPACT OF TERMS OF TRADE AND ITS VOLATILITY ON ECONOMIC GROWTH: A CASE OF ASEAN COUNTRIES. ADVISOR: ASST. PROF. PH.D. JUNE CHAROENSEANG, CO-ADVISOR: PH.D. DANUPON ARIYASAJJAKORN, 143 pp.

In this paper, the main purpose is to analyze the relationship between terms of trade and its volatility on economic growth, considering that both net barter and income terms of trade and their volatilities are one of crucial factors to determine growth. By utilizing annual data of ASEAN countries, which are four emerging market economies, for the period 1981-2010, using Unit root test, Johansen cointegration test, Vector error correction model (VECM), and Impulse response function are discussed to accomplish this study. In this paper, Johansen cointegration technique has been adopted and found the existence of long run relation between GDP per capita and terms of trade and its volatility in ASEAN. The results of the level and volatility of net barter terms of trade and income terms of trade of Indonesia and the Philippines, where depend largely on domestic consumption, have an unclear effect on economic growth. In case of countries relied deeply on international trade like Malaysia and Thailand, both net barter terms of trade and income terms of trade as well as their volatilities are economic factors which are clearly impacted real domestic growth and also support potential growth.

Field of Study:	International Economics and Finance	Student's Signature .....
		Advisor's Signature .....
Academic Year:	2014	Co-Advisor's Signature .....

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CHAPTER 1

Introduction

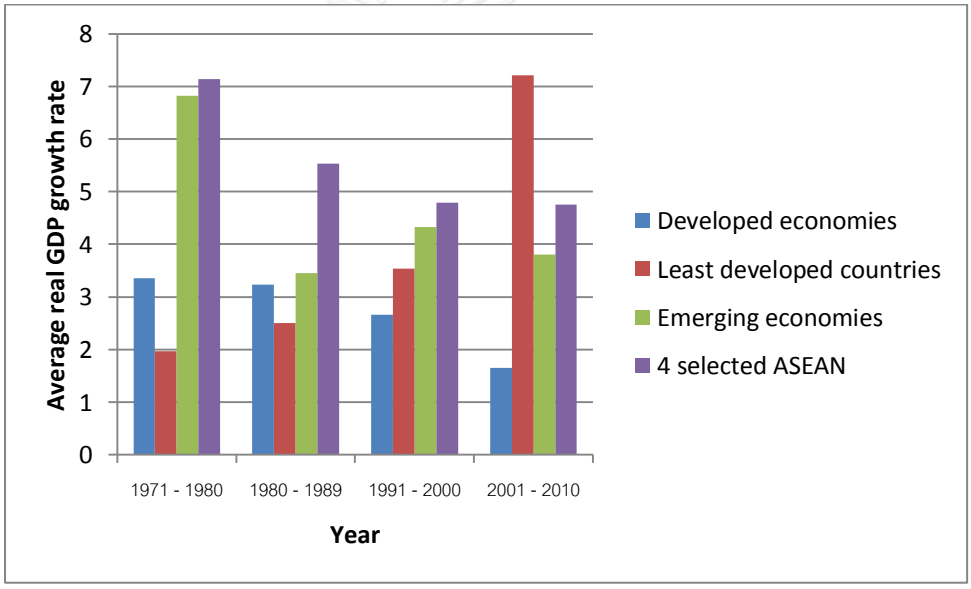
1.1 Background and significant of the problem

In this century, economic growth is one of the most popular topics that many researchers do the research to find the linkage of it with macroeconomic variables because the policy makers try to increase their national's welfare. Economic growth is somewhat one variable explained the change of economic status of an individual country because economic growth is a measure of country's ability to produce goods and services year on year, so higher growth rate means beyond just an accelerated productive capacity, an enlarged standard of living—the higher growth rate of the ratio of GDP to population—too.

Emerging market economies are economies which have transitional status from developing countries toward becoming developed countries because they are ongoing enlargement in their rapid growth, income per capita, economic freedom, and slow integration with global market, etc. (Kvint 2009). By nature, the average economic growth of emerging markets—about 4.6% in the 1971-2010—is higher than industrialize countries—2.7 percent on an annual average basis (see Figure 1). Only small group of emerging countries—particularly for four ASEAN (the Association of Southeast Asian Nations) countries where growth rate is higher than ordinary emerging economies' one—has expanded an output growth by an average of 5.5 percent in the whole forty years. It would imply that these emerging market countries and four selected ASEAN emerging market economies, including Indonesia, Malaysia, the Philippines, and Thailand, can catch up the economic development of industrialize countries in the short period of time. Observed throughout the same period, the least developed nations usually have slow growth rate, apart from a skyrocketing real GDP growth from 3.5 to 7.2 percent in the last decade. This evidence presented here hints at the possibility that a gradually increased real GDP

growth rate in the least developed nations is hardly to keep up with other nations. However, output growth in the last ten year could indicate that if the periphery nations have strong growth unstoppably, they may have a chance to reduced gaps between periphery and more advanced nations. Economic performance in ASEAN emerging economies had improved at a strong pace for several decades, with nearly two-digit growth rate for ten years before Asian financial crisis in 1997. Overall, ASEAN annual GDP growth is always positive, although the output growth, such as in 1998 and in 2009—when country has an internal and/or external crisis—appears to be less than zero percent.

Figure 1 Real GDP growth rate during 1971-2010



Source: UNCTAD database (1970-2010)

The income gap between most wealthy countries and poorest countries is continuously increased for the time pass (see Table 1). From UNCTAD statistic data in 1971-2010, per capita GDP of developing countries jump up 5.16 times, developed countries GDP per capita rise 5.65 times, and GDP per head of less developed countries slightly increase 2.44 times. Even if the GDP growth rate of less developed countries elevate significantly in the last ten year, its highest per head GDP is absolutely lower than developed-developing-emerging economies and four selected ASEAN. The evidence of real GDP per capita shown that only four selected ASEAN

emerging economies' and emerging economies' income can pursue developed economies with 20-year-lagged and 30-year-lagged, respectively. In the meantime the possibility of developing economies and least developed countries to pursue the income of developed economies is nearly zero. An income of developing economies appears to have two- and one-decade-lagged with emerging economies' and four selected ASEAN's income which implies that people in developing economies during 2001-2010 have close income rate with emerging economies' citizen in the 1980s and four ASEAN countries' citizen in the 1970s.

Table 1 Real GDP per capita (average 10 years annual data) during 1971-2010

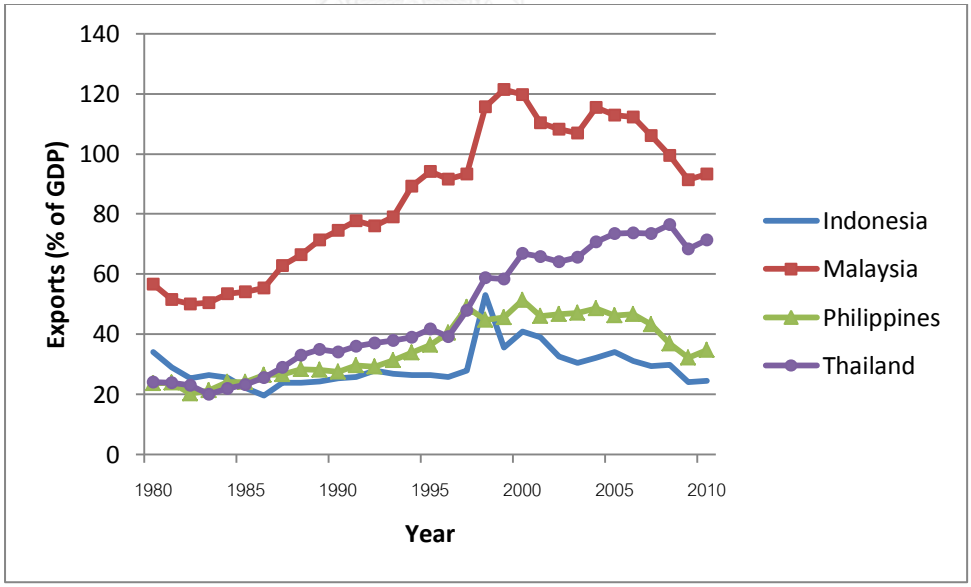
YEAR	1971-1980	1981-1990	1991-2000	2001-2010
Developing economies	462.2775	798.9584	1288.248	2389.393
Developed economies	6094.409	13390.82	23882.72	34480.3
Least developed countries	200.9211	274.5306	281.7532	491.6898
Emerging economies	1206.588	2376.541	5145.129	7509.526
4 Selected ASEAN	1991.049	4210.213	7649.463	11217.73

Source: UNCTAD database (1971-2010)

Per capita growth rate, which is a popular representative of economic growth, can be determined by many variables, for example, policies, institutions, national characteristics, the rule of law, investment ratio, ratio of government spending to GDP, inflation, terms of trade, international openness, etc. (Barro 2003). Terms of trade is an outstanding variable which reflects the competitiveness of country in the international market. With an improvement in the terms of trade, which presents rising income position from the shift of relative price, GDP per capita is likely to enhance because national's wealth comes from both internal expenditure (consumption, investment, and government expenditure) and international trade (exports and imports).

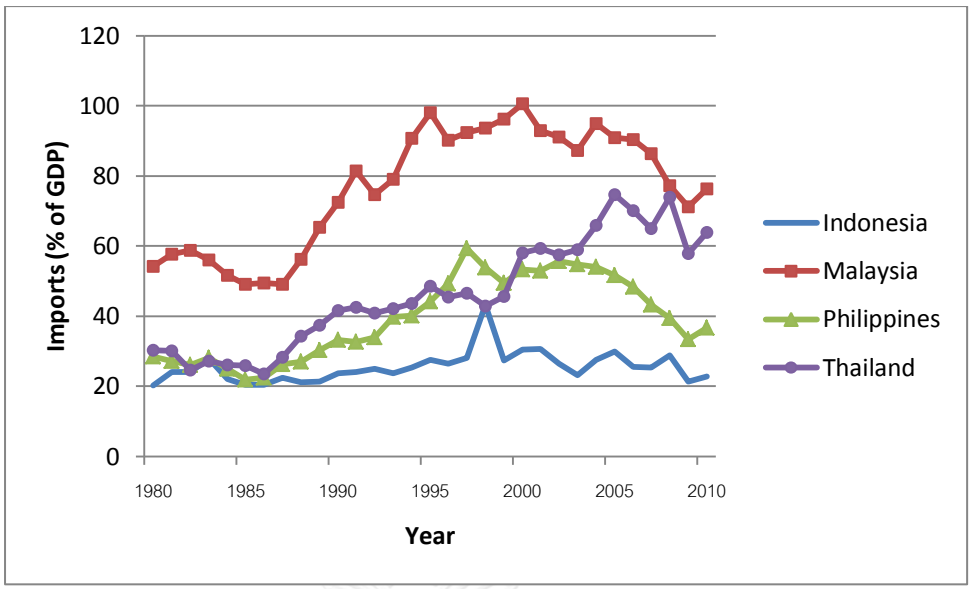
In addition to the World Bank data in 2011, the proportion of import of many countries is higher than 40% of GDP and the proportion of export in most countries is higher than 30% of GDP. We can imply that export and import is the important factor that affects the economic growth. Growth in ASEAN emerging economies has generally come from external trade like the rest of the world. As shown in figure 2 and 3, an average value of exports and imports shares of GDP during 1981-2010 is 29% and 26% in Indonesia, is 87% and 77% in Malaysia, is 36% and 40% in the Philippines, and is 48% and 47%in Thailand. An international trade in ASEAN increases regularly over time which gives a hint that exports and imports in this region has been a key determinant in growth's direction given that the ratio of other variable to GDP remains constant. However, slightly grown trade in Indonesia has translated into a clue that external trade might not be a critical variable influenced growth.

Figure 2 Four ASEAN exports of goods and service compared with overall value of GDP during 1981-2010



Sources: World Bank database (1981-2010) and author's calculation

Figure 3 Four ASEAN imports of goods and service compared with overall value of GDP during 1981-2010



Sources: World Bank database (1981-2010) and author's calculation

To put the emphasis of the value of export and import in % of GDP in figure 2 and figure 3, export and import have important impacts on GDP, hence terms of trade and its volatility which are factors influenced export and import should have affected economic growth. Terms of trade influence economic status by moved in the same direction whenever economy has higher proportion of trade with other nations than other internal indicators; therefore, the positive change in the terms of trade should normally lead a magnification in economic growth. Furthermore, Gross domestic product (GDP) of emerging markets grows continually by heavily dependent on international trade, so the investigation in an effect of terms of trade on economic growth is beneficial to our nations because of almost 50 percent of output volatility explained by the term of trade variation (Mendoza 1995, Mendoza 1997).

Normally, economies in the awakening of globalization have become more integrated with the global economy; what is noticeable is that the size of economic globalization (comprising an international trade and economic restrictions) appears to have increased over the time pass, such as in four ASEAN countries. We can then summarize the ideas above that the higher degree of globalization the larger domestic gain (loss) from foreign shocks. More economic integration will expand the volatility and uncertainty because of the close association, so the level and volatility

in the terms of trade are directly converged or diverged depended on the world export-import prices.

1.2 Objectives

Our main objective is to examine whether the long run impacts of the terms of trade and its volatility on economic growth over time. The purpose of this paper is presented as follows.

1. To examine whether net barter terms of trade & income terms of trade (its volatility) have contributed significantly positive (negative) long run relationship on economic growth.
2. To provide empirical evidence of linkage between economic status and terms of trade (its volatility) on four countries (Indonesia, Malaysia, the Philippines and Thailand) which are the representative of ASEAN emerging countries

1.3 Research Hypothesis

Hypothesis:

In order to examine and analyze the impact of terms of trade level and its volatility on economic growth, the mostly outward-focused approach of terms of trade uses the same hypothesis, the Prebisch-Singer hypothesis. The Prebisch-Singer hypothesis found that terms of trade of developing countries follows a declining trend (equate with a negative trend in the relative price of primary products in terms of production of manufactures), but not in the more economically developed countries. From the last twenty-five or thirty year of the 19th century to the first half of the 20th century, net barter terms of trade of the United State and the United Kingdom which had been used as a Prebisch and Singer's delimitation of the study had improved significantly as a result of sold industrial articles. However, Prebisch and Singer insisted that commodity product is a cause of deterioration in the terms of trade, especially in developing countries which solely specialize in commodity product. It is not strange that the gap of income between industrial countries and

developing countries is broader as a consequence of terms of trade atrophy in periphery. Mentioned in Prebisch thesis, specialization supported technological advance and then lead to higher incomes. To get rid of terms of trade deterioration, developing countries should specialize in other products since an improvement of terms of trade brings about an increase in domestic savings and (re)investment and then economic growth will rise.

As stated in the Prebisch-Singer hypothesis, terms of trade of developing countries specialized in primary commodity is weaker overtime when compare to developed countries specialized in manufactured goods which is actually true in the 19th century history. Over the past couple of decades, the validity of this hypothesis has been proved otherwise by many reasons (see Terms of trade deterioration topic written in Chapter 3 for further details). One of them is that, as time goes by, many successful developing countries change their economic status from less-developed economies to be known as emerging market economies. The developed market's characteristics of these economies are nearly alike industrialized countries since emerging market economies foster technical progress in their industrial sectors which could reflect in an enhancement in their terms of trade. Moreover, altering export proportion from primary commodities to manufactures in emerging market economies during thirty years past might influence the value of terms of trade and its volatility and then determine the economic performance. Consequently, income gaps of these economies and industrial countries should become smaller.

To assess whether the existences of terms of trade and its volatility in each country have tremendously affected on low or high individual economic growth, the author considers without realizing the causality's direction of terms of trade on growth. The hypothesis in this thesis will be in the middle of both agreeable and disagreeable Prebisch-Singer hypothesis sides because this thesis observes ASEAN emerging market economies—that have many unique characteristics unlike both core and periphery countries.

1.4 Scope of the study

In order to see the relationship of terms of trade and its volatility on economic growth, the author selects the annual data from Indonesia, Malaysia, the Philippines and Thailand from 1981 to 2010. For the period 1981-2010, the author chooses this long period of time because of demanding to see the trend of growth. To see the connection of these variables, this paper will utilize the estimation technique which is the cointegration model.

1.5 Benefits of the study

The results about the linkage between terms of trade and its volatility with economic growth should be useful to many economic agents including policy makers, entrepreneurs, domestic investors, and researchers by guiding suitable choices before taken action. The private sector can decide export goods and import goods to make its business successful. Together with this beneficial forecast, entrepreneurs in ASEAN emerging market economies would avoid the large losses that might happen from direct and indirect effects of the level and volatility of the terms of trade on growth in the future. Moreover, fiscal and monetary authorities can design the appropriate policies to handle with shocks from terms of trade and its volatility aimed at boosting economic performance or at least for stable and sustainable its economy.

1.6 Contribution

This thesis sheds light on an empirical work on relationship between both the historical level and volatility in the terms of trade (both net barter terms of trade and income terms of trade) on economic growth in four ASEAN emerging markets economies (that is, Indonesia, Malaysia, the Philippines and Thailand). Evidence for these four countries is presented various results—following an ordinary pattern and an unorthodox pattern—with respect to how changes in internal and external economic parameters have affected the magnitude of terms of trade and thus economic performance. This thesis's empirical and case study evidence also provides

the causes and effects of (un)conventional linkage of the level and volatility of the terms of trade with domestic growth which is never revealed in any researchers.

CHAPTER 2

4 ASEAN's Terms of Trade and its Volatility

In this chapter, we provide an overview of terms of trade in four ASEAN emerging market economies, showing the important factors influenced relationship between terms of trade and growth in each country (oil price, primary commodity price, degree of openness, domestic consumption, economic globalization, exports and imports destination).

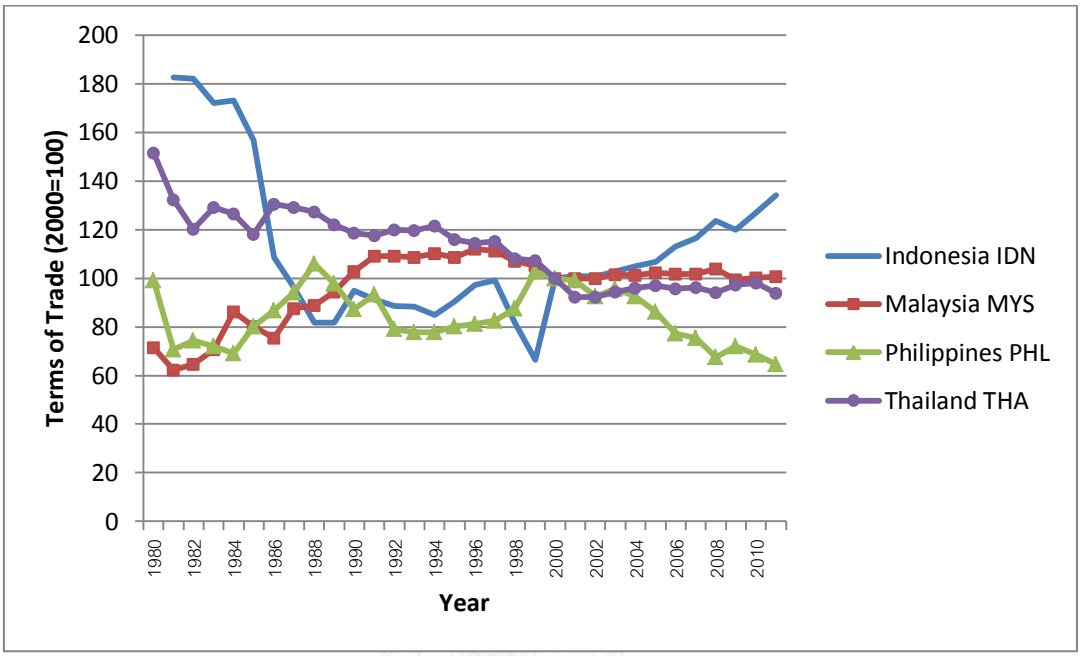
2.1 Overview of Four selected ASEAN countries

The unique feature of positive linkage between economic performance and terms of trade has been shown in the past empirical studies. But this aligned direction does not be a fixed answer because not only terms of trade and its volatility but also vast variables can determine value of growth. Likewise, the relationship between terms of trade volatility and growth can be either positive or negative depending on country's characteristics. In light of this gap, this paper focuses on the empirical relationship between the level and volatility in the terms of trade on economic growth (real per capita gross domestic product) by considered Indonesia, Malaysia, the Philippines, and Thailand as the representative of ASEAN emerging markets using time series data. These four ASEAN countries are small emerging economies which their GDP depends heavily on their export and import sectors. Furthermore, these four nations are members of 10 newly industrialized countries (NICs) which have speedy economic growth and have been named as Tiger Cub Economies. Moreover, these four ASEAN countries in this thesis are the victims of Asian financial crisis beginning in 1997 and also receive an indirect effect from global financial crisis in 2007-2009. As noted earlier, Thailand and Indonesia are the most suffered countries from ASIAN crisis meanwhile Malaysia and the Philippines are suffered from the slump. The effect of global financial crisis in these four nations depends on country's characteristic and also their connection with their trading partners.

Figure 4 shows the trend of net barter terms of trade in these four countries after 1980 throughout until 2010. Between 1981 and 2010, the shape of Indonesian net barter term of trade trend is U-shape. In 1987-1999, Indonesia has the deterioration of its terms of trade. On the other hand, with relatively comparable economic size, a downward trend in the terms of trade shows that the relative price of Thailand is gradually fallen from an increase of import value index. In 1980s, the underlying terms of trade trend in Malaysia reflects the low competitiveness of its countries in the international market. Malaysian term of trade index does not drop under 100 over the period 1990-1999; however, its index is a little bit above or below 100 after the 2nd Millennium which is rather stable. The Philippines, only one country in this region that has barely experienced an improvement in net barter terms of trade except in 1988 and in 1999, always has a downward trend due to consistently high import price throughout thirty years of its historical data. Indonesian trend before the 2nd millennium was shaped similar with Kenya's graph in study of Mendoza due to dwindling of terms of trade while Indonesia after the 2nd millennium as well as terms of trade in Malaysia along the first and half decades share an experience of upward trend in terms of trade, which is consistent with Canadian evidence in Mendoza's work. Most of the Canadian terms of trade trend—a representative of advanced economies—during 1955-1990 moved upward due to a relative price of its exports, although the terms of trade of Kenya which is a representative of developing nations during 1960s-1980s had continuously moderated identified in the study of Mendoza (1997). Accordingly, as reverse direction in Canada and Kenya terms of trade trends, a seriously moderated commodity prices from 1970 to 1990 and economic status of country (developed and developing countries) played a critical role in specified terms of trade value. Thailand's net barter terms of trade pattern in Figure 4 has harmonized with New Zealand's empirical analysis of Grimes (2006) by gradually decrease over time and stay around 100 at the last decade. In the hypothesis of the Prebisch-Singer, ASEAN countries which used to specialize in primary products but shifted to master in manufactured products should have an improvement in their terms of trade.

However, the trends of net barter terms of trade for these four countries are not following their hypothesis because of many different country characteristics.

Figure 4 Four ASEAN Net Barter Terms of Trade

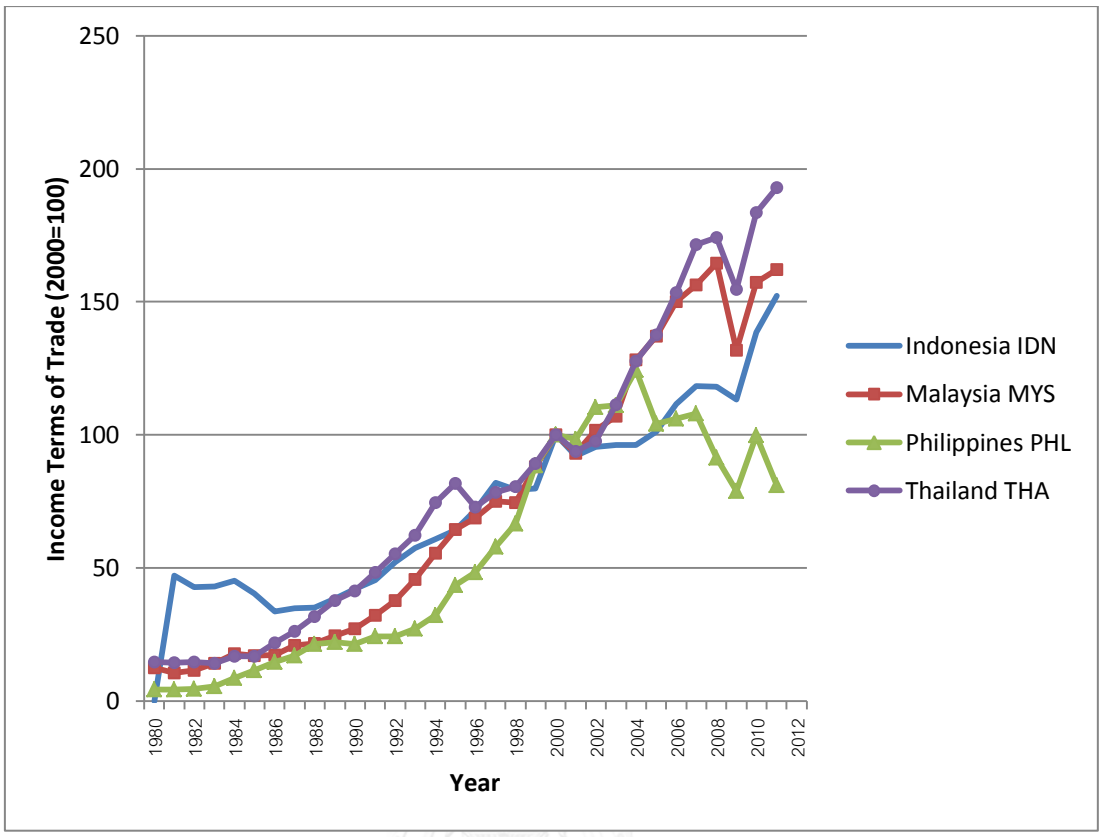


Sources: World Bank database (1981-2010)

As shown in Figure 5, the income terms of trade in four countries improved without stopping from 1981 to 2010. Before the base year in 2000, the income terms of trade index remains below 100. During 2001-2004, Indonesian income terms of trade are less than 100 by reason of low net barter terms of trade, but not from low export quantity index, but their income terms of trade is slowly improved. Constantly increase in the value of income terms of trade in Malaysia are mainly relied on both net barter of trade and the size of export quantitative volume index. By comparing the Philippines data with other nations shows that the Philippines' index over 2005-2010 decrease continually hinted to the big influence of net barter terms of trade. Under a scenario, especially a permanent deterioration in the relative price of imports in terms of exported products of the Philippines, lower terms of trade would transmit its negative effect to income terms of trade since 2005. Driven heavily by downward net barter terms of trade, the Philippines has endured lower relative purchasing power of exports in terms of imports, with less impact on positive export

volume index. The income terms of trade in Thailand is below 100 only for two years (2001-2002), but an improvement in Thailand's income terms of trade exceed 100 since 2003. The export volume of Thailand is twice from 101.6773 in 2001 to 205.6401 in 2011 even though the relative price index is decreasing slightly. Among income terms of trade in 4 ASEAN emerging market economies, their trends has raising continuously since 1981, but suddenly dropped in 2009 because of the global economic slowdown impacted exports across the region, which has the same movement of regional terms of trade in IMF report (2013) and Turkey's income terms of trade in Cambazo and Karaalp (2012). In Turkey, income terms of trade during 1982-2011 had improved constantly, from less than 20 percent to be above 100 in 2003, reflecting the extension of either net barter terms of trade and/or export volume index at boosting income terms of trade. Nevertheless, income terms of trade moderated in 2009, supported by an impact of global financial crisis on its declined exports. Regarding to the terms of trade figure in IMF report 2013, the terms of trade in every country (oil exporters, Sub-Saharan Africa, and Low-income country) dropped in 2009, aside from slightly uplifted terms of trade in Middle-income country. A risen movement of income terms of trade could be one factor that enhances GDP per capita growth in these nations.

Figure 5 Four ASEAN Income Terms of Trade

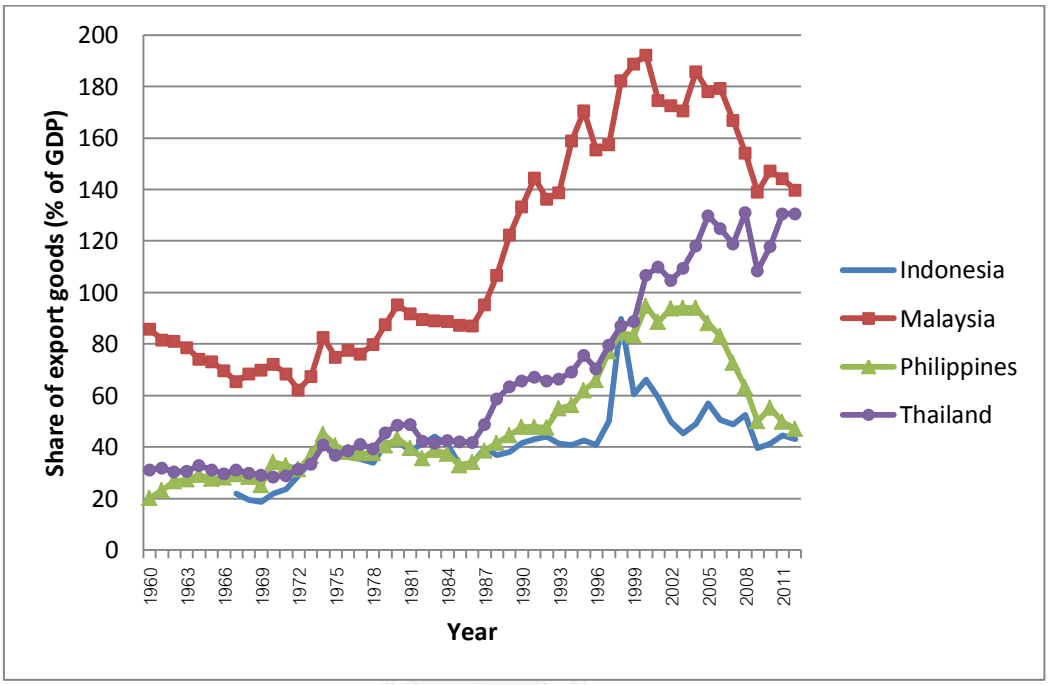


Sources: World Bank database (1981-2010) and author's calculation

Figure 6 presents evidence for the four ASEAN countries' trade in goods, showing the value of all goods exports and imports provided to the overall nations compared to the percentage of GDP. To compare each country in the figure, data of four countries over the period 1960-2012, except Indonesian data started in 1967, shows that the merchandise trade is increasing continuously over time but trade in goods of Indonesia, Malaysia begin to decrease in the last three years of 1990s. However, goods trade shares in Malaysian in 1988 and Thailand in 2000 up to now are different from Indonesia and the Philippines because their exports are value above 100% of GDP. To increase their own economic growth, the policy makers and government official could encourage trade in goods which have a major impact on gross domestic product by reduced policy on trade and investment barriers. Notice that the net barter terms of trade is measured by prices of export and import of merchandise, and not from both goods and services data, because the World Bank or UNCTAD online available data about service (for 6 years) is very short-term compared

with 30 years' merchandise data, so the author calculates terms of trade in this thesis solely depended on merchandise data.

Figure 6 Four ASEAN goods export shares (% of GDP)

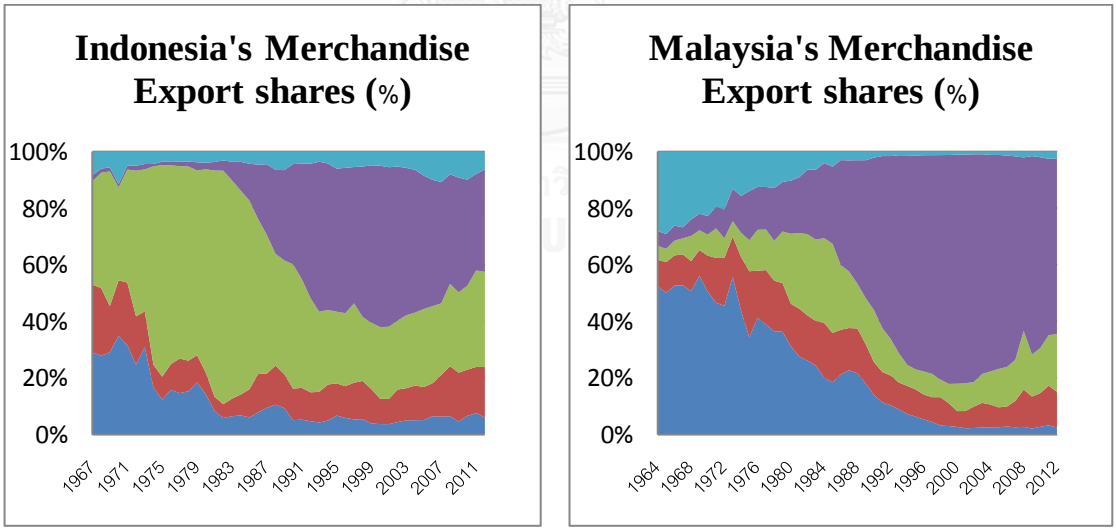


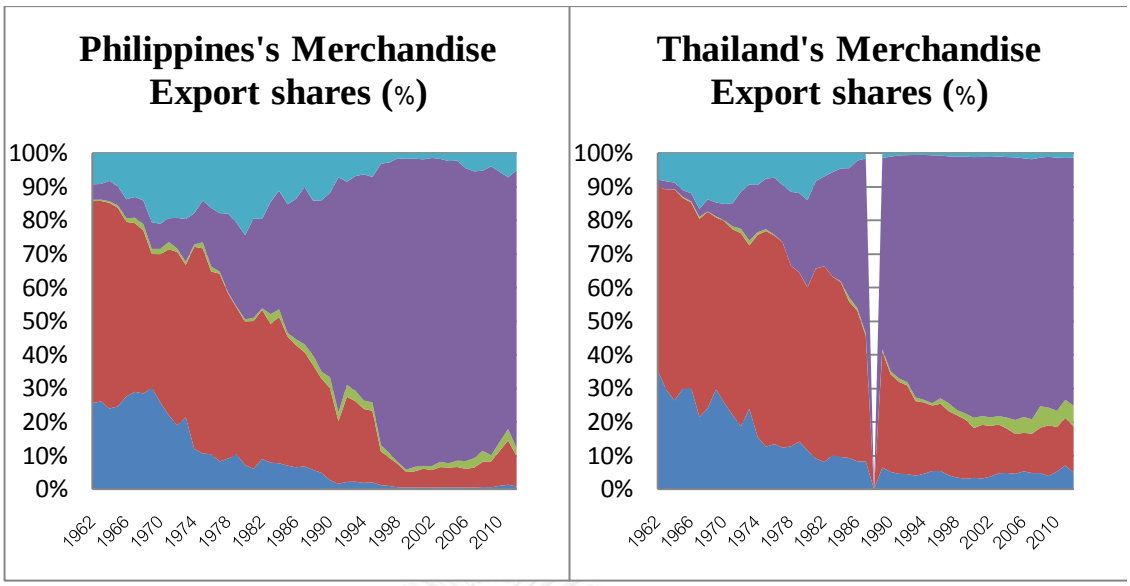
Sources: World Bank database (1960-2012)

For the past three decades or more, economic growth of many developing nations is mainly depended on exports of their primary products but afterward change exports shares to other sectors (see Figure 7). Excessive fluctuation in most commodity prices can explain why many emerging market economies decide to shift merchandise exports shares from primary products to manufactured products aiming to be like developed countries (Table 2). For primary commodities, more than half of commodities price have fallen but goes up after a decade past. This highly fluctuated price brings about uncertainty in export revenue, especially countries which have low exports share in manufactured goods. Look ahead, pungently fluctuated primary commodity prices might not become a key variable affected terms of trade because the shares of manufactured goods in these four nations is around 50 to 80 percent.

Agriculture products and raw materials from ASEAN and many developing countries are important to global market although their prices in the international market severally fluctuate along the past three decades. However, country which is the largest world-class leader of a specific commodity exporter will have a power to control the world price—for example, Indonesia with pepper, the Philippines with coconut oil, Indonesia and the Philippines with copra, Thailand with rice, and South East Asia with plywood (see Table 2). If Malaysia, as a giant supplier country setting prices of palm kernel oil, tin, tropical sawnwood in a global market, has a problem on its supply side, it will increase the world price and then decline country' GDP. For Blattman et al. (2007), finds that periphery nation which is large enough producers of a particular product to impact a global price (i.e. Chile with copper) leads findings to understate the predicted positive effect of terms of trade on domestic growth—that is, the improvement in the terms of trade trend does not stimulate its economy but deteriorate growth.

Figure 7 Four ASEAN Merchandise export shares (%)





Sources: World Bank database (1962-2012)

Table 2 Real Primary commodity prices (% change) from 1981 to 2000 and to 2010

Product	Real Price (% change) 1981-2000	Real Price (% change) 1981-2010	Product	Real Price (% change) 1981-2000	Real Price (% change) 1981-2010
FOOD			AGRICULTURAL RAW MATERIALS		
Wheat	-41.8	22.5	Linseed oil	-42.8	66.8
Maize	16.5	164.4	Tobacco	31.2	89.5
Rice	-53.0	20.1	Cotton	-28.6	-9.5
Sugar	-71.4	-25.7	Cattle hides	74.7	56.7
Beef	-30.2	21.2	Tropical logs	-2.8	70.2
Bananas	12.2	135.7	Tropical sawnwood	44.6	49.3
Pepper	109.4	191.1	Plywood	63.8	107.8

Soybean meal	-22.7	51.3	Rubber	-52.9	151.4
Fish meal	-18.1	234.5	MINERALS, ORES AND METALS		
TROPICAL BEVERAGES			Phosphate rock	1.7	186.1
Cocoa beans	-66.3	2.7	Manganese ore	13.7	371.9
Tea	29.6	62.4	Iron ore	-1.5	501.0
VEGETABLE OILSEEDS AND OILS			Aluminium	-10.3	25.7
Soybean oil	-43.4	67.9	Copper	-14.4	242.1
Sunflower oil	-38.0	69.8	Nickel cathodes	29.2	239.0
Groundnut oil	-16.8	63.4	Zinc	48.5	172.4
Copra	-32.7	65.4	Tin	-42.7	82.5
Coconut oil	-33.2	66.6	Gold, 99.5%	-54.4	100.3
Palm kernel oil	-38.8	63.2	Silver, 99.9%	-75.7	-1.8
Cottonseed oil	-25.5	46.5	Crude petroleum ($/barrel)	-20.4	122.9

Sources: UNCTAD database (1981-2010) and author's calculation

To obtain larger benefit and economic stability, emerging market economies which used to export their primary commodity to international markets have fostered industrialization and have increased the shares of manufactures in total exports. During 1965-1985 periods, the shares of manufactured exports of the Philippines and Thailand increase dramatically while the manufacture export proportion in two tiger cub economies like Indonesia and Malaysia are swing and stable, respectively (Sarkar and Singer, 1991). However, the data in Figure 7 of 1960s-2000s shows that the shares of manufactured exports of Malaysia, the Philippines and Thailand grow commonly and sharply while Indonesia increases with slower rate than others. Four ASEAN countries at present could have terms of trade trend and merchandise exports shares different from the former studies which identify these

emerging market economies as developing countries in the past, so the conclusion and finding may be contrast with usual hypothesis. A hypothesis of Prebisch and Singer (1950) about proficiency of developing nations in commodities and industrialized nations in manufactures could presently be weaken or incorrect owing to the time pass and its transitional phase. Furthermore, Prebisch-Singer hypothesis did not mention about emerging market economies since this economic group had set up after publicized this hypothesis for a couple of decades. Since emerging markets are hybrid economies which combined similar elements of developing and developed nations, their terms of trade's patterns might reject this null hypothesis. The proportion of exporting products in emerging market economies changes dramatically from agricultural primary commodities to manufactures in the past three decades meanwhile the developed nations shift their interest into service sectors (Cuddington et al., 2007).

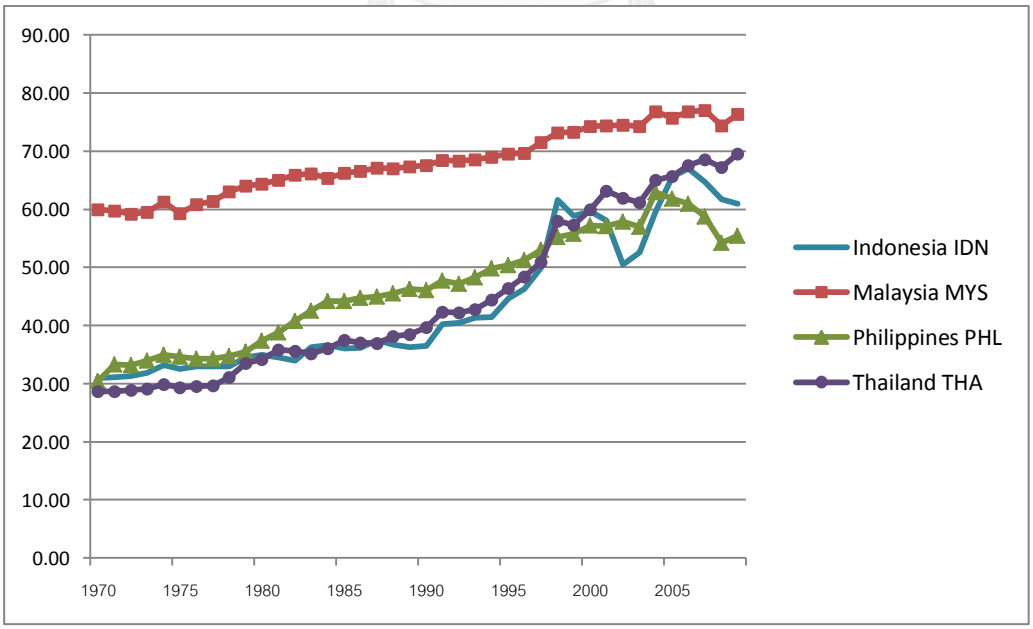
Thanks to the international integration and an assistance of periphery's government in industrialization, many developing nations have developed the technological progress in their industrial sector. The international integration has been displayed in the economic globalization[1] from KOF index definition which can be divided into 2 groups: the actual economic flows and the economic restrictions (see Figure 8) as a result of government's deregulation. To reduce or abolition tariff and nontariff barriers between nations for free flow of goods, services, and factors of production and increase co-integrated economic activities between countries are the main target of economic integration—brought about a technological know-how from abroad continue to mount and hence risen manufactured size. Figure 8 shows that the pace of economic globalization in four ASEAN countries enhances by 100 percent over the 40 years following takeoff, compared with about 30 percent, apart from Malaysia. Compared with 1970 takeoff, Malaysia started with higher degree of

[1] Actual economic flows are composed of 4 factors: trade, foreign direct investment, portfolio investment, and income payments to foreign nationals. Economic Restrictions comprises hidden import barriers, mean tariff rate, taxes on international trade, and capital account restrictions.

economic globalization than other countries, so its degree of globalization only increases from 60 to 80. However, high Malaysian globalization in ended and ongoing takeoff over the past forty years might imply that the economic growth of this country might have unfamiliar outcome with other countries. Double economic globalization in ASEAN countries during these four decades, aside from Malaysia, should have broadly changed economic structure, production line, and growth within these nations.

Furthermore, globalization can be in pattern of foreign company and could be weaken or strengthen domestic economy because greater openness in the international economy leads an expansion of multinational corporations (MNCs) to the rest of the world. A friendly foreign trade policy is an indicator which leads developed nations' company to establish new OEM plants in developing countries and ASEAN emerging market economies, and then the domestic exports to international market will also increase in terms of export volume and hence also continues to shift our economic potential.

Figure 8: KOF Index of Globalization indicated Economic Globalization during 1970s-2000s



Sources: KOF Swiss Economic Institution database (1970-2010)

Economic performance of an individual country has been associated with internal and external variables, so the size of these two variables will be determine direction of output per capita. The idea that international trade, especially terms of trade, is crucial to encourage economy's growth in developing nations might not be a synergy. Figure 9 illustrates four ASEAN countries' degree of openness which is measured by exports plus imports (both goods and services) as a share of GDP. The mean value of four ASEAN (Indonesia, Malaysia, the Philippine, and Thailand) degree of openness over the period 1981-2010 is 54.66, 164.19, 75.46, and 94.60 percent, respectively. An internal consumption within four countries is quite stable for thirty years with an average value of Indonesia at 69.83, Malaysian at 60.88, the Philippines at 82.19, and Thailand at 68.53 percent. Lower-than-average degree of openness in other ASEAN emerging market economies (for example, Indonesia and the Philippines) would lead to a different conclusion from others.

The author notices Indonesian characteristic that internal factor like domestic consumption may be the main driver of its economy (Figure 9 panel A). The mean value of Indonesian degree of openness over the period 1981-2010 is 54.66 percent; meantime, domestic consumption in Indonesia plays an important role in driving economy around 70 percent of GDP during the 1980s-2000s because of the highest population in this country, then production line will emphasize on internal consumption.

To take a consideration about long run growth rate, Malaysia extends its international openness double from 1.09 in 1981 to 2.20 in 2000 within two decades while its consumption expenditure is unchanged by an average of 60 percent along thirty years (Figure 9 panel B). The international openness, as reflected in exports and imports to GDP, appears to be more than consumption rate (% of GDP), so the proportion of these two variables specifies that the relationship between commodity terms of trade and growth must be positive.

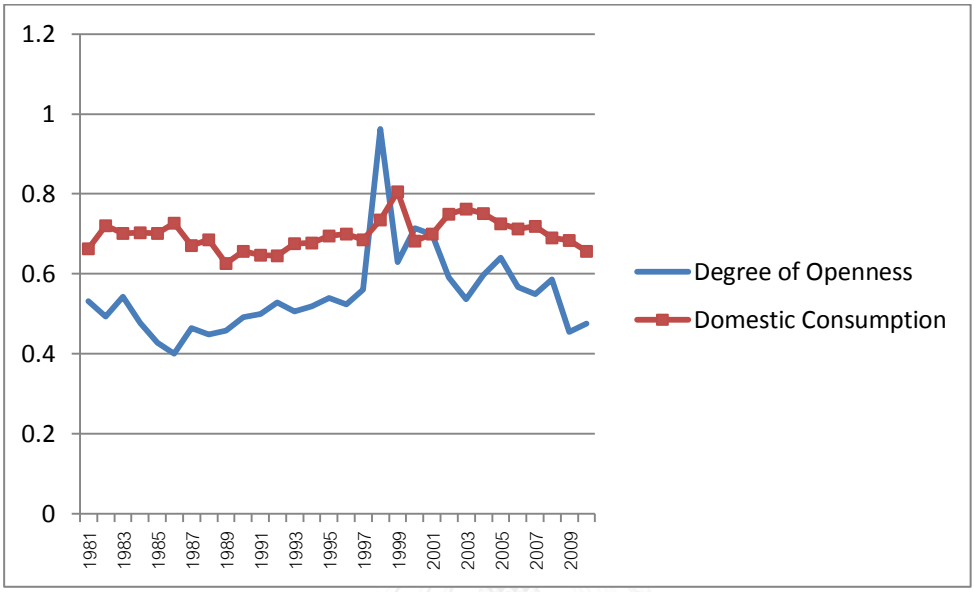
Actual economic growth of the Philippines has elevated by internal consumption instead of external factors, for instance, the evidence in 1980s to 1995 and the last three years of 2000s with higher private consumption than international

trade (Figure 9 panel C). This truth is illustrated that consumption rate, 82% of GDP on average, is a critical for stronger country's growth and also become an indicator to predict a negative relationship between terms of trade and economic activity because of lower mean terms of trade, by about 75%, equate to consumption. An actual economic growth of the Philippines—that is, GDP per capita shown in Figure 12—has climbed up slowly along 30 years, but the net barter terms of trade continue to deteriorate since 2000. The negative relationship could be explained by reverse direction of these two variables after 2000.

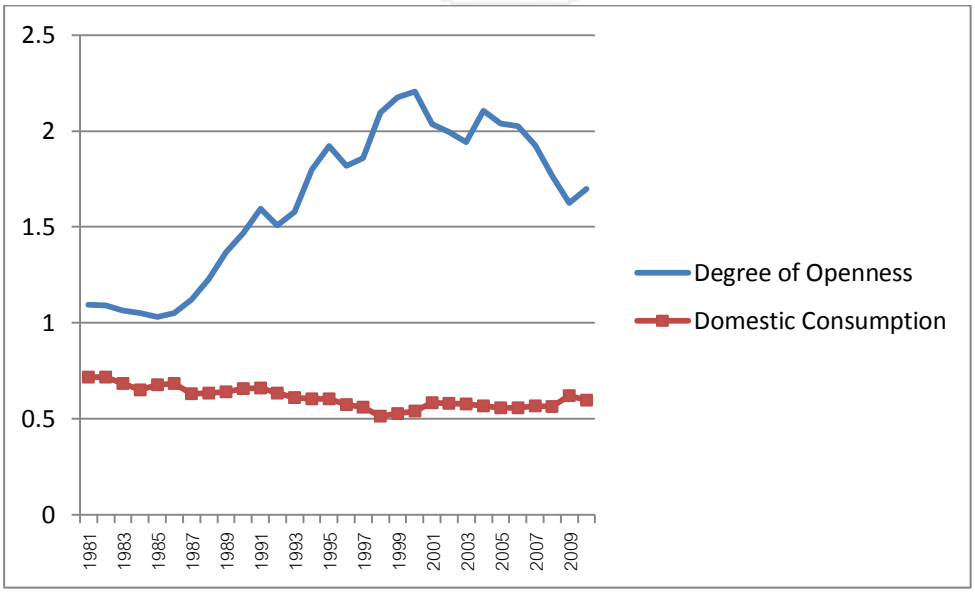
Economic integration such as trade openness of Thailand not only activates net barter terms of trade, but also stirs up domestic economy, which is in conformity with traditional assumption. A ratio of export and import to GDP in Thailand started with a little lower position than private consumption, but country's degree of openness since 1988 is larger than domestic consumption. The way in which international openness enlarged as time goes by, particularly after the 1988, could be summarized that the international openness takes part in determination of relative price and then country's growth (Figure 9 panel D).

Figure 9 4 ASEAN Degree of Openness and Domestic Consumption

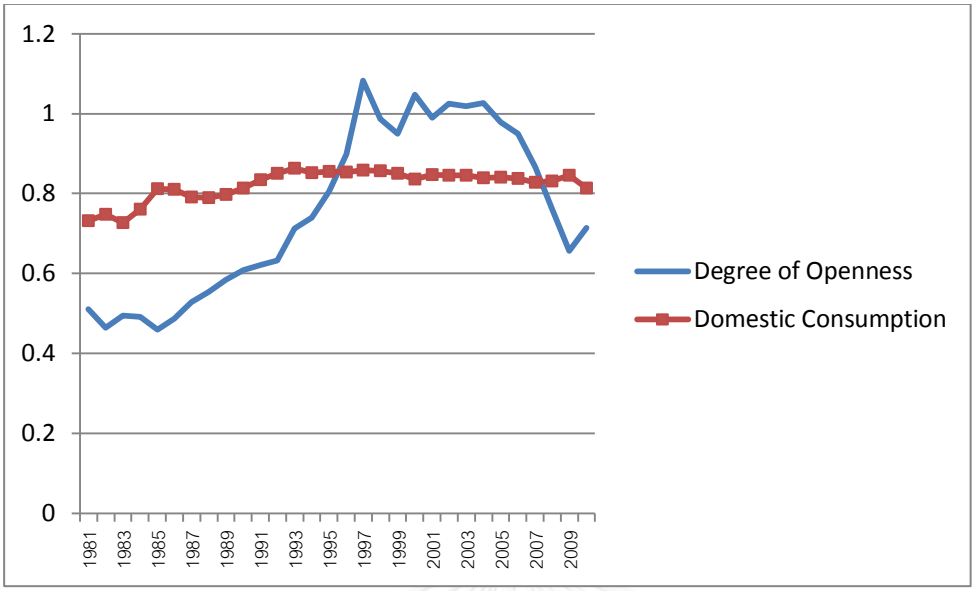
Panel A Indonesia



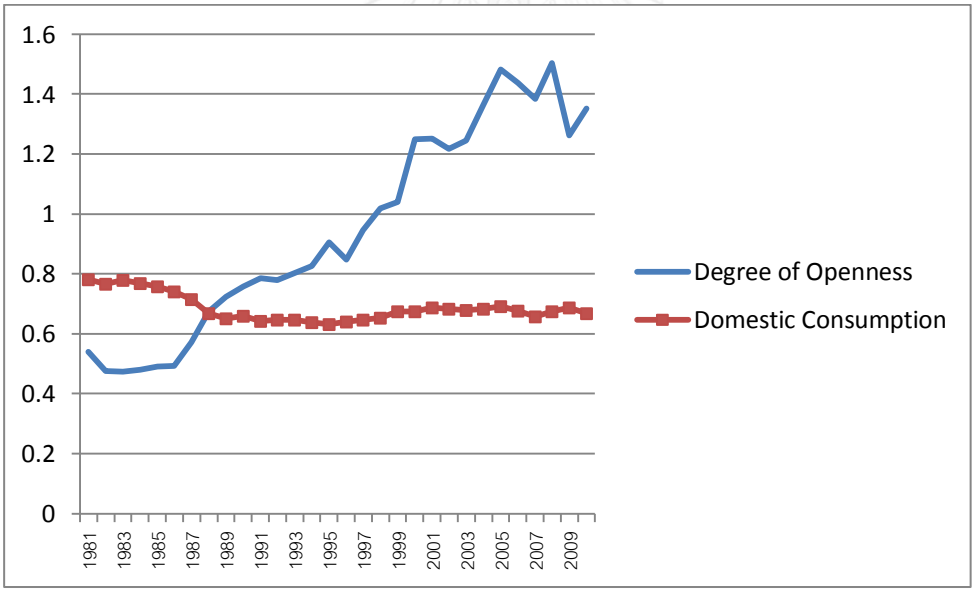
Panel B Malaysia



Panel C The Philippines



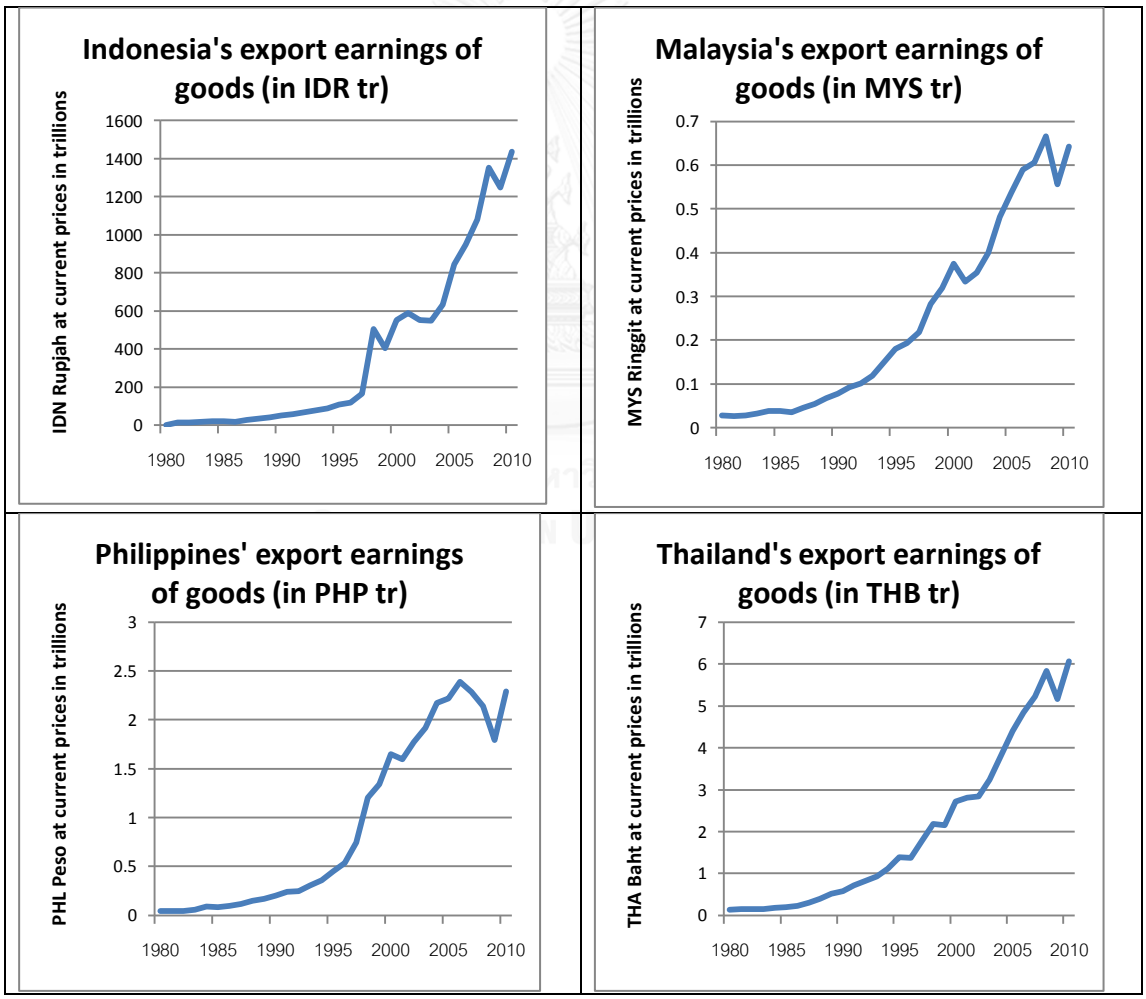
Panel D Thailand



Many emerging market and developing economies have succeeded in enlarging strong growth rate by supported from both internal and external factors. Among other things, higher export earnings has helped strengthen their economic potential—increased for nearly 100 percent in Indonesia, 25 percent in Malaysia, 50 percent in the Philippines, and 40 percent in Thailand of their total exports of goods in 1981 along with their rapid growth as the 30 years go by. For suffering experience in ASEAN, their export revenues which always increase over a time pass had been

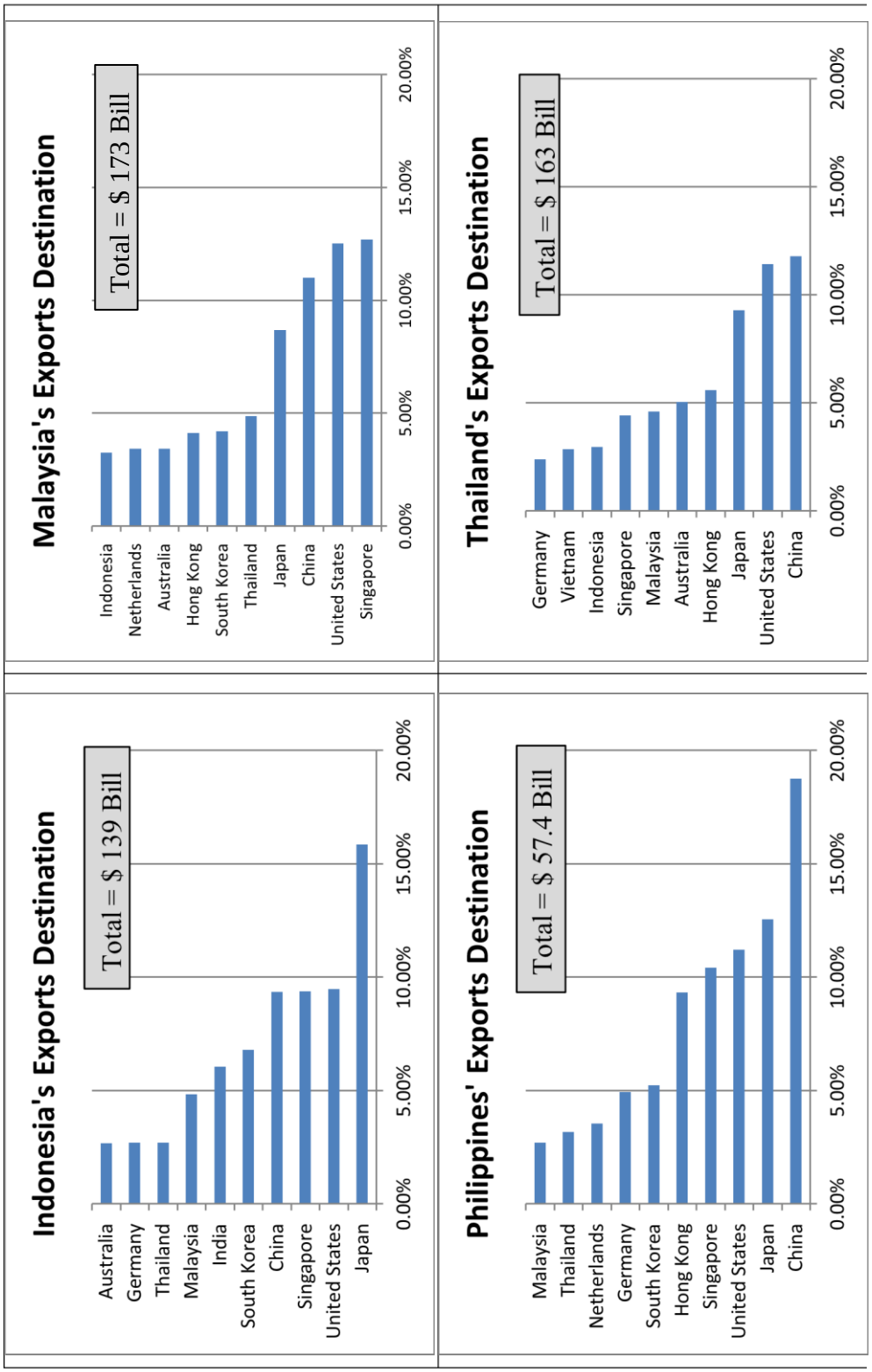
shrink when the ASIAN financial crisis started. A critical plunged export revenues in ASEAN happens again in 2009 since the global financial crisis (Figure 10), which leads their export values shorten 8% in Indonesia, 17% in Malaysia, 16% in the Philippines, and 11% in Thailand compared with local currency value in the previous year, had begun.[2] Malaysia is the most suffer in ASEAN emerging market economies during the global financial crisis because of its economic growth highly correlated with U.S.A and European nations while the Philippines' and Thailand's internal GDP growths went up with an unstoppable magnification in China (Figure 11).

Figure 10: 4 ASEAN's Exports earnings of goods in their local currencies during 1980s-2000s



[2] Export revenues of these four countries in goods data are available in UNCTAD database.

Figure 11: 4 ASEAN's Top Ten Exports Destination in US Dollar billion in 2009



Source: The Observatory of Economic Complexity data from URL: http://atlas.media.mit.edu/

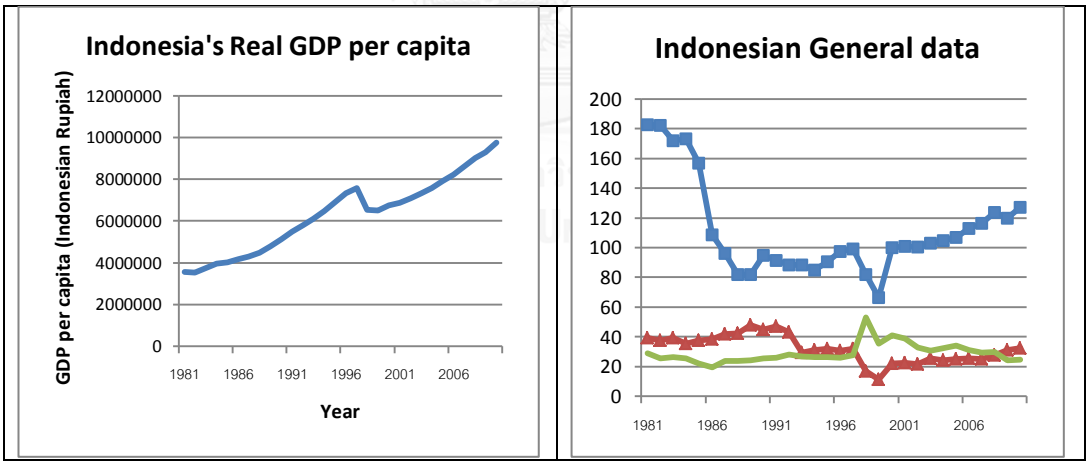
2.2 Transmission Channel of terms of trade to growth

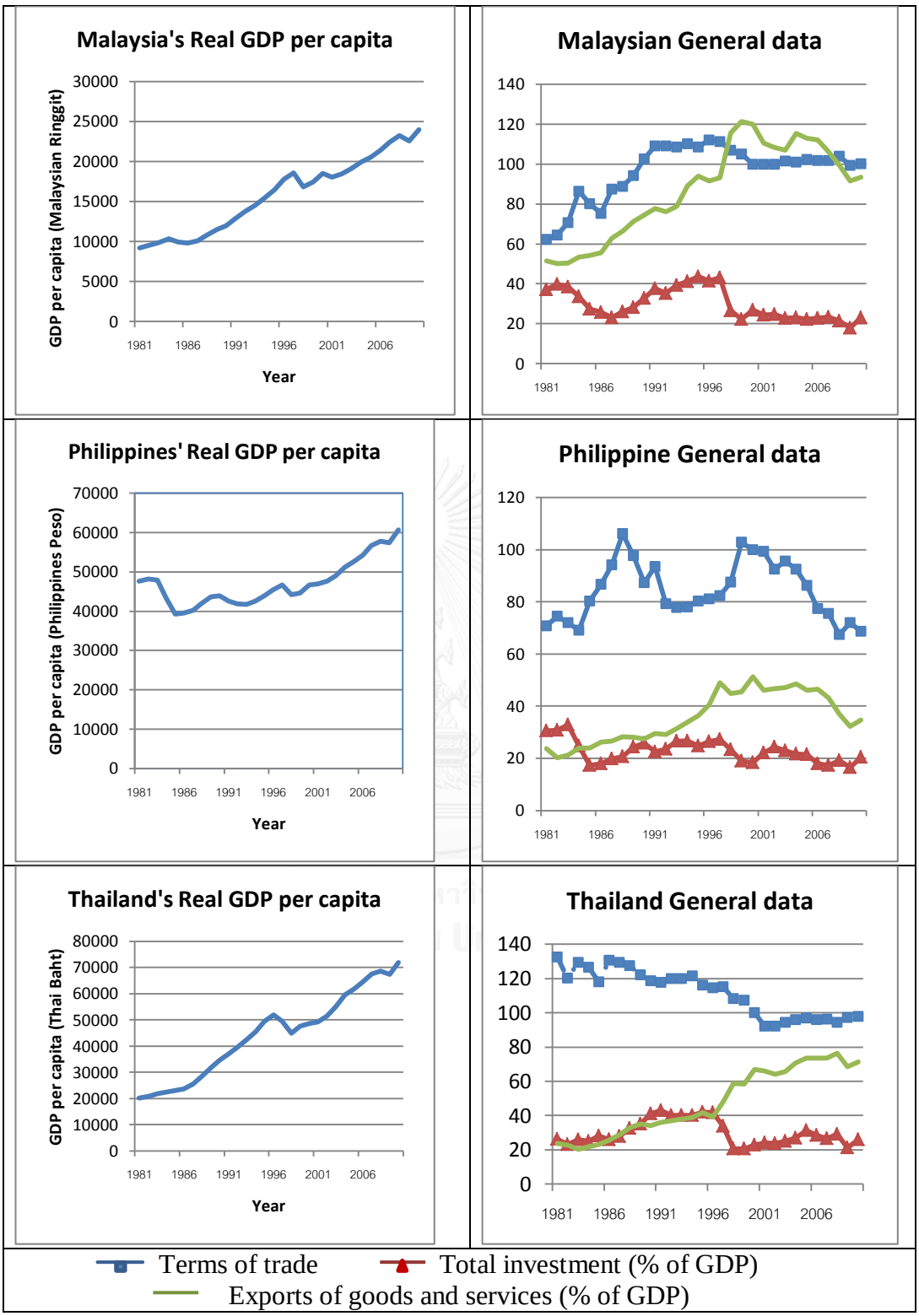
In fact, the effect of terms of trade and its volatility on economic growth can be positive and/or negative depended on many indicators. An improvement in terms of trade can induce high level of investment and then economic growth will expand in general. The idea that terms of trade can determine economic activity is formalized in a number of empirical studies. A favorable way of linkage between terms of trade and growth is channeling through investment (Basu and McLeod 1992; Lutz 1994; Mendoza 1997; Blattman et al. 2003, 2004, 2007; Grimes 2006; Williamson 2008). Quantity of investment is not only component to describe variability of terms of trade on growth, but an alteration in quality and/or composition of investment can affect these two variable associations claimed by Lutz. An empirical evidence of Basu and his partner insists that both trend and variability of the terms of trade have significant impacts on investment and economic growth, particularly in small open economies. The analysis of Lutz (1994) and Bleaney and Greenaway (2001) suggest that terms of trade might not have or have less impact on investment due to investing in less-productive non-tradable sector. Other studies point to the possibility that a relationship of terms of trade fluctuation on economic activity could be prescribed by the following factors: uncertainty, imported inputs, fluctuation in return to savings, capital accumulation, and expansion or contraction of primary export sector. Uncertainty of manufacturer to invest in the future project could happen in case studies of huge oil-producing countries because there is a huge risk of being invest in project when instability in the terms of trade improves which is only true in the short run (Dixit and Pindyck 1994) . As noted by Mendoza (1997), more terms of trade fluctuation leads risk aversion's consumer increased consumption and decreased savings but the growth rate of terms of trade causes an adverse result.

Terms of trade and its volatility affects growth through investment. Each country's volume and value of international trade has an important impact on developing countries and emerging market economies because export revenue appears to be surplus income. Due to this extra income, manufactures will enhance an investment in capital goods for further output and expect higher return from this

capital investment. According to 4 ASEAN terms of trade, the import value index is usually higher than export value index because our countries import new capital stock for enhancing the amount of output and also improving our productivity. Developing nations always purchase intermediate goods and equipment from abroad in order to produce manufactured goods for serving both internal and external demands. From Figure 12, 4 ASEAN countries apart from Indonesia in the last decade have real GDP per capita (in their local currencies) and exports of goods and service (% of GDP) move in the same direction, so exports is one channel enhanced real GDP per capita. However, strong growth and real investment in Indonesia might not be similar in some periods but trends of other nations accelerate and decelerate at the same moment. In the 1980s to 2000s, economic growth is encouraged through investment. At the same time, terms of trade is moving up and down together with the movement of total investment. As the reasons mention above, terms of trade can impact investment and then move growth.

Figure 12: 4 ASEAN's growth experience





The large improvement in economic potential in ASEAN emerging markets has been attributed to a variety of factors—such as labor and capital. During 1981-2010, four ASEAN economies constantly increase their income per capita more than 2.5

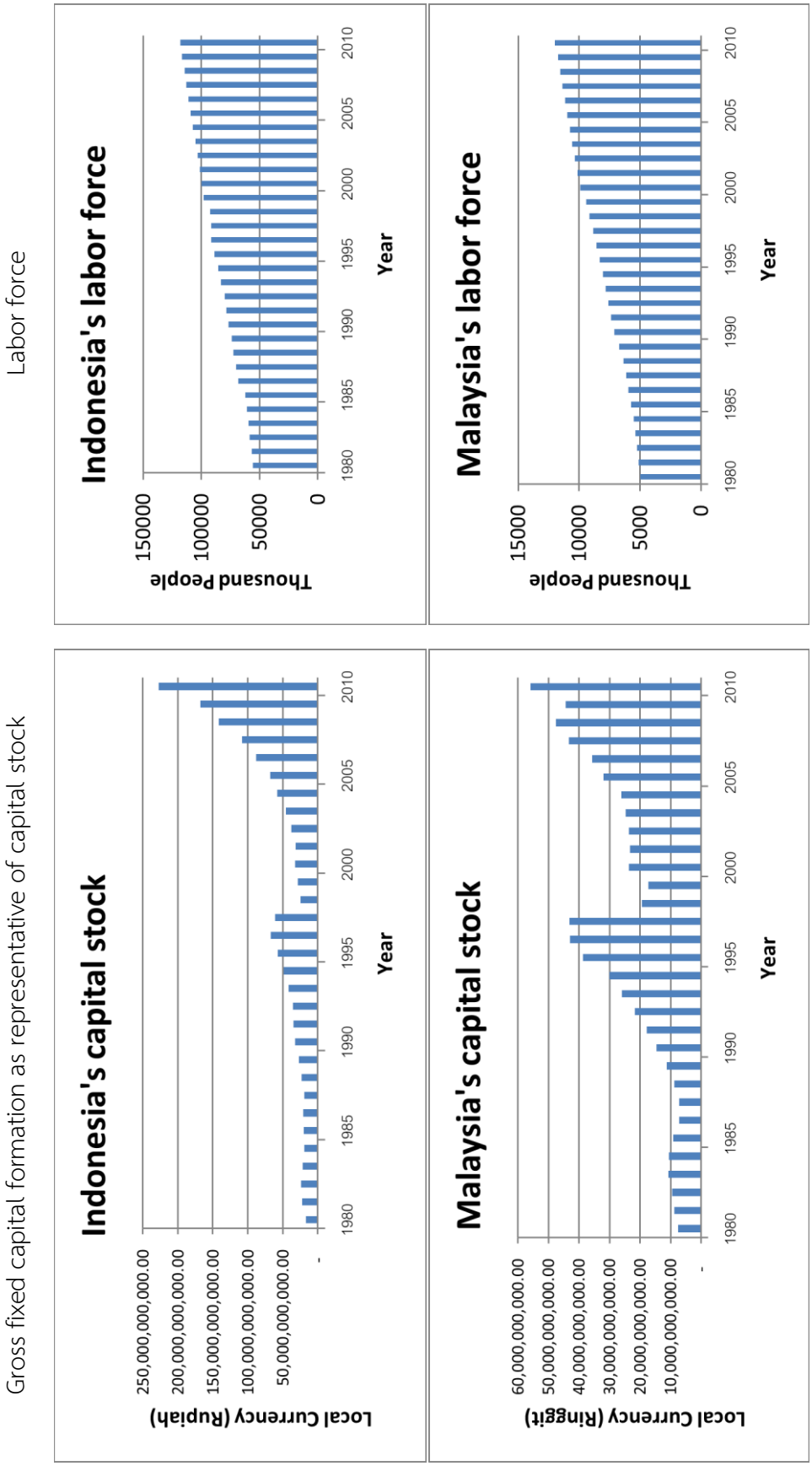
times in four countries, slightly increased just as in the Philippines (see Figure 12 on left hand column). An important factor of inputs of production like capital and labor should generally stimulate economic growth because labor and capital values in this region's four countries climb up unceasingly as the years go by as supported evidence. Labor force smoothly rises at least twice in these thirty years, but the long-term trend of capital seems to increase exponentially, which rises more than four times. Boosting productive factors, especially on capital, will raise GDP growth since these emerging economies become manufactured exporters which use mainly on machinery in their production line.

All real GDP per capita, a representative of economic growth, is illustrated in left hand side of Figure 12. Real GDP per capita of Indonesia usually mounts from nearly 3.5 million to 9.7 million rupiah within thirty years. Malaysia maintained its sharply arisen growth performance of the past thirty years by about 2.6 times compared with per capita GDP of 9,211 Ringgit in 1981 and nearly 24,000 Ringgit in 2010. Income per head in the Philippines grew 1.3 times from 47,692 to 60,648 peso along these thirty years while income per capita in Thailand climbed 2.55 times—from 20,211 baht since early 1981 to 71,949 baht at the end of 2010. The ASEAN nations' experiences of the early 2000s suggest that the GDP per capita kept increasing in these three decades with a slightly slump when faced with Asian and Global financial crises. In particular, the contrast experience happened in the Philippines owing to internal crisis in the first half of 1980s, so income of this nation elevated leisurely than other nations.

The sufficient conditions that cause a growing economic potential would be spurred by two physical inputs like labor and capital (Figure 13). Indonesian labor and capital value data over the period 1981-2010 climb up unstoppable from 22 to 227 billion rupiah and from 56.7 to 118 million workers, respectively. The capital and labor during the 1980s-2000s appeared to stimulate Malaysia's growth is undeniable with the shift of country's capital stock from 8 to 55.8 billion ringgit, and labor force from 5.1 to 11.9 million workers. The labor force in the Philippines is increasing as a result of the fastest growth populations between 1970s and 1980s. The total

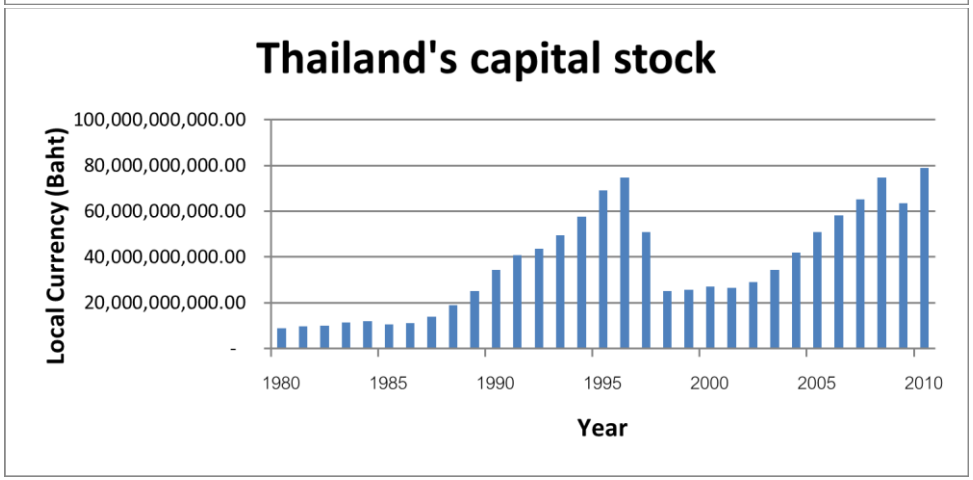
population is jumping double from 36.8 million to 60.7 million (1970) within two decades (1990), hence, this different population becomes labor force in the future—from 18.4 to 38.7 million workers during 1981-2010. The concern about constantly expansionary economy in Thailand arises because before ASIAN financial crisis, country's GDP was boosted by enormous domestic and foreign investments in physical capital. Thailand's growth rate of output comes from capital stock, roughly 70 percent in 1981-2002, followed by labor force and labor force's skill development (Warr, 2011). The impact of a capital shock in Thailand because of higher capital stock, elevated from 9.75 to 78.8 billion baht in these three decades (Figure 13), can improve its economic growth. Evidence in this study finds regularly elevated labor force from 24 to 39 million workers during 1981-2010, so rise in labor matches with an enlargement of GDP per head.

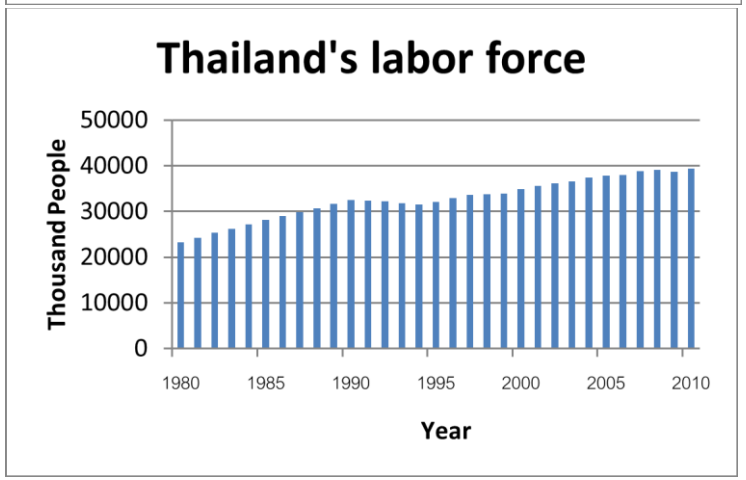
Figure 13 4 ASEAN's capital stock and labor force during 1980s-2000s



Gross fixed capital formation as representative of capital stock

Labor force





2.3 Indonesia's perspective

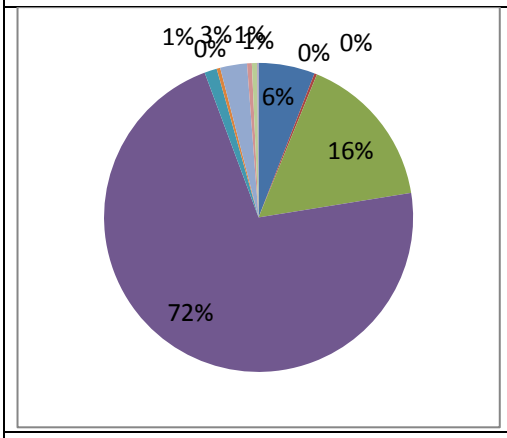
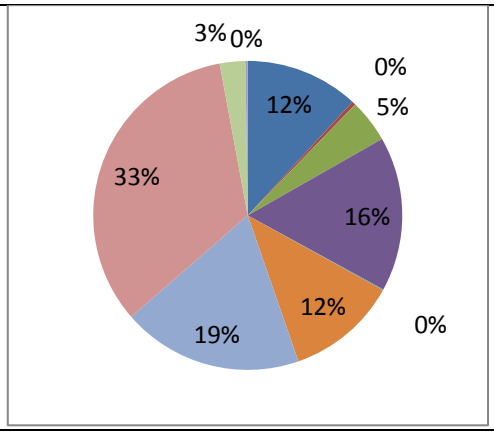
Over the past few decades, Indonesia which is the fourth of the world's most populous nation with a population of 242 million has increased manufactured sector in its merchandise share—like the other ASEAN emerging economies. Nevertheless, by supporting different proportion of manufactured sector, Indonesia—unlike the other nations—has developed industrial sector (manufactured goods, machinery and transportation equipment, miscellaneous manufactured articles, commodity and transactions) less than primary sectors. The share of industrial sector in Indonesia declines from 58 percent in 2000 to 37 percent in 2010, even though the rest of the region has higher industrial share—which are 81 in 2000 and 71 in 2010 on average—than Indonesia dominated by mineral fuel, crude materials, and animal and vegetable oils (see Figure 14, 17, 18, and 19).

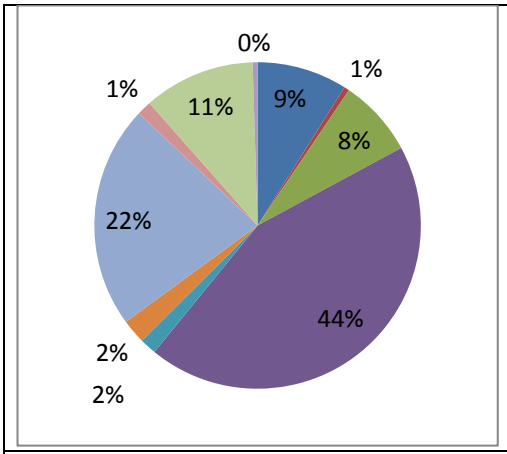
Indonesia, the only OECD member in ASEAN and the largest economy in ASEAN, has similar trend of GDP per capita growth as Thailand in the past three decades but the terms of trade of these two countries go the different directions. Every country's terms of trade is dependently on the value of exports and imports, so consideration of commodity's components is necessary because it can imply the country's competitiveness. Export activities in Indonesia broadly change from mainly mineral fuel (72 percent) in 1980 to various commodities such as manufactured goods, crude materials, machinery and transport equipment, and miscellaneous manufactured articles over time pass; however, the type of import goods along these thirty years have slightly varied with these four major commodities: mineral fuels, chemicals, manufactured goods, and machinery and transport equipment (see Figure 14). The structural alternation of export commodities in these forty years leads country to be like an industrial country's trade structure which emphasizes on modernizing products. A rarely changed range of import products has implied that this country had brought in costly imported components on chemicals (for example, organic chemicals, artificial resins and plastic materials,), manufactured goods (for example, iron and steel; textile yarn, fabrics, made-up articles; and manufactures of metals, n.e.s.) and machinery and transport equipment (machinery specialized for

particular industries, general industrial machinery and equipment, and electric machinery) from abroad.

An international trade of Indonesia has been in surplus since 1980. As a change in merchandise export shares from primary goods to manufactured goods, the positive trade balance in Indonesia had begun to be surplus more and more since the 2nd millennium. However, transitional period from fuel primary exporter to industrialized exporter in 1990 has the lowest trade surplus of 3,838 million US$ due to a decrease in oil price which mineral fuel occupied nearly half of total exports. Even if manufactured export proportion in 2010 reduces about 15% compared with one in 2000, the country benefits from excessively ascendant oil price at 17 US dollar per barrel in 1999 to reach 71 US dollar in 2010 (see Figure 15). For Indonesia oil exporter, this economy has two options which stir up export earnings, driven largely by both oil production and industrialized production. In 2000, the crude oil price is 27.39 US$ per barrel which contributed 25% of total exports while nominal price is 71.21 US$ with higher export volume (+5%) in 2010. As a result, the mineral fuel category is critical exported goods in this country, even if country has high risk on severely fluctuated world oil price.

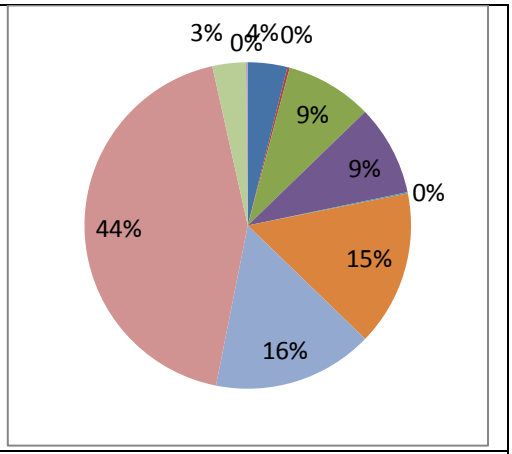
Figure 14 Indonesia Commodities Proportion by SITC

Export Commodities (% of Total Export)	Import Commodities (% of Total Import)
Figure1.1: Indonesia in 1980	Figure1.1: Indonesia in 1980
	
Total Export in 1980: 6,505 million US$	Total Import in 1980: 9,454 million US$
Figure1.2: Indonesia in 1990	Figure1.2: Indonesia in 1990



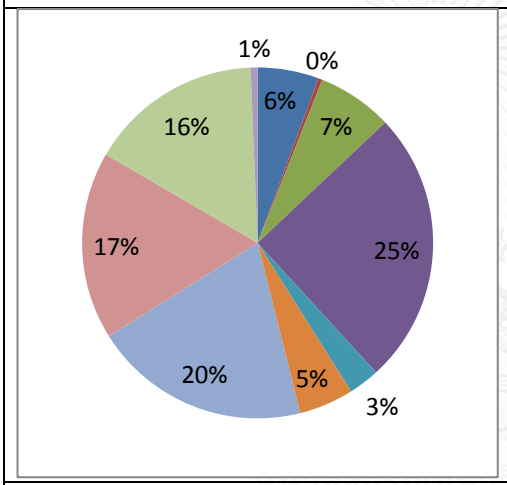
Total Export in 1990: 23,068 million US$

Figure1.3: Indonesia in 2000



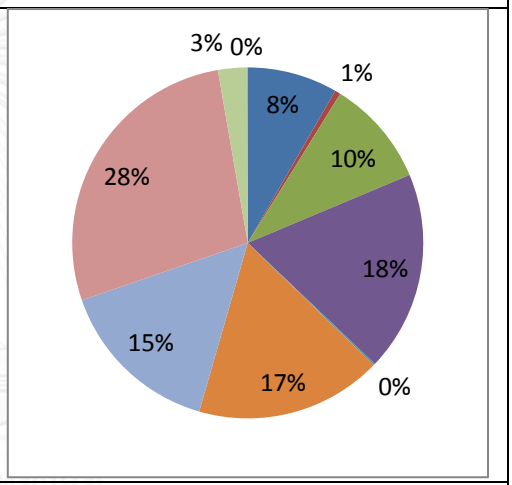
Total Import in 1990: 33,371 million US$

Figure1.3: Indonesia in 2000



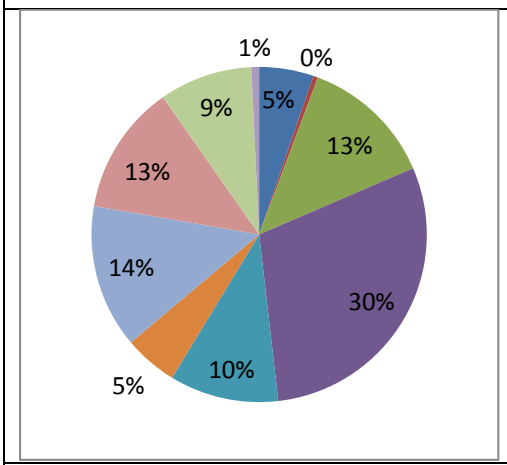
Total Export in 2000: 68,818 million US$

Figure1.4: Indonesia in 2010

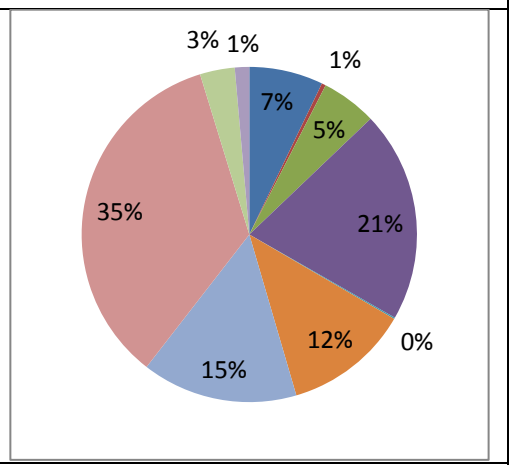


Total Import in 2000: 61,921 million US$

Figure1.4: Indonesia in 2010



Total Export in 2010: 195,311 million US$



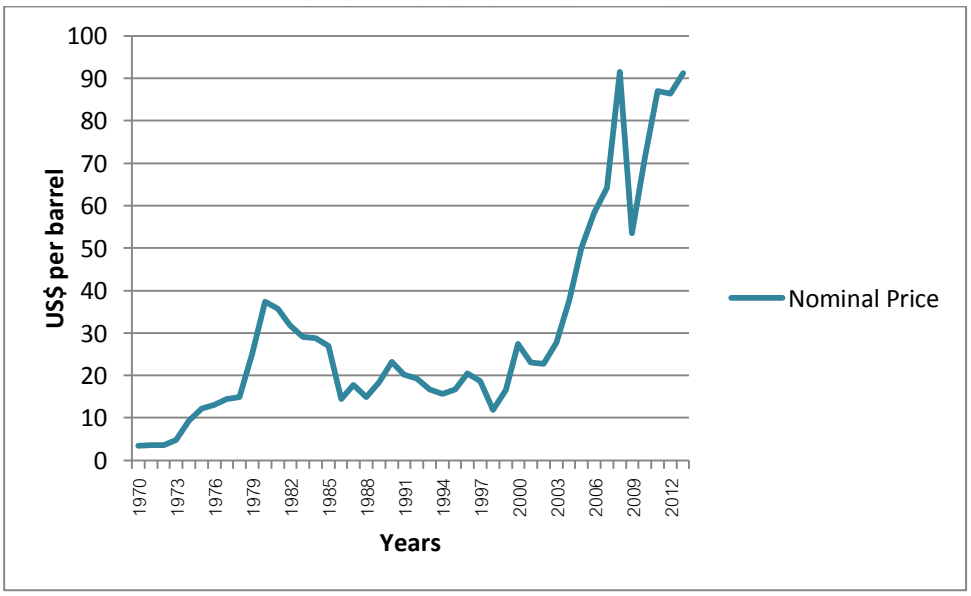
Total Import in 2010: 182,393 million US$

Food and live animals chiefly for food Beverages and tobacco Crude materials, inedible, except fuels Mineral fuels, lubricants and related materials Animal and vegetable oils, fats and waxs Chemicals and related products, n.e.s Manufactured goods classified chiefly by materials Machinery and transport equipment Miscellaneous manufactured articles Commodity and transactions not classified elsewhere in the SITC

Sources: UN Comtrade database (1980-2010) and author's calculation

An oil-exporting countries like Indonesia had been beneficial from acceleration in world's oil price in 1970s, but a long-term harsh deceleration in oil price since 1981 might have a big impact on macroeconomic variables (for example, terms of trade) and the economic growth as a consequence of overwhelming share of fuel exports (Figure 15). A declined oil price become a downside risk of this country, so the government or producers decide to produce other export commodities by supporting other goods, especially in many manufactured categories. Clearly, ten times skyrocketing oil price, which started in 1998 and hit a summit in 2008, can lead large revenue to country; even though, the proportion of fuel exports in the last decade is lower than exports in 1980 and in 1990. Among the data ahead, the most important commodity related to Indonesian growth is fuel exports led by crude oil, although there are falling or rising crude oil price.

Figure 15 Annual Average Crude Oil Price (US$/Barrel)



Sources:
http://inflationdata.com/inflation/inflation_rate/historical_oil_prices_table.asp

The pattern of surplus trade balance of Indonesia since 1980 can be implied that earnings of international trade drive economic performance (see Table 3). In fact, Indonesian imports for chemicals as well as machinery and transport equipment leads country's to have trade deficit but total trade value is still positive due to higher value in exports—mainly from mineral fuels, miscellaneous manufactured. The export values of crude materials and animal and vegetable oils jump excessively in the last decade and then encourage its trade balance. This country's experience in net imports in manufactured categories means that this export sectors might bring low economic status in international market and leads its real GDP per capita fallen.

Table 3 Indonesian Distribution of International Trade by SITC (in USD)

Country	Categories	1980	1990	2000	2010
		Net Exports (Net Imports)			
Indonesia	Food and live animals chiefly for food	6	1440	719	(1401)
	Beverages and tobacco	19	82	55	179
	Crude materials, inedible, except fuels	3080	91	1021	12999
	Mineral fuels, lubricants and related materials	13990	9280	9504	19102
	Animal and vegetable oils, fats and waxs	276	394	1725	16427
	Chemicals and related products, n.e.s	(1180)	(2740)	(2643)	(8239)
	Manufactured goods classified chiefly by materials	(1435)	2202	7314	1475
	Machinery and transport equipment	(3518)	(9104)	1519	(27334)
	Miscellaneous manufactured articles	(170)	2107	9030	9608
	Commodity and transactions not classified elsewhere in the SITC	6	88	367	(702)
Indonesia	Total	11075	3838	28609	22116

Sources: UN Comtrade database (1980-2010) and author's calculation

To take a consideration about total export quantity, Indonesian average share of mineral fuel—generally been oil—is 70 percent during 1980-1990 (Table 4). It is not strange that Indonesian export earnings might be received a negative effect from a severe deceleration in global oil price when its economy has occupied high proportion of export this product.

Table 4 Indonesia's total exports quantity (in kilogram) by SITC

Commodity Code	Commodity	1980		1990	
		Net weight (kg)	% of total export quantity (kg)	Net weight (kg)	% of total export quantity (kg)
0	Food and live animals chiefly for food	2,206,245,119	2.464123359	4,433,027,140	4.121776
1	Beverages and tobacco	28,743,771	0.032103503	68,774,451	0.063946
2	Crude materials, inedible, except fuels	16,800,294,513	18.76400668	14,749,449,499	13.71386
3	Mineral fuels, lubricants and related materials	68,608,208,288	76.6275185	73,963,783,152	68.77065
4	Animal and vegetable oils, fats and waxes	561,627,781	0.62727397	1,513,548,734	1.40728
5	Chemicals and related products, nes	264,595,354	0.295522735	2,080,283,665	1.934223
6	Manufactured goods classified chiefly by materials	1,032,655,642	1.153358196	10,291,717,286	9.569117
7	Machinery and transport equipment	9,973,287	0.01113902	87,006,889	0.080898
8	Miscellaneous manufactured articles	14,526,183	0.016224084	363,312,234	0.337803
9	Commodities and transactions not classified elsewhere in the SITC	7,816,339	0.008729956	479,489	0.000446
TOTAL	All Commodities	89,534,686,277	100	107,551,382,539	100

Source: UN Comtrade database and author's calculation

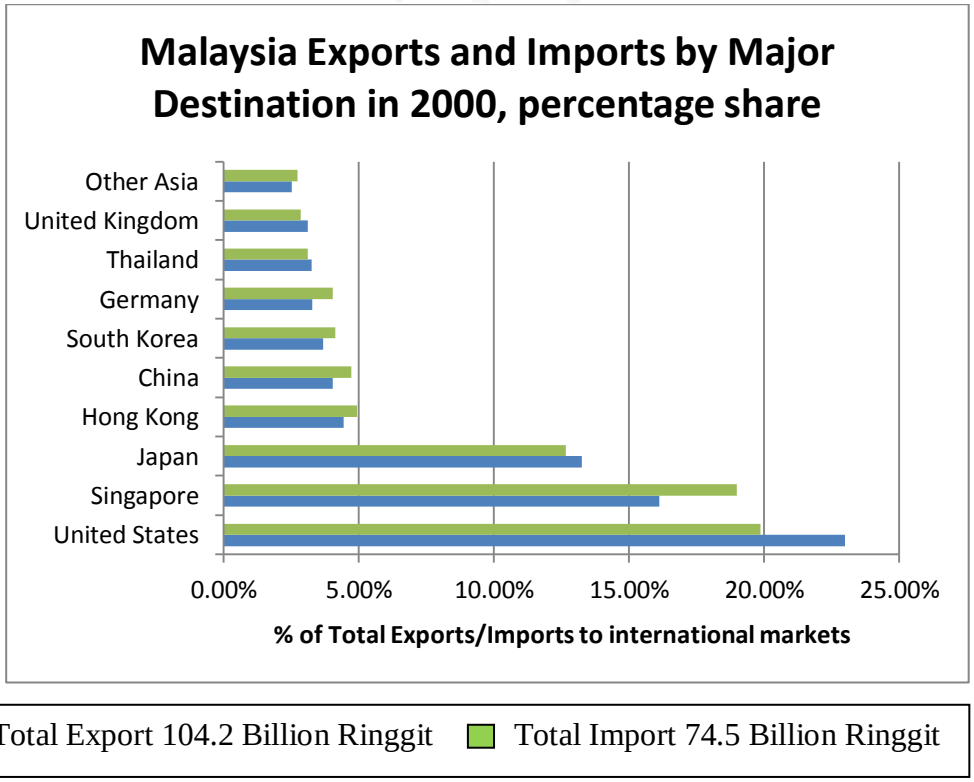
2.4 Malaysia's perspective

Malaysia, possess the third largest economic in the ASEAN region, is the most successful economies due to the highest GDP per capita in their group about two to four time compared with other nations. During the 1970s-1980s, Malaysian government supported an export-oriented industries policy and import substitution by relying on foreign direct investment (FDI) particularly from Japan and its domestic investment (Ariff 1998). Not only foreign participation in industrial sector, but also supportive government can shift its position from manufactured importer to manufactured exporter by about 30 percent for horizons of 10 years. Within the first decade in this study, Malaysian industrial products have important share on country's exports, which replaced other products especially primary commodities, as a result of declining prices of these goods. Over the period 1980-1999, Malaysian main export proportions of agricultural material (for example, palm oil, rubber, and tropical logs), food, fuel (for example, crude petroleum) and ores & metals (for example, tin) are dwindled down since the downward trend of demand and price (see Table 2). Much oscillated these non-manufactured goods' prices are a reason for country to shift its primary exports to specialize in manufactured goods instead. Malaysian manufactured exports share in an entire good exports was skyrocketing from 20% in 1981and being around 80% in 2000. Only one nation in ASEAN countries that have commodity export with developed economies is Malaysia as a result of its own robust external demand.

A political foreign relation during Mahathir's term from 1981-2003 with the West, particularly the United States, has a large disagreement while an international relation in Maharthir's tenure emphasized on Asian regions, so the Western countries blamed country's double standards. To protect domestic benefits from Western nations, its government had launched Internal Security Act (ISA) which disadvantaged nations claimed this law as a violation of human rights. Even if many monetary and fiscal problems are directly caused from high level of financial liberalization that are suggestion from European countries and the States, this country's main trading partner and largest foreign investor is the United States (Figure 16). A significantly

fallen demand for this country' export in 2009, particularly from United States who is the first rank Malaysian export destination during 1995-2007, causes its income terms of trade to drop immediately around 20% compared with last year. At the same time, other ASEAN countries also suffer from this global financial crisis but their income terms of trade cut down less than Malaysia with 4% in Indonesia, 13% in the Philippines, and 11% in Thailand in the previous year (Figure 2 in Chapter 1). Differences between Malaysia and neighborhood country like Thailand—reported in Political & Economic Risk Consultancy LTD. (2011)—are largely related to ability of domestic labor and sustainable government support and protection, correlated with their exports. Both nations are popular OEM (Original Equipment Manufacturer) for advanced countries' industry which intends to reduce cost; however, Malaysian government might not assist an industry with low priority in its perspective, so an uncertainty in foreign business in this nation is higher than settling down in Thailand which has permanent support regime and freely open to any industries. Besides, foreign investors that are seeking for labor intensive production might prefer Thailand which has an enormous labor force in both skilled and unskilled labor instead of plenty of high quality skilled labor in Malaysia (World Bank).

Figure 16: Malaysian Exports and Imports Destination in 2000

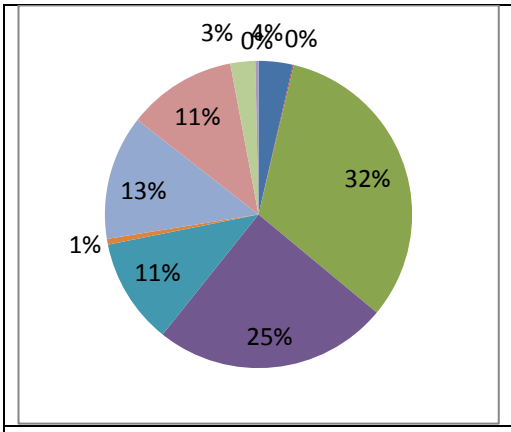


Malaysia's export activities during the 1980s and 1990s was switched mainly from primary goods (crude materials, mineral fuels, and animal and vegetable oils) to several kinds of industrial commodities; meantime, the import commodities in this country are chiefly in three commodities such as chemicals, manufactured goods, and machinery and transport equipment, which is similar with imports in Indonesia (Figure 17). The share of export commodities in modernizing products—especially for manufactured goods, machinery and transport equipment, and miscellaneous manufactured articles—was likely to elevate heavily from 27 percent at the end of 1980 to nearly 77 percent at the end of 2000, but a trend has moderated in 2010 by exported some primary products instead. Since 1980, the economy has increased imports of machinery and transport equipment, especially in electronic machinery, about 20 percent in each decade. However, there is a small return of primary import product in 2010 by a moderation in imported machinery and transport equipment.

Along with trade surplus since 1980, total exports of Malaysia always exceeds its total imports implied that this country faces a positive economic environment, marked by high employment, raising output, generating additional income, and then supporting economic growth. Additionally, this nation faces a regularly rapid increase in both total exports and total imports for 30 years, so it could reflect the play of international trade on its economic performance.

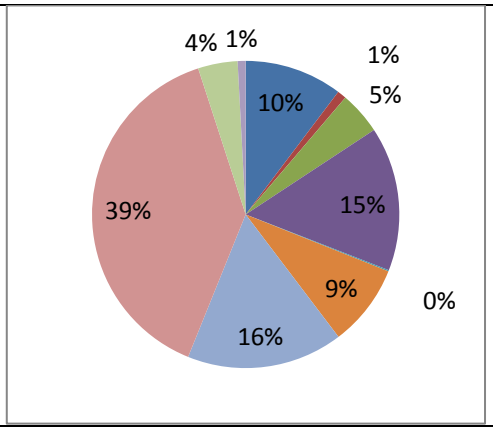
Figure 17 Malaysia Commodities Proportion by SITC

Export Commodities (% of Total Export)	Import Commodities (% of Total Import)
Figure1.1: Malaysia in 1980	Figure1.1: Malaysia in 1980



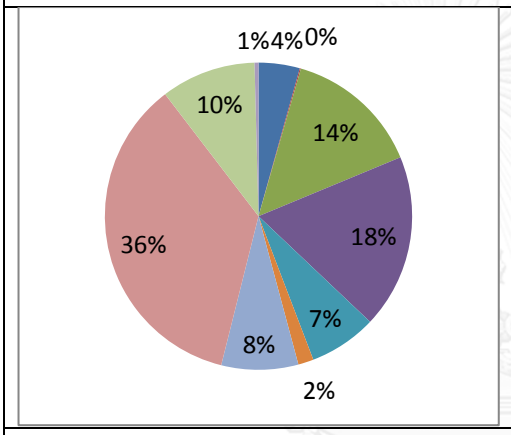
Total Export in 1980: 12,944 million US$

Figure1.2: Malaysia in1990



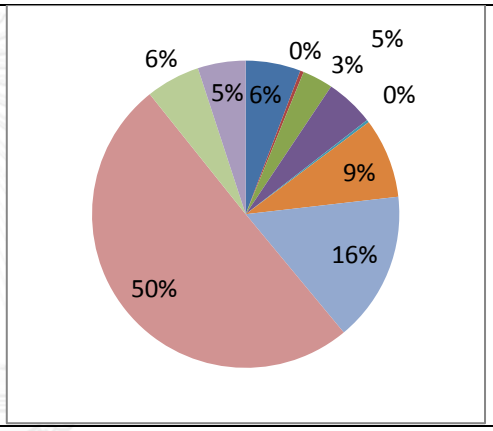
Total Import in 1980: 10,763 million US$

Figure1.2: Malaysia in 1990



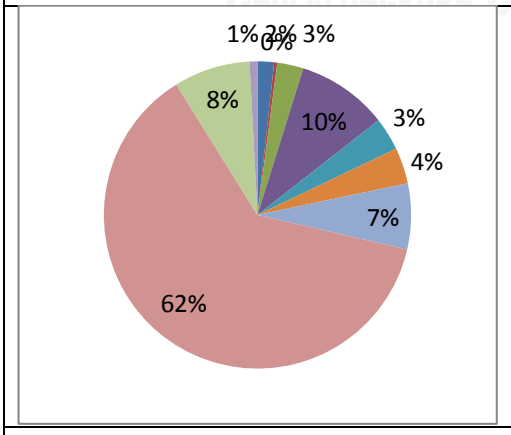
Total Export in 1990: 29,453 million US$

Figure1.3: Malaysia in 2000



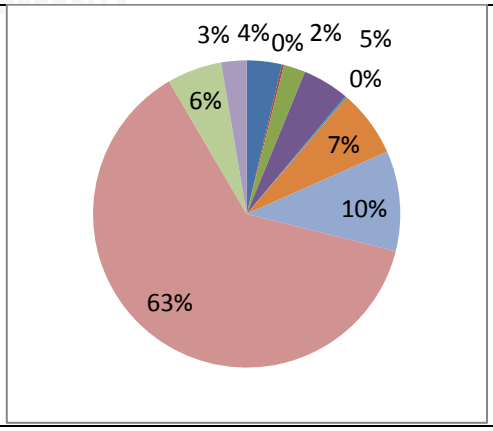
Total Import in 1990: 29,245 million US$

Figure1.3: Malaysia in 2000



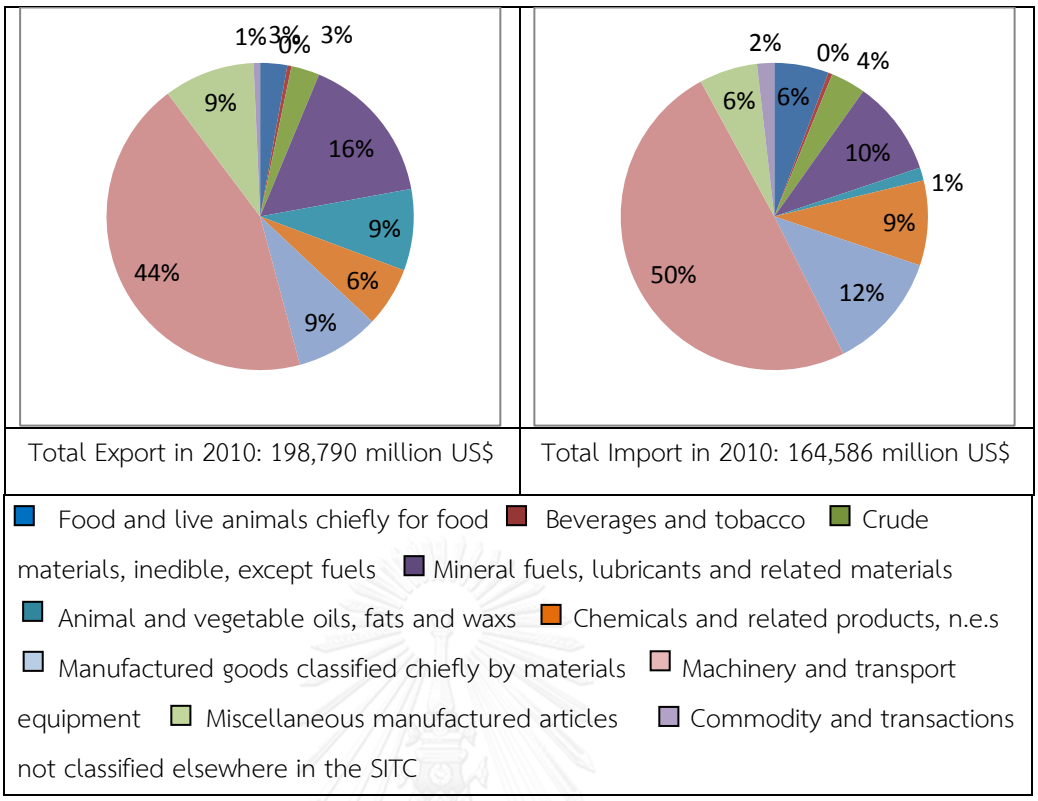
Total Export in 2000: 98,229 million US$

Figure1.4: Malaysia in 2010



Total Import in 2000: 81,289 million US$

Figure1.4: Malaysia in 2010



Sources: UN Comtrade database (1980-2010) and author's calculation

International trade has largely impact on output growth in Malaysia since the performance of exports and imports to GDP increases constantly ranged from 1.09 in 1981 to 1.69 in 2010 (Figure 9). The surplus of trade balance along 30 years is good sign for its economic potential (Table 5). During the period 1981-2010, mineral fuels, animal and vegetable oils always bring large earnings to its nation while these four categories of trade commodities—food and live animals, chemicals, manufactured goods, commodity and transactions—have led economies with trade deficit. Two commodities, as reflected in machinery and transportation and miscellaneous manufactured, have shifted their positions from net imports to net exports and become strong sectors driven economy.

Table 5 Malaysian Distribution of International Trade by SITC (in USD)

Country	Categories	1980	1990	2000	2010
		Net Exports (Net Imports)			
Malaysia	Food and live animals chiefly for food	(642)	(417)	(1292)	(3761)
	Beverages and tobacco	(88)	(73)	134	142
	Crude materials, inedible, except fuels	3700	3264	848	(101)
	Mineral fuels, lubricants and related	1565	3902	5455	15025

	materials				
	Animal and vegetable oils, fats and waxs	1425	2019	3247	14815
	Chemicals and related products, n.e.s	(851)	(1981)	(2008)	(2221)
	Manufactured goods classified chiefly by materials	(73)	(2237)	(1774)	(2888)
	Machinery and transport equipment	(2697)	(4194)	10476	5870
	Miscellaneous manufactured articles	(109)	1274	3208	8945
	Commodity and transactions not classified elsewhere in the SITC	(48)	(1350)	(1353)	(1621)
Malaysia	Total	2181	208	16940	34204

Sources: UN Comtrade database (1980-2010) and author's calculation

2.5 The Philippines' perspective

The Philippines, the sovereign island countries and the 5th largest economies in ASEAN, who is used to export agricultural products has mainly shifted to services and manufacturing sectors. The Philippines' experience stands out as a result of several macroeconomic instabilities along the second half of 19th century which causes its economy to drag behind other countries in the same region. The economic development in the Philippines normally divides into two periods: the economy until the mid-1980s and the economic reform after 1986. The Philippines always had experienced lower economic growth than other neighbor nations due to regularly macroeconomic instabilities—for instance, debt crisis starting 1970 from an imbalance of payment and sovereign debt defaults during 1982-1985. The Philippines' government led by Ferdinand Marcos was declared the martial law during 1972-1985, at this period, trade and investment drove higher GDP growth. In order to improve economic growth, the Philippines' government emphasizes on import substitution as an industrialization strategy since 1950s and have megaproject invested in infrastructure and energy. Furthermore, the government put a high priority on foreign borrowing to enhance growth and then lead to a huge foreign debt. Before the domestic crisis started, there are many precrisis signs: decreasing GDP growth, moderating terms of trade, increasing inflation, higher balance of payment deterioration, and accumulating enormous external debt for 13 years of Marcos era (Solon and Floro 1993). The economic deterioration in 1983-1986—for example, political turmoil from the assassination of Senator Benigno Aquino and

business's failure—was far worse than during earlier periodic crisis. Accordingly, domestic economy had various negative variables indicated an economic downturn such as reduced GNP, shrunk total investment from both private and public investments, promptly mounted inflation, suddenly jump in interest rate, higher external debt, and rising unemployment rate.

These internal economic and political problems (for example, giant industries' failure in their managements and the assassination of Benigno Aquino who is a leader of opposition party) had not only obstructed country's growth and led to economic downturn in 1983-1984, but also subsided a half of capital accumulation as a result of a great cutting down government budget for investing in capital intensive industries, and excessive loss of private and foreign investments before crisis and also substantial moderation of capital expenditures under economic reform program after crisis (Solon and Floro, 1993). A sizable gross fixed capital formation in the Philippines—a representative of investment—hits its peak 10.22 billion peso in 1982 and reaches its plummet at 4.79 billion US$ in 1986 (Figure 13). Meantime, average per capita GDP of the Philippines declines dramatically from 48,212 in 1982 to 39,190 peso in 1985 (Figure 12). This internal crisis causes large fail in both GDP per capita and capital stock—the amount of capital stock can recover to stand above maximum value before plummet within 8 years, but its GDP per capita took 21 years to regain back and stayed above the highest value in 1982. Hence, the linkage between capital and economic growth could even turn negative which is contrary to a normal assumption.

Large-scale economic activity in this country occurs after severely domestic crisis in 1983-1986 with brought back democracy by a "people power revolution". Greater revolution in many sectors, for example, tighter monetary and fiscal policies, government amendment, trade and financial improvement, etc., is needed to help economic status of this country. Income per head has risen continuously much more than in crisis period 1983-1985, and the pace of macroeconomic instabilities would relieve deteriorations from its past failure—consumption and investment climbed up, inflation and twin deficit (national government budget and current account

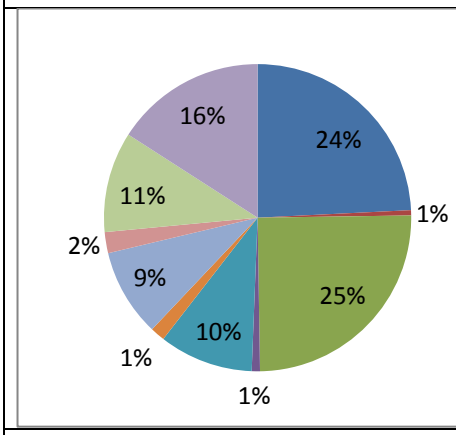
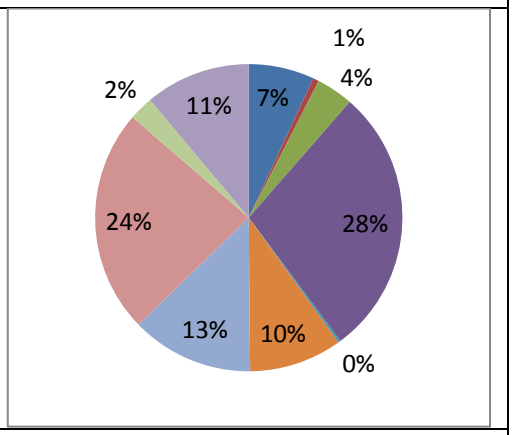
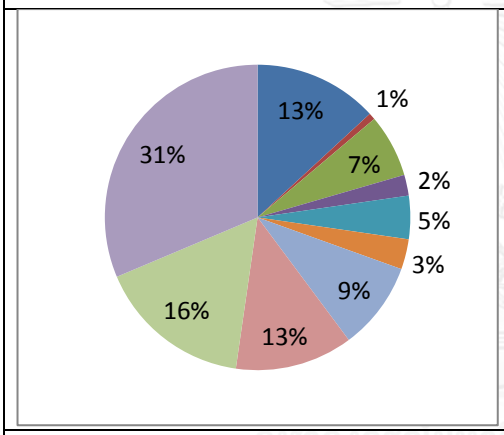
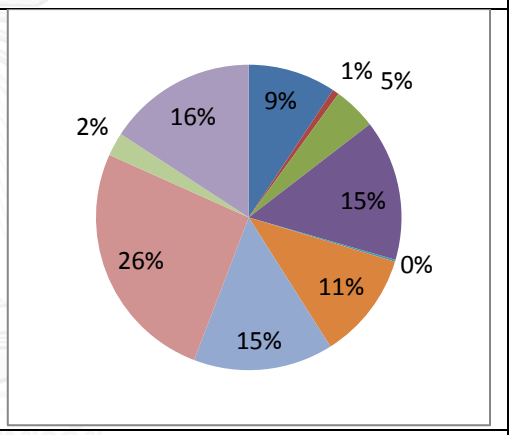
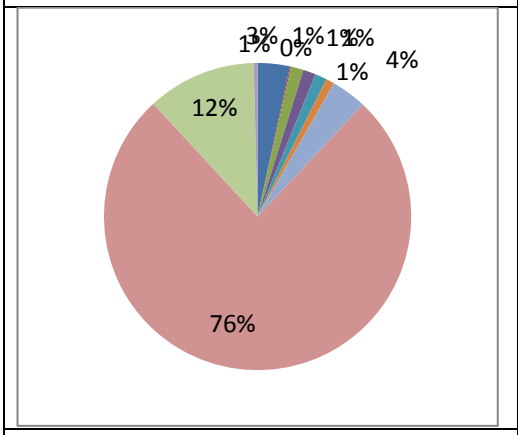
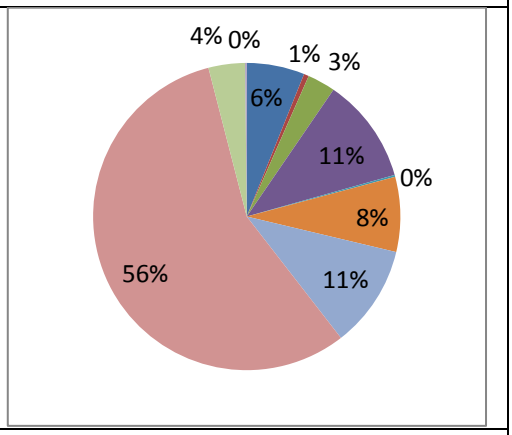
deficits) dwindled down (Figure 12). Total investment illustrated in Figure 12 had climbed up from 17 in 1985-86 and then keeps stable at about 22 percent of GDP since 1987.

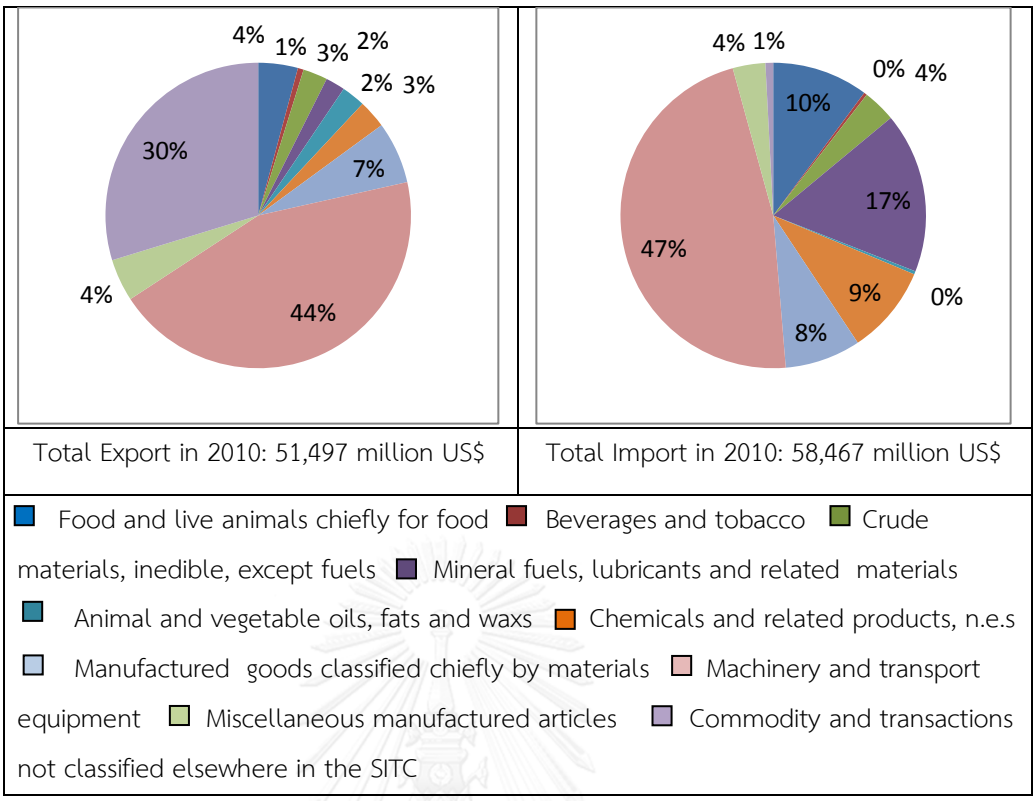
The structure of exports in the Philippines changes widely from primary products to industrialize products while imports commodities slightly change (see Figure 18). The Philippines' exports of four manufactured goods—for instance, manufactured goods, machinery and transport equipment, miscellaneous manufactured articles, and commodity and transactions—has risen from 38 percent in 1980 to 69 and 93 percent in 1990 and in 2000, respectively. For the first time in three decades, the Philippines has dropped industrial exports from nearly 100 percent in 2000 to 85 percent in 2010. Four ASEAN nations has followed a usual path specialized in industrial export commodities, but solely the Philippines produce commodity and transaction, particularly from special transaction, as one of main export earnings while other nations export three types of manufactured goods. The import commodities' experience in the 1980 and 1990 has hardly changed and has brought a variety of commodities from abroad. However, the size of manufactured import tends to be larger over time, especially in machinery and transport equipment—a quarter of total imports in 1980 and 1990 and then led to around 50 percent in 2000 and 2010.

A trade balance of the Philippines is generally negative aside from trade surplus in 2000. A backward of trade deficit is a slow economic growth which can stimulate unemployment rate, so it is not weird that the Philippines always have lower growth than other countries in this region. Concern that the higher component of exports commodities, particularly by machinery and transport equipment, than imports' one may have affected balance of trade appears to lead a positive balance of trade. Hence, this country can gain benefit from international trade only when it increases its exports in machinery and transport equipment.

Figure 18 The Philippines Commodities Proportion by SITC

Export Commodities (% of Total Export)	Import Commodities (% of Total Import)

Figure1.1: Philippines in 1980	Figure1.1: Philippines in 1980
	
Total Export in 1980: 5,787 million US$	Total Import in 1980: 8,295 million US$
Figure1.2: Philippines in1990	Figure1.2: Philippines in 1990
	
Total Export in 1990: 8,186 million US$	Total Import in 1990: 13,041 million US$
Figure1.3: Philippines in 2000	Figure1.3: Philippines in 2000
	
Total Export in 2000: 38,078 million US$	Total Import in 2000: 37,007 million US$
Figure1.4: Philippines in 2010	Figure1.4: Philippines in 2010



Sources: UN Comtrade database (1980-2010) and author's calculation

The Philippines' three ten of commodities, for example animal and vegetable oils, miscellaneous manufactured articles, and commodity and transactions, has positive trade value, but these three export earnings can not substitute the huge external expenditures of foreign products in the rest categories (Table 6). An outflow of domestic currency comes from not only various primary commodities but few industrial products; hence, the trade balance of this country is almost always negative. A growing deficit in tradable goods in the Philippines might not be hurtful to its country because an international trade in 1980, 1990, and 2010 is not a major indicator determined its domestic growth, through internal consumption that supports growth instead (Figure 9).

Table 6 The Philippines' Distribution of International Trade by SITC (in USD)

Country	Categories	1980	1990	2000	2010
		Net Exports (Net Imports)			
Philippines	Food and live animals chiefly for food	829	(138)	(968)	(3783)
	Beverages and tobacco	(20)	(32)	(142)	124
	Crude materials, inedible, except fuels	1124	(49)	(586)	(701)
	Mineral fuels, lubricants and related materials	(2308)	(1765)	(3597)	(8874)

	Animal and vegetable oils, fats and waxs	553	349	403	1095
	Chemicals and related products, n.e.s	(722)	(1218)	(2587)	(3944)
	Manufactured goods classified chiefly by materials	(536)	(1168)	(2572)	(1318)
	Machinery and transport equipment	(1830)	(2355)	8085	(4692)
	Miscellaneous manufactured articles	403	1015	2941	293
	Commodity and transactions not classified elsewhere in the SITC	(1)	506	93	14831
Philippines	Total	(2507)	(4856)	1071	(6970)

Sources: UN Comtrade database (1980-2010) and author's calculation

2.6 Thailand's perspective

Thailand, the Southeast Asia's second largest economy and rank 2nd in external trade volume, is one of the most impressive economic growth rates in this region because our nation have various impressive environments for foreign investor. As the only one countries in ASEAN region that has been never been colonized, Thailand—in which manifested in conventional macroeconomic policies, broadly trade and investment policies, and also emphasized mainly on maintaining economic stability—might have less experienced on trade and investment integration than other nations (Warr, 2011). Moreover, Higashi claimed that Thai government role in market intervention during 1960s-1970s is quite smaller than other nations' governments due to an unclear development target and state coordination of investment licenses and import duties (Shigeki 1996). Accordingly, as a distinct characteristic than many of its regional neighbors, Thai development strategy might be advantages and disadvantages for its own economic performance.

An accelerated domestic China growth in 2009-2010 can extend the growth rate and terms of trade in other emerging market (for instance, Thailand) reported in World Bank (April 2014). From Figure 19 and Figure 20, the 1st exports destination of Thailand is China for the 2 years 2009-2010 where has unstoppable two-digit average growth rate 10% year-on-year. Growth rate of Thailand has been supported by an improvement in terms of trade owing to a good signal in robust China's growth, even if these periods of time had violently economic downturn around the world, exceptionally the United States and European Union. The global financial crisis as of 2007-2008 led a deteriorate in terms of trade in emerging and developing economies,

but Thailand had reductions in growth and terms of trade less than some of neighborhood country, such as Malaysia, because Thailand has placed exports weight on China—which had good economic performance along this past three decades.

Figure 19 Thailand Exports Destination in 2009-2010

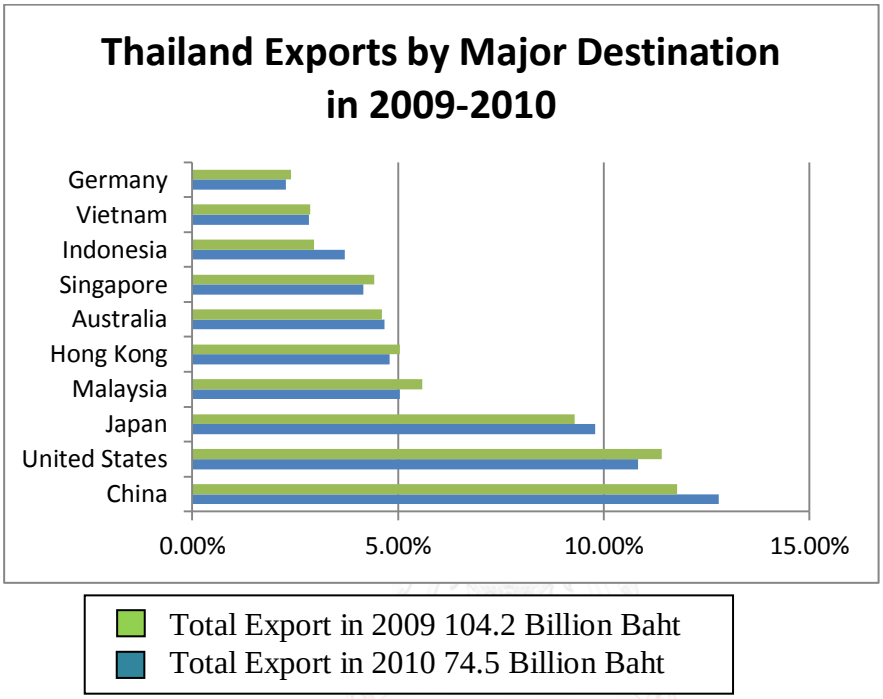
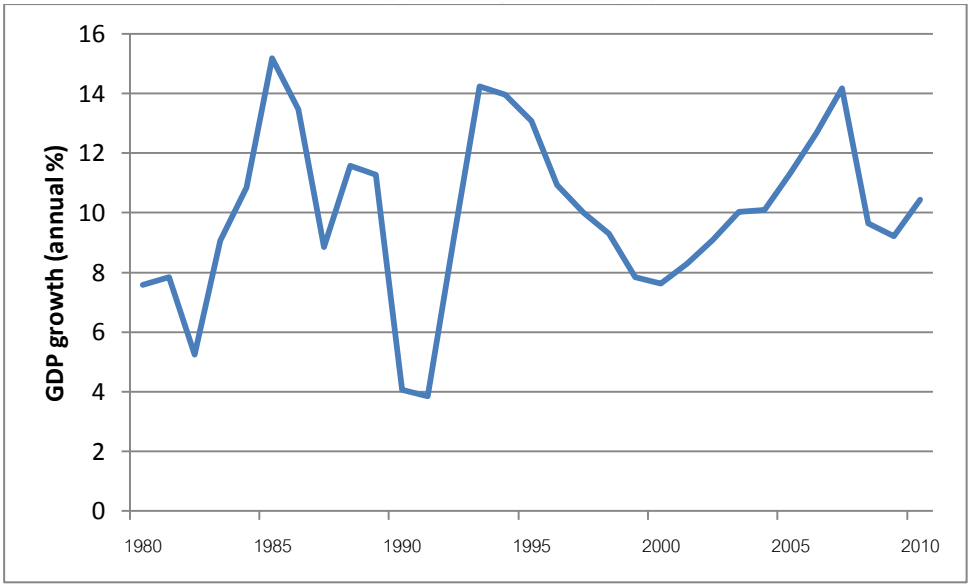


Figure 20 China's Annual percent growth rate of GDP (in Chinese Yuan)



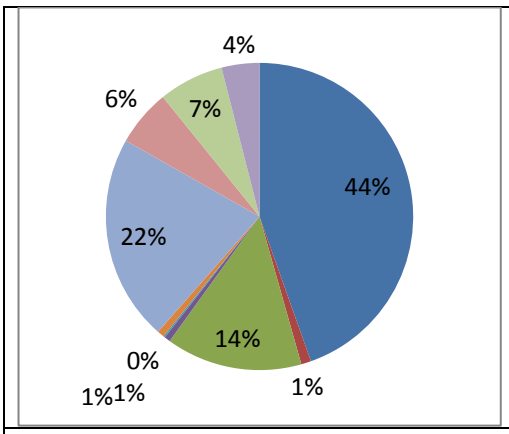
Thailand economic policy before 1980s was focused on food (especially rice 32% and vegetables 26% of food category) and crude materials exported goods,

which is crude rubber at about 65percent of crude materials (see Figure 21). Specialization in modernizing industries is brought in higher and stable earnings than fluctuated prices of primary goods, as a way to shift its economic status. Both exports and imports commodities in this country move in the same direction due to a declined size of nonfuel primary products and an increased size of manufactured products. The exported goods in Thailand had moderated quite fast from 61 percent in 1980 to less than 40 percent for the rest because the economy moves more toward modernizing products, exceptionally for machinery and transport equipment in these three sub-commodities: office machinery, electric machinery, and road vehicles. Exporting agricultural goods and other primary goods arise continuously throughout the entire 30 years, but the increased value of these categories is less than the enlarged amount of modernizing goods. Imports commodities in manufactured goods rose one fifth between 1980 and 1990 and are likely to remain so since then.

Thailand's balance of trade displays similar patterns as Indonesia's one with a deficit in 1980 and 1990 and become a surplus in 2000 and 2010. Thailand economic policy before the early 1970s was emphasized on import-substitution industrialization which leads trade deficit, but without success, just as in the 1980 and 1990. However, export-oriented industries in manufactured sectors started to improve trade balance and generated positive economic environment in 2000 and 2010, then these industrial sectors will drive up Thai economy. More modernizing exports, exceptionally in machinery and transport equipment, have fostered strong trade surplus. Moreover, significant enlargement in both total exports and imports can support the idea that an international trade has an important effect on economic growth.

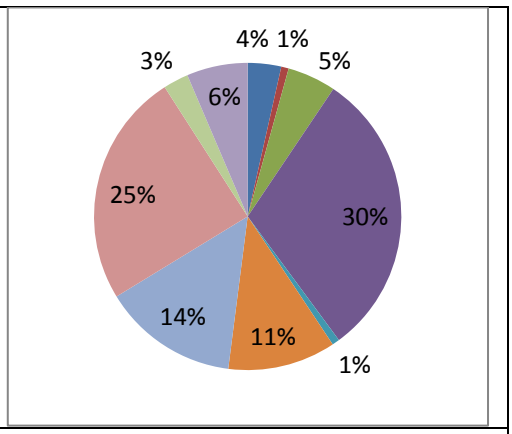
Figure 21 Thailand Commodities Proportion by SITC

Export Commodities (% of Total Export)	Import Commodities (% of Total Import)
Figure1.1: Thailand in 1980	Figure1.1: Thailand in 1980



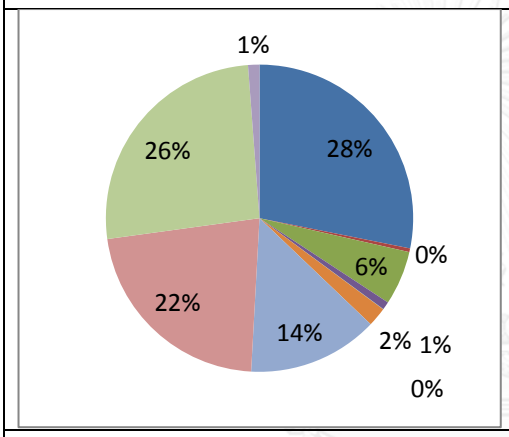
Total Export in 1980: 6,505 million US$

Figure1.2: Thailand in1990



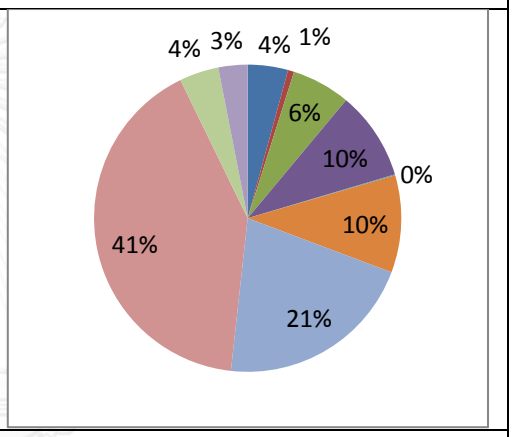
Total Export in 1980: 9,454 million US$

Figure1.2: Thailand in 1990



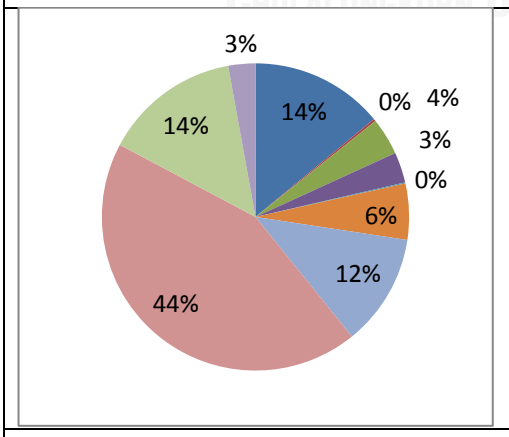
Total Export in 1990: 23,068 million US$

Figure1.3: Thailand in 2000



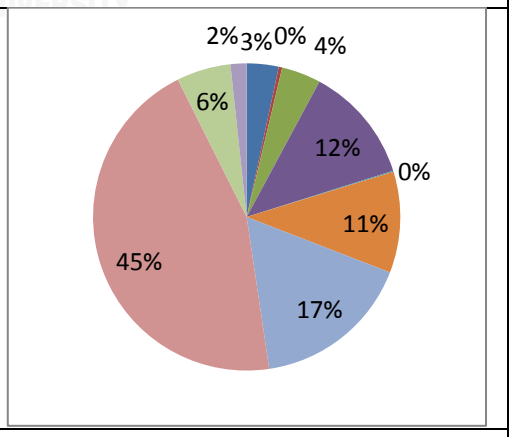
Total Import in 1990: 33,371 million US$

Figure1.3: Thailand in 2000



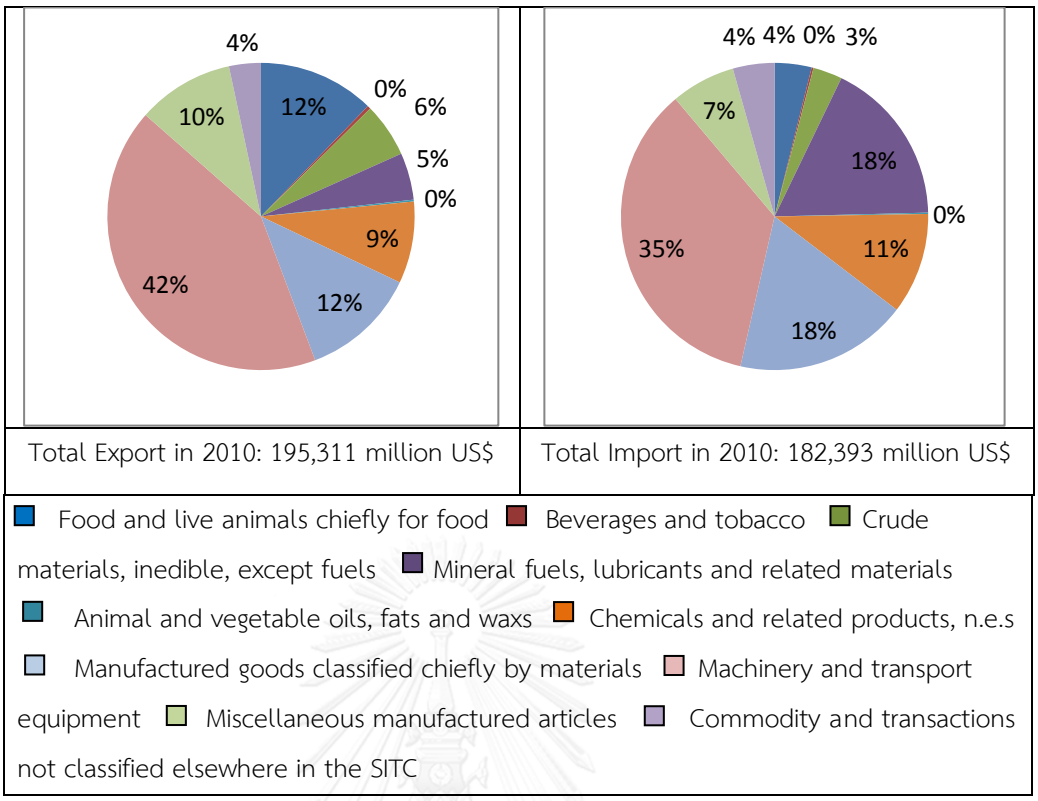
Total Export in 2000: 68,818 million US$

Figure1.4: Thailand in 2010



Total Import in 2000: 61,921 million US$

Figure1.4: Thailand in 2010



Sources: UN Comtrade database (1980-2010) and author's calculation

A large amount of trade deficit has influence in economic potential and could be a sign of future successful economy. Trade balance of Thailand before Asian financial crisis had experienced a trade deficit from Japan, the biggest trading partner which occupied nearly a quarter of all trade shares during 1985-1996 (Rajan, Sen et al. 2004). Much of the trade deficits came from importing high technology products—for instance, chemical, machinery, and manufactured goods. Furthermore, the size of trade deficit with Japan grew constantly and dramatically approximately US$ 11 billion along these 10 years before crisis. The surplus of trade balance started after this financial crisis in the 1997-1998 and has strengthened over the time pass because Thailand changes position from importer to exporter in some high technology goods such as machinery and transport equipment (Table 7). Although machinery becomes main export earnings, the mineral fuel expenditure which is crucial import goods seems to accelerate significantly—that is, oil price increases speedily and unceasingly in the last decade (Figure 15).

Table 7 Thailand's Distribution of International Trade by SITC (in USD)

Country	Categories	1980	1990	2000	2010
		Net Exports (Net Imports)			
Thailand	Food and live animals chiefly for food	2567	5081	7563	16832
	Beverages and tobacco	(7)	(125)	(54)	301
	Crude materials, inedible, except fuels	449	(747)	136	5549
	Mineral fuels, lubricants and related materials	(2839)	(2921)	(5396)	(22144)
	Animal and vegetable oils, fats and waxs	(63)	(24)	12	128
	Chemicals and related products, n.e.s	(1026)	(2954)	(2528)	(2592)
	Manufactured goods classified chiefly by materials	65	(3843)	(2262)	(9335)
	Machinery and transport equipment	(1941)	(8631)	2149	18099
	Miscellaneous manufactured articles	193	4611	6360	7514
	Commodity and transactions not classified elsewhere in the SITC	(348)	(750)	917	(1435)
Thailand	Total	(2949)	(10303)	6898	12918

Sources: UN Comtrade database (1980-2010) and author's calculation

2.7 Summary of overall ASEAN's perspective

The whole four ASEAN evidence presented in this chapter underlines that the succession in mounting their commodities to international trade, elevating proportion of industrialized production in merchandise export shares, and higher degree of economic integration to global market can help maintaining high long-term growth in ASEAN. Every country increases its production line and supplies them to both domestic and foreign demand. A sustained focus on structural reforms from primary sector to manufactured sector is one of a necessary condition for boosting emerging market's potential output to approach economic status of most advanced economies. These four countries continue to heighten their magnitude of economic globalization since nation could gain various benefits from foreign country, for example, new innovations and market extension.

More generally, improving both internal and external activity is needed for better economic performance. The combination of higher internal inputs like capital stock and labor force along with new technology from greater trade liberation in ASEAN region tends to bring about more efficiency on their production process because of more factors of production and more effective production process. However, ASEAN emerging market economies sell not only their goods from both

primary and industrial products abroad, but also purchase necessary product from foreign country, particularly in non-primary products. Further export commodity, especially in industrial article, is essential to enhance potential growth because prices of exporting primary goods are quite fluctuated while prices of more modernizing exports for instance, manufactured goods, machinery and transport equipment, and miscellaneous manufactured articles, are more stable. Export earnings and import expenditure of these four selected ASEAN countries, which distinguished by 10 categories of SITC (Standard International Trade Classification), have reflected the economic status in the course of time and then given information for planning a suitable route in the future. All above structure reform happens to be variable influencing relative price which is the most important factor in this research. The change in value and volume of exports and imports from structural reforms has led to higher (lower) terms of trade and hence could be acting as a boost (or a drag) on country's growth.

CHAPTER 3

Conceptual Framework/ Review of Literature

The aims of this chapter are presented into four main categories: conceptual framework, literature reviews, supporting details for unexpected positive sign, and summary of literature review and modified regression model. First, terms of trade and its volatility have been notable topic in the wake of the globalization even if many researchers have reported their relationship with growth over the past three decade or so. The past analyses mostly focus on net barter terms of trade, but only some papers include income terms of trade in their studies. Another topic is shown former empirical results about relationship between terms of trade and its volatility on economic growth, as well as special description of unexpected positive volatility sign. The next part mentions the believable reasons behind unexpected aligned direction between volatility and growth. The last part displays brief previous research findings and also mentions an origin of regression.

3.1 Conceptual Framework

3.1.1 Basic Concepts of Terms of Trade

The concept of terms of trade for determining the allocation of gains from trade between trading partners can roughly divided into three types: Net barter terms of trade, Gross barter terms of trade and Income terms of trade (Cambazoglu and Karaalp 2012). Most researchers normally employ two measures of terms of trade which are net barter terms of trade and income terms of trade because it is difficult to measure gross barter terms of trade.

Net barter terms of trade is usually referred to terms of trade and also called commodity terms of trade. It reflects the country's competitiveness and economic status in the international market because it calculates from the export price and import price. If the export price exceeds relative to the import price, the terms of trade index is more than 100 which means the terms of trade improvement or can

exchange more imports for each unit of export goods. If the terms of trade index is less than 100, it means the deterioration in the country's terms of trade. For example, primary product prices of a country's main export drops severely or an import price improves with unchanged export price. All indices are setting at 100 as a certain base year.

$$\text{Net barter terms of trade} = \frac{\text{Unit value index of total exports}}{\text{Unit value index of total imports}} \times 100$$

Net barter terms of trade = [Unit value index of total exports / Unit value index of total imports] * 100

Income terms of trade states the relative purchasing power of a country's export commodity in terms of import commodity. Some researchers confirm that income terms of trade which measure the real income level of a country's traded goods sector is more important than net barter terms of trade for explaining relative growth performance (Lutz 1994). Income terms of trade not only capture the effect of economic welfare from the fluctuation in the terms of trade but also measures quantity of export goods. From the above reason, income terms of trade is suitable to study as one factor that stimulate economy of developing countries. In addition, an improvement in the country's income terms of trade might come from an increase in price index and/or an increase in the export volume index. A magnitude of each index is important to determine the direction of income terms of trade; for instance, if a deteriorate in net barter terms of trade is bigger than export quantity index, income terms of trade will deteriorate; if the magnitude of net barter terms of trade which is less than 100 is smaller than the size of export quantity index, income terms of trade may improve.

$$Income\ terms\ of\ trade = \frac{Unit\ value\ index\ of\ total\ exports}{Unit\ value\ index\ of\ total\ imports} \times Export\ volume\ index$$

3.1.2 Terms of Trade Deterioration

A common view of terms of trade deterioration between primary commodities and manufactured products has been published in 1950 by two

renowned economists—Raul Prebisch and H.W. Singer—who worked independently developed his research. The Prebisch-Singer hypothesis (also Prebisch-Singer thesis) had explored the changing price relations (or terms of trade), which is a great vital factor diminished developing countries' benefits from international trade, by setting their sample observations seventies years before the end of WW II.

A study of Raul Prebisch (1950), which set his scope during 1876-1947, found that terms of trade trend of primary products exporting countries (seen as ratio of prices of primary commodities to those of manufactured products) has deteriorated in the long run by given the industrialized revolution in some less-developed countries. Observed 19 Latin American countries and the United States as a representative of under-developed countries and industrialized countries, respectively, he found that the price ratio in the last quarter of the 19th century seem to decrease continuously, so this factor lead lower trade and technological progress in commodity-exporting countries. Changed in terms of trade implied that standard living of core citizen is better off than those in periphery because the primary commodity price was swing severely—for instance, rising prices of primary goods in bull economy and shrinking their prices in bear economy— meanwhile price of manufactured product was quite stable throughout these seventies years.

Another well-known author who found a reduction in commodity terms of trade is Sir Han Wolfgang Signer (1950) by observed Great Britain during 1870s-1940s. Under-developed nations faced secular moderating net barter terms of trade as a result of from technological development boosted manufactured article's prices rather than primary goods' prices, with an exceptionally reverse price ratio at least in World War periods. This technical progress gives an enormous advantage to more economically developed countries due to gains from consuming low prices of primary products and producing high prices of industrial articles; in the meantime, developing countries were unprofitable from foreign trade—notably worse of both export-import sides. The same holds true for Signer (1950) report that varying terms of trade can hint that developed countries' living standards have increased faster than those in developing one due to different exporting articles for the period 1870-

1940. In underdeveloped countries prospective, manufacturing industries can lead to heighten urban education, skill, living standard, creativeness, habits, technological progress, etc. which are most preferable profits and desirable to those countries, but they are less interested in byproducts such as immediate goods or immediate social benefits, not main targets.

In brief, Prebisch and Singer shared consistent fact finding—which is a deteriorate of terms of trade in less-developed nations in the long run—even if these two economists did it separately. Another critical element of these two researches is that standard of living gap between these two distinctive country groups rises overtime if developing countries depend deeply on primary commodities and raw material exports. To break the vicious cycle of a terrible dilemma, developing countries had to approach the modern technologies, adjust from traditional trading to produce industrial articles, reinvestment their profit in many suitable kinds of developed domestic industries, and provide proper economic policies, etc. (Schumpeter 1939, Prebisch 1950, Singer 1950).

In fact, deteriorating terms of trade could not remain during the last three decade of the 2000s in most of developing countries. As a consequence of time pass, this hypothesis has not remained credible in many developing countries which previously exported food and raw materials but presently specialize in manufacturing industry, with numerous assisting research results. For all working paper of Blattman and his teammates (2003, 2004, 2007), Prebisch-Singer might not be a plausible assumption—has a little overlapped timing with Prebisch-Singer sample because connection between reduction in the terms of trade trend and slow economic activity of periphery countries in their studies was perhaps spurious since the last three decades of the 19th century. Another working paper of Borkin (2006) presented that this hypothesis does not hold its reliability anymore in New Zealand due to an opposite direction of price relative with hypothesis. Growth in an extraordinary advanced economy which exports primary commodities and imports industrial articles—like the less-developed countries—has a magnification in the commodity terms of trade since 1974, against long-term trend of assumption in case of nation

heavily sold food and raw materials. There are possibilities that, particularly in over time and unusual situations, price of primary articles might be different from this assumption. Depended on the rapid fall (rise) in the relative prices of commodity goods before (after) 2nd millennium, the credibility on Prebisch-Singer thesis might become weaker and could not hold forever (Grilli and Yang 1988, Cuddington John T., Rodney et al. 2007). Grilli and Yang (1988), who studied price of non-fuel commodities since 1900, suggest that the trend of relative prices of primary commodities could vary as time passes, not the monotone. Within this research (Cuddington et al., 2007), the Prebisch-Singer assumption does not hold for some primary products such as timber, so the terms of trade in country whose specializes in timber might not be worsened. The falling (rising) prices of raw materials before (after) 2000 are confirmed by data presented in Chapter 2. In the process of time, the real primary commodities prices data in my thesis supports (opposes) this hypothesis in column real price (% change) during 1981-200 (1980-2010) (see Table 2 in Overview of Four selected ASEAN countries topic written in Chapter 2 for further details). During the droughts and two world wars periods, the prices of enormous primary commodity shoot up in the past decade due to an excessive demand, so this hypothesis has some exceptions (Yamada and Yoon 2014).

3.1.3 Terms of Trade Volatility and Economic Growth

From a basic neoclassical model, Mendoza (1997) explains the relationship between terms of trade and economic growth under uncertainty. His empirical analysis uses data bases on 40 industrial and developing countries. He investigates an effect of terms of trade variability on consumption growth by utilized a stochastic growth model. The households intend to maximize expected lifetime utility as given by:

$$U(C) = E\left[\sum_{t=0}^{\infty} \beta^{t} \frac{c_t^{1-\gamma}}{1-\gamma}\right] \quad \text{when } \gamma > 0,\ 0 > \beta > 1 \qquad \text{(a)}$$

Where C stand for consumption of the imported good, β stand for a subjective discount factor, and γ stand for the coefficient of relative risk aversion. Mendoza emphasizes the role of terms of trade and growth as a determinant of

savings and growth. He assumes that savings are a funding source to invest in a perfectly durable asset for producing the export goods; the export production depends on a linear technology with a stochastic gross return of R per period. The consumption which comes from savings is calculated by R times one plus the proportional rate of the terms of trade variability (which we signify by z). Mendoza finds mean and variance value of the terms of trade variation by used a stochastic process. He concludes that the planned consumption growth drives up the terms of trade trend (the mean of z). On the other hand, the relationship between planned consumption growth and the terms of trade volatility (the variance of z) will be positive if $\gamma > 2$ (if $\gamma < 2$, this relationship is negative).

Based on a small open country, Mendoza (1997) finds that households consume imported goods by planning to maximize expected lifetime utility. From his empirical analysis, Mendoza chooses 40 countries from both industrial and developing countries for two decades (1971-1991) as his sample. In domestic country case, growth rate of consumption and rate of terms of trade fluctuation are almost linear correlation over time. In across countries case, he confirms positive relationship between mean growth rate of consumption and mean rate of terms of trade fluctuation, however, the assumption of positive or negative association with the variance by depended on degree of risk aversion is been cancelled. He finds only negative sign for the relationship on consumption growth with the variance of terms of trade. A mean-preserving increase in the change of terms of trade deteriorates (improves) growth when the coefficient of relative risk aversion is less (more) than 2. Reduction in uncertainty is good for social welfare in both situations. A low level of consumption instability has several advantages included consumption fluctuations around trend and consumption level. Under a neoclassical savings-uncertainty framework, his model predicts the linkage of terms of trade and growth, and hence terms of trade's position for determining the savings and growth.

The above predictions of utility function in regard to the effect of the terms of trade trend on consumption growth do not concern about output growth, so the

following equation will pay attention on output growth by ignoring the stochastic element and define wealth (A) as a new variable.

$$A_{t+1} = \beta^{1/\gamma} R^{1/\gamma} z_t^{1/\gamma-1} A_t \qquad (b)$$

Output growth is crystal-clear positively related with z when $\gamma < 1$. If the growth rate of purchasing power of output on the imported consumption goods equals to z, we have:

$$C_{t+1} / C_t = z_t A_{t+1} / A_t \qquad (c)$$

Substituting equation (c) into equation (b) yields:

$$C_{t+1} = \beta^{1/\gamma} R^{1/\gamma} z_t^{1/\gamma} C_t \qquad (d)$$

Follow from the model's structure, the effect of terms of trade volatility on consumption growth has the same impact on its output growth or GDP growth. The value of γ has an impact on the sign of relationship between output growth and both terms of trade trend and terms of trade volatility. Accordingly highly uncertain of the appropriate value of γ, the predicted results from this model is still obscure even in an isoelastic utility function.

3.2 Review of Literature

A literature review is comprised of two main points: (i) Terms of trade and economic growth and (ii) Terms of trade volatility and economic growth. According to the essay of Sapsford and Balasubramanyam (1994), the trend and volatility in the terms of trade must be treated together as 'twin-pillars' for avoiding the problem of the less developed countries because export revenues from these countries depend mainly on primary commodities (but nowadays some countries strongly export components and manufactured goods). Even if Blattman and his teammates explain, the secular change is less and less important to account for accumulation and growth than is volatility (Blattman, Hwang et al. 2004).

3.2.1 Terms of trade and economic growth

The research in the terms of trade issue has studied more than six decades. The main hypothesis for countless papers in the future is Prebisch-Singer

hypothesis—which has invented by Prebisch and Singer in the mid-20th century, this hypothesis explains the downward trend in the terms of trade. Since the 1980s, the overwhelming majority of paper has emphasized on the secular deterioration in the prices of primary products as compared to the price of manufactured goods or the negative trend in the commodity terms of trade (Spraos 1980, Sapsford 1985, Grilli and Yang 1988).

Under two-commodity dynamic trade model which assumed perfect competition and constant returns to scale, Kaneko (2000) examines the relationship between commodity terms of trade improvement and growth rate of national income by considered that physical and human capital accumulation as factors stimulated growth (Kaneko 2000). An additional assumption in this paper is that every small nation must perfectly specialize under free trade. The conclusion of this work under many above assumptions is that a country which specializes in consumption commodities has clear positive relationship between the commodity terms of trade on growth—which is opposed to an ordinary Prebisch-Singer assumption. On the other hand, a country specialized in capital commodities has not found any relationship of commodity terms of trade on growth, not followed conventional one.

To gain a basic understanding of net barter terms of trade and income terms of trade of each country, some researchers do their empirical evidences on specific countries with a mixture of (un) supportive traditional hypothesis. Suggestive evidence of Berge and colleague in answer to the impact of South Korea's terms of trade on growth exists in manufactured trade with LDCs (less developed countries) and MDCs (developed market economies) (Berge and Crowe 1997). During the period 1976-1995, South Korea's net barter terms of trade does not have any significant effect on mean growth rate in case of MDCs but quite significant when trade with LDCs. One clear suggestion from the South Korea data is that an improvement in income terms of trade through the export volume tends to lead higher growth without worsens its relative prices. To explore the effect of terms of trade on economic growth in Malaysia over the period 1965-2002, Wong (2004) chooses commodity terms of trade and income terms of trade to measure terms of trade

estimated by the Granger-causality and Johansen cointegration model. Wong finds that an improvement in both terms of trade can lead higher economic growth, but not strong evidence in short- and long-term. Formal work by Fatima has been investigated Pakistan's terms of trade variation (both net barter terms of trade and income terms of trade) on income and consumption (Fatima 2010), anticipating its behavior on economic growth by using time-series data between 1990 and 2008. The deterioration of terms of trade will directly decreases the economic potential (GDP) of its nation. These three empirical studies, which include two emerging markets (Malaysia and Pakistan) and former emerging market like Korea—one of the newest industrialize countries, share the same conclusion that the directions of two types of terms of trade and domestic growth are aligned. These researches confirm that a magnification in terms of trade could boost up economic status in accord with an orthodox hypothesis.

At the panel data analysis, researcher gives the similar result as individual evidences. Studying eighteen emerging countries covered period 1990-2004, Cakir investigates the association between commodity terms of trade and economic growth by considered annual data and he finds the positive sign of these relationships (Cakir 2009). Amongst these countries have convergent sign which refers that the rapid growth of these countries stimulates their economies and make them catch up with developed economies.

3.2.2 Terms of trade volatility and economic growth

Few decades ago, a large number of researchers take an interest in studying the relationship between trend and volatility in the terms of trade and economic growth. Most of researches which explore the linkage of terms of trade and its volatility on economic growth are using cross-country evidence for considering the trend of many countries. Only few papers focus only on volatility in the terms of trade of specific nation without considering other countries.

General research results present some common findings. First, the level of net barter terms of trade considerably encourages domestic performance in

developing countries, and the volatility of net barter terms of trade always be a great obstruction on country's growth (Basu and McLeod, 1992; Easterly and Kraay, 2000; Bleaney and Greenaway, 2001; Turnovsky and Chattopadhyay, 2003; Furth, 2010; Wong, 2010; Samimi, Sadeghi, and Sadeghi, 2011; Jawaid and Raza, 2012; Awel, 2012). For industrialized countries, high economic potential of New Zealand in Grimes (2006) and Borkin (2006) is associated with high (low) commodity terms of trade (its volatility). Second, there are many papers comparing an empirical evidence of core and periphery countries (Lutz, 1994; Mendoza, 1997; Blattman, Hwang, and Williamson, 2003, 2004, 2007; Williamson, 2008; Mansfield and Reinhardt, 2008; Wong, 2010; and Jawaid and Waheed, 2011). Half of these researches follow traditional relations —like the studies of either core or periphery countries; uncommon growth-expanding or abating terms of trade (its uncertainty) association is the other half. These related patterns—aligned (opposite) direction in case of terms of trade (its variability)—do not hold in all researches, particularly in studies of both developing and developed nations.

3.2.2.1 Research evidence from solely economic group

With the periphery area showing conventional relationship between terms of trade trend (its volatility) and country's growth, these reviews of literature are as follows. Basu and McLeod who examine the effect of terms of trade fluctuations upon economic growth and capital accumulation through stochastic growth model find a positive and negative relationship between great terms of trade levels and variability on output, respectively (Basu and McLeod 1992). To make the fact precise, this observation of twelve less developing countries, mostly from Latin America which specialize in commodity export, can be found the persistent impacts of transitory terms of trade shocks on output level. After this pioneer, many researchers confirm the relationship of terms of trade volatility and growth. The empirical evidence in Easterly and Kraay indicates that the effect of terms of trade volatility experienced by the small states is larger than the larger state case. They suggest that an enormous trade share to GDP of small country and country's specialization in both export goods and international market affect terms of trade variability. They

also confirm the negative relationship of terms of trade instability and growth shaped by the neoclassical Solow growth model (Easterly and Kraay 2000). The severe effect of the fluctuations in the terms of trade which affected on investor's decision had become the inspiration for Bleaney and Greenaway. From the Sub-Saharan Africa study of Bleaney and his teammate (Bleaney and Greenaway 2001), who study fifteen years panel of 14 countries in sub-Saharan African about the impact of terms of trade and real exchange rate volatility on investment and growth, has confirmed the significant positive (negative) relationship between terms of trade (its volatility) and growth employing a stochastic endogenous growth model developed by Mendoza (1997). As long as terms of trade improve and real exchange rate overvalues, both economic growth and investment will rise. Although acceleration in current terms of trade is associated with an increase in the rate of growth, lagged change in terms of trade appears to be misalignment with growth.

In the two past decade, many researchers pay attention at the volatility in the terms of trade as an important factor that influences the economic growth as a result of the intention to stimulate the GDP. Turnovsky and Chattopadhyay who choose a developing economy as their scope find the effect of volatility on growth which faces an imperfect world capital market using a new developed analytical model—namely, the Grinols-Turnovsky growth model (Turnovsky and Chattopadhyay 2003). In case of high volatility economies, they confirm that these three variables which include terms of trade volatility, government expenditure volatility, and monetary volatility have strong negative impacts on the equilibrium growth rate. They report the same results of the weak positive impact of mean growth rate of terms of trade on mean output growth as the other numerical experiments. Furthermore, more volatility in the terms of trade leads low level of real per capita GDP. Even though the negative effect of terms of trade variability holds across the full sample of 61 developing nation, an ordinarily held view is not persistent in sub-samples—from low volatility countries that turn out to be positive association with output growth. Cross-sectional analysis of Furth indicates significant negative impact of terms of trade volatility on GDP growth across 54 developing nations by using data

for the years 1980 through 2007 (Furth 2010). Furth utilizes a neoclassical growth model with Cobb-Douglas production identifying whether terms of trade lead to business cycle. He suggests that precautionary savings could lower the loss from terms of trade volatility and thus mount total factor productivity (TFP) growth. Some researchers aim at the oil exporting countries terms of trade instability that affects on their economic growth (Samimi, Sadeghi et al. 2011). Focusing on the large amount of 20 countries, they find a significant positive impact of terms of trade on GDP. These Islamic researchers also confirm the result of the negative impact of terms of trade volatility on growth during 1980-2005 by adopting GMM method. Most recent work using solely net barter terms of trade to measure terms of trade but this paper uses both net barter terms of trade and income terms of trade to investigated the impact of terms of trade growth and its volatility on economic growth along with system GMM regression (Awel 2012). Using a data set comprising 35 countries in Sub-Saharan Africa from the period 1985 to 2010, the result shows the strong positive association of net barter terms of trade and income terms of trade growth with economic growth. On the contrary, he finds that the volatility of net barter terms of trade and income terms of trade have the significantly negative impact on economic growth. Further, Jawaid and Raza (2012) analysis studies about the effects of terms of trade and its volatility on economic growth in India from 1980 to 2010. The Johansen cointegration results thus provide variability in the terms of trade has a strongly positive impact on economic growth; on the contrary, they suggest significant and negative relationship between the volatility of terms of trade and growth. Supporting export sector will decrease the degree of terms of trade volatility and encourages economic growth in this country. In sum, the whole literature focusing on less-developed nations has shown that rising terms of trade and reducing its fluctuation are the need to sustain their good domestic performance.

To test the sample of developed countries, especially in island country in the southwestern Pacific Ocean, two researchers make use of a formal econometric model like ordinary least square (OLS). The work of Arthur Grimes in 2006 which investigates New Zealand with volatile terms of trade finds that the terms of trade

volatility directly lead the lower investment, lower capital stock and lower economic growth (Grimes 2006). Amplified the methodology and sample period of Grimes, Borkin corroborates the existence of a negative volatility in the terms of trade and a positive trend in terms of trade originated chiefly from the level of export price on New Zealand's economic growth (Borkin 2006), however, his result refuses the Prebisch-Singer thesis due to an increase trend in its historical terms of trade. On the commodity-export developed countries like New Zealand, terms of trade and its variability have amplified and deteriorated economic status, respectively, although there has been a question whether other developed countries will find same solution as this nation or not.

For an overview conclusion of merely studies in more economically developed or less-developed countries, acceleration in terms of trade and deceleration in its variability induce economic performance. There are tiny unusual details in some empirical studies exhibited an opposite connection with hypothesis. The lagged change of terms of trade in Bleaney and Greenaway (2001) displays an unfamiliar solution as a reverse connection with income growth rate. On a sub-sample result of Turnovsky and Chattopadhyay (2003), they discover new finding about terms of trade volatility and growth. Any country that has an economic status of low terms of trade uncertainty and low terms of trade depreciation would have higher level of economic uncertainty and then follows by a light negative impact on its growth rate. This might appear surprising but is consistent with various credible evidences which will be written in the next topic.

3.2.2.2 Research evidence from two economic groups

In contrast, in the rich and poor economies the ongoing improvement in the terms of trade can either stimulate a more expansionary domestic growth or hinder it. Most of research results in these literatures face an aligned direction of relationship between volatility in the terms of trade and country's growth rate at least one sub-sample of them. Moreover, as Lutz (1994) shows, his research looks specifically at the net barter terms of trade (NBTT) which calculated from export price and import price whereas the majority of research works on the terms of trade

in form of export and import of goods and services and the income terms of trade (ITT) which captures the purchasing power of a country's export commodity. Obviously, the relation of NBTT volatility and output growth, by running OLS regression, is not negative as the hypothesis but it turns out to be positive while the relation of terms of trade movement and growth is surely positive. Lutz is an only researcher who discover that net barter terms of trade fluctuation has surprisingly positive impact on country's growth—beyond those of manufacturing exporters and LDC manufacturing exports. He finds a significant negative relationship between trend and volatility in the ITT and economic growth. However, surprising results have shown in wealthy countries in case of negative association between ITT and growth and periphery countries resulting from positive sign in ITT volatility on growth. As a splendid research of Mendoza (1997) have inspired many researcher to find the impact of terms of trade uncertainty on the economic growth. From his empirical study, he finds that the degree of risk aversion has directed affected on the sign of terms of trade volatility (they can be both positive and negative) with the use of a stochastic endogenous growth technique. When the risk aversion is low, the terms of trade volatility will decrease welfare and economic growth. He presents some simple results suggesting that an increase in growth and the mean rate of terms of trade makes higher consumption and economic growth.

In the event of each country in the pre-WWI, Blattman and his teammates employ basic technique like OLS model to examine terms of trade relationship in core and periphery. In order to find the relationship of terms of trade (level and volatility) and economic growth, Blattman et al. (2003) examine the panel data evidence of 35 periphery countries between 1870 and 1938. They find that volatility of the terms of trade is more harmful to developing countries' income growth than secular terms of trade changes. In developing countries, the concern is that the combination of terms of trade trend and volatility would determine a half of economic activity (Blattman, Hwang et al. 2003). Their following empirical evidences in 2004 and in 2007 hold the same scope, but, extend their data to be during the 1870 and 1939. The evidence presented in 2004 also finds that the changes in terms

of trade growth and changes in terms of trade volatility in Core and Periphery are quite reverse. The movement in the terms of trade plays a key element for determining country's growth potential particularly in developing countries where a great deal of damage in economic growth comes directly from a deteriorate of terms of trade, but not in the industrialized countries. Less volatility in the terms of trade will be better off to the developing nation because of an increase in per capita income growth and a reduced income gap between industrialized and developing nations, while high volatility in the terms of trade becomes an encouragement in the economy of Core. An outstanding paper of Blattman and his colleagues which focus on the terms of trade instability near century of pre WW II also confirms their previous research result, as evidenced by terms of trade (its fluctuation) influenced a large impact on income divergence among developing (developing and developed) countries (Blattman, Hwang et al. 2007). Their research shows that the terms of trade volatility in the less industrialized periphery play a vital position on economic growth while the case of more industrialized core countries has smaller impact. To explain the asymmetry between core and periphery, the authors claim that positive price shocks—that is, terms of trade—would lead industrialized countries to strengthen their comparative advantages. Moreover, these countries have more effective and splendid institutions and market as insurance to handling price fluctuation—terms of trade volatility—than the rest of the world.

In this regard, a response of long-term economies to changes of terms of trade and its volatility is a goal of every researcher. Notwithstanding this, some researchers minimize their targets to study short period of horizontal phase. The empirical investigation of Jawaid and his partner also confirms the significant positive effect of fluctuation in the terms of trade on economic growth, which is uncommon perspective, in the vast number of cross-country data employing OLS model (Jawaid and Waheed 2011). This paper of Jawaid et al. is unlike previous research due to utilizing very short 5 years data from 94 countries from industrialize and developing nations. Activities in two distinctive country groups—developing and developed economies—share broadly alternative results which have reverse associations with

classical one. An unexpected deterioration in national GDP growth rate, with a shock from the level of net barter and income terms of trade, can happen in some research results. Uncertainty of terms of trade generally dwindles down economic performance while it sometimes could imply a strong pace of national development. The idea that the terms of trade level enhances and its variability obstructs country's growth would not be formal solution anymore.

A small number of papers, whose set both more economically developed and less-developed countries as their research targets, appear to have robustness of regular results—faced going up terms of trade (its uncertainty) to support (weaken) economic status. For their investigation of globalization for the year 1782-1913 during the Great Divergence, Williamson uses 23 countries from core and periphery and show that terms of trade volatility in the poor countries is much greater than in the core (Williamson 2008). An improvement in terms of trade can activate long run growth, particularly in the wealthy nations but not in the periphery. He also finds the negative effect of volatility in the terms of trade and long run growth in the poor countries in the early 1930s and also during1960-2000. De-industrialization in periphery countries in the pre-WWII had become re-industrialization in the 20th century due to a long secular deterioration in terms of trade. This is not consistent with the Prebisch-Singer hypothesis, which has emphasized the critical role of a deteriorate in terms of trade sending its influence to income growth in developing nations. In addition, the re-industrialization inducement would have been robustness in economies in which terms of trade reach the summit earliest and hit the plummet steepest. To reduce each country's terms of trade volatility, Mansfield and Reinhardt who study data on 103 countries from 1978 to 2002 and also utilize heteroskedastic regression model take GATT and WTO into consideration as trade agreements (Mansfield and Reinhardt 2008). They confirm with high degree of trade openness the negative impacts of terms of trade volatility on an economy, slowing down economic growth and investment, enhancing the foreign borrowing cost, and decreasing globalization which supported by public sector. Wong investigates whether or not the terms of trade and its volatility affect on economic growth in Japan and Korea by

adopting Johansen cointegration (Wong 2010). The result of Korea shows that an improvement in volatility in the terms of trade causes a reduction in real GDP per capita but an increasing oil price will improve terms of trade volatility in Japan. Little amount of research results meet commonly expectation for stabilizing GDP per capita growth through lowering level (rising volatility) in the terms of trade.

To identify the overview of empirical studies of more economically developed and less-developed countries, shocks from level and volatility of the terms of trade can encourage and discourage output growth relied on numerous domestic economic factors—provided summarized details in topic 3.2.4. In comparing and contrasting the results of solely and both country groups, note the following:

1. For the whole researchers, focused only on more economically developed or less-developed countries, find a role in boosting terms of trade and in declining terms of trade variability raised country's performance. These findings support a traditional connection.

2. An evidence of sample groups included pairs of more economically developed and less-developed countries could be for and against common views. Majority researchers, the main encouragements for economic development can stem from the mount or reduction in the level and/or volatility in the terms of trade. Minority researchers get an identical method to support output growth with researchers who set their targets on one country group.

There are abundant economic factors determined an enlargement of country's potential and affected value of terms of trade. The international trade is the source of extending the economic growth (see elaborate details in the first topic of chapter 1). The degree of openness is also an important factor that drives the entire economy from low income country to become wealthy through price ratio. Country's economic structures, including the degree of openness (proxied by the trade share of GDP), is an important variable influencing the direction of terms of trade and GDP growth association (Basu and McLeod, 1992). An enlarged country's

openness to world trade could reduce terms of trade volatility since country expands a variety of its exporting products after heightened trade openness (Mansfield and Reinhardt, 2008). Nevertheless, some researchers do not find the connection between terms of trade and other international economic factors. The idea of Mollick and his teammates that a deteriorate in commodities' terms of trade has no correlation with globalization indicates that international trade, globalization, or lack of economic integration is not a necessary factor to decline terms of trade trend (Mollick, Faria et al. 2008).

3.2.3 Supporting details for unexpected positive sign

A number of studies have discovered that terms of trade is positively correlated with output growth for all economies; in the meantime, numerous empirical analyses of terms of trade variability on country's growth indicate a negative relationship exists. There are copious amounts of studies, for example, Lutz (1994), Mendoza (1997), Turnovsky and Chattopadhyay (2003), Blattman et al (2003, 2004, 2007), and Jawaid and Waheed (2011), indicated a positive association between terms of trade volatility and economic growth. Only a few researches—Mendoza and Jawaid and Waheed—who studied this topic explain certainly reasons behind these mystery relations. Others are merely presented their research findings without amplifying vivid details.

Unlike classical research results, Mendoza (1997) has claimed that the degree of risk aversion would determine positive or negative effect of terms of trade uncertainty on saving and growth. The positive terms of trade volatility result hinges, however, on the high level of risk aversion that will enhance economic performance and decrease social welfare. Following the research result of Jawaid and his partner which found significant positive relation between terms of trade volatility on country's growth, the positive causality comes directly from globalization led these two factors move in the same direction (Jawaid and Waheed 2011). To the extent that liberalization and specialization are important factors to determine economic potential, the globalization bring shocks to country frequently, which is then increased both variability and growth.

In a few cases in which growth and volatility have positive relationship is presented some believable reasons. To trade-off benefits and costs of variance with expected-returns technologies, the country especially in developing nations could gain an advantage of higher variance to boost its economic growth (Black 1987). Pessimistic people who has motivation about precautionary savings will consider higher volatility as a signal of higher saving rate, and then higher investment rate (Mirman 1971). The increase in the investment will bring about higher GDP growth rate.

3.2.4 Summary of Literature Review and modified regression model

An important conclusion from numerous reviews of literature is that terms of trade and its volatility are one element to impact domestic growth rate. A common view is that high level (volatility) in the net barter terms of trade in general has held a positive (reverse) linkage to growth. A great number of either developing or developed countries' empirical results are confirmed the positive (negative) relationship of terms of trade (volatility) and growth. Only limited papers have not followed common view—an opposite direction of lagged change of terms of trade reported by Bleaney and Greenaway, an aligned direction of terms of trade level found by Borkin, and positive sign in low volatility countries studied by Turnovsky and Chattopadhyay.

To the extent that more economically developed and less-developed countries' researches could be divided into two conclusions, the majority analysis verifies that the results do not hold. Focusing on two economic groups, many authors suggest that an expansion in volatility in the terms of trade could be need for improving domestic growth against the other numerical experiments. Minority suggestive evidences of core and periphery result the same conclusion as research results from one country group. Among the studies ahead, few samples of some researchers refuse Prebisch-Singer hypothesis (i.e. Lutz, Blattman et al., and Williamson) due to a reverse connection.

An explicit challenge arise in attempting to verify both net barter and income terms of trade and their uncertainty effects on growth instead of exclusively net barter terms of trade (Lutz, 1994; Awel, 2012). It is not necessary to ensure that the relation of two types of the terms of trade volatility has to be contrary direction with output growth—that fluctuation in net barter terms of trade in Lutz's study is not negative as assumption. Although Awel's finding insists a significantly reversed impact of the variability in the net barter and income terms of trade on growth, these two researchers whose indicates an opposite result in volatility can share similar results of the causality of two terms of trade gone in same direction with economic activity.

Unlike classical research results, a concept of positive volatility in the terms of trade on country's growth is illustrated in Mendoza's (1997) and Jawaid and Waheed's (2011) studies. Two considerable factors in exploring about positive sign of terms of trade uncertainty are the degree of risk aversions and globalization. To begin with Mendoza's empirical study, the higher risk aversions the greater welfare and economic potential through terms of trade uncertainty. The other in critical element in thinking positive association is reported in Jawaid and his colleague; nevertheless, the explanation about positive sign in this paper is unlike previous research. They have claimed that liberalization and specialization—that led by country's openness—lead unexpected shocks to economies often and thence cause positively correlated between volatility and growth.

The modified regression model for examine the correlated between terms of trade and its volatility and real GDP per capita growth is a mixture of models in previous researches. To help assess the proper analysis in 4 ASEAN countries, the model in other researches based on the production function is not estimable the effect of global financial crisis and/or of domestic crisis. Thesis's model considers existence of internal and external crisis as dummies to get more powerful, correct and stable model and also realize an oil price as additional exogenous variable. These time dummy variables have be added to catch a harshly crisis since these two crises (Asian and global financial crisis) have affected macroeconomic variables in ASEAN economies at that period. To investigate long run association of terms of trade

and it volatility on country's growth in 4 ASEAN countries, the models of Wong (2010) and Jawaid and Waheed (2011) which considers terms of trade separately from its volatility are the main model for this thesis. Applying extra ordinary variables in model by cointegration technique leads to more accurate results in each country, for example, life expectancy, export as percentage of GDP, remittances, inflation, domestic and foreign demand, oil prices, and trade balance (Tsen 2009; Jawaid and Raza 2012). Each country has its own shocks that affect its economic activity; therefore, it is necessary to add exogenous and/or dummy variables.

CHAPTER 4

Methodology

4.1 The model applied

The subject matter of this paper is examined the impact of terms of trade trend and its volatility on economic growth which uses the time series economic data of Indonesia, Malaysia, the Philippines and Thailand. To this point, our econometric model to investigate the impact of terms of trade and its volatility on potential economic growth is derived by using the production function framework. The basic building block of our model will be the aggregate production function.

$$Y = f(L, K, TOT) \quad (1)$$

Where Y is GDP per capita, L is labor force, K is capital stock and TOT is terms of trade which is not described as factor of production: K and L. In order to make the reasonable assumption, the impact of terms of trade and its volatility on economic growth will operate through TOT.

From a theoretical point of view, the per capita GDP will be the function of: labor force, capital stock[3], level and volatility of net barter terms of trade/income terms of trade, and time dummy for controlling the special events occurring during the sample period. Based on a production function framework, the author uses the cointegration model to investigate the long run effect of mean terms of trade and its volatility on economic growth. Following the research strategy of Lutz (1994), Wong (2010), Jawaid et al. (2011) and Jawaid et al. (2012), the regression model in this study is specified in the form below.

$$\log Y_t = \beta_{10} + \beta_{11} \log K_t + \beta_{12} \log L_t + \beta_{13} \log NBTT_t + \beta_{14} D_1 + \beta_{15} D_2 + e_t \quad (2.1)$$

$$\log Y_t = \beta_{20} + \beta_{21} \log K_t + \beta_{22} \log L_t + \beta_{23} \log ITT_t + \beta_{24} D_1 + \beta_{25} D_2 + e_t \quad (2.2)$$

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[3] Owing to the unavailable data of capital stock, the author chooses gross fixed capital formation to proxy capital stock.

$$\log Y_t = \beta_{30} + \beta_{31} \log K_t + \beta_{32} \log L_t + \beta_{33} VNBTT_t + \beta_{34} D_1 + \beta_{35} D_2 + e_t \quad (2.3)$$

$$\log Y_t = \beta_{40} + \beta_{41} \log K_t + \beta_{42} \log L_t + \beta_{43} VITT_t + \beta_{44} D_1 + \beta_{45} D_2 + e_t \quad (2.4)$$

Where TOT is log NBTT, log ITT, VNBTT, and VITT, log is the natural logarithm, $NBTT_t$ is the level of net barter terms of trade, $VNBTT_t$ is volatility of net barter terms of trade, ITT_t is the level of income terms of trade, $VITT_t$ is volatility of income terms of trade, and D_1 and D_2 are dummy variables for capturing the Asian financial crisis between 1997 to 1998 impact on Indonesia, Malaysia, the Philippines and Thailand and the global financial crisis of 2007-2009 that has led to great reductions in their economies. D_1 and D_2 equal to 1 for period from 1997 to 1998 as well as 2007-2009 and 0 for the rest, and e_t is the error term at time t.

The modified regression model for examine the correlated between terms of trade and its volatility and real GDP per capita growth is a mixture of models in previous researches. To help assess the proper analysis in 4 ASEAN countries, the model in other researches based on the production function is not estimable the effect of global financial crisis and/or of domestic crisis. Thesis's model considers existence of internal and external crisis as dummies to get more powerful, correct and stable model and also realize an oil price as additional exogenous variable. These time dummy variables have be added to catch a harshly crisis since these two crises (Asian and global financial crisis) have affected macroeconomic variables in ASEAN economies at that period. To investigate long run association of terms of trade and it volatility on country's growth in 4 ASEAN countries, the models of Wong (2010) and Jawaid and Waheed (2011) which considers terms of trade separately from its volatility are the main model for this thesis. Applying extra ordinary variables in model by cointegration technique leads to more accurate results in each country, for example, life expectancy, export as percentage of GDP, remittances, inflation, domestic and foreign demand, oil prices, and trade balance (Tsen 2009; Jawaid and Raza 2012). Each country has its own shocks that affect its economic activity; therefore, it is necessary to add exogenous and/or dummy variables. In Indonesia, oil price in the world market is an exogenous variable since rising (declining) economic performance of the oil-exporting countries has received a large effect from an

increase (a decrease) in crude oil price. Extremely large domestic crisis happened in the Philippines during 1983-1986 would be an additional dummy in every model of the Philippines because this crisis left a big wound in trading sector and actual economy.

4.2 How to calculate Volatility

To measure volatility in terms of trade, many researcher calculate it from these 4 methods; standard deviation of the terms of trade over the 5/10-year interval, Generalised Autoregressive Conditional Heteroskedasticity model or GARCH (1,1) , 5/10 years moving averages of terms of trade and 5/10 years moving standard deviations of terms of trade (Wong 2010, Awel 2012, Jawaid and Raza 2012). The terms of trade volatility calculated by standard deviation is the most famous and most used measurement, researchers who utilize this method neither do the panel regression of many countries nor access to monthly or quarterly basis data. The volatility calculated by moving average is based on a trailing window of observation (i.e., the previous five or ten years), so the number of terms of trade variability is less than other estimations. Moving average has some weaknesses, for example, a harshly rising terms of trade shock in one period drive moving average around that trailing window higher or lower than usual, so the value of moving average in other period after trailing window passes will back to normal value. Moving standard deviation is another method of estimating volatility, but it is not appropriate to use in this thesis because it provides the least amount of volatility compared with other three methods. Numerous researchers select GARCH model, although this model has many unavoidable disadvantages, such as unexplained reasons in volatility's variation and symmetry of volatility on both positive and negative signs of previous shocks, because it is capable of overcoming the autoregression and heteroskedasticity problem. An outstanding advantage of GARCH (1,1) estimator which other methods do not have is that we could get a maximum number of volatility which is a little bit less than 30 values for 30 years annual time-series terms of trade index; meanwhile, the amount of volatility after calculated by other methods is less than GARCH (3 volatility for 10 years standard deviation, for example) due to an inability to compute

a single year. Moreover, used GARCH (1,1) to forecast volatility is another benefit but this thesis does not include this forecasting qualification in the study. After compared advantages and disadvantages of these 4 methods, the author has unable to deny the GARCH (1,1) model to proxy terms of trade volatility because of the limitation of online available data.

The volatility in the net barter and income terms of trade is measured using their residual terms, which are assumed as a normal distribution with constant variance. To calculate volatility in the terms of trade, GARCH model is utilized by taken two steps: mean equation and variance equation. The mean equation's analysis focuses on getting the error term while the variance equation is measured by ARCH (p) process and GARCH (q) process. The amount of GARCH (p, q) in parentheses are ARCH terms which is defined to how many autoregressive lags occur in the equation and GARCH terms determine the number of moving average lags, respectively. To model volatility with a GARCH process, GARCH (1,1) is naturally used due to its simplest and most robustness volatility model. With my annual time-series data limitation, the higher-order GARCH model would not be necessary because this methodology is particularly useful for a long span of data, for example, thousands of hourly or daily data (Engle 2001).

Over a few years ago, several researchers (e.g. Wong, 2010; Jawaid and Waheed, 2011; Jawaid and Raza, 2012, Samimi et al., 2012, Awel, 2012) attempt to check the robustness of the result by applied many methods to calculate terms of trade volatility; however, all of the sensitive analysis is confirmed the robustness of the impact of volatility on economic growth. Then, there is no need to calculate volatility by many methods when the method of volatility does not alter the matters of fact.

4.3 Data description and sources

In this study, a time series data set is used consisting of annual data on Indonesia, Malaysia, the Philippines and Thailand during the 30-year period (1981-2010). GDP per capita, capital stock, and net barter terms of trade data are

downloaded from World Bank's official database meantime labor force is obtained from UNCTAD database due to an absent data during 1980s in World Bank database. Net barter terms of trade volatility, income terms of trade, and income terms of trade volatility are computed by author's calculation. Income terms of trade is calculated by net barter terms of trade*export volume index when export volume index data—defined as the ratio of the export value indexes to the corresponding unit value indexes—is also retrieved from World Bank.

The whole explanatory variables in the models are not necessary to have the expected signs as mentioned in Wong research, which expects to find the positive coefficients of capital, labor, and terms of trade meantime the expected sign of volatility in the terms of trade is negative (Wong 2004). There is huge number of author who appears to find a reverse coefficient of terms of trade with Wong's findings because coefficient of economic factors is flexible and depends on each country's characteristics (see appended details from Literature review topic in Chapter 3). The GDP per capita, the dependent variable which is on the left hand side of the equation, is the representative of the economic growth. We put the level and volatility of terms of trade as well as other variables on the right hand side as an explanatory variable. The coefficient estimate of the terms of trade should normally be positive since the more both net barter terms of trade and income terms of trade, the more increases in economic growth due to the higher levels of investment. The terms of trade at level could have negative coefficient when the magnitude of internal affairs is larger than degree of openness's one. Usual analysts expect to find the negative relationship between the terms of trade volatility and economic growth because the more fluctuated terms of trade leads to the more instability, so it will cause the low economic growth. An increase in basic inputs like labor and capital will exerted a positive influence on economic growth through production function, thus the coefficient of labor and capital should be positive. A definition of all variables is displayed in the table below.

Variables	Type / Expected signs	Description
GDP per capita (Y)	Dependent variable (+)	Average value of gross domestic product divided by total population in midyear
Labor Force (L)	Explanatory variable (+)	Actual number of employed and seeking job people, at the ages of 15 or older
Capital Stock (K)	Explanatory variable (+)	The annual value of net additions to fixed assets or total annual physical capital
Net Barter Terms of Trade (NBTT)	Explanatory variable (+)	The value of a country's exports relative to that of its imports
Net Barter Terms of Trade Volatility (VNBTT)	Explanatory variable (-)	Standard deviation of growth rate of net barter terms of trade
Income Terms of Trade (ITT)	Explanatory variable (+)	The relative purchasing power of a country's export commodity in terms of import commodity
Income Terms of Trade Volatility (VITT)	Explanatory variable (-)	Standard deviation of growth rate of income terms of trade

4.4 Methodology

The study of this paper begins with testing qualification of the time series data before analyze the model—that is, co-integration technique. An econometric analysis utilizes unit roots and co-integration method in order to studying the long run relationship between variables that contain unit roots. Most of empirical studies on the economic growth, from time-series regression, take the following steps:

4.4.1 Unit root test

Before identifying the stationarity of the variables, I investigate that time series variables are stationary by using Augmented Dickey Fuller (ADF), Phillip Perron (PP) and the KPSS unit root tests to ensure that the residuals from the regression equation are not spurious. These three standard unit root tests are applied to confirm robustness but these tests have different goals. ADF and PP tests are explored the null of a unit root meanwhile the KPSS is tested the null of stationary around a determined trend. An important difference of ADF unit root test, which uses a parametric autoregressive to estimate the ARMA structure of error, and PP unit root test, which use non-parametric corrections based on estimates of the long-run variance that ignore any serial correlations, is a capability to deal with serial correlation and heteroskedasticity in the errors. If the variables are stationary in levels under the alternative hypothesis of the ADF and PP tests and under the null hypothesis of the KPSS, I will test the second step.

Before analyzed the ADF unit root test statistics, it is necessary to determine the suitable number of lag length (ρ) by utilizing the AIC (Akaike information criterion) or the SBC (Schwarz information criterion). After compared lag length between AIC and SBC in the Augmented Dickey-Fuller test statistic, a great number of lag length in SBC is smaller than AIC's lag. The larger the lag length, the less power of the test. Then the SBC is practically picking a greater parsimonious model than AIC test. In order to avoid bias above, the author chooses SBC to determine the suitable lag length (ρ) in ADF test by the time the Newey-West estimator is automatically used to estimate the optimal lag length of PP and KPSS unit root tests.

To indicate the stationarity of all variables, graphical and correlograms analyses are the other two options to point the same conclusion. However, checking for (non) stationarity by plotting data and observing graphs is rather hard to identify whether variables have intercept and/or time trend because this analyze depends on an attitude and experiment of analyst. More broadly, the main reason that many researchers use these three ADF, PP, KPSS statistic tests instead of the other two

options is a credibility of statistic results. For further details of ADF, PP, and KPSS tests, these information is illustrated in Appendix.

4.4.2 Selection of VAR lag order

The crucial step in creating model and considering an impulse response function is to select the VAR lag order by adopted well-known lag order selection criterions, LR, FPE, AIC, SIC, and HQ. Various researchers set the suitable lag from examining Akaike information criterion (AIC) with Schwarz information criterion (SIC) by investigated the lowest value of AIC or SIC. If their results do not match, choosing SIC will be the best choice, as noted by Walter Ender (Enders 2004). In order to choose the proper lag selection criteria, I have to consider the pros and cons of each lag order selection criteria. In fact, it is necessary to trade-off between the fit and reduction of the degrees of freedom for finding the best lag length because too much lags decreases the degrees of freedom and also enhances the under-fitting to the model. For finite-order VAR model, SIC and HQ are being acknowledged that they are more appropriate criteria than AIC which is fitting for infinite lag-order model. Though considered large sample size, AIC or FPE can be misled as a consequence of the overestimation of the true lag length with positive probability after minimizing them.

Likelihood Ratio: $LR(h) = 2(logL(h) - logL(h-1))$

Final Prediction Error: $FPE = e^{\left(\frac{logL}{T}\right)}\left(\frac{T+(N/K)+1}{T+(N/K)-1}\right)^{K}$

Akaike Information Criterion: $AIC = -2\left(\frac{logL}{T}\right) + \frac{2N}{T}$

Schwartz Information Criterion: $SIC = -2\left(\frac{\log L}{T}\right) + \frac{NlogT}{T}$

Hannan-Quinn Criterion: $HQ = -2\left(\frac{\log L}{T}\right) + 2\frac{N[\ln(log\,T)]}{T}$

Where K is the amount of equations, N is the number of parameters (regressors) in the model, T is the total number of observations, $logL$ is log likelihood of the VAR, and $logL(h)$ is the value of the log likelihood with h lags.

Even though all likelihood-ratio-type tests, which are LR, FPE, AIC, SC, and HQ, have their own incomparable advantages, the author will select SIC as an optimal lag length because it tends to choose appropriate cointegration rank as well as defines the actual model asymptotically.

4.4.3 Johansen cointegration test

Investigate the existence of a long run relationship of all variables by utilizing cointegration test of the Johansen and Jeuuselius (Johansen and Juselius 1990). Johansen cointegration test statistic is the most trust worthy test and is suitable for small sample properties than other cointegration tests. One way to test a number of cointegrating vectors (or at most *r* cointegrating vectors) is to calculate two likelihood test statistics which are known as the maximum eigenvalue ($\boldsymbol{\lambda}_{\text{Trace}}$) and trace ($\boldsymbol{\lambda}_{\text{Max}}$) statistics. The two tests are constructed as:

$\boldsymbol{\lambda}_{\text{Trace}}(r) = -T \sum_{i=r+1}^{n} \ln(1-\lambda_i)$

$\boldsymbol{\lambda}_{\text{Max}}(r, r+1) = -T \ln(1-\lambda_{r+1})$

where T represents the number of usable observations (all observations minus the amount of lags length), ln represents the logarithm, and $\boldsymbol{\lambda_i}$ represents the eigenvalue. As a matter of fact, the $\boldsymbol{\lambda}_{\text{Max}}$ statistic test is equal to the $\boldsymbol{\lambda}_{\text{Trace}}$ statistic test when n- r = 1. Under the null hypothesis (H_0) of $\boldsymbol{\lambda}_{\text{Trace}}$ test statistic, the number of cointegrating vectors is less than or equal to r against the alternative of r vectors. The $\boldsymbol{\lambda}_{\text{Max}}$ statistic tests the null hypothesis that the number of cointegrating vectors is r against the alternative hypothesis (H_A) that ranks r+1cointegrating vectors. The $\boldsymbol{\lambda}_{\text{Max}}$ will be small only when the eigenvalue is close to zero. Tables of critical values of the $\boldsymbol{\lambda}_{\text{Trace}}$ and the $\boldsymbol{\lambda}_{\text{Max}}$ tests are computed by using the Monte Carlo approach.

In general, the presence of cointegrating vector in each model indicates that there is a long run equilibrium relationship among dependent variable (real GDP per capita) and independent variables (the real gross fixed capital formation, employment, terms of trade, terms of trade volatility, and dummy).

Each country has its own choice of the trend assumption as follows. For Indonesia and Malaysia, the results of the $\boldsymbol{\lambda}_{\mathbf{Max}}$ and $\boldsymbol{\lambda}_{\mathbf{Trace}}$ test statistics are

computed with restricted intercepts and no deterministic trends in VAR. All Indonesian and Malaysian series has non-zero mean and none of the variables resembles to have a trend by considered non-zero variance. For the Philippines, the results of the $\boldsymbol{\lambda_{\mathbf{Max}}}$ and $\boldsymbol{\lambda_{\mathbf{Trace}}}$ test statistics are estimated with unrestricted intercepts and linear deterministic trends in VAR because all trending series occur as stochastic trend. The mean and variance values of these two countries appear to be above zero. For Thailand, the results of the $\boldsymbol{\lambda_{\mathbf{Max}}}$ and $\boldsymbol{\lambda_{\mathbf{Trace}}}$ test statistics are reckoned with restricted intercepts and linear trends in cointegrating equations because mean and square standard error values are not zero. The evidence of some series in Thailand seems to have trend stationary.

In the cointegrating rank of a VECM model, if the result from maximum eigenvalue is opposite with trace test's result, Lüutkepohl and his co-workers suggest trace test which is more preferable than maximum eigenvalue in terms of power performance but has a failure of more largely distorted sizes (L¨UTKEPOHL, SAIKKONEN et al. 2001).

4.4.4 Vector Error Correction Model

The equations of vector error correction model (VECM) to investigate the long-run relations between the series are the following:

$$\Delta Y_t = \alpha_{01} + \alpha_{11}\sum_{i=0}^{n}\Delta Y_{t-i} + \alpha_{12}\sum_{i=0}^{n}\Delta K_{t-i} + \alpha_{13}\sum_{i=0}^{n}\Delta L_{t-i} + \alpha_{14}\sum_{i=0}^{n}\Delta TOT_{t-i} + \gamma_{01}ECT_{t-1} + \mu_{01}$$

$$\Delta K_t = \alpha_{02} + \alpha_{11}\sum_{i=0}^{n}\Delta Y_{t-i} + \alpha_{12}\sum_{i=0}^{n}\Delta K_{t-i} + \alpha_{13}\sum_{i=0}^{n}\Delta L_{t-i} + \alpha_{14}\sum_{i=0}^{n}\Delta TOT_{t-i} + \gamma_{02}ECT_{t-1} + \mu_{02}$$

$$\Delta L_t = \alpha_{03} + \alpha_{11}\sum_{i=0}^{n}\Delta Y_{t-i} + \alpha_{12}\sum_{i=0}^{n}\Delta K_{t-i} + \alpha_{13}\sum_{i=0}^{n}\Delta L_{t-i} + \alpha_{14}\sum_{i=0}^{n}\Delta TOT_{t-i} + \gamma_{03}ECT_{t-1} + \mu_{03}$$

$$\Delta TOT_t = \alpha_{04} + \alpha_{11}\sum_{i=0}^{n}\Delta Y_{t-i} + \alpha_{12}\sum_{i=0}^{n}\Delta K_{t-i} + \alpha_{13}\sum_{i=0}^{n}\Delta L_{t-i} + \alpha_{14}\sum_{i=0}^{n}\Delta TOT_{t-i} + \gamma_{04}ECT_{t-1} + \mu_{04}$$

where, the differenced operator is denoted by Δ, *n* is the number of lags, ECT_{t-1} is the lagged error correction term—the estimated residual from the cointegration regression and $\mu_{01}, \mu_{02}, \mu_{03}$, and μ_{04} is residual term which assumes to be normally distributed with zero mean and constant variance. If the coefficient of ECT_{t-1} is significant, it implies that past equilibrium errors is one factor to determine the current outcomes. The coefficient of the ECT_{t-1}, γ_{0j} $(j = 1,2,3,4)$, represents the speed of the adjustment, which represents how quickly the variables reach the stable path of equilibrium or the long-run equilibrium.

4.4.5 Impulse Response Function and Long run relationship

What is then the explanation for the fact that a long run relationship between variables is taken into consideration only when there is the presence of cointegration among series. The long run equilibrium relationship between dependent variable (real GDP per capita) and all explanatory variables (the real gross fixed capital formation, employment, terms of trade, and terms of trade volatility) can be explained by normalized cointegrating vectors and impulse response function.

An impulse response function describes the extent that the effect of a one-time transitory (or persistent) shock to the innovations on current and future values of endogenous variables. Impulse response can provide more information about the dynamic feature that the variables interact each other for a time horizon of ten periods. The purpose of using impulse response function is to use it as an additional

check of result from cointegration method. An interpretation in this thesis does not include the “own-effects” of shocks.

Comparing the pros and cons of these two methods (normalized cointegrating vectors and impulse response function), a serious problem of normalized cointegrating vector is that the relation between variables might not display in one period and then it would bring about to the wrong conclusion; meanwhile, impulse response function is more dynamic and considers a long period of time than the other one. To analyze the long-run interactions in the empirical analysis, the signs of the reaction of endogenous variables to an unexpected shock will be measured from the impulse responses functions in Figure 36 to Figure 39.

The log-linear estimated model to explore the relationship is based on the following equation: $\log(Y) = \beta_0 + \beta_1 logK + \beta_2 logL + \beta_3 TOT + D_1 + D_2 + e_t$ Note that we use TOT in two different types in this paper—first at the level-net barter terms of trade and income terms of trade, and then at volatility, which consists of the volatility in the net barter terms of trade and the volatility in the income terms of trade.

CHAPTER 5

Empirical Results and Result Discussion

Analysis in this thesis is arranged into four parts: (1) Descriptive statistics (2) The results of stationary test by ADF, PP, and KPSS tests, graphs and correlogram (3) Johansen Cointegration analysis (4) Specific country analysis. The assumptions of this chapter are based on the ideas and concept in the previous chapter.

5.1 Descriptive Statistics

As table 8 shows, the descriptive statistics on time-series variables represent economic growth and their explanatory variables of four ASEAN emerging market economies which are Indonesia, Malaysia, the Philippines, and Thailand. All variable are taken the natural logarithm form or volatility form calculated by GARCH (1,1).

Table 8 Descriptive Statistics

This table is the summary statistics of economic growth and their explanatory variables in Indonesia, Malaysia, the Philippines, and Thailand during 1981 to 2010. logY represents the natural logarithm of GDP per capita, logK represents the natural logarithm of capital stock, logL represents the labour force, logNBTT represents the natural logarithm of net barter terms of trade, logITT represents the natural logarithm of income terms of trade, VNBTT represents the volatility of net barter terms of trade calculated by GARCH (1,1) and VITT represents the volatility of income terms of trade calculated by GARCH (1,1).

Variable	Indonesia						
	logY	logK	logL	logNBTT	logITT	VNBTT	VITT
Mean	15.61158	18.75788	11.36278	4.658335	4.204478	208.2365	73.07167
Median	15.68850	18.77646	11.40768	4.611066	4.271005	217.0362	52.07206
Maximum	16.09168	21.44839	11.67863	5.204791	4.931463	417.6012	335.8144
Minimum	15.07723	16.46413	10.94661	4.194590	3.513493	0.680731	3.243000
Std. Dev.	0.305947	1.490736	0.229367	0.241533	0.444516	159.8584	88.64214
Variable	Malaysia						
	logY	logK	logL	logNBTT	logITT	VNBTT	VITT
Mean	9.623517	11.01892	9.011556	4.576465	4.000109	11.39055	66.19458
Median	9.720755	11.25560	9.039818	4.620099	4.230341	5.282962	14.89403
Maximum	10.08382	12.09956	9.390758	4.719114	5.102653	45.23359	497.2928
Minimum	9.128222	9.792779	8.539012	4.166448	2.437648	0.027543	2.565168
Std. Dev.	0.314776	0.749396	0.275270	0.140029	0.853591	14.20035	112.3673
Variable	Philippines						
	logY	logK	logL	logNBTT	logITT	VNBTT	VITT

Mean	10.75116	12.91260	10.22286	4.431097	3.689050	43.31192	73.27985
Median	10.73707	13.04765	10.24193	4.411675	3.879369	47.59525	25.02532
Maximum	11.01285	14.42948	10.56409	4.663666	4.822580	60.26459	354.7440
Minimum	10.57620	11.26635	9.820243	4.211338	1.491708	0.856958	2.085776
Std. Dev.	0.117571	1.013012	0.226716	0.129642	0.984776	14.50821	98.90912
Variable	Thailand						
	logY	logK	logL	logNBTT	logITT	VNBTT	VITT
Mean	10.62202	13.75611	10.39730	4.658335	4.204478	208.2365	73.07167
Median	10.74810	13.95158	10.39426	4.745752	4.362412	12.07227	30.22035
Maximum	11.18371	14.73153	10.58163	4.871438	5.212639	105.0838	317.2005
Minimum	9.913986	12.26821	10.09597	4.523561	2.652359	4.882471	4.877015
Std. Dev.	0.405863	0.797298	0.133282	0.120723	0.798958	25.43557	77.19738

An exception phenomenon of terms of trade in Indonesia leads the author to consider oil price as an important factor influenced both terms of trade and country's growth. Oil price is an endogenous variable of terms of trade from 1981 to 2010. logO represents the natural logarithm of oil price. The summary statistics of oil price is presented below:

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
$logO_t$	1.423904	1.363514	1.961326	1.075912	0.229003

5.2 The results of stationary test by ADF, PP, and KPSS tests, graphs and correlogram

In order to continue an analysis on time series, unit root tests are methods to examine the stationarity of time series variables. Specifically, they address the following questions: Are variables non-stationary? And is there any long run relationship between terms of trade and growth using cointegration analysis if all variables are I(1)? Firstly, we denote whether there is a presence of unit root test in the time series at level and become stationary at 1^{st} differenced in all the tests except KPSS test, which has opposite null hypothesis. Despite many methods to check stationarity, time series data remain robust in most of alternative estimates, supported by three unit root tests, graphical and correlogram analyses.

Table 9 shows the results from the ADF, PP and KPSS unit root tests, where the lag length of the ADF has been established using the Schwarz information criterion while PP's lag length and lag truncation in the KPSS procedure are automatically selected the Newey-West Bandwidth. To make sure that my findings are not fortuitous on the specification in any tests, I select the three test statistics (ADF, PP, and KPSS test) to check stationary of time-series variables even if the ADF and PP tests are not absolutely comparable with KPSS test. From this table, the result from both ADF and PP tests disclosed that variables are normally non-stationary in their level data, except that some variables are stationary either in constant case or in constant and trend case or sometimes in both cases. With these exceptions, the stationarity in level almost always happens in case of net barter terms of trade volatility. Since volatility in the $NBTT_t$ is stationary in level, the expectation of $VNBTT_t$ in the first difference should be stationary too. However, there are accidentally and surprisingly non-stationary outcome from $VNBTT_t$ in level, for instance, Malaysia's $Z(\tau_\tau)$ case and Thailand's $Z(\tau_\mu)$ and $Z(\tau_\tau)$ cases as well as in the first difference such as Malaysian's τ_τ and $Z(\tau_\tau)$ cases. Most variables will be stationary in the first-differencing level and also have a unit root, except some variables as follows. In ADF test, the log L_t of Malaysia at the first difference (with constant) is non-stationary; in the meantime, the VNBTT of Malaysia, log Y_t of

Thailand, log K_t of Thailand, and log L_t of Thailand at the first difference (with trend and constant) are non-stationary. The results of VITT of the Philippines in ADF test statistic are non-stationary at the first difference in both cases (with constant and with trend & constant). Evidence for the PP test has unexpected non-stationary in the first difference, for example, log L_t of Malaysia in both $Z(\tau_\mu)$ and $Z(\tau_\tau)$ and as well as VNBTT of Malaysia, log Y_t of Thailand, log K_t of Thailand, log L_t of Thailand and VITT of Thailand in $Z(\tau_\tau)$ case. My proposal anticipates that the volatility in the net barter and income terms of trade ($VNBTT_t$ and $VITT_t$) would be stationary in their levels; nevertheless, only my data about $VITT_t$ reveals an astonished finding which is non-stationary in level but stationary in the first difference except Indonesia's τ_μ and $Z(\tau_\mu)$ cases which are significant at level. Under the null hypothesis of KPSS test, I predict to find stationary at level in overall results with minor exception of $VNBTT_t$ case. But that $VNBTT_t$ should be stationary in first difference does not be true in the Thailand's $\hat{\eta}_\mu$ and $\hat{\eta}_\tau$ cases. About 78 percent of our KPSS' results at level are largely confirmed our prediction, but all variables except log ITT_t has some non-stationary in level experiences. Nearly four tenth results of KPSS test are exposed non-rejective stationary evidences in first difference against its alternative hypothesis. The logO_t which is an additional variable in an Indonesian extra equation is stationary in the first difference by three unit root tests; however, it is also stationary at level in KPSS test. Graphs and correlograms of the series in Table 10 shows that much of variables are non-stationary in the level but their majority of series are stationary in 1^{st} differences except some variables. The results show that the variables might have a long run relationship.

A great number of stationary tests; ADF, PP, KPSS, graphical and correlograms analysis usually provide unique and strong evidence that most variables in this thesis has a unit root at the level but stationary at their first differences. Even if some variables can not reject the null hypothesis of the existence of unit root at the 1^{st} differenced, at least one number of stationary tests is not reject its null and thus the summary of the series has become stationary after integrated of order one. Therefore, all yearly variables follow an *I(1)* processes or are integrated at order 1.

Table 9 The results of stationary test by ADF, PP, and KPSS tests

Variables	ADF test				PP test				KPSS test			
	I (0)		I (1)		I (0)		I (1)		I (0)		I (1)	
Indonesia	τ_μ	τ_τ	τ_μ	τ_τ	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$
log Y_t	-0.7270	-2.0998	-4.0504 *	-4.0462 **	-0.7312	-1.6668	-4.0833 *	-4.0503 **	0.6847 **	0.1272 ***	0.1092	0.0868
log K_t	1.4444	-1.6210	-5.7881 *	-6.2139 *	1.6752	-1.6038	5.7827 *	-6.2139 *	0.7138 **	0.1168	0.3000	0.0722
log L_t	-4.1178 *	-0.9875	-4.8973 *	-4.9717 *	-6.6903 *	0.5790	-4.8889 *	-9.7559 *	0.7029 **	0.1855 **	0.4737 **	0.3227 *
log $NBTT_t$	-2.1961	-1.6437	-3.6727 **	-4.4836 *	-2.2056	-1.3296	-4.5873 *	-7.2484 *	0.2231	0.1720 **	0.3883 ***	0.1843 **
log ITT_t	0.5412	-2.7728	-4.5397 *	-3.5435 ***	0.4174	-2.7738	-4.5177 *	-4.6311 *	0.6531 **	0.0951	0.2588	0.1436 **
$VNBTT_t$	-58.8984 *	-58.7332 *	-84.3768 *	-82.6337 *	-56.0743 *	-70.3945 *	-300.203 *	-294.788 *	0.3658 ***	0.2882 *	0.3870 ***	0.3095 *
$VITT_t$	-2.7848 ***	-2.7527	-4.9803 *	-4.9072 *	-2.9125 ***	-2.8781	-6.1799 *	-6.0637 *	0.0986	0.0793	0.1157	0.0906
log O_t	-0.7594	-1.9136	-5.7712 *	-4.9812 *	-0.6295	-1.7158	-5.7712 *	-10.5137 *	0.3585 ***	0.1796 **	0.3615 ***	0.4657 *
Malaysia	τ_μ	τ_τ	τ_μ	τ_τ	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$
log Y_t	-0.6017	-1.5913	-4.5240 *	-4.4431 *	-0.6070	-1.7455	-4.5240 *	-4.4431 *	0.6895 **	0.1120	0.0931	0.0792
log K_t	-0.6120	-1.6192	-3.6768 **	-3.6021 **	-0.6120	-1.8720	-3.6095 *	-3.5309 ***	0.6480 **	0.0959	0.0959	0.0948
log L_t	-3.2954 **	1.0453	-2.3380	-3.3393 ***	-2.4550	0.6517	-2.2959	-3.1955	0.7023 **	0.1768 **	0.4076 ***	0.1332 ***
log $NBTT_t$	-3.5948 **	-2.1097	-4.7276 *	-5.6159 *	-3.7344 *	-2.1061	-4.7099 *	-5.6159 *	0.4343 ***	0.1807 **	0.5116 **	0.0651
log ITT_t	-1.8489	-0.9335	-5.1195 *	-5.7474 *	-2.0640	-0.9335	-5.1195 *	-5.7532 *	0.6957 **	0.1691 **	0.3346	0.0887
$VNBTT_t$	-8.1827 *	-6.7656 *	-4.6345 *	-2.4972	-7.5302 *	-2.5142	-3.0392 **	-2.9026	0.5463 **	0.1675 **	0.6462 **	0.5000 *
$VITT_t$	-1.6389	-2.6963	-4.5890 *	-7.0102 *	-1.6279	-2.6931	-4.5890 *	-4.7556 *	0.4979 **	0.1656 **	0.1822	0.2118 **

Variables	ADF test				PP test				KPSS test			
	I (0)		I (1)		I (0)		I (1)		I (0)		I (1)	
Philippines	τ_μ	τ_τ	τ_μ	τ_τ	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$
log Y_t	0.6496	-1.8202	-2.9942 **	-4.8867 *	0.1478	-2.4579	-2.8359 ***	-3.5263 ***	0.5148 **	0.1939 **	0.6532 **	0.2901 *
log K_t	-2.7563 ***	-1.7162	-4.2577 *	-4.1850 **	-0.7053	-1.9282	-4.1790 *	-4.1094 **	0.6997 **	0.1434 ***	0.1438	0.1163
log L_t	-1.6852	-1.6588	-5.4600 *	-5.8249 *	-1.8999	-1.6172	-5.4607 *	-5.8585 *	0.7122 **	0.1525 **	0.2943	0.0540
log $NBTT_t$	-1.6096	-1.4976	-4.7202 *	-4.9480 *	-1.9488	-1.6444	-4.7492 *	-4.9491 *	0.1174	0.1175	0.2172	0.0610
log ITT_t	-3.0788 **	-0.5984	-3.2734 **	-4.3927 *	-2.9090 ***	-0.6840	-3.3176 **	-4.3969 *	0.6673 **	0.1606 **	0.4172 ***	0.0758
$VNBTT_t$	-4.0690 *	-4.0176 **	-7.0842 *	-6.9240 *	-3.9954 *	-3.8684 **	-10.5744 *	-10.3710 *	0.0908	0.0641	0.5000 **	0.5000 *
$VITT_t$	2.0163	1.7606 (6)	4.5933	1.1205	5.4001 (5)	-0.2521	-5.3843 *	-8.4775 *	0.5915 **	0.1841 **	0.5717 **	0.1258 ***
Thailand	τ_μ	τ_τ	τ_μ	τ_τ	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$Z(\tau_\mu)$	$Z(\tau_\tau)$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$	$\hat{\eta}_\mu$	$\hat{\eta}_\tau$
log Y_t	-1.3614	-2.0645	-3.0075 **	-3.0601	-1.2089	-1.3741	-2.9628 ***	-2.9499	0.6777 **	0.1416 ***	0.1709	0.0754
log K_t	-1.6039	-2.3975	-2.7754 ***	-2.8138	-1.4958	-1.4666	-2.6346 ***	-2.5867	0.6146 **	0.1328 ***	0.1613	0.0844
log L_t	-1.5199	-5.0625	-2.9476 ***	-2.9195	-2.8684 ***	-2.9109	-2.8961 ***	-2.9663	0.6944 **	0.1133	0.3398	0.1201 ***
log $NBTT_t$	-1.2382	-2.2003	-6.6087 *	-6.4626 *	-1.2023	-2.3141	-6.6087 *	-6.4626 *	0.6393 **	0.0987	0.1043	0.0923
log ITT_t	-1.3671	-1.0419	-4.5912 *	-4.8677 *	-1.3671	-1.1054	-4.5776 *	-4.8460 *	0.6820 **	0.1623 **	0.2191	0.0802
$VNBTT_t$	-2.6463 ***	-3.3348 ***	-6.6002 *	-6.5292 *	-2.4298	-3.2228	-10.0520 *	-14.1594 *	0.4655 **	0.1487 **	0.1203	0.0955
$VITT_t$	-0.5963	-1.8782	-3.6176 **	-3.5624 ***	-0.6412	-1.9282	-3.6083 **	-3.2242	0.5229 **	0.1605 **	0.1712	0.1333 ***

∗ Significance at the 1% level

∗∗ Significance at the 5% level

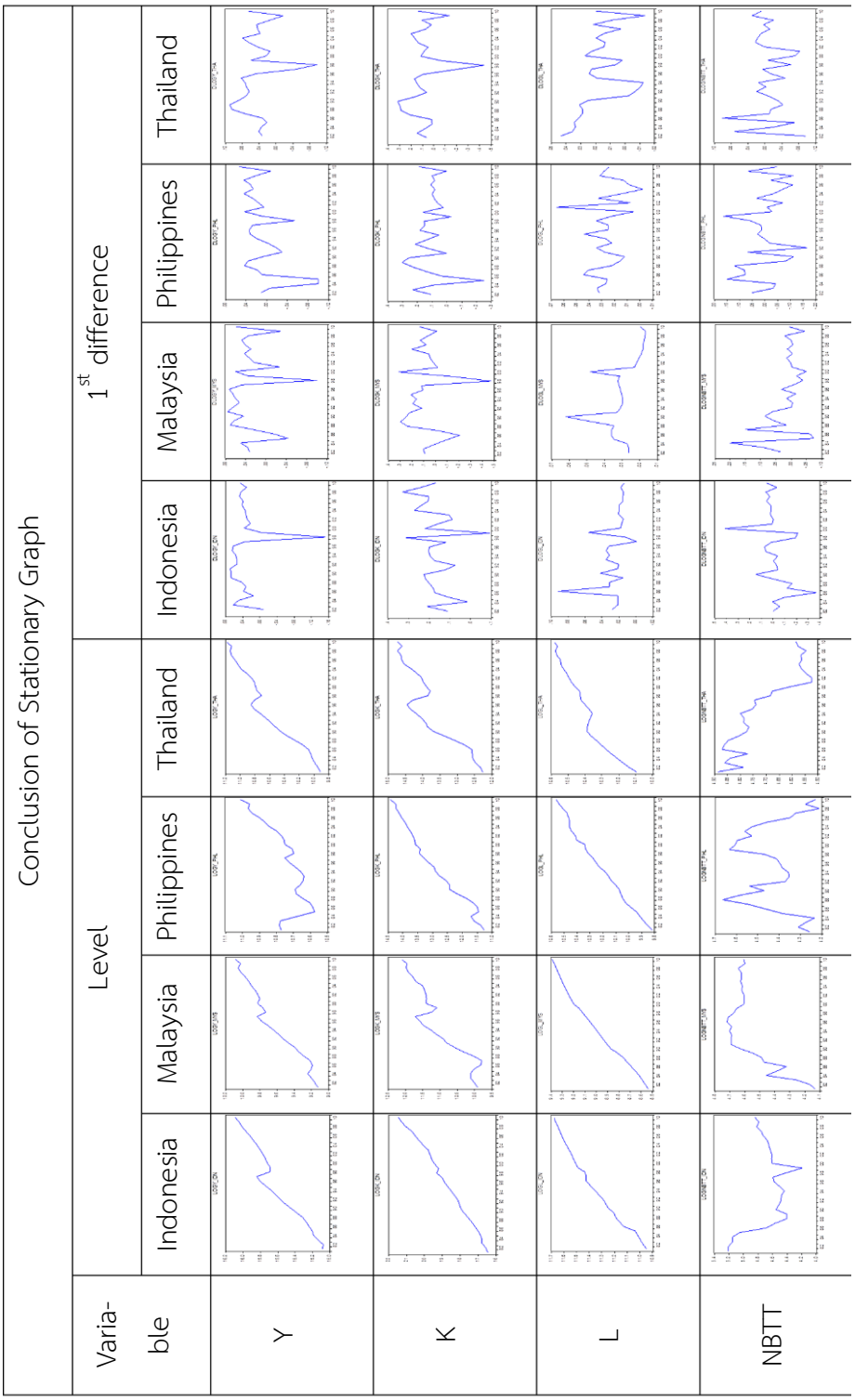
∗∗∗ Significance at the 10% level

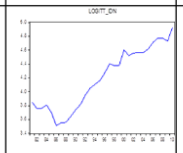
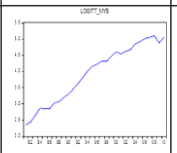
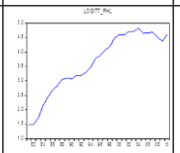
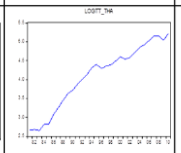
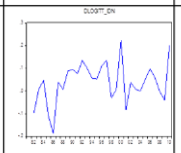
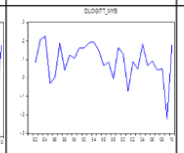
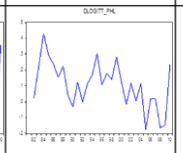
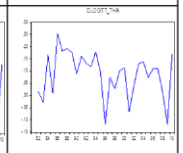
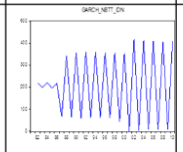
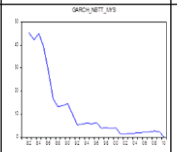
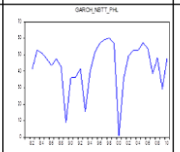
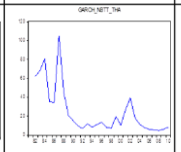
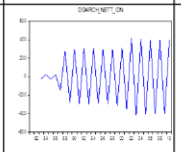
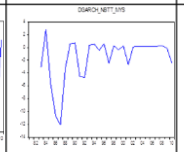
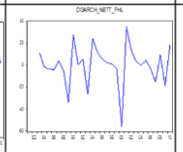
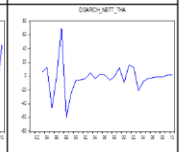
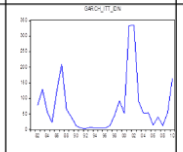
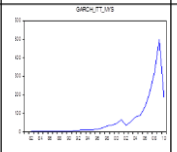
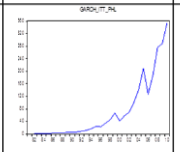
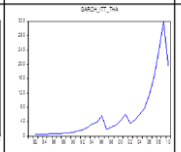
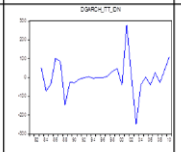
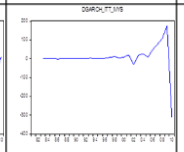
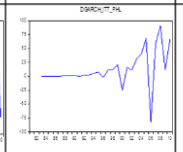
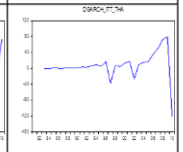
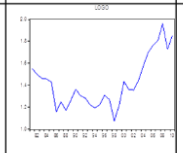
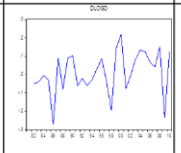
Critical	ADF: τ_μ	ADF: τ_τ	PP: $Z(\tau_\mu)$	PP: $Z(\tau_\tau)$	KPSS: $\hat{\eta}_\mu$	KPSS: $\hat{\eta}_\tau$
1 %	-3.6891	-4.3239	-3.6891	-4.3239	0.7390	0.2160
5 %	-2.9718	-3.5806	-2.9718	-3.5806	0.4630	0.1460
10 %	-2.6251	-3.2253	-2.6251	-3.2253	0.3470	0.1190

Note: The critical values for ADF and PP unit root test statistics are used the MacKinnon (1996) one-sided p-values; in the meantime, Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1) is used as the critical value for KPSS test.

Source: Author's calculation

Table 10 The results of stationary test by graphs and correlogram



Varia-ble	Level				1st difference			
	Indonesia	Malaysia	Philippines	Thailand	Indonesia	Malaysia	Philippines	Thailand
ITT								
VNBTT								
VITT								
O								

Conclusion of Correlogram Graph								
Variable	Level [logX]				1st difference [DlogX = logX-logX(-1)]			
	Indonesia	Malaysia	Philippines	Thailand	Indonesia	Malaysia	Philippines	Thailand
Y	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary
K	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Non-stationary
L	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Non-stationary	Stationary	Non-stationary
NBTT	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary
ITT	Non-stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary
VNBTT	Non-stationary	Non-stationary	Stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary
VITT	Stationary	Non-stationary	Non-stationary	Non-stationary	Stationary	Stationary	Stationary	Stationary
O	Non-stationary				Stationary			

5.3 Johansen Cointegration analysis

In order to analyze the long run equilibrium linked between real GDP per capita and its determinants (capital, labor, and terms of trade), the author utilizes Johansen Cointegration analysis which applied the maximum likelihood procedure. Johansen cointegration has two superior points over Engle and Granger cointegration, reflecting in ability in taken multiple cointegrating vectors into account and also provided a more correct ability to reject an incorrect null hypothesis (Bahmani-Oskooee 1996). Viewed through the lens of this test, we can capture the accurate long run relation.

For Model 1 to Model 4 of Indonesia-Malaysia-Philippines-Thailand, the trace and maximum eigenvalue tests of each country have a different number of vectors ranking from zero to four cointegrating vectors. Furthermore, this thesis applies a time dummy variable for capturing the ASIAN financial crisis in 1997-1998 and the global financial crisis of 2007-2009. As a result, time dummies are added for the purpose of capturing the unusual situation which takes value of one if that time is between 1997 and 1998 represented as Dummy1 and 2007-2009 represented as Dummy2 and zero otherwise. With a downturn economic activity of four ASEAN countries, the author has controlled for three years because this recent financial crisis hits its most critical stage for our economies in 2009. Table 11 reveals that the four ASEAN emerging market economies in our sample, Indonesia, Malaysia, the Philippines, and Thailand, overall VAR order of Thailand's model accompanied by Indonesia's VNBTT models and Malaysia's VNBTT model equals to 2. Four cases of the Philippines, NBTT, ITT and VITT models in Indonesia as well as Malaysia's NBTT, ITT, and VITT models have only 1 VAR lag order. At the 0.05 level, the null hypothesis will reject when the $\boldsymbol{\lambda_{\mathbf{Trace}}}$ and $\boldsymbol{\lambda_{\mathbf{Max}}}$ test statistics are bigger than critical value, otherwise accept the null. Some studies in Indonesia, the $\boldsymbol{\lambda_{\mathbf{Trace}}}$ and $\boldsymbol{\lambda_{\mathbf{Max}}}$ test statistics are one, one, two and one cointegrating vectors in case of NBTT, ITT, VNBTT and VITT model, respectively. Malaysia has somewhat of a special and extreme case in the NBTT, ITT, VNBTT and VITT model because the $\boldsymbol{\lambda_{\mathbf{Trace}}}$ and $\boldsymbol{\lambda_{\mathbf{Max}}}$ tests have three, one, three, and one number of cointegrating vectors,

respectively. In the Philippines, the $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ tests in the two net barter terms of trade level and volatility models present that both NBTT and VNBTT models have the same amount of cointegrating vectors at one. From the Philippines' ITT model, there is only two cointegrating vectors in the $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ tests while two likelihood test statistics known as the $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ statistics in VITT model have one and two cointegrating vectors. A similar, but not even number of cointegrating vectors, pattern appears in four countries included Thailand. For Thailand, an identical amount of cointegrating vectors in $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ tests found in two models, two likelihood test statistics suggest that the cointegrating vectors of ITT model equal to two but NBTT and VNBTT models have exhibited in two and three cointegrating vectors in the $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ tests. However, the amount of cointegrating vectors in the $\lambda_{\mathbf{Trace}}$ and $\lambda_{\mathbf{Max}}$ test statistics in VITT model are three. As can be seen from the Philippine's ITT and the Philippine's VNBTT models, the sign (*) which is shown the rejection of null have exhibited in one, two and four (ITT case) as well as one, three, and four in $\lambda_{\mathbf{Trace}}$ tests and one and four in $\lambda_{\mathbf{Max}}$ tests (VNBTT case) number of cointegrating vectors. These signs (*) in $\lambda_{\mathbf{Max}}$ tests of four (in ITT) and four (in VNBTT) cointegrating vectors as well as the sign (*) in $\lambda_{\mathbf{Trace}}$ test of three and four (in VNBTT) cointegrating vector do not take into a consideration of measuring the optimal number of cointegrating vectors as a result of insignificant in its previous rankings. Hence, an amount of cointegrating vectors in the Philippine ITT and the Philippine VNBTT model will depend on cointegrating vector in $\lambda_{\mathbf{Trace}}$ tests.

Under a number of four models in these ASEAN countries, the $\lambda_{\mathbf{Max}}$ and $\lambda_{\mathbf{Trace}}$ statistic tests at the 95% critical levels can reject the null hypothesis of r=0 against the alternative of r=1 because there are one to three cointegrating vectors for the overall sample, so we summarizes that there are cointegrating vectors for every models. At least one cointegration relationship would then denote the long run relationship between two types of terms of trade (their volatilities) and economic growth.

We should adopt the VECM, which is a restricted VAR, in the next step because all variables are stationary and cointegrated in the same level while we impede the use of a VAR, whenever parameters would not be cointegrated. However, VECM is technique which does not provide the impulse response standard errors in the results. Due to a lack of standard errors in the interpretation, it might be a weak point for variable's significance and reduces the credibility of results.

Table 11 Johansen Cointegration analysis

Model		λ_{Trace} test statistic				λ_{Max} test statistic			
H_0	No. of cointegrating vectors	r = 0	r ≤ 1	r ≤ 2	r ≤ 3	r = 0	r ≤ 1	r ≤ 2	r ≤ 3
H_A		r ≥ 1	r ≥ 2	r ≥ 3	r ≥ 4	r ≥ 1	r ≥ 2	r ≥ 3	r ≥ 4
Indonesia	**VAR order**								
NBTT	1	77.82517 *	30.49440	8.857619	3.784606	47.33077 *	21.63678	5.073013	3.784606
ITT	1	79.07027 *	31.40602	11.78112	4.150198	47.66425 *	19.62491	7.630918	4.150198
VNBTT	2	93.12337 *	53.12672 *	14.83609	2.456620	39.99664 *	38.29063 *	12.37947	2.456620
VITT	1	77.31244 *	35.30339	9.685016	2.302113	42.00905 *	25.61837	7.382903	2.302113
5% Critical Value		63.87610	42.91525	25.87211	12.51798	32.11832	25.82321	19.38704	12.51798
Malaysia	**VAR order**								
NBTT	1	87.82860 *	50.27038 *	23.69142 *	3.999924	37.55821 *	26.57896 *	19.69150 *	3.999924
ITT	1	56.55070 *	27.92044	14.23671	1.512515	28.63026 *	13.68373	12.72419	1.512515
VNBTT	2	123.2934 *	68.16604 *	24.49729 *	1.310856	55.12739 *	43.66876 *	23.18643 *	1.310856
VITT	1	54.20532 *	23.76718	7.213218	3.493886	30.43814 *	16.55396	3.719332	3.493886
5% Critical Value		54.07904	35.19275	20.26184	9.164546	28.58808	22.29962	15.89210	9.164546

Model		λ_{Trace} test statistic				λ_{Max} test statistic			
H_0	No. of cointegrating	r = 0	r ≤ 1	r ≤ 2	r ≤ 3	r = 0	r ≤ 1	r ≤ 2	r ≤ 3
H_A	vectors	r ≥ 1	r ≥ 2	r ≥ 3	r ≥ 4	r ≥ 1	r ≥ 2	r ≥ 3	r ≥ 4
Philippines	**VAR order**								
NBTT	1	52.60865 *	23.69280	6.652345	0.081226	28.91585 *	17.04046	6.571119	0.081226
ITT	1	63.55593 *	33.03550 *	10.71652	3.927321 *	30.52043 *	22.31898 *	6.789203	3.927321 *
VNBTT	1	58.57508 *	29.22524	15.61565 *	4.401471 *	29.34984 *	13.60959	11.21418	4.401471 *
VITT	1	62.79913 *	27.08762	5.561679	0.049847	35.71151 *	21.52594 *	5.511832	0.049847
5% Critical Value		47.85613	29.79707	15.49471	3.841466	27.58434	21.13162	14.26460	3.841466
Thailand	**VAR order**								
NBTT	2	111.0226 *	58.04187 *	24.58770	1.697317	52.98076 *	33.45417 *	22.89039 *	1.697317
ITT	2	97.54858 *	49.05348 *	20.97105	1.752595	48.49510 *	28.08242 *	19.21846	1.752595
VNBTT	2	97.84657 *	54.56786 *	25.12285	3.611180	43.27871 *	29.44501 *	21.51167 *	3.61180
VITT	2	114.2081 *	57.86332 *	29.30029 *	6.409806	56.34483 *	28.56303 *	22.89049 *	6.409806
5% Critical Value		63.84657	42.91525	25.87211	12.51798	32.11832	25.82321	19.38704	12.51798

Note: The order of the VARs was selected by the most repetitious lags in 5 criterions. To determine the appropriate lag length when there are two maximum lag, the choice of optimal lag will be the lower one. * denotes rejection of the hypothesis at the 5 percent significance level, based on the MacKinnon-Haug-Michelis (1999) p-values.

Source: Author estimates model by using EViews 7.2

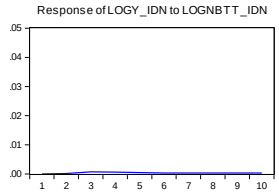
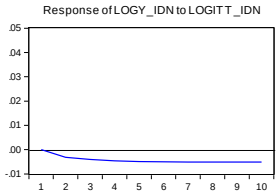
5.4 Specific country analysis

The results presented in each figure (Figure 31 to Figure 34) from panel A to panel D indicate that there are mixed sign evidence in two variables: capital (K) and labor (L) because both variables are the main components of every models. Hence, the most relationship happened in the same variable becomes a conclusion. For the sign of four terms of trade types, the relation of terms of trade to economic growth in each model has its unique answer (Figure 22, 25, 27, and 29). The VECM impulse response in this empirical study can not describe the standard deviation (S.D.), so a lack of S.D. in the interpretation in VECM result is a drawback.

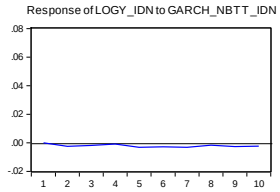
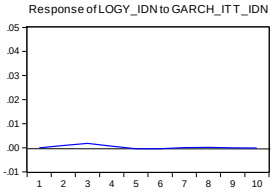
5.4.1 Indonesia

With only one exception from other ASEAN emerging market economies—notably in every Indonesian graph—their models will consider oil price as an additional exogenous variable. In figure 31[4] panel A, the impact of net barter terms of trade on GDP per capita growth rate, capital, labor and its own response is presented. On the panel B, the impacts of one S.D. innovation of income terms of trade are illuminated the response of every variable. Following an innovation in the volatility of net barter and income terms of trade in panel C and D, four responses are shown.

Figure 22 Graphs of VECM impulse response function of four types of terms of trade shocks on growth illuminated the response to Cholesky One S.D. Innovations in case of Indonesia

Panel A: Indonesian NBTT model	Panel B: Indonesian ITT model
	
Panel C: Indonesian NBTT volatility	Panel D: Indonesian ITT volatility

[4] Figure 31 is shown in Appendix.

model	model
	

Indonesian impulse response analysis and discusssion

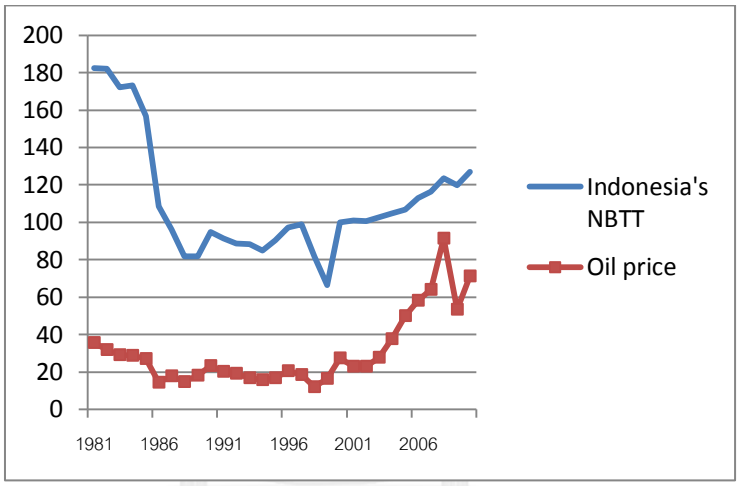
The graphs of Indonesian four models present the impulses for any shocks on the responses of economic growth considering an oil price as an additional exogenous variable. As it is shown, capital and labor shocks appear to have positive effect on economic growth in all Indonesian models (Figure 31)—that is, capital and labor shocks have encouraged the role of economic growth in a long run—which can support a fact finding exhibited in Chapter 2.

A general long run connection between terms of trade shocks and reaction of economic growth is that when the levels of net barter and income terms of trade go up, the economic performance should be increased. Furthermore, an improvement in net barter and income terms of trade volatility normally causes deterioration in national growth; however, there is a possibility that the responses of domestic growth from two types of terms of trade level and volatility shocks can turn out to not support the hypothesis, particularly true in Indonesia. Note that an importance of terms of trade in each nation might rely on the size of internal and external economic activities that principally encourage the role of economic growth.

Figure 22 shows the impulse response of terms of trade shocks on real economic potential of Indonesian economy, with mostly no responsive and one negative reaction country's growth. Indonesian three forth of terms of trade have no impact on real GDP growth because international trade in this country might not be the main driver of its economy (see further details in Chapter 2). For Indonesia which is an oil exporting country, oil price will bring about a deteriorate in its net barter terms of trade whenever the price of crude oil in the world market goes down (see

Figure 23). Compared the decline of two variables, the graphs of net barter terms of trade and oil price had fallen constantly and hits the lowest in 1998 by having -55% and -66%, respectively. Even if these two variables go down during 1981-1998, the domestic income per capita seems to enlarge unceasingly since 1980s, except deterioration in 1998 (Figure 12 in Chapter 2). Then, Indonesian net barter terms of trade have no effect on real domestic growth due to internal consumption pressure and heavily deteriorated oil price since 1981.

Figure 23 Trend of Indonesia's net barter terms of trade with oil price during 1981-2010

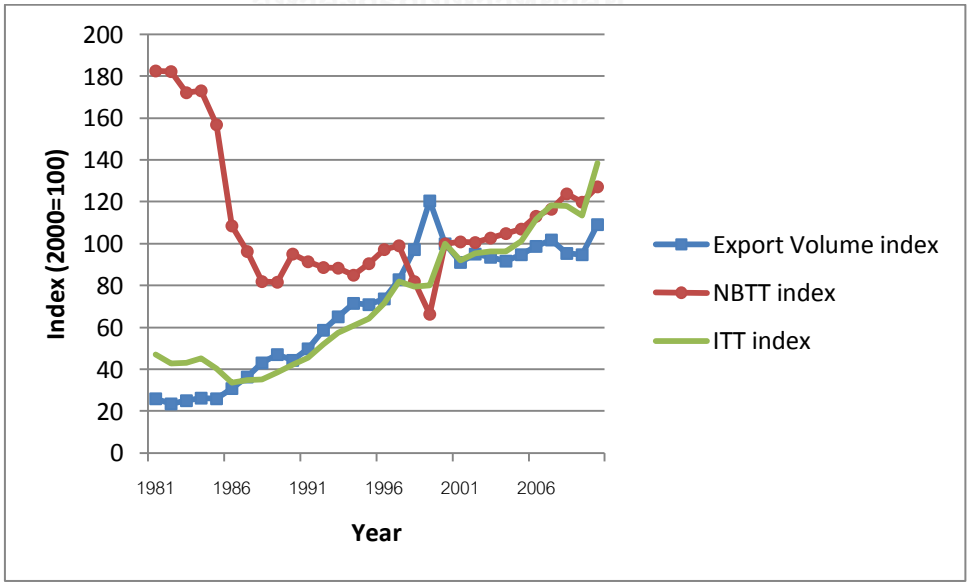


The fact findings in Indonesian case could be against traditional hypothesis which displays in my thesis result and confirms by many researches, for instance, Basri and Patunru (2012) and IMF report (2014). Indonesia, which is broadly well-known as economy relied deeply on its internal market as well as proceeded inward looking strategy, could avoid a huge impact of international trade from the global financial crisis. Many countries, where depend less on external demand and emphasize on domestic demand, could survive from foreign crisis shocks and be a good example of self-dependent national economy that does not have an export-led growth strategy like others (Basri and Patunru 2012). To confirm my fact findings by IMF report, economic growth of six emerging market economies (China, Indonesia, the Philippines, Poland, South Africa, and Turkey) has obviously discouraged by terms of trade. This report gives the reasons that the terms of trade and an enhancement

in global demand might have opposite movements. The other reason is that a linkage between supply shocks and economic performance do not always go to the same direction (IMF, April 2014).

The severe oil price decreases of the early 1980's with approximately 70 percent of fuel export in total export quantity leads to summarize the ideas that, intense deterioration in the income terms of trade seem to have opposite direction with a gradual augmentation in its economic growth which is different from hypothesis. Income terms of trade, which consider relative prices and export volume, can change even if either its net barter terms of trade or export volume index have no change. The downward trend of income terms of trade occurs because the magnitude of increasing export volume, which fuel exports contains 70 percent of overall export quantity (Table 4 in Chapter 2), is smaller than the decreasing net barter terms of trade from 1981-1986 (Figure 24). To be more specific, a violently progressing drop in oil price during 1980s-1990s come along with high proportion of fuel in overall exports seems to be factors which lead Indonesian's income terms of trade trend to weaken, hence a deteriorate in income terms of trade from changed total exports affects Indonesian economy.

Figure 24 Indonesian income terms of trade

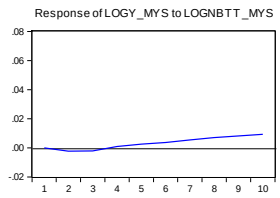
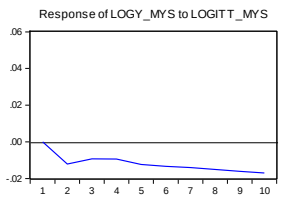


Two terms of trade instability shocks do not seem to stimulate Indonesia's growth. As discussed above, domestic growth in Indonesia might depend upon domestic variable such as consumption instead of neither net barter terms of trade nor two types of terms of trade volatilities, then it could turn out to be no economic performance's response from these terms of trade volatility shocks.

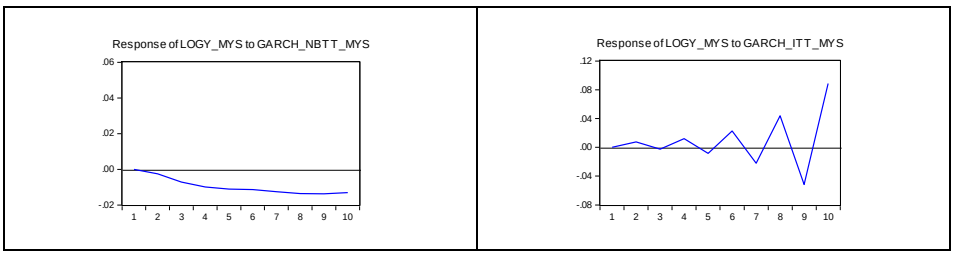
5.4.2 Malaysia

At the beginning of an interpretation of net barter terms of trade model, the effects of all variables on potential growth shown in figure 32[5] panel A are considered. Next, the panel B's figure which is taken income terms of trade as an innovation finds that there are responses of other series and its own. Regarding to panel C figure, the impacts observed for an innovation in net barter terms of trade volatility to all variables are dissimilar. In the figure on panel D, the responses of economic status, capital and labor to an innovation in the income terms of trade volatility are always above zero.

Figure 25 Graphs of VECM impulse response function of four types of terms of trade shocks on growth illuminated the response to Cholesky One S.D. Innovations in case of Malaysia

Panel A: Malaysian NBTT model	Panel B: Malaysian ITT model
	
Panel C: Malaysian NBTT volatility model	Panel D: Malaysian ITT volatility model

[5] Figure 32 is shown in Appendix.



Malaysian impulse response analysis and discusssion

The predictions that ascendant capital and labor have been triggered to support economic activity are confirmed by Malaysian results which is the same as hypothesis (Figure 32). Due to Malaysia's result in these three decades, the expected positive association between capital and income growth is revealed in every model, but nearly no response in Panel D. In general, the literature reviews specify that labor is positively associated with the GDP per capita growth. Labor in Malaysian four models indicates a positive sign along ten horizons, aside from no response to its real domestic growth in Panel C which is VNBTT model.

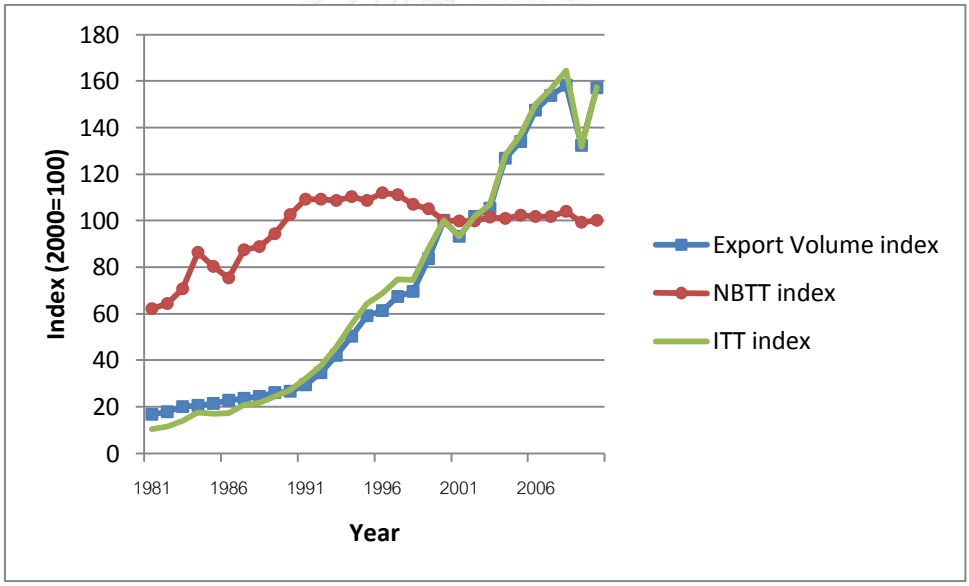
Figure 25 displays Malaysian income growth reaction after received terms of trade shocks, including both supportive evidences—which are the level and volatility of the net barter terms of trade—and against common assumptions for the rest of empirical results. The overall trend of net barter terms of trade has positive sign only for no response in the first two periods while the potential activity trends from the volatility of the net barter terms of trade shock has negative sign. Surprising result has shown up in the level of income terms of trade which have negative impact on economic growth and in the volatility of income terms of trade which has revealed a swing up and down effect in every period.

As expected, the level and volatility of net barter terms of trade will improve and disrupt the economy's growth, respectively. Like the traditional hypothesis, Malaysian net barter terms of trade and real GDP per capita growth are positively correlated, which insists the influence of this shock on its own economic activity, because an international trade is main macroeconomic variables influenced country growth rather than its own economic activity (see an additional details in Chapter 2).

For the higher variability of the net barter terms of trade in this country, the growth rate is projected to fall confirmed an opposite relation's assumption reported in many previous researches. Wong (2004) who also explored Malaysia from 1965 to 2002 finds that an upswing in net barter terms of trade and income terms of trade has enhanced GDP per head. My result could support the fact finding of previous researcher.

My finding in income terms of trade is contradictory with Wong's evidence; the result shows that, income terms of trade does not help spur output per capita within Malaysia, which actually blocks an encouragement in output growth (Figure 26). This thesis's finding is contradict with a common theory because an increased pace of income terms of trade should activate economic activity.

Figure 26 Malaysian income terms of trade

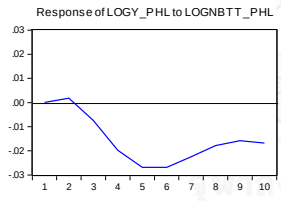
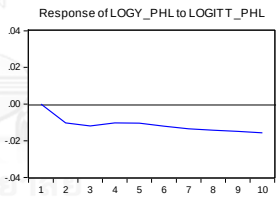
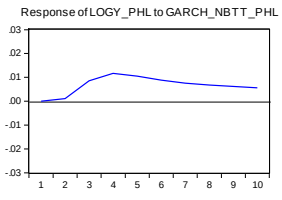
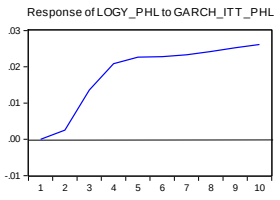


Growth in Malaysia is not supported by income terms of trade volatility since income terms of trade volatility has an unidentified effect on country's growth against an original assumption about an adverse effect on the growth rate. This pendulous response might result in an unpredictable outcome for its domestic economy that can support or hinder growth, but their results could be summarized as no response of growth from this shock.

5.4.3 The Philippines

As for the figure 33[6] on panel A, it is displayed the action of various variables for a one standard error shock from the net barter terms of trade. An impulse response of other series to income terms of trade shocks are shown in the figure of panel B. As in the case of an innovation in net barter terms of trade volatility, the figures on panel C show the effect from an innovation to all variables. The panel D figures display the original response of four variables to a unit shock in income terms of trade volatility. A supplementary time dummy variable will be added to catch an intensely internal crisis in the Philippines during 1983-1986 as an exogenous variable since real GDP per head has declined in this period.

Figure 27 Graphs of VECM impulse response function of four types of terms of trade shocks on growth illuminated the response to Cholesky One S.D. Innovations in case of the Philippines

Panel A: Philippines' NBTT model	Panel B: Philippines' ITT model
	
Panel C: Philippines' NBTT volatility model	Panel D: Philippines' ITT volatility model
	

[6] Figure 33 is shown in Appendix.

The Philippines' impulse response analysis and discusssion

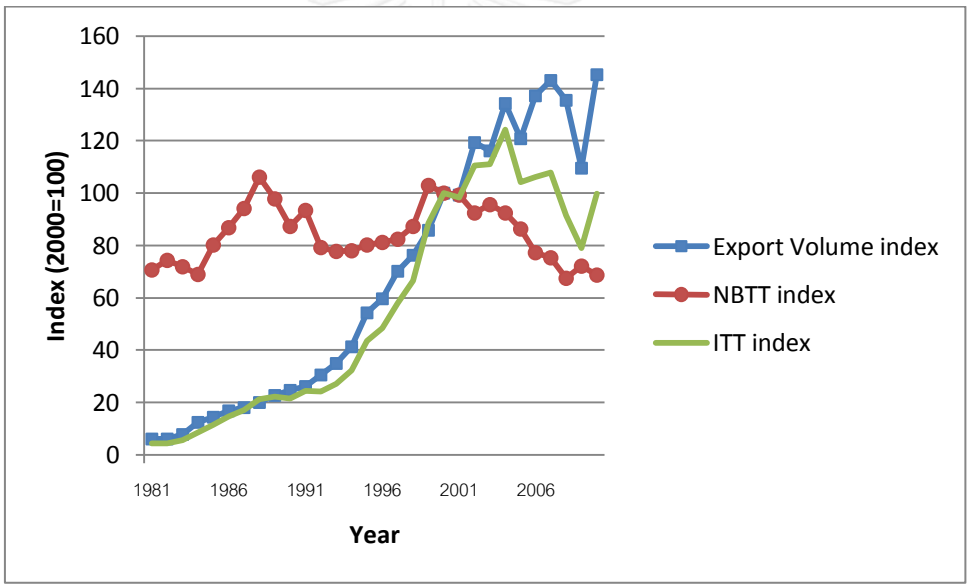
All the Philippines' graphs studied correlation of four types of terms of trade on economic performance attribute an internal crisis during 1983-86 as a supplementary time dummy in these econometric models. A reverse sign from my assumption in capital happens in every model since an increase in the Philippines' capital leads to a decrease in real GDP per capita (Chapter 2 Figure 13). All graphs of domestic growth responses to capital shocks are negative because the Philippines took longer period of time to recover real GDP per capita than to capital stock after crisis years of 1983-1985 (Figure 33). Labor in all models has a positive sign which is the same as standard assumption, except labor in NBTT model which has positive sign for the first five years before becoming unexpected negative sign for the rest and labor in ITT model with no response.

In a number of economies, including the Philippines, an opposite sign of output growth after received four types of terms of trade shocks has happened against a common assumption on the ground of many unique characteristic affected on economic potential (Figure 27). To put the emphasis of negative impact from net barter and income terms of trade which are shocks into aspect, both responses in domestic GDP per capita growth have be impeded by two innovations in the terms of trade. Exact opposite results happen again in net barter and income terms of trade volatility along the whole ten periods according to the implicitly positive sign.

Although elevated net barter terms of trade will push economic activity up in accord with common hypothesis, the long run relationship between these two variables does not seem to have aligned direction by the following reason. The internal outlays like consumption rate could be a leading economic indicator improving country's activity (see further details in Chapter 2). This uncommon negative relationship between terms of trade and this country's economic performance has also reported in IMF report April 2014—look for further detail in Indonesian impulse response analysis and discussion topic.

The fact of the Philippines' income terms of trade value that its value calculated by the net barter terms of trade—which almost always stays below 100 implied that the average price of imports is higher than export value per unit—and export volume index can be relied on the magnitude of these two indices. One possible explanation for the decline in income terms of trade in the Philippines is that the influence of lower net barter terms of trade is larger than of export volume index, in particular during 2004-2009 (Figure 28). Although income terms of trade has raised continuously year-by-year as a consequence of expansion in exports, it begins to decline by about 46 (dip to 78.9 in 2009 from about 124.2 in 2004), which will lead to contrary association with boosted real economic growth overtime.

Figure 28 The Philippines' income terms of trade

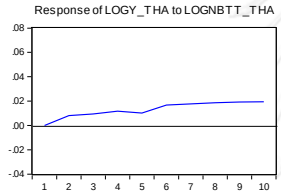
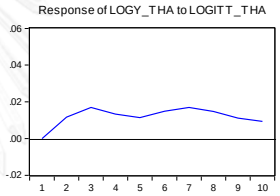
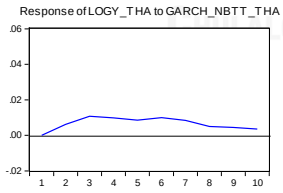
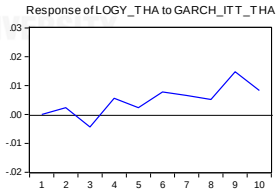


An increase in income growth could be identified as upswings in net barter and income terms of trade uncertainty which opposes traditional assumption. The Philippines' research results find the same positive relationship between terms of trade instability and the nation's level of growth with Jawiad and Waheed (2011) research. These two researchers, who studied sample of 94 core and periphery countries including the Philippines and Thailand, discover that higher terms of trade volatility can accelerate economic potential.

5.4.4 Thailand

Taken into consideration, the shocks of net barter terms of trade are presented in panel A in figure 34[7]. Shocks to one of the endogenous variables (GDP per capita growth, capital and labor) have visualized each variable's response (see panel B figures). The net barter terms of trade volatility shocks, which graphs are shown in panel C, exhibit an individual response of each variable. As can be seen in panel D figures, all response of various variables are positive in the first two phases.

Figure 29 Graphs of VECM impulse response function of four types of terms of trade shocks on growth illuminated the response to Cholesky One S.D. Innovations in case of Thailand

Panel A: Thailand's NBTT model	Panel B: Thailand's ITT model
	
Panel C: Thailand's NBTT volatility model	Panel D: Thailand's ITT volatility model
	

Thailand's impulse response analysis and discusssion

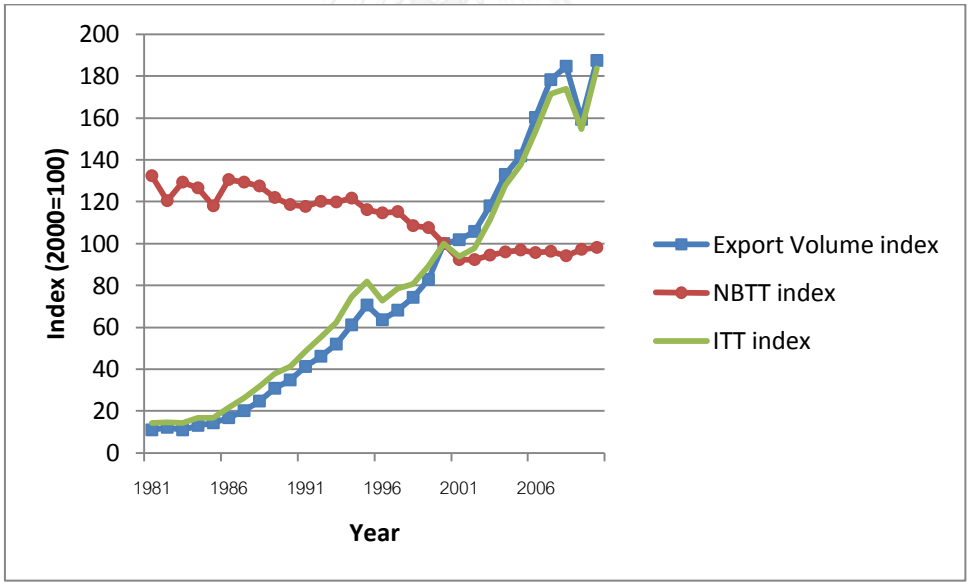
The results of responses of income growth to one standard deviation shock of four types of terms of trade are exhibited in Figure 29. The effect of level of net barter and income terms of trade on economic growth is positive—which is

[7] Figure 34 is shown in Appendix.

harmonized with ordinary hypothesis—since an improvement in net barter and income terms of trade will bring a rise in real income growth for the entire time span. Conversely, the net barter and income terms of trade volatility are likely to have an unexpected positive relation with output growth—that can be described by the following alternative assumption.

An improvement in net barter terms of trade stirs up Thailand's economic growth (see more details in Chapter 2). The rising income terms of trade is increasing Thailand's growth by reasons below. An ongoing extension in income terms of trade—about 9.5 percent growth rate each year—will boost real GDP per capita growth (Figure 30) in consequence of greater magnitude in unstoppable escalated quantity of exports than the quiescently downward shock of net barter terms of trade.

Figure 30 Thailand's income terms of trade



On the contrary, net barter and income terms of trade volatility enhances economic growth–notably unexpected positive relationships and disagreeable solutions with main hypothesis. Even if ordinary empirical evidences found negative linked between terms of trade volatility and growth, Thailand's result has the same

sign as the Philippines's one which match the empirical result of Jawaid and Waheed (2011).

CHAPTER 6

Conclusions and Policy Implication

6.1 Conclusion

This study began by presenting that an importance of terms of trade on ASEAN emerging market economies' economic potentials differs with respect to each country's characteristic as an introduction. The broad summary of empirical section documented a positive/ a negative/ an irresponsive relationship between four types of terms of trade and domestic activity in four ASEAN nations without any deep explanation. The interpreting causes and effects of such surprises and ordinary signs in the previous section are presented in this section with many details behind the results—arranged as net barter terms of trade, income terms of trade, net barter terms of trade volatility, and income terms of trade volatility. Together, similar and/or different characteristics in the case studies will be mentioned. Lastly, it is worth noting that the response of potential growth for terms of trade shocks in each country has been presented in a rough summary.

In an era of globalization, economic wealth depends heavily on value and volume of exports and imports—this is likely to hold true for most advance and developing countries and also for some of acutely export-dependent ASEAN emerging market economies. An improve in terms of trade might not always lead to an enhancement in domestic real GDP growth, implying that general assumption on terms of trade cannot be an exact solution for all countries such as ASEAN emerging market economies' results. My empirical evidence, especially in net barter terms of trade of Indonesia and of the Philippines that does not follow orthodox assumption, could be verified by IMF report that quoted in last chapter. Some acceleration of ASEAN countries' growth in the past three decades might have received an influence from internal factors , like domestic consumption, or other economic indicators and move to an opposite direction with shock from the level and volatility in the terms of trade. An uncertainty in terms of trade does not only tend to weaken economic

performance but could be further strengthened growth, as evidenced by this thesis for more than half of the countries in the sample.

Expected and unexpected directions of domestic growth rate associated with terms of trade shocks are shown as follows. All ASEAN emerging market economies in the sample demonstrate numerically positive or negative relations between domestic growth and terms of trade (it volatility), whereas for irresponsive three types of Indonesian terms of trade exceptions (the level and volatility in the net barter terms of trade and volatility in the income barter terms of trade). For net barter terms of trade and its volatility in Malaysia as well as both net barter and income terms of trade in Thailand, terms of trade correlation with country's growth has shown positive signs for level and negative signs for volatility. In contrast, Indonesia's and Malaysia's income terms of trade as well as two types of terms of trade in the Philippines are negative correlated with its domestic GDP growth while income terms of trade volatility in Malaysia is unpredictable. With a few exceptions—notably in the Philippines' and Thailand's net barter and income terms of trade volatility—a surprising outcome volatility have positive impact on its economy. Following the traditional assumption, most of the economies enjoyed an improvement in the level of net barter and income terms of trade since they have normally led higher economic growth. A vicious instability in both net barter and income terms of trade, on the other hand, may encourage or undermine economic performance, since national characteristics are different across country, thereby the results in this thesis might be against a normal assumption—that is an opposite linkages between volatility and growth.

Net barter terms of trade which reflects country's competitiveness and economic status in the international markets might have either strong (positive linkage) or weak (negative linkage) influence on country's real GDP per capita growth rate depended on each country's characteristics—the related signs of commodity terms of trade and GDP per head growth are absorbed mainly through degree of openness or national consumption. ASEAN countries' low dependency on foreign trade, especially Indonesia and the Philippines, do not have similar characters to

those countries with high external dependence. The economic growth of Indonesia which is emphasized on its domestic consumption would not have been received any shocks from net barter terms of trade or might be faced small influence. Even for the Philippines in which has depended on its domestic consumption for two third of studied time horizon , except periods started from the 1996 until 2007, presents that whenever net barter terms of trade reduces, national real GDP growth will be enlarged. Rather, a dissimilar attribute (Indonesia and the Philippines) is the relatively long experience of domestic affairs driven income growth which the Philippines' experience of driven growth by international trade for 12 years has more than Indonesian one with few years. This difference might leads these two nations to have opposite sign in income terms of trade and their volatility in both terms of trade which is discussed below. Within this broader picture of linkage between net barter terms of trade and growth, countries in which growth was led by international trade should present more accurate growth responses from terms of trade shocks. The role of domestic exports and imports could be a determinant of increasing net barter terms of trade and domestic ASEAN countries' growth, particularly true for a number of countries with high degree of openness (Malaysia along thirty years and Thailand since 1988), suggesting that an augmentation of net barter terms of trade in these two nations is likely to be a factor to boosting domestic growth instead of consumption within countries.

Furthermore, income terms of trade, as claimed to be more essential than the net barter terms of trade type, explain about the relative purchasing power of country's export goods in terms of import goods, so these two types may not give the same effect on country's growth. Another supporting detail of an income terms of trade's importance is that it could capture the effect of price change and quantity of international commodity trade at the same moment. The paper's main finding is that there are economic factors for any ASEAN emerging market country to affect income terms of trade linkages with economic performance—time and magnitude of net barter terms of trade and export quantity. Countries with low size of net barter terms of trade and/or weak export quantity occurred in some period of time lead to

a deterioration in income terms of trade while income per capita have remained expand (for example, Indonesia and the Philippines). In addition, oil price in Indonesia is a special variable impact the association of income terms of trade and output growth. The mixture of various variables could determine the associated direction of the level of income terms of trade and potential growth. A contrary direction between income terms of trade and growth happen in Malaysian result At the same time, income terms of trade in Thailand and economic activity remained increase as time passes which has straighten direction as expected.

The author could notice some similar and dissimilar characteristics of four ASEAN countries about linkage between terms of trade instability and potential growth, then combine all empirical results and describe the criterion for judging direction of their relations thoroughly. Two types of terms of trade volatility are illustrated different viewpoints in international trade's variability. Volatility in the net barter and income terms of trade measured by GARCH is regularly less than the level in terms of trade aside from Indonesia case and during the Global financial crisis, however, this volatility calculates without realizing direction. In practice, it is reasonable to assume that whenever raising the volatility of terms of trade could expand or discourage economic growth depended on countries' characteristic at that time. The procedure that the author used in considered the sign of terms of trade volatility impact on income growth is to (1) compare time and magnitude of nation's share of consumption demand with the sum of exports and imports to GDP (2) the degree of economic globalization. A necessary condition to analyze the linkage of terms of trade instability with growth is the long period of time that has a large amount of strengthened international openness compared to internal expenditure. This suggests that country which has emphasized on international openness for a decade may have high opportunity to face positive connection between potential growth and terms of trade volatility, for example, Malaysia, the Philippines, and Thailand. If the country's growth depends on external trade less than 10 year, it might not be necessary to consider a second step and could summarize that domestic performance in Indonesia is not based on terms of trade uncertainty,

particularly in Indonesia. A second condition is how much the countries globalize at the beginning and the end of sample period. When the degree of trade and financial liberalizations is low from the start and accelerate significantly, country's high uncertainty in the terms of trade may raise GDP growth which is illustrated in the Philippines and Thailand. Conversely, slightly improved trade liberalization during the time passes probably have led the misaligned direction between terms of trade and output growth which is manifested in Malaysian results. Boost growth potential by enhancing terms of trade variability is not illustrated in Indonesia due to a great influence of country's consumption on its growth in most of sample period, even though there is an enlargement of economic globalization (nearly double its value like the Philippines and Thailand cases). Despite most evidences of volatility in ordinary researches are shown a reverse linked of volatility and growth, declining net barter and income terms of trade volatility in Malaysia—only one in four emerging markets—which has been related with greater degree of globalization along 30 years will lead to more magnification and irresponsive in the GDP growth, respectively. In the Philippines and Thailand, an ongoing enhancement in economic globalization probably lead terms of trade volatility to have positive relationship with growth only when these country's GDP are dependent dramatically on foreign trade for a long time, for example, Thailand since 1988 and the Philippines during 1980s-mid of 1990s and during 2008-2010. Also note that the Philippines' and Thailand's economic globalization are double from 30% to 62%, whereas these two countries' magnitude of international trade higher than domestic demand at least a decade may be the important part in determining positive potential growth connection with respect to terms of trade instability.

The unique results could be attributable to a variety of individual characteristics in each nation; therefore, it does not matter that we can not find the same conclusion in 4 ASEAN countries. Some economy-specific differences appear in this study: for example, economies depended largely on its domestic consumption (for instance, Indonesia) show no relationship between terms of trade and its volatility on country's growth except negative impact from income terms of trade

because of domestic affairs propelled country's activity. In Malaysia, exports and imports drive stronger economy growth along the whole thirty years, so terms of trade and its volatility will be a critical source of enlarged economy with a half of unorthodox results. As for Thailand's results, the level and variability of the terms of trade has been triggered to assist Thailand's economic status, implying that further accelerated terms of trade and its volatility is needed for approaching more economically developed country. The Philippines has gained profit from higher variability in the terms of trade, but this country should provide massive stimulus to support net barter and income terms of trade for becoming positive because none of these terms of trade follows general assumption of positive (negative) sign in case of terms of trade (its volatility).

Both net barter terms of trade and income terms of trade could be critical variables affected economic status, but they considered in different angles. An expansion in net barter terms of trade always enlarges country's activity owing to being better economic status in the global market; in the meantime, income terms of trade—mean national ability to imports—plays an importance role in heighten country's economic performance. These two terms of trade normally have a positive connection with growth, but the linkage of these two types of terms of trade on country's activity is not necessary move in the same direction, for example, Indonesian and Malaysian results. From this thesis's empirical analysis, the author finds that factors affected the correlation of net barter terms of trade on growth is domestic consumption and degree of openness. However, the author could not identify an absolute solution on whether there is only one or few economic variable that determine the connection between income terms of trade and economic performance because sign of income terms of trade does not only rely on net barter terms of trade, but also depends on export volume index as well as various unpredicted variables.

6.2 Policy Implication

In case of Malaysia and Thailand, which have a positive relationship between terms of trade and economic growth, an international trade in these countries is an

important factor for extending country's growth. Therefore, these nations should support policies which enhance a linkage with an international market.

6.3 Limitations and Areas for the future researches

This thesis has a limitation according to the time constraint and trustworthy available terms of trade data. Even if domestic authorities in emerging market economies provide monthly and/or quarterly data, their data have many unsuitable reasons for using in this study because of discrete data, lack of long term data, and difficulty in converted data from different based year.

For future studies, researchers should attempt to use broaden time series data such as monthly and/or quarterly data instead of annual data or else utilize panel data in order to avoid missing data as well as cover longer study duration. For further study to add more interesting variables (for example, country's specific characteristics, exchange rate regime, and its fiscal and monetary policies), future outcome might be more accurate and more credible evidences. The future research's direction should consider technological problem and market structure of export market into its model specification because these economic variables could provide more reasonable and easily explanatory results whenever selected sample country changes their economic reforms for approach their targets on sustainable economic growth.

From this thesis's empirical result, the author can capture some characteristics that might affect the association between terms of trade and growth as well as be useful for further study. The author witnesses enormous solutions against traditional hypothesis of positive (negative) effect of the level (the variability) of terms of trade on country's growth due to each national characteristic from two types of terms of trade and their volatilities in ASEAN countries. In case of unconventional relationship between net barter terms of trade and its domestic growth in Indonesia and the Philippines, it might be involve with larger size of internal market compared with the international trade's proportion that drive up economies. A national growth rate in Indonesia has a unique characteristic than other nations in ASEAN region because national growth depended largely on internal

market and could ignore external market. Moreover, there has a possibility that the uncommon sign of terms of trade volatility impact on income growth, especially in Indonesia, the Philippines, and Thailand, may concern about 2 factors: time and magnitude of nation's share of domestic demand, and the degree of economic globalization. These thesis's remarks may be beneficial and could become new hypotheses for future research.

REFERENCES

Ariff, M. (1998). "The Malaysian Economic Experience and its Relevance for the OIC Member Countries." Islamic Economic Studies **6**(1): 1-41.

Awel, A. M. (2012). "Terms of Trade Volatility and Economic Growth in Sub-Saharan Africa." Munich Personal RePEc Archive(45453): 1-24.

Bahmani-Oskooee, M. (1996). "Exchange Rate Uncertainty and Trade Flows of LDCs: Evidence from Johansen's Cointegration Analysis." Journal of Economic Development **21**(1): 23-35

Barro, R. J. (2003). "Determinants of Economic Growth in a Panel of Countries." Annals of Economics and Finance **4**(2): 231-274.

Basri, C. M. and A. A. Patunru (2012). "How to keep trade policy open: The case of Indonesia." the Bullentin of Indonesian Economic Studies **48**(2): 191-208.

Basu, P. and D. McLeod (1992). "Terms of trade fluctuations and economic growth in developing economies." Journal of Development Economics(37): 89-110.

Berge, K. and T. Crowe (1997). "The Terms of Trade Facing South Korea with Respect to Its Trade with LDCs and DMEs." Queen Elizabeth House (QEU)(12): 1-47.

Black, F. (1987). "Business cycles and equilibrium." Cambridge, MA.

Blattman, C., et al. (2004). "The impact of the terms of trade on economic growth in the periphery, 1870–1939: volatility and secular change." National Bureau of Economic Research(10600): 1-47.

Blattman, C., et al. (2003). "The Terms of Trade and Economic Growth in the Periphery 1870-1938." National Bureau of Economic Research(9940): 1-40.

Blattman, C., et al. (2007). "Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the Periphery 1870-1939." Journal of Development Economics **82**(1): 156–179.

Bleaney, M. and D. Greenaway (2001). "The impact of terms of trade and real exchange rate volatility on investment and growth in sub-Saharan Africa." Journal of Development Economics **65**(2): 491–500.

Borkin, P. (2006). "Past, Present and Future Developments in New Zealand's Terms of Trade." NEW ZEALAND TREASURY: 1-43.

Cakir, M. (2009). "Terms of Trade and Economic Growth of Emerging Market Economies." The University of Johannesburg Journal for Applied Economic and Econometric Research **6**: 16-31.

Cambazoglu, B. and a. H. S. Karaalp (2012). "Trends in Turkey's terms of trade from 1982 to 2011." Procedia – Social and Behavioral Sciences **58**: 1228-1238.

Cuddington John T., et al. (2007). Prebisch-Singer Redux. Natural Resources Neither Curse nor Destiny. D. L. a. W. F. Maloney. Stanford University Press, and the World Bank**:** 103-140.

Dickey, D. A. and W. A. Fuller (1979). "Distribution of the Estimators for Autoregressive Time Series With a Unit Root." Journal of the American Statistical Association **74**(366): 427-431.

Dickey, D. A. and W. A. Fuller (1981). "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root." Econometrica **49**(4): 1057-1072.

Dixit, A. K. and R. S. Pindyck (1994). "Investment under Uncertainty." RAND Journal of Economics **25**(1): 141-159.

Easterly, W. and A. Kraay (2000). "Small States, Small Problems? Income, Growth, and Volatility in Small States." World Development **28**(11): 2013-2027.

Enders, W. (2004). Applied Econometric Time Series, John Wiley & Sons.

Engle, R. (2001). "GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics." Journal of Economic Perspectives **15**(4): 157-168.

Fatima, N. (2010). "Analysing the Terms of Trade Effect for Pakistan." Pakistan Institute of Development Economics: 1-23.

Furth, S. B. (2010). Terms of Trade Volatility and Precautionary Savings in Developing Economies. DEGIT, Dynamics, Economic Growth, and International Trade.

Grilli, E. R. and a. M. C. Yang (1988). "Primary commodity prices, manufactured goods prices, and the terms of trade of developing countries: what the long run shows." World Bank Economic Review **2**(1): 1-47.

Grimes, A. (2006). "A smooth ride: Terms of Trade, volatility, and GDP growth." Journal of Asian Economics **17**(4): 583–600.

Jawaid, S. T. and a. S. A. Raza (2012). "Effects of Terms of Trade and its Volatility on Economic Growth in India." Munich Personal RePEc Archive: 1-18.

Jawaid, S. T. and A. Waheed (2011). "Effects of Terms of Trade and its Volatility on Economic Growth: A Cross Country Empirical Investigation." Journal of Transition Studies Review **18**(2): 217-229.

Johansen, S. and K. Juselius (1990). "MAXIMUM LIKELIHOOD ESTIMATION AND INFERENCE ON COINTEGRATION — WITH APPLICATIONS TO THE DEMAND FOR MONEY." Oxford Bulletin of Economics and Statistics **52**(2): 169–210.

Kaneko, A. (2000). "Terms of trade, economic growth, and trade patterns: a small open-economy case." Journal of International Economics **52**(1): 169-181.

Kvint, V. (2009). The Global Emerging Market: Strategic Management and Economics, Routledge.

Kwiatkowski, D., et al. (1992). "Testing the null hypothesis of stationarity againstthe alternative of a unit root: how sure are we that economic time series have a unit root?" Journal of Econometrics **54**: 159-178.

L¨UTKEPOHL, H., et al. (2001). "Maximum eigenvalue versus trace tests for the cointegrating rank of a VAR process." Econometrics Journal **4**(2): 287-310.

Lutz, M. (1994). "The Effects of Volatility in the Terms of Trade on Output Growth: New Evidence." World Development **22**(12): 1959-1975.

Mansfield, E. D. and E. Reinhardt (2008). International Institutions and Terms of Trade Volatility.

Mendoza, E. G. (1995). "The Terms of Trade, the Real Exchange Rate and Economic Fluctuations." International Economic Review **36**(1): 101-137.

Mendoza, E. G. (1997). "Terms-of-trade uncertainty and economic growth." Journal of Development Economics **54**: 323-356.

Mirman, L. J. (1971). "Uncertainty and Optimal Consumption Decisions." Econometrica **39**(1): 179-185.

Mollick, A. V., et al. (2008). "Can globalisation stop the decline in commodities' terms of trade?" Cambridge Journal of Economics **32**(5): 683-701.

Newey, W. K. and K. D. West (1987). "A Simple, Positive Semi-Definite, Heteroskedasticity and AutocorrelationConsistent Covariance Matrix." Econometrica **55**(3): 703-708.

Perron, P. (1990). "Testing for a Unit Root in a Time Series with a Changing Mean." Journal of Business & Economic Statistics **8**(2): 153-162.

Phillips, P. C. B. and P. Perron (1988). "Testing for a unit root in time series regression." Biometrika **75**(2): 335-346.

Prebisch, R. (1950). "The economic development of Latin America and its principal problems." Lake Success: United Nations.

Rajan, R. S., et al. (2004). "Misalignment of the Baht and its Trade Balance Consequences for Thailand in the 1980s and 1990s." The World Economy **27**(7): 985-1012.

Samimi, A. J., et al. (2011). "The Impact of the Terms of Trade Volatility on Economic Growth: Evidence from Oil Exporting Countries." International Journal of Economics and Management Engineering (IJEME) **1**(1): 50-53.

Sapsford, D. (1985). "The statistical debate on the net barter terms of trade between primary commodities and manufactures: a comment and some additional evidence." Economic Journal **95**: 781-788.

Schumpeter, J. A. (1939). Business cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process New York, McGraw-Hill.

Shigeki, H. (1996). "Economic Policy and the Growth of Local Manufactures in Thailand." IDE APEC Study Center Working Paper Series(6): 1-21.

Singer, H. (1950). "The Distributions of Gains between Investing and Borrowing Countries." American Economic Review **40**: 473-485.

Solon, O. and M. S. Floro (1993). The Philippines in the 1980s: A review of National and Urban Level Economic Reforms, World Bank.

Spraos, J. (1980). "The statistical debate on the net barter terms of trade between primary commodities and manufactures." The Economic Journal **90**(357): 107-128.

Turnovsky, S. J. and P. Chattopadhyay (2003). "Volatility and Growth in Developing Economies: Some Numerical Results and Empirical Evidence." Journal of International Economics **59**(2): 267-295.

Williamson, J. G. (2008). "Globlaization and the Great Divergence: Terms of Trade Booms and Volatility in the Poor Periphery 1782-1913." National Bureau of Economic Research **13841**.

Wong, H. T. (2004). "Terms of Trade and Economic Growth in Malaysia." Labuan Bulletin of International Business & Finance **2**(2): 105-122.

Wong, H. T. (2010). "Terms of Trade and Economic Growth in Japan and Korea: an Empirical Analysis." Empirical Economics **38**(1): 139-158.

Yamada, H. and a. G. Yoon (2014). "When Grilli and Yang meet Prebisch and Singer: Piecewise linear trends in primary commodity prices." Journal of International Money and Finance **42**: 193–207.

Zivot, E. and D. W. K. Andrews (1992). "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis." Journal of Business & Economic Statistics **10**(3): 251-270.

APPENDIX

Augmented Dickey Fuller (ADF) tests (1979)

Even though ADF test is the most popular classical unit root test that a large number of authors choose (Dickey and Fuller 1979), the ADF test has a weak point for variables which might have structural changes in its mean level. For instance, Perron (1990) and Zivot and Andrews (1992) reported that the classical ADF test can be biased toward nonrejection of the null hypothesis of a unit root (Perron 1990, Zivot and Andrews 1992). For avoiding the incorrect conclusion about nonstationarity of variables, I will use other unit root tests too.

In 1979, Dickey and Fuller generated an autoregressive model

$y_t = \delta y_{t-1} + \mu_t$ when μ_t ~ iid (0,σ^2)

In order to rewrite this equation into the first difference, we will subtract y_{t-1} on both sides of equation and write the equivalent form:

$\Delta y_t = \rho y_{t-1} + \mu_t$ where $\rho = \delta - 1$.

The condition of y_t will be stationary when $|\delta| < 1$

Testing for the unit root tests, it is essential to set the null and alternative hypotheses

H_0 : $\rho = 0$ or $\delta = 1$ (Unit root or the variables are nonstationary)

H_1 : $\rho < 0$ or $\delta < 1$ (No unit root or the variables are stationary)

The tau statistic test is utilized which has the same measurement as t-statistics.We have to compare the tau ratio $\left[\tau = \frac{\hat{\rho}}{\sigma_{\hat{\rho}}}\right]$, where $\hat{\rho}$ represents the estimated coefficient and $\sigma_{\hat{\rho}}$ represents the standard error in the coefficient estimate, with critical value in table Dickey-Fuller statistic at significant level.

Due to the weak pointof DF test such as extraordinary value of variance (Dickey and Fuller 1981), the Dickey-Fuller has developed their model by increased lagged value of variables in the model and called the new test as Augmented

Dickey-Fuller term (ADF test). The ADF test canexpel all the structural effects (autocorrelation) in the time seriesand allow for higher-order autoregressive processes. The ADF has new forms (standard, constant only, and constant and time trend):

$$\Delta y_t = \rho y_{t-1} + \sum_{i=1}^{n} \rho_i \Delta y_{t-1} + \mu_t$$

$$\Delta y_t = \alpha + \rho y_{t-1} + \sum_{i=1}^{n} \rho_i \Delta y_{t-1} + \mu_t$$

$$\Delta y_t = \alpha + \beta t + \rho y_{t-1} + \sum_{i=1}^{n} \rho_i \Delta y_{t-1} + \mu_t$$

When μ_t ~ iid (0, σ^2), α is the interception, t is the time trend, and n is the optimal lag for solving the autocorrelation problem of error term (μ_t).

Phillips and Perron (PP) test (1988)

Perron (1990) who developed a unit root test procedure with a structural break comment both ADF and Phillip and Perron (1988) unit root tests that they might inaccurately fail to reject the null hypothesis (Phillips and Perron 1988, Perron 1990). The studies on financial time series are often used the PP unit root test. Dealing with serial correlation and heteroskedasticity in the errors is an advantage of the PP test which is one problem of DF test because the PP test can ignore any serial correlation in the regression. In addition, PP test does not require to indicate a lag length for the test regression. To show the last advantage of PP test, it is better than the ADF test for finite samples.In this case, the PP test is starting with the model

$$\Delta y_t = \alpha + \pi y_{t-1} + u_t$$

Where u_t is I(0) implies π=0 as the null hypothesis and t = 2,..., T. We can include the constant or include a trend term in PP test. Phillips and Perron's two statistics tests [$Z(\pi)$ and $Z(t)$] can be calculated as follows:

$$Z_\pi = T(\hat{\pi} - 1) - \frac{1}{2}(\hat{\lambda}^2 - \hat{\sigma}^2)\left(T^{-2}\sum_{t=2}^{T} y_{t-1}^2\right)^{-1}$$

$$Z_t = \left(\frac{\hat{\sigma}}{\hat{\lambda}}\right) t_{\hat{\pi}} - \frac{1}{2}(\hat{\lambda}^2 - \hat{\sigma}^2)\left(\hat{\lambda}^2 T^{-2}\sum_{t=2}^{T} y_{t-1}^2\right)^{-1/2}$$

Where $\hat{\lambda}^2$and $\hat{\sigma}^2$ are consistent estimates of the variance parameters

$$\hat{\lambda}^2 = \lim_{T\to\infty}\sum_{t=1}^{T} E[T^{-1}u_t^2], \qquad \hat{\sigma}^2 = \lim_{T\to\infty} T^{-1}\sum_{t=1}^{T} E[u_t^2]$$

Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests (1992)

Unlike the null hypothesis of ADF and the PP unit root tests, in which their null hypotheses become an alternative hypothesis of KPSS test (Kwiatkowski, Peter C.B. et al. 1992), KPSS unit root test has focused its attention on the null hypothesis of mean stationarity or trend stationarity (stationary around a deterministic trend). KPSS is not only testingboth the unit root test hypothesis and stationarity hypothesis but also fulfill the weak point of other unit root tests. The test regression for the KPSS testsis defined by three composites: deterministic trend, a random walk, and a stationary error.

$$y_t = \beta' x_t + v_t + u_t \quad (1)$$

$$v_t = v_{t-1} + \varepsilon_t \quad (2), \quad \varepsilon_t \sim \text{iid } (0, \sigma_\varepsilon^2)$$

Where y_t represents the observed series, x_t represents deterministic vectors (intercept or intercept plus time trend), v_t represents a random walk, $u_t$is deviations from deterministic (linear) trend, and ε_t represents an error process or deviation from trend. The initial value of v_0 is assumed to be fixed and become a constant term.The hypothesis of stationarity can simply divide into level stationarity (special case), in whichunder the null y_t is stationary around a level (v_0) when β' = 0, and trend stationarity (normal case), in whichy_t is trend-stationary if and only if the null hypothesis H_0: σ_ε^2 = 0 due to stationary assumption of u_t. The author presumes e_t as the representative for residuals from equation (1) on intercept and time (t) and supposes S_t be the partial sum of e_t:$S_t = \sum_{t=1}^{t}(u_t - \bar{u}) = \sum_{j=1}^{t} e_j$. The Newey-West (1987) estimator of the long-run variance of the error u_t is σ_u^2 or $s^2(\ell)$ (Newey and West 1987).

$$s^2(\ell) = \frac{1}{T}\sum_{t=1}^{T} e_t^2 + \frac{2}{T}\sum_{s=1}^{\ell}\left[1 - \frac{s}{\ell+1}\right]\sum_{t=s+1}^{T} e_t\, e_{t-s}. \quad (3)$$

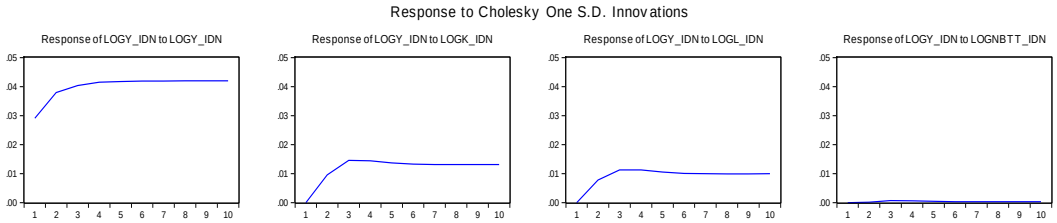
Where $(s, \ell) = 1 - \frac{s}{(\ell+1)}$.For consistency of $s^2(\ell)$ under the null hypothesis of stationarity, the lag truncation parameter (ℓ) should be $\ell \to \infty$ as $T \to \infty$ but $\frac{\ell}{T} \to 0$. Aimed for testing the null hypothesis, the KPSS statistic for the trend stationary case, $\hat{\eta}_\tau(\ell)$, is expressed as follows:

$$\hat{\eta}_{\tau}(\ell) = \frac{1}{T^2}\sum_{t=1}^{T} S_t^2 / s^2(\ell)$$

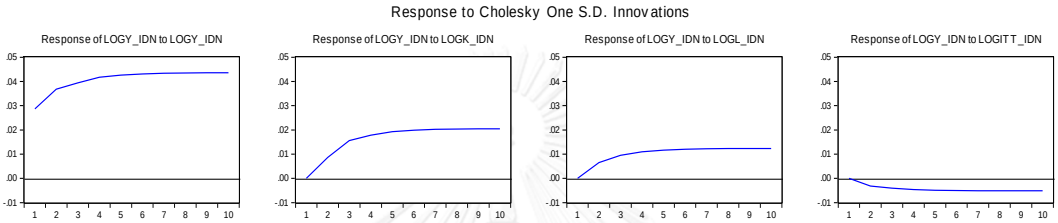
The KPSS statistic for the level stationary case, $\hat{\eta}_{\mu}$, is defined identically except that we set β' = 0 in regression of y_t by having residuals $e_t = y_t - \bar{y}$.

Figure 31 Graphs of impulse response function of all variables illuminated the response to Cholesky One S.D. Innovations in case of Indonesia

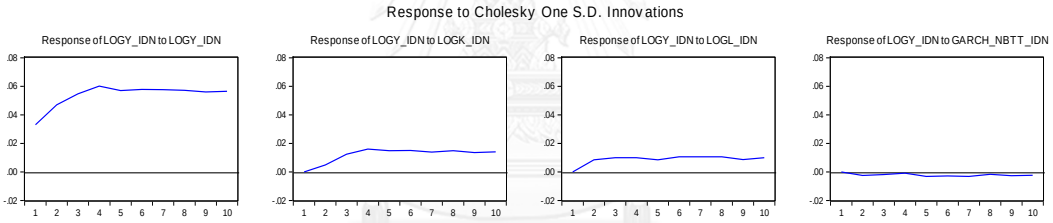
Panel A: Indonesian net barter terms of trade model



Panel B: Indonesian income terms of trade model



Panel C: Indonesian net barter terms of trade volatility model



Panel D: Indonesian income terms of trade volatility model

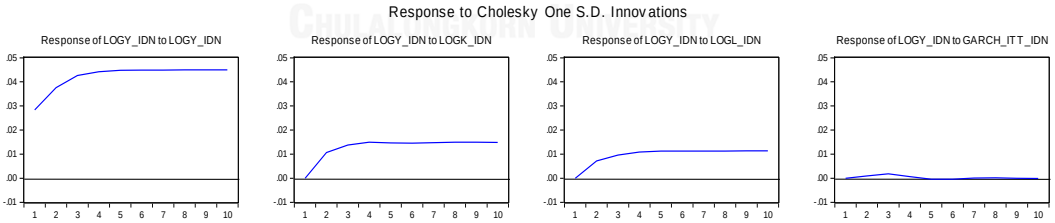
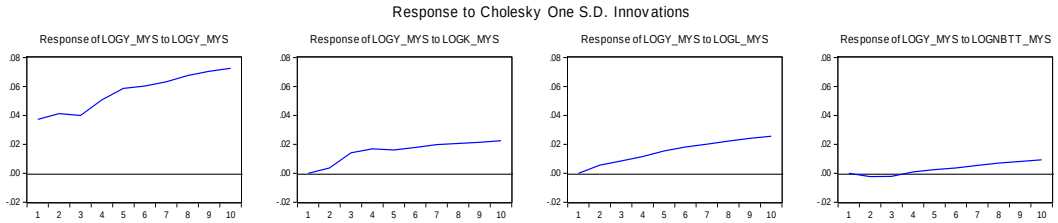
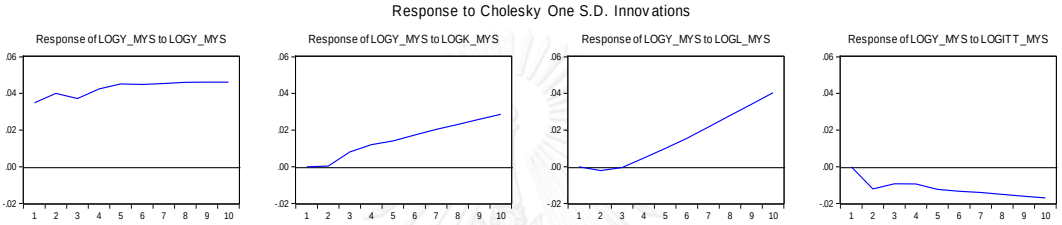


Figure 32 Graphs of impulse response function of all variables illuminated the response to Cholesky One S.D. Innovations in case of Malaysia

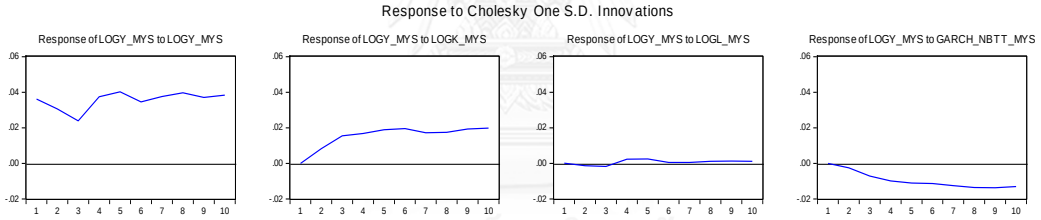
Panel A: Malaysian net barter terms of trade model



Panel B: Malaysian income terms of trade model



Panel C: Malaysian net barter terms of trade volatility model



Panel D: Malaysian income terms of trade volatility model

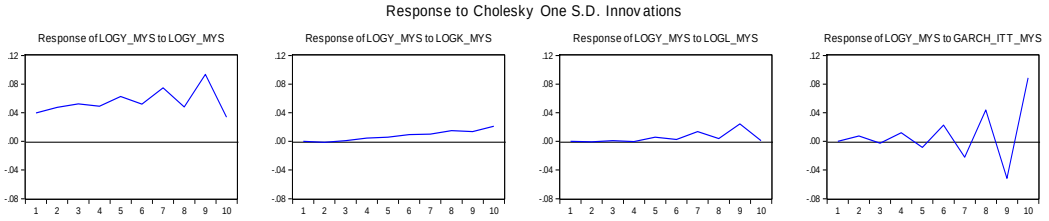
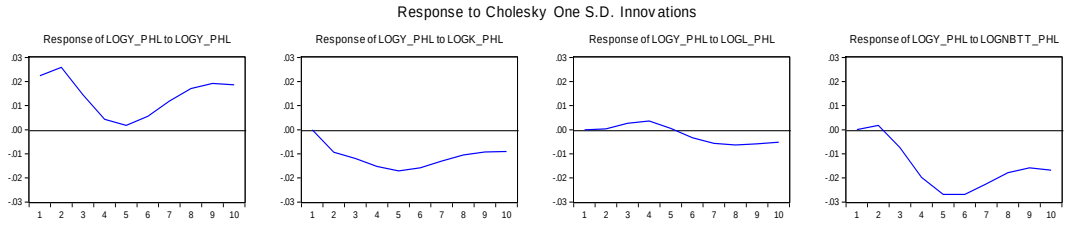
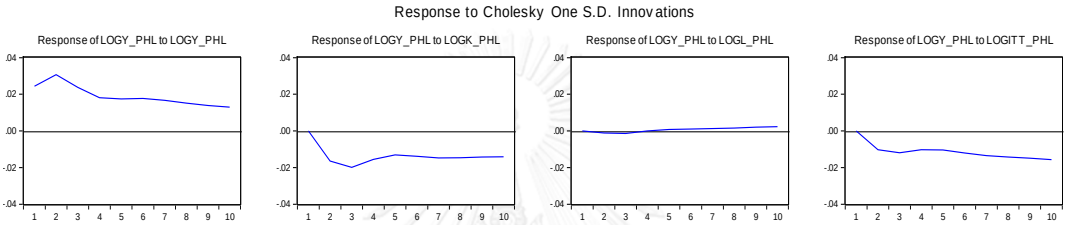


Figure 33 Graphs of impulse response function of all variables illuminated the response to Cholesky One S.D. Innovations in case of the Philippines

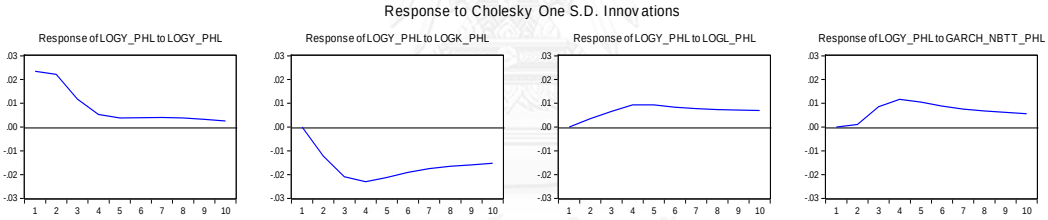
Panel A: Philippines' net barter terms of trade model



Panel B: Philippines' income terms of trade model



Panel C: Philippines' net barter terms of trade volatility model



Panel D: Philippines' income terms of trade volatility model

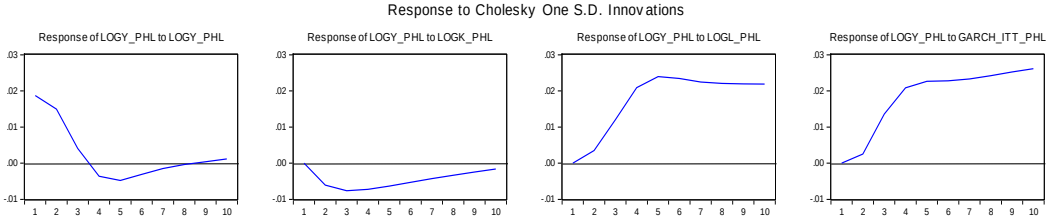
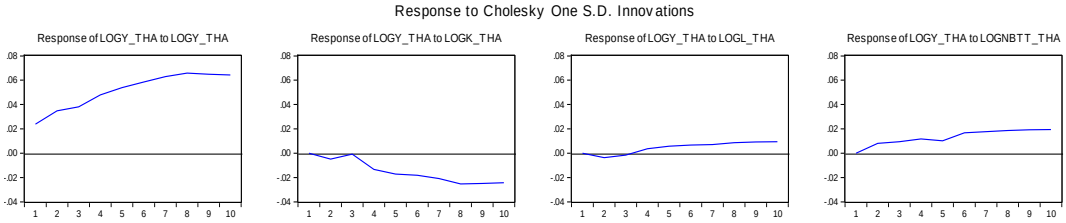
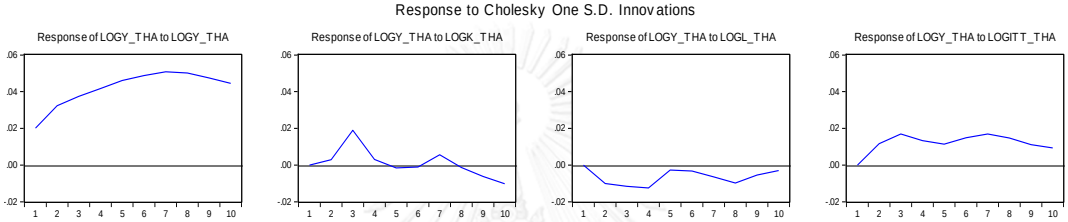


Figure 34 Graphs of impulse response function of all variables illuminated the response to Cholesky One S.D. Innovations in case of Thailand

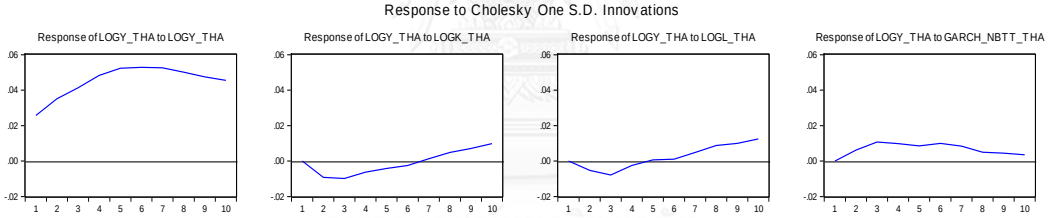
Panel A: Thailand's net barter terms of trade model



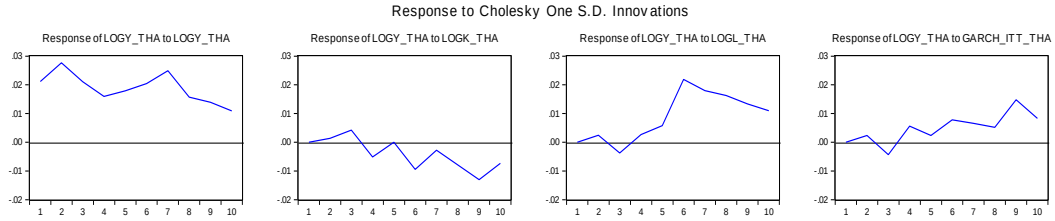
Panel B: Thailand's income terms of trade model



Panel C: Thailand's net barter terms of trade volatility model



Panel D: Thailand's income terms of trade volatility model



VITA

Patcharaporn Banchorndhevakul was born in Bangkok, Thailand in September 24, 1990. She graduated secondary school from Chulalongkorn University Demonstration school (Satit Chula school). She received a Bachelor of Economics with second class honor, major in Monetary Economics from Chulalongkorn University in 2011. She enrolled in a Master's degree majoring in International Economics and Finance at Chulalongkorn University in May 2012.