THE ECONOMIC, ENVIRONMENTAL, AND GEOPOLITICAL IMPACTS OF THE ASEAN-CHINA FREE TRADE AREA (ACFTA) ON INDONESIA

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THESIS

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Abstract

The normalization of political relationship between ASEAN and China brings a closer economic cooperation between them. It culminated through the establishment of ASEAN-China Free Trade Area (ACFTA). In this research, I analyze the economic, environmental, and geopolitical impacts of ACFTA on Indonesia. The economic analysis covers trade expansion and consumer welfare effect of bilateral trade between Indonesia and China under ACFTA framework using partial equilibrium approach. Then, I make a comparison between the result of partial equilibrium approach and the result of existing literature that uses general equilibrium approach. Based on the results, I estimate the increase of energy demands and CO_2 emissions from Indonesian perspective using Indonesia's input-output data, which is part of environmental analysis. The simulation results indicate Indonesia will likely expand its export to and import from China. However, the trade expansion between them might be asymmetric since the Indonesia's import expansion might be faster than Indonesia's export expansion. The trade expansion will also increase Indonesia's energy demands. Due to the dependency of Indonesia on fossil fuels, the increase of energy demands will increase the CO_2 emissions as well. At the end, I analyze and discuss the geopolitical implication of ACFTA, particularly on Indonesia.

Keywords: ACFTA, trade expansion, welfare effect, energy demands, CO_2 emissions, geopolitics

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Executive Summary

After the normalization of political relationship between ASEAN and China in 1990s, the economic relationship between them is getting closer and it culminated through the establishment of ACFTA. Looking at the trade figure between Indonesia and China in particular, the trade values between them had exponential growth in the last five years. Indonesia's export to China amounted to USD 13 billion in 2010. At the same time, Indonesia's import from China amounted to USD 17.2 billion. The average annual increase of Indonesia's export to and import from China is 27% and 41%, respectively. If the import rate keeps exceeding the export rate, then it will deteriorate Indonesia's trade balance.

There are no convergences of opinion whether the trade liberalization will be beneficial for the countries. It is the same thing in the case of ACFTA for Indonesia. As stated by recent Indonesia Ministry of Industry survey, some industries experienced a 50% decline in production (Malik, 2011). The survey also found that the majority of industries, accounting for 44.2% of surveyed industries blamed ACFTA as the cause of this poor performance. To get better understanding on the impacts of ACFTA on Indonesia, this research is addressed to answer the following main research question: **What are the economic, environmental, and geopolitical impacts of ACFTA on Indonesia?**

The **economic** part discusses trade expansion and consumer welfare effect of bilateral trade between Indonesia and China under ACFTA framework using partial equilibrium (PE) approach. The results indicate both Indonesia and China will likely expand their exports. Indonesia's export expansion rate might be less than Indonesia's import expansion. The consumer welfare effect will likely be positive since the consumer will enjoy cheaper products through tariffs removal. Then, the results will be compared with the existing literature that uses general equilibrium (GE) approach. In this case, I will use a paper by Urata and Kiyota (2003) because it has same sector categorization and scenario. Qualitatively, most industries from the results using both PE and GE approach have the same positive sign, except mining. However quantitatively, the values of trade expansion from these two different methods have huge difference. This strongly suggests that the second-round and higher-rounds effects of ACFTA are big. This is particularly true for food products & beverages, transportation machinery and general machinery which are precisely sectors featuring relatively strong backward production linkages with other sectors. What this means, for example, is that the demand for transportation machinery is likely to grow not only directly (due to more demand from China) but also indirectly because the exports of all other sectors to China are growing (and need more transport equipment).

Some would expect the trade expansion will likely affect the **environment**. In this research, the impacts of the ACFTA on environment are limited to the increase of energy demands and CO_2 emissions. Indonesia's input-output (IO) table 2005 is utilized to estimate the increase of energy demands and CO_2 emissions. It is the most up-to-date IO table and it is assumed that the Indonesia's economic structure does not change significantly in the last five years. The big increase of energy demands might come from food products and beverages, other manufacturing, electronic equipment, and textiles and footwear. Food products and beverages sector has the biggest increase of energy demands because it has the second biggest trade expansion after mining. Mining sector has small increase of energy demands because it is among the low energy intensive industries. Other

manufacturing, electronic equipment, and textiles and footwear have high increase of energy demands because they have high energy intensity. The increase of energy demands is in line with the increase of CO_2 emissions because of Indonesia's dependency on fossil fuels, accounting for 98% of energy sources (ESDM, 2010).

The domination of economic role of China might change the **geopolitical** landscape in East Asia. Japan and the United States that are used to be the dominant countries in the region might have to share their influences with China. Based on the trade expansion figure, Indonesia has geopolitical importance for China in providing primary products (mainly mining products) as production inputs for Chinese economy. Besides, Indonesia's industries will likely compete against China, especially in manufacturing sectors. If Indonesia loses in competition for manufactured products against China in both domestic and overseas market, then Indonesia will keep exporting primary products and might lose capability in manufacturing sectors. At the end, it might lead to deindustrialization in Indonesia. As a result, it will likely reduce geopolitical positioning of Indonesia in front of China in the region. The rising China will likely behave as hegemonic power in the region so that Indonesia (generally ASEAN) will likely still need Japan and the U.S. to balance its power. The importance of Japan and the U.S. will gain significance in solving regional security issues, such as border issue in Spartly Islands. In this case, Japan and the U.S. have interests as well because they need to secure their energy supply from the Middle-East. In energy sector, Russia also has geopolitical importance in securing energy supply to East Asian countries, especially China, Japan, and South Korea. It is not surprising that Russia will be a new member of East Asian Summit in 2011. Indonesia is expected to gain momentum for its role as Host of East Asian Summit in 2011, Chair of ASEAN in 2011, and Host of APEC in 2011.

Policymakers will find this research useful to direct their strategies. Industrial analysis under ACFTA framework has been done to identify which industries might win and lose against China in particular. It will provide foundation to take necessary actions to maintain the industries' competitiveness. Besides, the insights on energy demands and CO_2 emissions will give ideas to policymakers that Indonesia's aggressiveness in pursuing free trade areas with other countries will likely increase the energy demands and CO_2 emissions.

This research has also several contributions to the existing literature. Firstly, the simulation results using PE approach complements the existing results that use GE approach. Secondly, this research estimates the increase of energy demands and CO_2 emissions using input-output analysis from Indonesian perspectives. The estimation is derived from the trade expansion results using PE approach. Thirdly, geopolitical analysis is conducted based on the economic and environmental analysis as well as analysis on existing literature.

There is no a research without limitations, including this research. Several limitations of this research include unavailability of competition analysis at the commodities level, exclusion of service sector and non-tariffs barrier, a very strict assumption of Indonesia national energy structure during the estimation of energy demands and CO_2 emissions, and only high-level analysis of geopolitical aspect of the ACFTA. Future researches should address the limitations encountered in this research. All in all, current research will provide insights for policymakers in directing their strategies related to ACFTA for national interests.

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Kukuh Kurniawan

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Chapter 1   Introduction

Economic cooperation between ASEAN and China has become closer since the normalization of their political relationships in 1990s. Closer cooperation culminated in the countries agreeing to be part of the ASEAN-China Free Trade Area (ACFTA) during the ASEAN summit in November 2002 in Cambodia. As a follow up of this agreement, ACFTA was effectively launched on New Year of 2010 for ASEAN 6[1] and China, and on 2015 for the newer country members include Cambodia, Myanmar, Lao PDR, and Vietnam. It is the biggest free trade area in terms of number of consumers, about 1.7 billion consumers.[2]

The full implementation of ASEAN-China Free Trade Area (ACFTA) could be an opportunity or a threat for Indonesian industries. It could be an opportunity because it gives Indonesian firms broader market access to the large number of (Chinese) consumers, and the possibility of achieving economies of scale. This would increase Indonesia's exports to China, which already amount to USD 11,6 billion in 2008 (with about 27% year-to-year increase). However, it could be a threat as well, because Indonesia and China have the same export structure (Tongzon, 2005). Indonesia's imports from China grow at the rate of 41% per year and the imports amounted to USD 15.2 billion in 2008. That year was the first time Indonesia had trade deficit with China. If the Indonesian and Chinese industries are really head-to-head competitors, then this strong growth of imports might indicate that Indonesian industries cannot even compete in the domestic market with their Chinese counterparts.

China is also hungry for natural resources to fuel its economic engine. And, Indonesia as a natural resources-rich country seems like a good partner for China. However, if the Indonesian economy becomes too dependent to natural resources –just like in the Dutch colonial era, then this situation will be a curse. On the one hand, Indonesia will have difficulties to diversify its economy. On the other hand, a deterioration of Indonesia's environment is plausible. Therefore, long term sustainability of environment will be the limit to grow for both Chinese and Indonesian economy.

China as the fastest growing economy of the region can shift the geopolitical map in the East Asia region. This geopolitical shift will affect the decision making process on economic, security, and other issues in the region. The United States and Japan who are used to be dominant actors in the region might have to share their dominance with China. The ASEAN countries agreed to establish trade cooperation through ACFTA hoping that through this they can enjoy the economic and power benefits as well. ACFTA might be a way to improve ASEAN's bargaining position in international arena.

Indonesia is one of the founders of ASEAN and just stepped-in to be the chair of ASEAN in 2011. Indonesia will also be the host of the East Asian Summit in 2011 and the chair of APEC in 2013. These

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[1] ASEAN 6 consists of Indonesia, Singapore, Malaysia, Philippine, Thailand, and Brunei Darussalam.
[2] Population of Myanmar is 58.5 million; of Lao is 5.7 million; of Vietnam is 86.2 million, of Thailand is 66.4 million; of Malaysia is 27.8 million; of Cambodia is 14.6 million; of Brunei Darussalam is 397,000; of Singapore is 4.8 million; of Philippines is 90.5 million; of Indonesia is 228.5 million; of China is 1.3 billion.

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roles emphasize the importance of Indonesia for ASEAN and countries outside ASEAN, especially in the East Asia region. A geopolitical analysis is needed, especially for Indonesia, to balance the economic-and-environmental analysis of the Free Trade Area (FTA) that helps policymakers in formulating policies in the economic domain and in negotiating terms related to FTA, not necessarily limited to ACFTA but also to other FTAs as well.

1.1. Research Objectives

The objectives of the research project are as follows.

a.   To provide an up-to-date overview related to the ACFTA from the beginning of its initiation until now.

b.   To complement the existing literature related to economic analysis of the ACFTA by using partial equilibrium approach.

c.   To fill the knowledge gap on the relation between the ACFTA, energy demands, and CO_2 emissions, particularly on Indonesia.

d.   To analyze the geopolitical consequences of the ACFTA on Indonesia since the literature is limited in this area.

1.2. Research Scope

This research is limited to the analysis of bilateral trade between Indonesia and China under ACFTA framework from the Indonesian perspective. The analysis excludes the effect of non-tariffs barrier. Besides, service sector is excluded from the analysis. The quantification of trade expansion and consumer welfare effect will be done using partial equilibrium approach by Laird and Yeats (1986). Then, based on these results, the increase of energy demands and CO_2 emissions are estimated using Indonesia's input-output table. At the end, these results in addition to the existing literature will be used to analyze the geopolitical implications of the ACFTA on Indonesia.

1.3. Research Questions

To achieve the research objectives, the main research question is formulated as follows.

**What are the economic, environmental, and geopolitical impacts
of ASEAN-China Free Trade Area on Indonesia?**

To be more specific, this research will give answers to the following research questions:

a.   What is ACFTA?

b.   How much trade value (net-exports) will be created and diverted for Indonesia through the implementation of ACFTA?

c.   Which Indonesian industries will likely gain through the implementation of ACFTA?

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d.   How much will Indonesian economic welfare change through the implementation of ACFTA?
e.   How likely will ACFTA increase the level of energy demands and CO_2 emissions in each Indonesia's industries?
f.   What will be the geopolitical implications of ACFTA on Indonesia?

1.4.   Research Framework

The following research framework will be utilized to respond to the research questions.
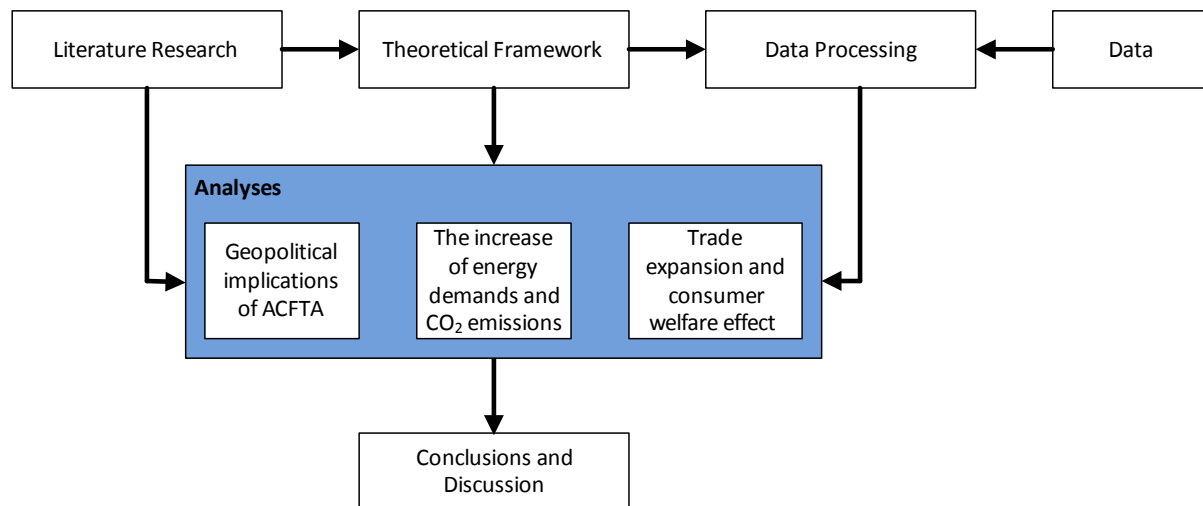
Figure 1 Research Framework

Following this framework, I expect to answer the research questions. The research begins with literature research on trade theory and ACFTA. Based on the literature search, I will find a (partial equilibrium) model within which the effects of ACFTA on Indonesian trade flows with China as well as the impact of ACFTA on Indonesian welfare can be estimated. Concurrently, the search of data is needed to match the model from literature and data so that I can plug-in the data into the model. The literature research and data processing results using partial equilibrium approach will give answers to research questions a, b, c, and d (overview of ACFTA, trade creation, trade diversion, and consumer welfare effect of ACFTA). Then, based on these results, the increase of energy demands and CO_2 emissions can be estimated. In other words, it will answer research question e. These analyses on data processing results and literature research will also give answer to research question f about the geopolitical implications of ACFTA on Indonesia. According to these analyses regarding economic, environmental, and geopolitical aspects, I will identify opportunities and threats to come up with necessary strategy for Indonesia to benefits from ACFTA. At the end, conclusions can be derived from the finding and discussion in the previous steps.

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1.5. Methodology and Data

Partial equilibrium modeling framework will be used to quantify the trade creation, trade diversion, and welfare effect. This model is based on Laird and Yeats (1986). I choose partial equilibrium (PE) approach because there have been plenty researches of FTAs using general equilibrium (GE) approach. As a result, this research will complement the existing literature that utilizes GE approach as I will make a comparison between the results of PE and GE approach. The fundamental difference of PE and GE approach is PE only consider the first round effect of trade liberalization, while GE consider the second round and next round effect of trade liberalization until the system achieves its equilibrium. In the case of ACFTA, the complementary results of PE approach will help us to understand how big the second round and next round effect of trade liberalization. In other words, if the results of PE approach have small difference with the results of GE approach, then the second round and next round effect of trade liberalization are small.

The other reason of utilization of PE approach is its simplicity. Unlike the PE approach, GE approach is a black box and is hard to understand the interdependence among the variables inside the system. Using PE approach, I can see more detail how the output comes from and the interdependence among the variables. However, the simplicity of PE approach is not only an advantage, but also a disadvantage. In this case, PE approach fails to include the interdependence between one market with other markets.

After the trade expansion value is obtained, the increase of energy demands and CO_2 emissions can be estimated. Input-output analysis will be used to quantify the increase of energy demands and CO_2 emissions.

At the end, all of the results will guide us through the discussion on geopolitical implication of the ACFTA on Indonesia. The existing literature on this topic will also enrich the discussion.

The trade data are mainly supplied by website of Indonesia Ministry of Trade, Central Bureau of Statistic (BPS), and WITS database. For input-output analysis, I will use Indonesia's input-output (IO) table 2005. The energy intensity data are based on ESDM (2010). The conversion of energy data to carbon figure will be based on IPCC (2006).

1.6. Expected Outcomes and Structure of the Report

Through this research, I will produce one thesis report, which consists of comprehensive analysis on ACFTA related to economic, environment, and geopolitical aspects. This report consists of five chapters. At the beginning, chapter 1 provides an introduction. It presents an overview of the ACFTA, objective and scope of the research, and how the research will be done.

Literature review in chapter 2 presents the international trade theory and existing literature that is relevant with the economic, environmental, and geopolitical aspects of free trade areas. It provides some perspectives on how trade liberalization will likely affect a country's economic growth. In addition, I present some free trade areas involving East Asian countries. The issue on trade and

environment are also discussed. And at the end of the chapter, the geopolitics of East Asia is presented.

Then, the economic impacts of ACFTA, covering trade expansion and welfare effect, will be discussed in chapter 3. The simulation is based on partial equilibrium approach. Besides, the industrial analyzes will be done by using other data as well to enrich the analyses. This chapter provides discussion on policy recommendations and some lessons learned.

The simulation results (trade expansion of ACFTA) from chapter 3 are used to quantify the increase of energy demands and CO_2 emissions in chapter 4. Before estimating the increase, I present Indonesia's economic structure to understand better the linkages among the industries. Some policy implications and lessons learned are derived at the end of the chapter.

Lastly, chapter 5 presents conclusions and discussion. This chapter provides answers for each research questions, discussion, contributions of this research to the literature, implications to policymakers, research limitations, and recommendations for future research. This report includes the appendices, where all relevant data and some supporting simulation results are presented.

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Chapter 2   The Economic, Environmental and Geopolitical Impacts of Free Trade Areas: A Survey

This literature survey will cover three research areas on economic, environmental, and geopolitical impacts of free trade areas (FTAs). At the beginning, I will discuss the linkage of trade and economic growth. Then, I discuss the economics of free trade areas that involve Asian countries in section two. The discussion will provide overview of the past, present, and future of Indonesia-China bilateral relation. It will also cover the present and future Indonesia-China economic relation under the ACFTA framework. In section three, I present the environmental consequences of economic growth that have been previously discussed in the research literature as the result of international trade. Finally, the discussion will be closed with the geopolitical impacts of international trade.

2.1   International Trade and Economic Growth

While most likely there could be a convergence of opinion that international trade might associate with economic growth, there is hardly any agreement on how trade liberalization might associate with economic growth. Sachs and Warner (1995) claimed developed and developing countries that are open[3] can grow their economy by 2.29% and 4.49% respectively. Further, they emphasized that developing countries can simply open their economies to sufficiently achieve economic growth larger than 2%. They also claimed there will be unconditional convergence among open countries since open developing countries tend to grow faster than open developed countries. So, they implied growth can be achieved without implementing other policies. In other words, if you have low quality of labor force, low level of public investment, and bad allocation of property rights, then the open countries will still be able to achieve economic growth easily through opening their economies. It is far from reality as from Singapore's experiences to achieve economic growth; it combined outward orientation with other government interventions, such as expansion of public investment in the economy and tax incentives (Young, 1992).

Rodrik and Rodriguez (1999) criticized it by showing that the countries classification into open and closed is mainly derived from black market premium and state monopoly of export. Other criteria are negligible –could be omitted, and the end results are not much different. The country

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[3] Sach and Warner (1995) categorized open and closed countries based on the following criteria:
1. It had non-tariff barriers (NTBs) higher than 40%.
2. Its non-tariff barriers covered on average more than 40% of imports.
3. Its black market premium exceeded 20% during either the decade of the 1970s or the decade of the 1980s.
4. It socialist economic system.
5. It had a state monopoly of major exports.

They defined open countries as "one" if none of the five conditions applies and vice versa.

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classification into open and closed using binary logic 1 and 0 respectively is also problematic. The partition between open and closed countries is fuzzy rather than strict. Degree of openness among open countries in Sach-Warner sample must be diverse as well; they do not necessarily represent the same logic of 1. There are also misspecifications of some countries in Sach-Warner sample. Indonesia was considered open since 1970 in the sample. But, in reality, import substitution, and tariffs and non-tariff barriers were the characteristics of Indonesian trade in 1970s. Indonesia should be considered open in the 1980s when it did trade liberalization, following policy recommendations from World Bank and IMF (Hill, 2000 and Feridhanusetyawan & Pangestu, 2003). Taiwan was also considered open since 1963, but in reality, it maintained high tariff barriers until 1980s and started reducing tariffs after gaining significant capability in manufacturing sectors (Rodrik, 2010). In addition, according to Bosworth and Collins (2003), Sachs-Warner indicators of openness are not significantly associated with growth.

Learning from 19th century, historian Paul Bairoch (1972) found different results of economic growth from free trade between developed and less developed countries. It is based on the observation of protective tariff and economic growth in the 19th century. In France, Germany, and Italy as less developed countries, the economic growth slowed down since the removal of tariff protection. Then, about 1880-1890, the less developed reintroduced the protective tariff and there was progress in economic growth. On the contrary, Britain as the leading industrial nation experienced economic growth through the removal of protective tariff.

Regression analysis by O'Rourke (2000) supports Bairoch's hypothesis. Using data from some European countries, United States, Canada, and Australia in the 19th century, he found out the positive correlation between protective tariff and economic growth.

The relationship between international trade and economic growth is complex. There are other interdependent factors (besides trade) that explain economic growth of the countries in the 19th century. In other words, the protective tariff is not the only or "full" explanation of the economic growth. Besides, the positive correlation between economic growth and protection does not mean there is causal relationship between them. Some countries (e.g. Canada) grew rapidly in the 19th century because it experienced an investment boom (e.g. railroad development) (Irwin, 2002). Furthermore, Irwin explained, in some export-oriented "staple" economies such as Canada and Australia, tariffs were not intended to protect the domestic products against the foreign products. The tariffs were revenue tariffs that were charged on a few commodities, such as alcoholic beverages and tobacco.

The relationship between countries' openness and economic growth has to be interpreted cautiously. Simply opening up the economy is not a shortcut to achieve economic growth. On the contrary, history shows that some protectionism practices had helped some developing countries (e.g. Taiwan, South Korea, Indonesia, and India) to climb the ladder of economic development (Amsden, 2001). In addition, she shows that the U.S. had the highest tariff barriers in its early phase of development, two times as high as Japan. The countries will only dismantle their trade barriers once they are rich (Chang, 2003).

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Some degree of protectionism might bring opportunity for the developing countries to develop infant industries as future source of economic growth[4]. The infant industry could become the vehicle to shift industrial capability of developing countries in particular from unskilled labor intensive industry to better skilled labor intensive industry. As a result, the developing countries could diversify their economies. Local content requirements, import substitutions, and high tariffs were parts of India's strategy to climb the ladder of economic development while expanding public investment in areas that are not its comparative advantages (Kochhar, Kumar, Rajan, Subramanian, & Tokatlidis, 2006). Nunn and Trefler (2010) also supported the view that there are real benefits of protectionism, mainly in skill-intensive industries, for long-term growth. The research and development (R&D) collaboration between U.S. Department of Defense and information technology industries (mainly in Silicon Valley) can be seen as a form of protectionism. As an example, Global Positioning System (GPS) and internet protocol were developed for military purposes before the companies launched them commercially. Once the results of R&D are available for commercial purpose, it might create new jobs that could foster economic growth.

Trade liberalization should not likely be the best option for most developing countries to foster economic growth. However, the international organizations, such as World Bank and IMF often forced the countries to embrace free trade as a condition for assistance. Borrowing the term from Amsden (2001), we can call it "imperialism of free trade"[5]. To think about growth strategy, Rodrik (2005) offered investment strategy for the short run and institution building as the follow up step, to sustain economic growth in the long run.

2.2   The Economics of Free Trade Areas in Asia

Trade liberalization might have different impacts on different countries. Every country should decide voluntarily whether it will embrace trade liberalization. However, some countries might have done trade liberalization because of pressure from international organization, such as World Bank and IMF. In the 1980s, Indonesia has done trade liberalization based on suggestion from the World Bank. During financial crisis in 1998, IMF used trade liberalization as a condition for assistance to Indonesia. As a result, President Suharto signed the Letter of Intent to established free trade of agriculture products, such as rice, wheat, and soybeans.

Agriculture is an important sector because it generates the most employment in rural areas, although the number went down below 50% of total labor force since 1993 (Tambunan, 2005). Removal of tariff barriers will result in contraction of output in this industry (Croser, 2002; Strutt & Anderson, 2000). Looking at the specific agriculture products, Sugiyarto and Corong (2006)

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[4] Chang (2008) illustrated the infant industry argument through the protection of his son. His son, named Jin-Gyu might have chance to make better living in the future if the parents protect and nurture Jin-Gyu until he reach certain age. Otherwise, Jin-Gyu could end up as unskilled worker if he already joined labor market at the age of 6 without any protection from his parents. The same thing could also happen to infant industries in developing countries if they are forced to do have free trade by neglecting the maturity of the infant industries. At the other extreme, he pointed that the protection for Jin-Gyu (or infant industries) should not last forever.

[5] Amsden (2001) used this term to described the situation in China and Ottoman Empire who were forced by European powers to open their market; their tariff were nil.

confirmed that tariff reduction would decrease the supply of rice, soybean, maize, and potato by 2.83% (from 51.1 million tons to 49.7 tons), 1.6% (from 1.68 million tons to 1.64 million tons), 2.7% (from 16.8 million tons to 16.3 million tons), and 2.8% (from 1.035 million tons to 1.005 million tons) respectively. They further showed that tariff reduction would increase import quantity of rice, soybean, maize, and potato by 1.7 million tons, 67,800 tons, 461,700 tons, and 43,000 tons respectively. The increase of import might indicate fierce competition between domestic and foreign agriculture products. The decrease of output of agriculture products might create inflation on local agriculture products. This inflation could increase the spending on food and it possibly hurts the society, especially the poor.

As labor supply is very responsive to output changes (Tambunan, 2005), the decrease of output caused by tariff reduction might force the labor force in agriculture industry to move to other sectors. Most likely, local farmers would be suitable for manufacturing jobs as unskilled workers. However, total manufacturing jobs would disappear because of falling output following further trade liberalization. These manufacturing industries include: manufactures metals, construction equipment, manufactures electrical, manufactured chemicals, manufactured non-metals and communication equipment (Croser, 2002). It might be caused by willingness of Indonesia to eliminate its local content regulations by 2000 under Trade Related Investment Measures (TRIMS) (Abimanyu, 2000).

Looking at the lists of "losers", someone might wonder why Indonesia as a country with millions population might experience declination in production output of communication equipment. Logically, Indonesia should have positive network externalities because of high population. Indeed, there are large number of mobile subscribers, about 135 million subscribers. This situation should create opportunity to grow business in skilled-intensive industries that produce communication infrastructures and equipment. But, Indonesia has not had capability yet in its skilled-intensive industry. It shows that local content regulations might be able to give opportunity for development of infant industries until they achieve maturity. UNDP (2003) argued that developing countries deserve policy instruments (e.g. local content regulations) that could enhance their value added, employment, and trade competitiveness. Manufacturing industries in textile, electronics, etc employ a lot of female workers. If the production output of these industries declined, then most of these female workers would be more dependent on their spouse or family. The source of income for families would decrease as well. As the results, the nutrition intake might be decreasing and number of school dropouts might be increasing. So, UNDP (2003) suggested that trade policies should be considered in the broader picture, including human development.

Recently, Indonesia just joined the implementation of ACFTA. It made more lists of Indonesian participation in the free trade. The first experience joining a FTA for Indonesia is ASEAN Free Trade Area (AFTA) by signing the agreement on the Common Effective Preferential Tariff (CEPT) Scheme during the 4th ASEAN summit in Singapore on January 1992.

The intense economic cooperation and development of regional relations between ASEAN and China can be traced back to the early 1990s. At that time, China normalized its relationship with the ASEAN countries. China also started joining the ASEAN summits in December 1997 in Malaysia. Further idea of economic cooperation was proposed by Chinese Premier Zhu Rongji during the ASEAN informal Summit on December 2000 in Singapore. In the following ASEAN Summit in November 2001 in

Brunei Darussalam, ASEAN and China started negotiating on the establishment of ACFTA. Then, the framework agreement on comprehensive economic cooperation between ASEAN and China was signed during the ASEAN Summit in November 2002 in Cambodia.

The interesting part of this agreement is the availability of the so-called Early Harvest Program (EHP), within which the tariffs of some agricultural and manufacturing products are negotiated between individual ASEAN countries and China. The EHP enables the acceleration of tariffs reduction for those products started on January 2004 and zero tariff on January 2006 for the latest for ASEAN-6 countries; and no later than 2010 for the newer members of ASEAN. The agreement on trade in goods was signed in November 2004 and effectively implemented in July 2005. It offers ASEAN-6 and China to eliminate the tariffs of products by 2010. The newer members of ASEAN will follow the tariff elimination by 2015.

There has been a vast empirical research analyzing the economic impact of East Asia economic integration, which involves Indonesia and China in it under ACFTA framework. Most of the empirical researches used general equilibrium models to analyze the welfare impacts of trade integration. Using general equilibrium models, the changes (e.g. a tariff reduction) in one specific market will affect all markets. For the case of trade, the changes on protective tariffs of a market will affect other markets. The following literatures will complement our previous discussion on the economic impact of ACFTA and other FTAs involving East Asian countries.

Jiang and McKibbin (2008) examined the impacts of three different FTAs scenario, named Free Trade Area of the Asia Pacific (FTAAP), ACFTA, and East Asia Free Trade Area (EAFTA), using dynamic and multisectoral model, APG Cube; static global model, GTAP, and static China model, CERD. Based on the simulations, China might get benefits from the entire scenario. Throughout 50 years, from 2007 to 2057, China gains USD 731 billion in real GDP, USD 899 billion in real GNP, and USD 605 billion in consumption. Real GDP and GNP gains are contributions of ACFTA, EAFTA, and FTAAP by about 36%, 40%, and 20%.

In the FTAAP scheme, China gains the most in the textile industry; In the EAFTA scheme, China gains the most in the agriculture; and in the ACFTA scheme, China gains the most in the motor vehicles and parts and other transport equipment (MVP). At a glance, this simulation indicates fierce competition between Indonesia and China in the agriculture, manufacturing, and textile industry. The interesting thing is that the MVP sector might be the winner in the ACFTA, but it might be the loser in the EAFTA and FTAAP scheme. The plausible explanation could be China has less comparative advantage than Japan and Korea, while China enjoys comparative advantage over ASEAN countries in the MVP sector. Another interesting feature of this simulation is the United States (U.S.) as a part of FTAAP and EAFTA. The U.S. might have less trade deficit with China in the FTAAP case (about USD 6.11billion) than in the EAFTA (about USD 9.02 billion).

Under different scenario, Strutt and Rae (2008) evaluated the FTAs in the East Asia region using the GTAP dynamic model. There are four scenarios: first, all bilateral tariffs are removed between China and three regions: Australia and New Zealand in 2009, ASEAN countries in 2010 (new ASEAN countries in 2015), and the Republic of Korea in 2012; second, FTA consists of China, ASEAN, the Republic of Korea, Australia, and New Zealand with the same timing as scenario 1, but now also liberalizing trade between ASEAN, Australia and New Zealand, and the Republic of Korea in 2013

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(extended to 2017 for new ASEAN countries); third, the same as scenario 2 without liberalizing sensitive sectors, assumed to be the rice, cattle and sheep meat, and dairy sector products for Asian countries and textiles, wearing apparel, and leather products for Australia and New Zealand; and fourth, developed APEC countries are assumed to fully liberalize their tariffs by 2010 and developing countries by 2020. Based on the simulations, the entire scenarios contribute positive change in real GDP of each country. As the exception, Australia and New Zealand have negative change in real GDP under scenario 1, referring to bilateral agreement that China as the hub. Almost all scenarios have positive contributions to the welfare of the countries, except Australia and New Zealand under scenario 4 (APEC). In this study, the impacts of FTAs are hardly observable in the each industrial sector and there are limited explanations on the impacts on each country, for example there is only discussion the impacts of FTAs to ASEAN, no discussion on each ASEAN countries.

Other studies that have similar conclusions include Francois and Wignaraja (2008) and Bchir and Fouquin (2006). Although they developed different scenarios of FTAs in the East Asia region, they ended up with about the same conclusions: almost all of countries that are involved in FTA would benefit from the entire scenarios; the countries that are not part of FTA might experience trade diversion; the industry winners and losers differ across countries, and it differs under different scenarios.

Trade liberalization would likely reduce the production output of Indonesia's agriculture sector. Manufacturing sector is the other Indonesia's industry that might have tight competition under any trade liberalization scenario, especially the inclusion of China as one of FTA members. The unskilled labors who usually work for these industries as the largest portion of Indonesia's labor force would likely have the hardest pressure, comparing to their skilled labor counterparts (Croser, 2002). The bottom line is trade liberalization might bring gains, but the losses would still likely outstrip the gains in the short run because the displaced labor force could not get better job, especially this situation might be relevant for developing countries (Chang, 2008). Storm (2001) argued that instead of full integration with world market through free trade and subsidies elimination, trade liberalization should be liberalized up to the point that it might be beneficial for country's national economic interests. For the case of Indian agriculture, he showed that economic recovery due to supply shock of tradable agriculture products might be faster than full liberalization without price inflation by keeping government intervention.

With the help of this literature, we can address several weaknesses. There is limited explanation on the industry winners and losers in each country. Often, the argument is about the comparative advantage. It is not convincing enough to explain the complex system of international trade. Future research should address the effect of FTA to industrial sectors specifically for each country. Strutt and Rae (2008) admitted that the data availability remains the issue. It becomes more relevant for the developing countries because the data is not neatly stored and possibly different standards of reporting are used than in other countries. Another weakness is the general equilibrium simulation (e.g. GTAP) looks like a magic black box with the economic parameters as the output of international trade simulation. It is difficult for non-economists (e.g. policy makers and diplomats as trade negotiators) to follow what is going on in the model. Future research should uses simpler model without simplifying things and compatible with the incomplete data that are the nature of developing countries. There is no perfect model to explain such a complex system of international trade and building more complex model does not necessarily could simulate it perfectly. On some

occasions, simpler models are not always inferior to the complex ones. It depends on the objectives. Last but not least, the literature did not explore deeper on the bilateral trade under regional trade agreement (e.g. Indonesia and China trade under ACFTA). Future research should explore more on this aspect, especially in the case of trade as strategic and political decision.

2.3   International Trade and the Environment

If it is true that international trade leads to economic growth, then the degradation of environmental quality is inevitable. There may be market expansion and increase of economic activity through trade, so that it would increase the energy demand. Since we are dependent on fossil fuel, it would produce more pollutants and deplete natural resources faster. The increase of economic activity will pollute more if trade leads to specialization on intensive polluting industries.

According to some studies, the relationship between environmental quality and income level follows the pattern of Environmental Kuznets Curve (EKC). The curve is derived based on the hypothesis of Simon Kuznets about the relationship between income inequality and income level. At first, income inequality increases when the income level increases, then income inequality will decrease at the certain value of income level (Kuznets, 1955). In the case of EKC, environmental degradation increases when the income level increases, then environmental degradation will decrease at the certain point of income level.

One of the very first attempts to examine the pattern of EKC was Grossman and Krueger (1991). According to the work of Grossman and Krueger (1991), the relationship of some pollutant as indicators of environmental quality and income level follow the pattern of EKC. They used three air pollutants (SO_2, dark matter, and suspended particle) in 42 countries based on the Global Environmental Monitoring System (GEMS) data to study this relationship. They found out that SO_2 and dark matter will increase as the income level increases but decrease drastically after a certain income level. However, suspended particle does not follow this pattern and it keeps going up as the income level increases. They did not provide further analysis on this.

With broader datasets, Grossman and Krueger (1994) made a comeback on this issue. The datasets include concentration of urban air pollution, measures of the state of the oxygen regime in river basin, concentration of fecal contaminants in river basin, and concentration of heavy metals in river basins. Almost all of the parameter follows the shape of EKC. The exception is the concentration of total coliforms, which rises as the income level rises, then falls, then rises again.

Hettige, Lucas, and Wheeler (1992) also found the inverted U-shaped pattern on the toxic intensity per unit of GDP and income level. However, the toxic intensity per unit of industrial output does not follow the pattern. In their research, they developed environmental quality measure, toxic intensity for 80 countries from 1960 to 1988 in the manufacturing, instead of using the specific indicators to measure environmental quality. The idea was to make the generalization of environmental quality on air, water, etc.

The studies showed that not all indicators of environmental quality follow the pattern of EKC. Besides, we cannot simply think that if a country has achieved a certain income level, the

environmental quality will voluntarily increase. There should be a convincing explanation and a clear mechanism that shape the relationship between environmental quality and income level.

The environment can be seen as a common. It is something shared among members of society. At a certain point, property rights have to be established and enforced to make people use the environment in a sustainable way. Therefore, policies and institutions are also important points in defining the environmental quality and economy growth, which will affect the shape of EKC.

Panayotou (1997) attempted to include the quality of policies and institutions in analyzing EKC. He used SO_2 as indicators of environmental quality. Using panel data of 30 countries, he found out that at the beginning of development (low income level), the quality of policies and institutions can reduce the environmental degradation by SO_2. At a high income level, it will accelerate the environmental improvement. These findings showed that policy intervention might be necessary to exploit the environment sustainably. Policy intervention will enable a country to maintain economy growth without compromising environmental quality.

Policies intervention for more sustainable environment could mean stricter environmental regulation. Developed countries usually have stricter environmental regulation than developing countries, so that it will shift the pollution intensive industries from developed to developing countries (pollution haven hypothesis) (Copeland & Taylor, 2004). Some researches seem to support this hypothesis. In the case of Japan-China trade, China is the net-exporter of CO_2 to Japan and keep increasing overtime based on the Japan-China input-output analysis in the period of 1990 to 2000 (Xianbing, Masanobu, Can, Yanli, & Wenling, 2010). Austria as developed country is net-importer of CO_2 (Kratena & Meyer, 2010) and about one-third of Austrian consumption comes from developing countries' products (Munoz & Steininger, 2010). However, the evidence of Pollution haven hypothesis (PHH) could be mixed depending on the measure criteria. Cole (2004) found the import of developed countries from developing countries supports the evidence of dirty industries relocating to developing countries by examining the NO_x, SO_2, CO, Suspended Particulate Matters (SPM), and Volatile Organic Compound (VOC). But, the share of dirty export to the developing countries could also be found in the measurement of SO_2.

Still, the EKC hypothesis is problematic. First, not all indicators of environmental quality follow the pattern of EKC, Second, the results could be different because of different measures. Using Ecological Footprint (EF)[6], Caviglia-Harris, Chambers, and Kahn (2009) found no empirical evidence of an EKC relationship between the EF and GDP. Moreover, EF keeps increasing with growth of GDP. Third, the results could be different because of different method of data processing. Contradictory findings came from Perman and Stern (2003) who argued that EKC does not exist, at least for SO_2 emissions. They used cointegration analysis to test EKC hypothesis using panel dataset of SO_2 emissions and GDP data for 74 countries in the period 1960-1990. Fourth, problems in the theoretical modeling approach and econometric in estimating EKCs (Muller-Furstenberger & Wagner, 2007).

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[6] Ecological footprint is a single measure that condenses a large array of environmental data so that it will be easy to make comparison among countries with regard to carrying capacity (Caviglia-Harris, Chambers, & Kahn, 2009)

Besides the criticisms above, there is at least one pollutant, CO_2, which might not follow the pattern of EKC. The reason is our dependency on fossil fuel. Despite the growth of non-fossil energy (such as geothermal and hydropower), fossil fuels have maintained their shares of the world energy supply relatively unchanged, accounting for about 82% of the global total primary energy supply, since 1971 (IEA, 2009a). This situation can be shown in the figure below.
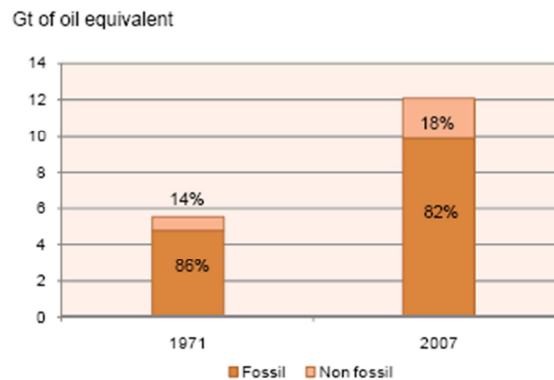
Figure 2 World Primary Energy Supply

Source: IEA (2009a)
Note: Non-fossil energy includes nuclear, hydro, solar, wind, tide, and other renewable energy.

If fossil fuels still dominate the world energy supply, then CO_2 emissions will still keep increasing in the future. Based on IEA projection, world energy supply will increase by 40% between 2007 and 2030, the CO_2 emissions will be expected to increase from 29 Gt CO_2 in 2007 to 40.2 Gt CO_2 in 2030 if the composition of energy supply is unchanged (IEA, 2009b).

This short illustration might show the weakness in the EKC hypothesis. Indeed, some researches (Caviglia-Harris, Chambers, & Kahn (2009) and Akbostanci, Türüt-Aşik, & Tunç (2009)) that examined energy demand and CO_2 emissions found no significant evidence for the existence of EKC. Using EF, Caviglia-Harris, Chambers, and Kahn (2009) found that energy is the biggest component of EF. More importantly, they conducted energy sensitivity analysis and the result is shown in figure 3.
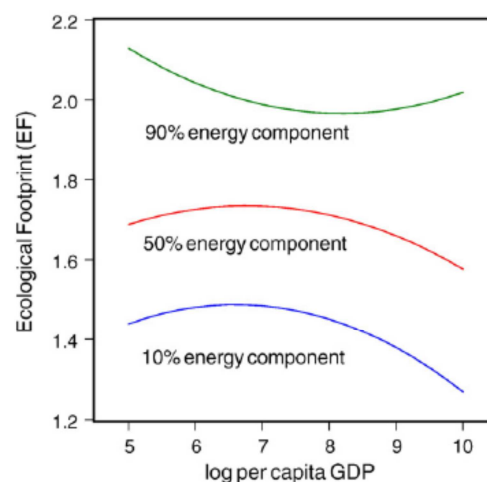
Figure 3 Estimated Relationship between the EF and log per capita GDP

Source: Caviglia-Harris, Chambers, & Kahn (2009)

Figure 3 shows that the pattern of EKC exists if there is a decrease of energy use by 50%. In other words, substantial cuts of energy will reduce CO_2 emissions.

Based on the country specific experience, Akbostanci, Türüt-Aşik, & Tunç (2009) also found no evidence of EKC relationship between CO_2 and GDP per capita in Turkey. CO_2 keeps increasing when the GDP grows in Turkey. This situation might also occur in other emerging economies, such as China and Indonesia that have high dependence on fossil fuels. In the future, China and Indonesia will be more dependent on coal because of their energy intensive industries and abundant coal reserves. Coal will be 45.61% of primary energy supply of Indonesia in 2025 (PEUI, 2006). In China, coal will be 56% of primary energy supply in 2030 (Komiyama, -).
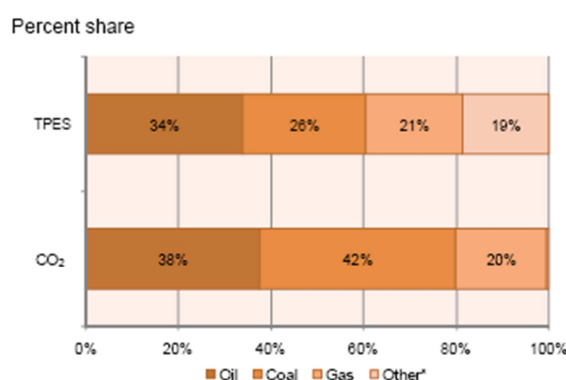
Figure 4 World Primary Energy Supply and CO_2 Emissions: Share by Fuel in 2007

Source: IEA (2009a)
Note: Non-fossil energy includes nuclear, hydro, solar, wind, tide, and other renewable energy.

Looking at figure 4, coal pollutes two times as much as other fossil fuels. So, we can expect the rapid growing level of CO_2 emissions in China and Indonesia. Moreover, the economic cooperation between these countries in the ACFTA framework might increase the exploitation of coal and CO_2 emissions through burning coal. To reduce the energy demand, individual countries might do the following actions: (1) rapid growth in service industries; (2) importing more pollution intensive goods; (3) installing domestic pollution control devices; (4) increasing energy efficiency (Agras & Chapman, 1999). However, the first and second actions will increase emissions in other countries. Besides, it might not be applicable for Indonesia and China now since they have comparative advantage in "dirty" industries. The invention of carbon capture storage (CCS) is one attempt to reduce CO_2 emissions. The development of renewable energy is another attempt to solve this problem.

Asian countries have undergone trade liberalization and embrace free trade aggressively in the last decades. Indonesia has been actively participating in Uruguay Round negotiation, joining ASEAN Free Trade Area (AFTA), etc. To be more specific, Indonesia is part of it and one of the countries that relies on export as growth strategy. The full implementation of ACFTA is the latest breakthrough in its trade liberalization. Indonesian aggressiveness in embracing free trade has improved awareness to environmental impact of trade liberalization.

Strutt and Anderson (2000) claimed that trade policy reforms by fulfilling Uruguay Round[7] and joining APEC could improve the environment (at least with respect to air and water pollution) in the period 2000-2020. The trade policy reforms scenarios are compared with the baseline level, assuming Indonesia will not liberalize its international trade. Using GTAP for the simulation, they use CO_2, SO_2, and NO_2 as air pollution indicators and biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved solid (DS), and suspended solid (SS) as water pollution indicators. Table 1 shows the percentage change of pollution in Indonesia under different scenario.

Table 1 Percentage Change of Pollution in Indonesia under Different Scenario

Pollutants	% Change of Pollutants under Baseline Scenario	Additional % Change of Pollutants with Trade Policy Change		
		Uruguay Round	APEC	APEC with additional 0.5% economic growth
a. 1992-2010				
CO_2	134%	-1.1%	2.9%	16%
SO_2	132%	-1%	4.8%	19%
NO_2	162%	-1.5%	4.9%	19%
BOD	52%	-2.5%	7.9%	39%
COD	64%	-1.9%	6.2%	31%
DS	-46%	-0.3%	-0.4%	2%
SS	23%	5%	-4.2%	24%
b. 1992-2020				
CO_2	264%	-0.6%	2.1%	12%
SO_2	247%	-0.6%	3.4%	14%
NO_2	328%	-1%	-1.6%	15%
BOD	42%	-0.9%	2.4%	12%
COD	62%	-0.7%	2.4%	12%
DS	-81%	-0.3%	-1.8%	6%
SS	-21%	0.9%	-4.2%	7%

Source: Strutt & Anderson (2000)

This simulation assumed Indonesia will be able to adopt technology to reduce air pollution and improve the effectiveness of irrigation. This strict assumption might contribute to the low level of additional change of pollutants under the scenarios. The assumption on the level of economic growth contributes to the change of pollutants. Additional 0.5% increase of economic growth among

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[7] Uruguay Round was the 8th multilateral trade negotiation. The previous negotiation rounds include: Geneva (1947), Annecy (1949), Torquay (1951), Geneva (1956), Dillon Round (1960-1961), Kennedy Round (1964-1967), and Tokyo Round (1973-1979). Feridhanusetyawan and Pangestu (2003) summarized the Indonesia's commitments under Uruguay Round as follows: (1) binding of a majority of tariffs across-the-board at the ceiling rate of 40%, (2) tariffs reduction in agriculture sector of at least 10% per line item, or about 24% overall, over the 10 years from 1994, (3) the commitment to remove non-tariff barriers, (4) elimination of all import surcharges on items included in Indonesia's market access over a 10-year period from 1994, (5) liberalization of five service sectors, namely telecommunication, industrial services, tourism, financial services, and banking, (6) the commitment to remove local content regulation under the Trade Related Investment Measures (TRIMS). Other feature of Uruguay Round is the elimination of bilateral quotas under Multifibre Arrangement (MFA).

APEC countries will give additional air pollution and water pollution (only BOD and COD) by more than 10% in the period 1992-2020.

Under the Uruguay Round scenario, textiles, clothing, and leather are the most contributors of pollutants. This contribution might be decreased if China is included in the Uruguay Round scenario. It might be because Indonesia competes with China in these sectors. Indeed, percentage change of output in these sectors would be decreased from 61.9% to 38.5% by including China. Moreover, the output would decrease by -2.6% under APEC liberalization and would only increase by 2.9%, assuming that the APEC countries would have additional 0.5% economic growth. Under Uruguay Round scenario, we can also interpret the decrease of water pollutants is due to the decrease of water consumption from water-hunger sectors, such as paddy rice and due to the assumption that Indonesia would improve the efficiency of irrigation. The decrease of water consumption from paddy rice sector sounds plausible because reduction tariffs in agriculture sector are one of the features of Uruguay Round. Indeed, paddy rice output would decrease by -0.6% and -0.3% without China and with China respectively. The decrease of output might be caused by more intense competition in this sector under Uruguay Round. Farmers might be characterized as poor in developing countries. Even, some of them are landless farmers who cultivate other farmers' land. The decrease of output from agriculture sector due to trade liberalization could lead to mass unemployment of farmers. The unemployed farmers might have a chance to get a job as un-skilled workers due to their low education level in the manufacturing sectors. Textiles, clothing, and leather factories could be the option. However, this sector would have less aggressive growth under both trade liberalizations so that the unemployed farmers would be no longer able to find a job. If the job creation in other sectors was slower than the job depletion from agriculture sector, then trade liberalization would worsen farmers' standard of living, including their families.

Strutt and Anderson (2000) claimed that social welfare is going to be improved by both Uruguay Round and APEC liberalization because it would only add small environmental degradation and the inevitable economic gain. I do not think it would really be the case for Indonesia because there would not be a balance between environment and economic gain. The only small increase of environmental degradation from baseline scenario through trade liberalization and the deterioration of some important sectors in Indonesia –as illustrated in the paddy rice, textiles, clothing, and leather sectors, are unacceptable.

In order to help the farmers who get affected by trade liberalization, government of Indonesia would likely use subsidy policy on some products of agriculture-related inputs. Abimanyu (2000) showed that subsidy on fertilizer as one of agricultural inputs would likely increase some level of pollutants. The pollutants include: suspended particulate matter (SPM), SO_2, NO_2, CO, and biological oxygen demand (BOD). On the other hand, his results indicated a reduction of import tariffs for agricultural-related inputs might decrease the pollutants. He further concluded that the results might suggest that domestic products are dirtier than foreign products. However, Indonesia might import more waste if the import is far higher than the export, although the foreign products are cleaner than the domestic one.

In the case of ACFTA, Vuthai and Jalilian (2008) released publicly the environmental study of ACFTA on Greater Mekong sub-region. The study is about the environmental impact of ACFTA to Greater Mekong Subregion (GMS). GMS belongs to Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and

the Southwestern Chinese province of Yunnan. Using the industrial pollution projection system (IPPS)[8] (Hettige, Martin, Singh, & Wheeler, 1995), the industries are divided into three categories: most polluting[9], moderately polluting[10], and least polluting sectors[11]. The following pie chart shows the portion of Cambodia's import from China in the year of 2007.
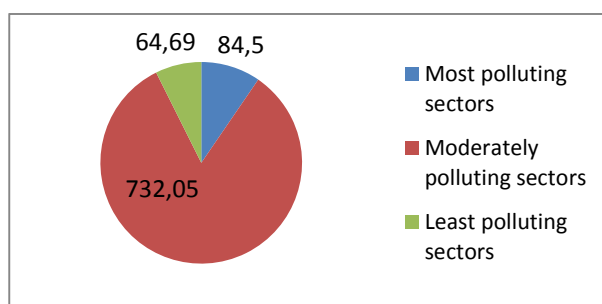
Figure 5 Cambodia's Import from China in 2007 (in million USD)

Source: Vutha & Jalilian (2008)

Figure 5 shows that Cambodia's import from China was dominated by moderately polluting sectors. China's products from moderately polluting sectors flooded Cambodia's market with the average increase of 123% per year in the period year 2001-2007. In the most polluting sectors, China is estimated to gain pollution through trade with Cambodia since Cambodia does not have comparative advantage in these most polluting sectors; the increase of China's export to Cambodia was about 69% per year in the period 2001-2007. The estimating pollution intensity through IPPS also indicated the same tendency of increase.
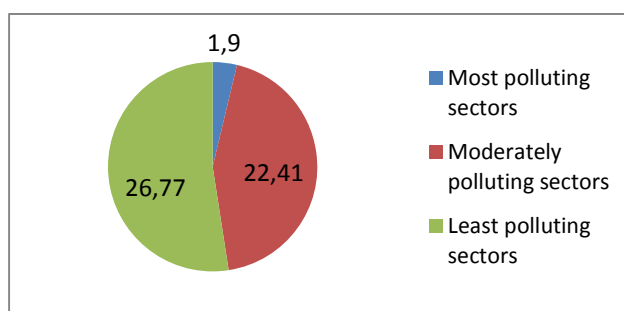
Figure 6 Cambodia's Export to China (in million USD)

Source: Vutha & Jalilian (2008)

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[8] IPPS is a modeling system which can use industry data to estimate comprehensive profiles of industrial pollution for countries, regions, urban areas, or proposed new projects. The comprehensive profiles of industrial pollution are derived from the detailed industry survey information on employment, value added or output.

[9] Most polluting sectors include: metals, chemicals, plastics, pulp and paper, and hides and leather.

[10] Moderate polluting sectors include: machinery and electrical appliances, mineral products, textiles and apparel, rubber products, vehicles, miscellaneous manufactured articles

[11] Least polluting sectors include: vegetable products, wood and wood articles, stone/cement/ceramics, prepared foodstuffs, footwear, and optical, precision and musical instruments.

In the moderately polluting sectors, Cambodia has the highest year-to-year increase of export to China and at the same time, about 87% annual increase in the period 2001-2007; the pollution trend showed the same tendency. In the least polluting sectors, Cambodia expected less significant increase of pollution, about 9% annual increase in the period 2001-2007. However, these sectors might lead to other environmental destruction, such as deforestation and depletion of natural resources. Through ACFTA, the country members will expect more intense of intra-regional trade and it might cause unsustainable and overexploitation of natural resources.

The environmental study of ACFTA is relevant for Indonesia. China is the resources-hungry country and Indonesia seems having ability to fill China's needs. But, the richness of natural resources could be a curse if Indonesia does not exploit its natural resources and environment sustainably. It will make Indonesia too dependent on its natural resources, just like during Dutch colonial era. In addition, Indonesia may become too complacent with this status quo and will not be able to diversify its economic structure.

2.4   China, ASEAN and the Geopolitics in East Asia

China is Asia's (and the world's) rising economy and power. The debate on the rising China as dominant country in the ASEAN happens after the collapse of Soviet Union and their normalized relations. Japan and the U.S. have long history of influence in the ASEAN. The improvement of China-ASEAN relations since the 1990s could shift the geopolitical map in the region. Since the power game in identifying geopolitical map is often characterized as zero-sum game, Japan and the U.S. might have to share their power in the region.

Although China and ASEAN normalized their relationship in the 1990s, these countries continued to have a dispute over Spratly Island on the South China Sea. As time goes by, China showed friendly gesture by participating in the ASEAN summits and proposed further economic cooperation, which is the seed of ACFTA. Besides, China has willingness to discuss Spratly issues in multilateral fora (Ba, 2003). It might be a cause of the de-escalation of Spratly Island dispute (Emmers, 2007). The aggressiveness of China in engaging ASEAN makes Japan also show willingness to increase its economic cooperation with the ASEAN countries. Possible ASEAN-Japan cooperation is always one of the topics during yearly ASEAN summit. As Soesastro (2003) noted that FTAs involving East Asian countries, including ACFTA, are essentially politically-driven.

With regard to China's power status, it is debatable on how to make a ranking due to the difference in method, data, and perspective so that it will affect the final conclusions (Yan, 2006). Yan analyzes the country power based on the military, political, and economic power. Military power is used to tackle security threats, economic power is to deal with economic conflicts, and political power is to deal with political pressures. Yan compared China with other states, such as France, Britain, Russia, Japan, Germany, and India, in these three measurements. Yan concluded that China is categorized as strong in overall measurements, while France, Britain, Russia, and Japan are categorized as strong in two measurements, military and political power. Japan and Germany are categorized as strong only in economic power, while India is categorized as strong only in military power. But, China is still inferior to that of the U.S., in terms of military, political, and economic power. The only advantage

that China has is it has more domestic political mobilization than the U.S. since China has more administrative measures to mobilize its people. But, China does not have the same political mobilization capability in the international stage. At the end, Yan concludes that China might rank third as global power behind U.S. and European Union (EU), assuming that EU will act as a single state.

Although the economy is not the only criteria of power status, it is a necessary element to climb up the rank of global power. China and ASEAN economic cooperation under ACFTA framework is the reality of economic expansion and the change of geopolitical landscape. This economic cooperation scheme might be a tool for them to mitigate U.S. domination in the region. Just like Asia-Pacific Economic Cooperation (APEC) that is viewed by China and ASEAN as a tool of U.S. domination (Nesadurai, 1996).

However, there is skepticism about the sustainability of China's growing power. As discussed in the previous section, energy supply availability is one of the limits to grow the economy. The dependence of fossil fuel energy will harm the environment that could also hinder the economic growth. These forces will also limit the growth of power.

Moreover, Friedman (2010) argues that China's growing power will not be sustainable. His argument is centered on the characteristic of China's cultural diversity and domestic political instability. In his scenario analysis, he predicts China will be divided into pieces due to cultural clashes and uneven domestic political progress. It implies that the China threats will not deal with wars or challenges from other countries, but will deal with weaknesses from within. Before the release of Friedman's book, Yan (2006) also argued that the descent of China's power will have something to do with political crisis, instead of wars and economic difficulties.

The political stability in China might have something to do with economic development disparity between rural and urban areas. Rural area as agricultural society is poorer than urban area as industrial society. This divides happen because the Chinese government treated them differently. Naughton (2007) describe these differences of treatment between rural and urban community. On the one hand, the government eliminated the private rights of land in rural areas. This collective ownership land is the major source of dispute in rural areas. On the other hand, the government gave privileges of urban residents, which include: job security, guaranteed low-price access to food grains and other commodities, health care, pension fund, primary and middle school education for their children, and low cost housing. Furthermore, he described poverty as rural phenomena in China. Recently, Chinese government allowed the population movement from rural to urban areas in order to fill the gap of workers demand, especially in coastal areas. However, the migrants still receive discrimination, for example the employers tend to fire migrants in order to protect the jobs of urban residents. The inequality of treatment could cause the economic disparity between rural and urban areas. And, economic disparity could lead to social clashes that harm the political stability. The optimists might have no doubt that China would make a seamless transition to more equal society by embracing gradual globalization to sustain economic growth that could spread across China.

The domestic political stability is also a weakness for some ASEAN countries. Take Indonesia as an example. Indonesia also shares similar characteristics, in terms of cultural diversity and domestic

political stability. Terrorism and separatist movement are two relevant topics for Indonesia. Cohen (2009) described Indonesia as a state waiting to implode. His argument based on the reality of separatist movements that have already existed since 1950s. The repressive government during Suharto era could partially eliminate the existence of separatists. Growing international concerns over human rights made Indonesian government considers military action as not the first option. This international pressure culminated in May 2002 when East Timor gained independence. This event gave momentum to other separatist movement. There were clashes between government military and Acehnese separatists, but eventually, the government could create peace by offering special autonomy to Aceh until now. The challenges of domestic political stability in China and Indonesia are different. However, the results could be the same; the instabilities might hamper economic development.

Regardless of the skepticism of China's raising power sustainability, growing influence of China in the ASEAN region is foreseeable. Indonesia can use ASEAN as testing platform for its leadership in improving their bargaining position in the regional stage.

2.5   Summary

The analysis of the domain of international trade is multifaceted. At least, the actors involved in it operate in three interconnected areas: the economic, the environmental, and the geopolitical. In other words, the economic impact is not the only parameter to decide whether a country should join a FTA or not. It is hard to weigh the three aspects (economic, environmental, and geopolitical) and it is even harder to decide which aspect will be more important than the others.

There are contradictory views about whether trade liberalization will promote economic growth. It seems like every country has unique experiences regarding the results of trade liberalization. However, economists generally think that trade liberalization will positively contribute to economic growth. In the case of FTAs in East Asia, the existing research shows that the members of FTAs will benefit from these economic cooperation frameworks. However, looking at the specific sectoral level, most of Indonesian industries would lose since the most generating employment sectors (agriculture and manufacture) were indicated experiencing decrease of outputs. At the micro level, it might drive up mass-unemployment in these sectors. Decrease of agriculture supply in particular might create inflation of food prices. It would possibly hurt the consumers, especially the poor.

Environmental degradation seems a plausible negative effect of further intensification of trade for Indonesia, especially trade with China. One of the reasons is both countries are dependent on fossil fuel. Moreover, their future energy strategy would use coal as the biggest portion of primary energy supply. Indonesia will likely pollute more domestically and at the same time, coal reserve will likely be depleted since the future export of coal will account for more than 50% of total coal production. China might be the consumer for this coal export. It might indicate that environmental degradation in Indonesia would not follow the pattern of EKC.

Finally, the decision to join the FTAs might change the geopolitical map of a region. In the case of ACFTA, the motives of China and Indonesia might be political, not only economic. On the one hand, China as the rising power and economy would mitigate the long-term influence of the U.S. and Japan

in ASEAN. On the other hand, ASEAN will have a louder voice in the region by establishing this economic cooperation with China. However, the economic aspect as a source of power is not the only factor that might change the geopolitical map. Domestic politics in the countries also plays a role in shaping its power. China and Indonesia have challenges in domestic political stability since they share similar diversity in culture and economic diversity among domestic regions. Particularly for Indonesia, policy makers in Jakarta should be able to accommodate the diverse needs of different islands. The political structure of Indonesia should enable economic development of Outer islands (especially the eastern islands) to achieve economic convergence among regions. Distribution of economic development might reduce separatist movements and increase tolerance.

Every country is likely to have a unique experience of trade liberalization. So, there will be no trade liberalization strategy that fits all countries' unique needs. Therefore, the analysis of FTAs should be customized on a country by country basis. This research will contribute the analysis of FTAs from three perspectives: the economic, the environmental, and the geopolitical, in the case of Indonesia under ACFTA framework. A partial equilibrium approach will be used to analyze the impacts of the ACFTA since there is already vast literature that utilizes general equilibrium approach. Subsequently, the comparisons between partial and general equilibrium approach will be made.

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Chapter 3   Simulating the ASEAN-China Free Trade Area (ACFTA) using a Partial Equilibrium Approach

Relatively open trade regime has served the Indonesian economy very well (Hill, 2000). It does not automatically mean that full liberalization of trade will sustain economic growth. As indicated in the previous literatures, the relationship between trade liberalization and economic growth is ambiguous. In some cases, trade liberalization has not contributed to economic development; in other cases, it did, but as is illustrated by Singapore, which did embrace an open trade regime, trade reform has been complemented by government interventions, such as expansion of public investment and tax incentives, to help sustain economic growth (Young, 1992). On the other hand, experience suggested that trade barriers might benefit skill-intensive industries for long-term growth and create positive externalities for other industries (Nunn & Trefler, 2010).

This chapter discusses the economic impacts of the ACFTA to Indonesia, while chapter 3 and 4 will discuss the environmental and geopolitical impacts of ACFTA on Indonesia respectively. First, I will present an overview of how countries belonging to the Association of Southeast Asian Nation (ASEAN) and China have gradually begun building the ACFTA. This part covers mainly the economic initiatives from the beginning of its establishment until now. Second, I provide an overview of the trade pattern of Indonesia. The discussion focuses on the main trading partners of Indonesia and on the commodity structure of Indonesia's exports and imports. Third, I simulate the impact of ACFTA on Indonesia using a partial equilibrium approach. Fourth, the simulation results are analysed for every industry. The results are also compared with major existing general equilibrium studies. And, the last part of this chapter discusses Indonesia's policies to move forward related to trade and lessons learned.

3.1   An Overview of ASEAN and ACFTA

ASEAN was established on 8 August 1967 in Bangkok, Thailand to accelerate economic growth, promote regional peace and stability, and enhance cooperation in the economic, social, cultural, technical, scientific, and administrative fields. The founding countries of ASEAN who signed the ASEAN Declaration are: Indonesia, Singapore, Malaysia, Philippines, and Thailand. Later, Brunei Darussalam joined ASEAN on 7 January 1984, Vietnam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999.

At the beginning, the reason for the establishment of ASEAN was political rather than economic. The economic collaboration among ASEAN countries got momentum after the preferential trading arrangements in 1970s and 1980s, and the signing of the ASEAN Free Trade Area (AFTA) on 1 January 1993. The economic cooperation was also enlarged to the neighbouring countries, such as China,

Japan, India, and Australia. I summarize important dates and activities related to ASEAN initiatives on trade and also economic cooperation between ASEAN and China in the ACFTA framework in the table 2.

Table 2 Important Dates and Activities about ASEAN and ACFTA

Dates	Remarks
8 August 1967	Indonesia, Malaysia, Singapore, Philippines, and Thailand signed Bangkok Declaration.
24 February 1976	Signing ASEAN Concord, including the early idea of preferential trading arrangement (PTA) among ASEAN countries, trade expansion in food and energy, and joint efforts of market expansion outside ASEAN.
7 January 1984	Brunei Darussalam joined ASEAN.
15 December 1987	The signing of Manila Declaration, which it included the improvement of PTA (e.g. reduce the exclusion lists, relaxing of ASEAN-content requirement, improvement on ASEAN industrial joint venture, and negotiation on non-tariff barrier).
1 January 1993	The signing of ASEAN Free Trade Area.
28 July 1995	Vietnam joined ASEAN.
15 December 1995	The signing of Bangkok Summit Declaration, which included ASEAN Framework Agreement on Services, acceleration the progress of AFTA before the target date of 2003, and removal tariffs and non-tariff barriers by 1996.
23 July 1997	Myanmar and Lao PDR joined ASEAN
15 December 1997	ASEAN vision 2020 to be a zone of peace, freedom and neutrality, stable, prosperous and highly competitive economic region in which there is free flow of goods, services, and investments.
December 1998	Framework Agreement on ASEAN Investment Area. Hanoi Plan of Action as the first series of plans of action building up to the realization of the goals of the ASEAN vision 2020 covering the period of 1999 to 2004.
30 April 1999	Cambodia joined ASEAN
28 November 1999	ASEAN, Japan, China, and South Korea (ASEAN+3) committed to strengthen efforts in accelerating trade and investment.
2000	Launching of Initiative for ASEAN Integration (IAI), which it will focus on education, skill development, and worker training. Chinese Premier, Zhu Rongji, suggested the possibility to establish ASEAN-China Free Trade Area (ACFTA).
November 2001	ASEAN-China Expert Group submitted the study about ASEAN-China economic cooperation.
5 November 2002	The signing of Framework Agreement on Comprehensive Economic Cooperation between ASEAN and China.
October 2003	Declaration of ASEAN Concord II as agreement to establish ASEAN Community, which comprising three pillars, namely political and security cooperation, economic cooperation, and socio-cultural cooperation.
November 2004	Agreement to accelerate integration of 11 priority sectors, which consist of electronics, e-ASEAN, healthcare, wood-based products, automotive, rubber-based products, textiles and apparels, agro-based products, fisheries, air travel, and tourism. Vientiane Action Program (VAP) towards the realization of ASEAN vision 2020 that comprised period of 2004 to 2010.

December 2005	The leaders of ASEAN welcomed China to become the development partner for ASEAN.
2006	Early Harvest Program as part of ACFTA came into effect.
January 2007	The signing of agreement on trade in services of the framework agreement on comprehensive economic cooperation between ASEAN and China. Declaration on the acceleration of the establishment of an ASEAN Community by 2015.
November 2007	ASEAN+3 cooperation work plan 2007-2017. Declaration of ASEAN Charter as the institutional framework of ASEAN.
2009	The signing of the Initiative of ASEAN Integration (IAI) work plan II for period of 2009-2015.
2010	ASEAN members ratified ASEAN Trade in Goods Agreement (ATIGA). ACFTA phase II, under Normal Track I, came into force.
2011	Discussion of implementation progress of ASEAN Economic Community (AEC) blueprint.
2012	ACFTA phase II, under Normal Track II, will come into effect. ACFTA phase III, under Sensitive List, will come into effect so that the maximum tariff will be 20% and keep decreasing up to 0=5% in 2018.
2015	ACFTA phase III, under High Sensitive List, will come into effect so that the maximum tariff will be 50%.

Summarized from www.aseansec.org

Looking at the activities of ASEAN, there were not many engagements prior to 1990. The intensive collaboration among ASEAN members was started in the 1990s. In the economic aspect, ASEAN signed AFTA in 1993. There is also an increase in the share of intra-ASEAN trade, from almost none in 1990s to 24.5% of ASEAN total trade in 2009. In particular, countries like Myanmar and Lao PDR have a high dependency on their neighbouring ASEAN countries. Their trade with ASEAN amounted to more than 50% of their total trade in 2009. Vietnam had the smallest intra-ASEAN trade share to its total trade, namely 17.6% in 2009, while Lao PDR had the largest intra-ASEAN trade share to its total trade, namely 80% in 2009.

3.2   Indonesia's Trade Pattern

In 1990, Japan and the United States were the two main countries of destination for Indonesia's exports, accounting for 56% of Indonesia's total exports. Oil and gas dominated Indonesia's exports, accounting for 43%. But over time, Indonesia has been able to diversify its export destinations, mainly to ASEAN countries, China, Taiwan, and South Korea. Oil and gas did not dominate the Indonesia total export anymore and oil and gas only accounted for 18% of Indonesia total export in 2010. However, oil and gas still have the biggest share of the export composition.

Indonesia's exports to China have shown promising growth in the last decade. Indonesia's exports to China were negligible in 1990 but accounted for 10% of total exports in 2010. Indonesia's exports to China have had steep growth since 2000s and Indonesia's imports from China have grown rapidly as well, as depicted in figure 7.

Prior to 2002, Indonesia's exports to China experienced sluggish growth. The explanation could be the relationship between Indonesia and China was still in the early phase prior to 1990s. In the period 1997-2002, this situation also happened to other export destinations as well. Weak demand from Asian countries that were still in the recovery process from the financial crisis of 1998 might be the reason. The other reason could be the low global demand due to the September 11 event. The year of 2002 seems the point where the trade between Indonesia and China started to take off. Indeed, this is also the year when the Framework Agreement on Comprehensive Economic Cooperation between ASEAN and China was signed.
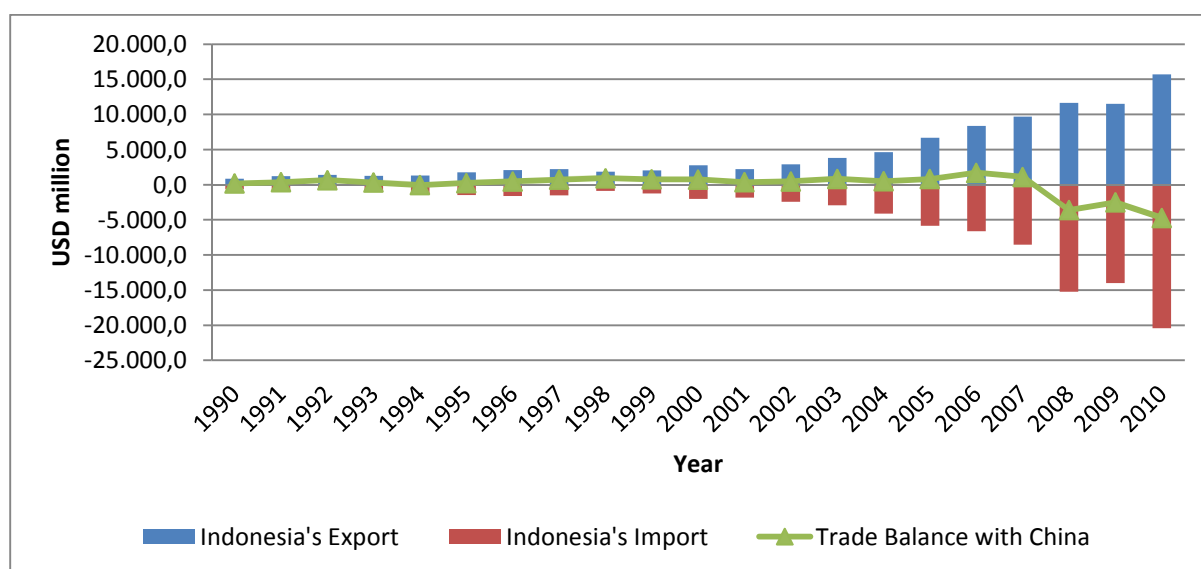
Figure 7 Indonesia's Export to and Import from China in the Period 1990-2010

Source: WITS database

Indonesia still had a surplus trade balance with China until 2007, but it became a trade deficit from 2008 onwards. Looking at the specific industries, Indonesia mainly exports mining, food products and beverages, electronic equipment, and chemicals to China, which amounted to USD 5.6 billion, USD 2.1 billion, USD 1 billion, and USD 0.8 billion in 2010 respectively. Mining accounted for 43.5% of Indonesian exports to China. Agriculture, forestry, fishery, and food products and beverages accounted for 1%, 1.2%, 0.4%, and 15.8% respectively. Taken together, primary products accounted for 61.9% of Indonesian exports to China. The remaining sectors which represent manufacturing sector accounted for 38.1%. Table 3 shows the complete list of Indonesia's exports to and imports from China in 2010. Appendix 1 provides information on how the classification of industries is conducted based on the HS Code[12], while more information on trade flows between Indonesia and each ASEAN countries by sectors can be seen in appendix 2.

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[12] Harmonized Commodity Description and Coding System (HS) generally referred to as "Harmonized System" or simply "HS" is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). It comprises about 5,000 commodity groups; each identified by a six digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 200 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics.

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Table 3 Indonesia Export and Import with China in 2010 (USD million)

Industry	Export	% of Export	Import	% of Import	Trade Balance
Agriculture	135.6	1%	487.6	2.8%	-352.0
Forestry	159.2	1.2%	69.8	0.4%	89.4
Fishery	48.3	0.4%	22.2	0.1%	26.1
Mining	5,666.6	43.5%	1,025.3	6%	4,641.3
Food products and beverages	2,061.1	15.8%	281.5	1.6%	1,779.5
Textiles and footwear	305.5	2.3%	2,007.6	11.7%	-1,702.1
Pulp, paper, and paper products	756.9	5.8%	101.4	0.6%	655.5
Chemicals	806.8	6.2%	1,674.4	9.7%	-867.6
Iron, steel, and metal products	779.0	6%	2,376.0	13.8%	-1,597.0
Transportation machinery	5.4	0%	891.0	5.2%	-885.6
Electronic equipment	1,039.3	8%	3,095.2	18%	-2,055.8
General machinery	665.8	5.1%	3,591.1	20.9%	-2,925.3
Other manufacturing	593.3	4.6%	1,561.0	9.1%	-967.7
Others	0.0	0%	0.1	0%	-0.1
Total	13,022.8	100%	17,184.2	100%	-4,161.4

Source: WITS database

Indonesia mainly imported general machinery, electronic equipment, iron, steel, and metal products, and textiles and footwear from China, which amounted to USD 3.6 billion, USD 3.1 billion, USD 2.4 billion, and USD 2 billion in 2010 respectively. Roughly speaking, Indonesia exported primary products to China and Indonesia imports processed products in return.

Table 4 Indonesia's Export and Import with ASEAN in 2010 (USD million)

Industry	Export	Import	Trade Balance
Agriculture	500.2	288.8	211.4
Forestry	120.2	57.7	62.6
Fishing	376.4	18.6	357.8
Mining	4,882.6	10,580.4	-5,697.8
Food products and beverages	2,616.0	460.7	2,155.3
Textiles and footwear	582.3	856.6	-274.2
Pulp, paper, and paper products	688.5	343.5	345.0
Chemicals	1,188.2	2,970.7	-1,782.6
Iron, steel, and metal products	4,478.7	3,483.5	995.3
Transportation machinery	929.0	2,758.3	-1,829.3
Electronic equipment	3,157.7	7,574.8	-4,417.0
General machinery	2,470.5	8,465.0	-5,994.5
Other manufacturing	1,494.1	3,443.9	-1,949.8
Others	12.5	32.8	-20.3
Total	23,497.0	41,335.1	-17,838.2

Source: WITS Database

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With ASEAN countries as shown in table 4, Indonesia mainly exported mining, food products and beverages, iron, steel and metal products, and electronic equipment. Indonesia mainly imported mining, general machinery, electronic equipment, and iron, steel and metal products.
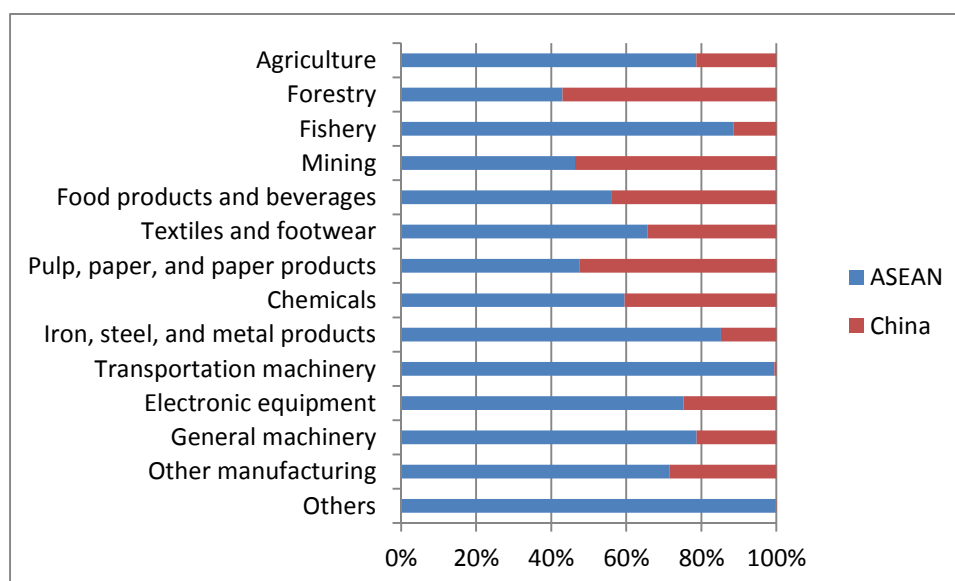
Figure 8 Percentage Shares of Indonesia's Export to ASEAN and China

Source: WITS Database

In terms of percentage shares as depicted in figure 8, Indonesia exported relatively the same value to ASEAN and China in the following industries: forestry, mining, food products and beverages, pulp, paper and paper products, and chemicals. Indonesia's export market had strong shares (> 75%) in ASEAN for the agriculture, fishery, iron, steel and metal products, transportation machinery, electronic equipment, general machinery, other manufacturing, and others. China had relatively small shares of Indonesia's export in these sectors because China also had strong presence in the sectors. Indeed, China is among the biggest producers of iron, steel and metal products in the world. Transportation machinery, electronic equipment, and general machinery accounted for 60% of China's exports. It suggests Indonesia might have difficulties to access the Chinese market due to strong competition from the Chinese products. The big share of Indonesia's export to ASEAN in these sectors might indicate Indonesia has comparative advantage against their ASEAN counterparts. For textiles and footwear, and chemicals, the percentage shares of Indonesia's export to ASEAN were slightly higher than its export to China, about 60%. As importer, Indonesia imported more than 60% of total import in each industry from ASEAN, except for agriculture, forestry, fishery, and textile and footwear as depicted in figure 9. China is dominant supplier for textiles and footwear.
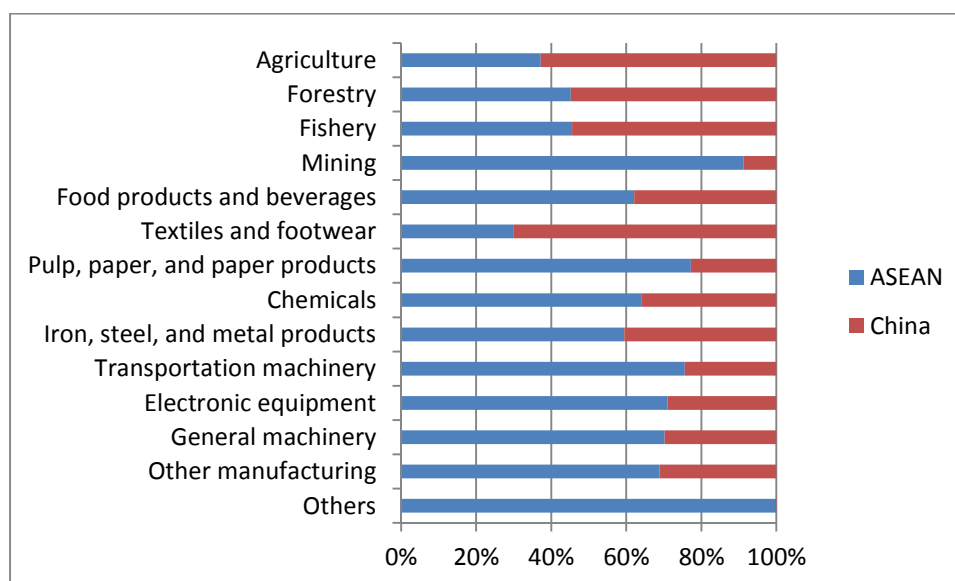
Figure 9 Percentage Shares of Indonesia's Import from ASEAN and China

Source: WITS Database

Now, China is in the top-five list of Indonesia export destinations and it has higher rank than the United States. The current top list of Indonesia export destinations is shown in table 5. Singapore is the only ASEAN country in the top list of Indonesia's trading partners.

Table 5 Top List of Indonesia Trading Partner in 2010

Rank	Country/Region	Volume (USD billion)	% change over 2009
1	Japan	42.7	50.4
2	Singapore	31.7	23.0
3	China	30.4	16.0
4	European Union	26.6	12.7
5	United States	21.2	32.8

Source: UN COMTRADE and BPS

In total, Indonesia exported more goods to China than to ASEAN countries as depicted in figure 9. Among the ACFTA members, the countries that have a significant share of Indonesia's exports include China, Singapore, Malaysia and Thailand. The total exports of Indonesia to China, Singapore, Malaysia, and Thailand amounted to USD 13 billion (8.3% of total exports), USD 11.5 billion (7.3% of total exports), USD 6.5 billion (4.1% of total exports), and USD 3.7 billion (2.4% of total exports) respectively in 2010.
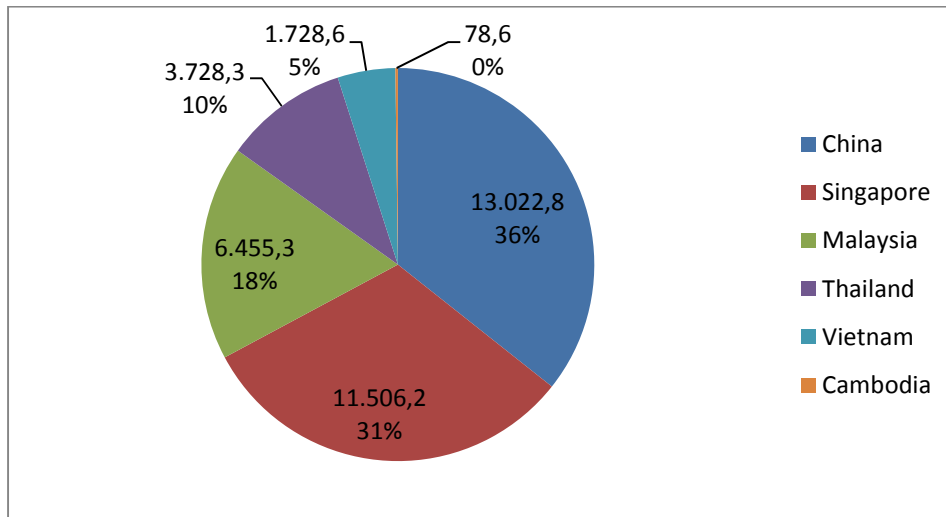
Figure 10 Indonesia's Export to ASEAN and China in 2010 (USD million)

Source: WITS Database

Formerly, Singapore was the biggest export destination for Indonesian goods. China took over Singapore's position in 2008 and ever since then China is the Indonesia's biggest export destination as can be seen in figure 11. Among ASEAN countries, Malaysia seems gaining importance as export destination for Indonesian goods. But Indonesia's exports to other ASEAN countries seem to experience rather sluggish growth.
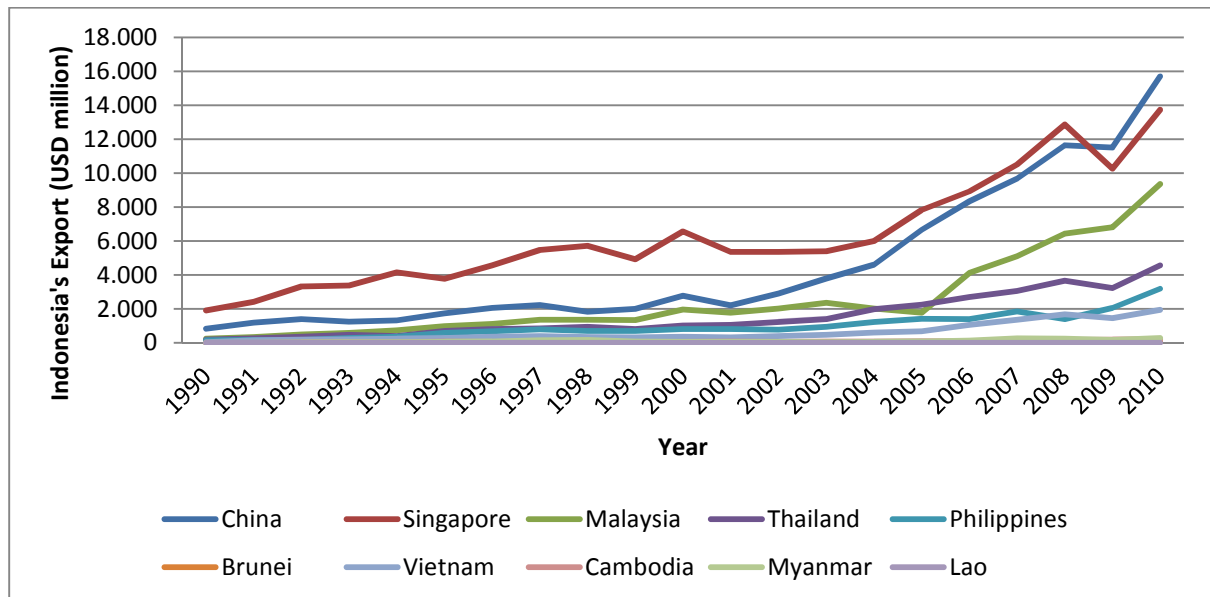
Figure 11 Indonesia's Export to ASEAN Countries and China in the Period of 1990-2010

Source: WITS Database

Among the ACFTA members, Indonesia imported goods mainly from Singapore, China, and Thailand, amounting to USD 34.9 billion (25.7% of total imports), USD 17.2 billion (12.7% of total imports), and USD 5.8 billion (4.3% of total imports) respectively in 2010.

From Indonesia's point of view, China is an important trading partner, in terms of trade value. Every ASEAN country sees China as the important trading partner as well. However, trade relationships are not symmetric, because no ASEAN countries features in the top list of China trading partners (see table 6).

Table 6 The Top List of China Trading Partner in 2010

Rank	Country/Region	Volume (USD billion)	% change over 2009
1	United states	385.3	29.2
2	Japan	297.8	30.2
3	Hong Kong	230.6	31.8
4	South Korea	207.2	32.6
5	Taiwan	145.4	36.9

Source: China's Customs Statistics

However, if ASEAN is considered as one entity, then ASEAN will replace Taiwan in the fifth place in the top list of China trading partner. The total trade between China and ASEAN amounted to USD 207.1 billion in 2010. It accounted for 15% of total Chinese trade.

3.3   Trade Expansion of the ACFTA

I conducted a simulation to analyse the impact of the ACFTA on Indonesia using partial equilibrium model based on Laird and Yeats (1986). The complete model can be found in appendix 3. The simulation is conducted by eliminating tariffs for all traded goods among ASEAN countries and China. The removal of tariff barriers is expected to expand trade among the ACFTA members. In this discussion, we focus on Indonesia and China. Trade expansion is summation of trade creation and trade diversion. Trade creation captures trade expanding aspects of liberalization that lead to the replacement of expensive domestic production by cheaper imports from more efficient trading partners in ACFTA. Trade diversion captures the replacement of cheaper imports from the rest of the world to less efficient producers under ACFTA framework.

Table 7 presents the estimated trade expansion for Indonesia under the ACFTA framework. Appendix 4 provides detail information on trade creation and trade diversion for each ACFTA member.

As an exporter, Indonesia would likely increase its exports to ASEAN and China for whole industries through the implementation of ACFTA. The estimated increase in total exports from Indonesia to ASEAN and China is equal to USD 1,224 million, or 3.4% increase of total export. In terms of (absolute USD) value, trade expansions are estimated to be big (> USD 100 million) for the following industries: food products and beverages, mining, transportation machinery, and other

manufacturing. It is in these industries that Indonesia has a strong comparative cost advantage vis-à-vis ASEAN and China.

Relatively modest trade expansion (< USD 100 million) is experienced by the following industries: agriculture, forestry, fishery, textile and footwear, pulp, paper and paper products, chemicals, iron, steel, and metal products, electronic equipment, and general machinery. In terms of percentage change of exports, the changes are estimated to be big for transportation machinery, agriculture, textiles and footwear, and fishing. Big percentage change might be caused by small Indonesia's initial total export. More modest percentage changes of exports will be experienced by iron, steel, and metal products, electronic equipment, general machinery, and mining. The results also suggest that trade creation might be bigger than trade diversion. Some of the inefficient producers in the ACFTA will likely replace more productive from the rest of the world, as indicated in the trade diversion value. But, the trade diversion value seems negligible. It shows ACFTA might have small economic effect to the non-members. In other words, ACFTA will not likely create regionalism.

Table 7 Estimated Trade Expansion by Indonesia as Exporter under ACFTA Framework

Industry	Trade Creation (USD million)	Trade Diversion (USD million)	Trade Expansion (USD million)	% Change of Exports[a]	% Change of Exports[b]
Agriculture	80.1	5.1	85.2	13.4%	2.6%
Forestry	8.2	1.6	9.8	3.5%	13.9%
Fishing	16.4	7.2	23.5	5.5%	11.3%
Mining	201.1	25.7	226.8	2.2%	-0.6%
Food products and beverages	226.2	18.7	244.9	5.2%	52.0%
Textiles and footwear	41.6	18.9	60.5	6.8%	11.5%
Pulp, paper, and paper products	29.5	18.4	47.8	3.3%	11.3%
Chemicals	43.5	32.3	75.8	3.8%	1.2%
Iron, steel, and metal products	31.8	21.6	53.4	1.0%	9.0%
Transportation machinery	92.0	76.6	168.6	18.0%	105.8%
Electronic equipment	35.6	33.4	69.0	1.6%	36.0%
General machinery	27.5	27.7	55.2	1.8%	44.4%
Other manufacturing	64.4	38.9	103.3	4.9%	9.1%
Total	898	326	1,224		

Source: [a]author's calculation and [b]Urata and Kiyota (2003)

How do my estimates of trade expansion based on a partial equilibrium model compare with the findings from general equilibrium (GE) model studies? In the table 7, I have included the simulation results from Urata and Kiyota (2003) in the last column of the table. Urata and Kiyota (2003) is the study which is the most comparable to my own analysis because it presents the results for all ACFTA members with the same industries categorization.

The first thing to note is that, although the estimated effects differ in quantitative terms, they are similar in qualitative terms: most of the estimated effects have the same sign. Urata and Kiyota

(2003) also predicted that for most industries exports will likely increase following ACFTA. The only industry where the signs differ is mining. Urata and Kiyota (2003) estimate that the Indonesia's mining exports will decline by 0.6%, while I estimate these will increase by 2.2%. First thing to note, most of Indonesia's trade creation in mining might come from petroleum. One of the plausible reasons might be the Indonesia's demand of mining products to keep up with the export expansion under ACFTA framework. Instead of export, Indonesia will use the mining products for domestic purpose. It is plausible because other sectors categorized as energy intensive (e.g. transportation machinery, electronic equipment, and general machinery) will likely be among the big winner of ACFTA. The other plausible reason is the price increase of global mining products, especially petroleum. Urata and Kyota (2003) included price factor in the GE simulation. If there is an increase of global prices of mining products, then there will likely be decrease of global demand. Besides, in reality Indonesia has difficulties to find new oil well to keep up with domestic demand so that the oil production kept decreasing in the last decade and it culminated in the withdrawal of Indonesia from OPEC in 2008.

Second, a closer look reveals that the general-equilibrium effects predicted by Urata and Kiyota (2003) are almost all larger than the partial-equilibrium impacts obtained in the present analysis. This strongly suggests that the second-round and higher-rounds effects of ACFTA are big. This is particularly true for food products & beverages, transportation machinery and general machinery (see table 7), which are precisely sectors featuring relatively strong backward production linkages with other sectors. What this means, for example, is that the demand for transportation machinery is likely to grow not only directly (due to more demand from China) but also indirectly because the exports of all other sectors to China are growing (and need more transport equipment).

So far, the presentation is centred on the industries. Let us turn to the countries that might import more from Indonesia. Figure 12 depicts the simulation results for the countries that could be the export destination for estimated trade created by Indonesia. Indonesia might increase significantly the exports to China, Thailand, and Vietnam, amount to USD 462.1 million, USD 441.6 million, and USD 185.8 million respectively. The significant increase of export to China might be caused by the lowering of the existing high tariffs, while the ASEAN countries already reduced most of the tariffs to 0-5% under the Common Effective Preferential Tariffs (CEPT) agreement. Exports to Cambodia and Malaysia increase less, by USD 56.1 million and USD 78.4 million respectively. There might be zero additional exports to Myanmar, Lao PDR, Brunei, Philippines, and Singapore. For the Singapore case, the reason is that Singapore has already eliminated the tariffs to zero for all goods. For Myanmar, Lao PDR, Brunei and Philippines, the reason is their trade value with Indonesia is small and negligible (in this calculation, I round the result to one decimal place with USD million unit).
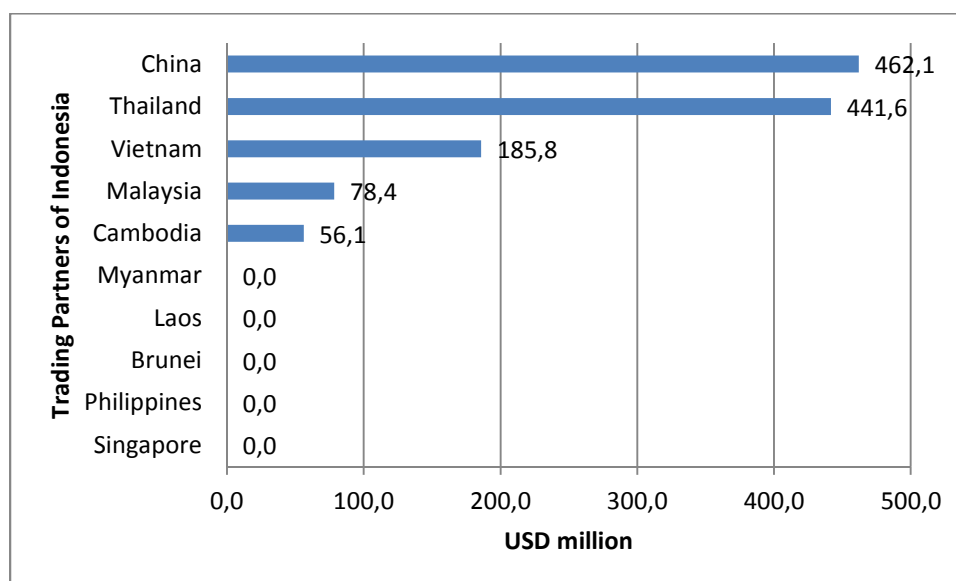
Figure 12 Export Destination of Indonesia's Trade Expansion under ACFTA Framework

Source: author's calculation

ACFTA might not only expand Indonesia's exports, but also the Indonesia's imports. Table 8 presents the trade expansion under the ACFTA framework with Indonesia as importer. As an importer, Indonesia will likely import more from the ACFTA members as indicated by the positive sign of the percentage change of imports for the whole industries. In terms of absolute USD values, the industries that have notable increases of imports include transportation machinery, textiles and footwear, iron, steel and metal products, and other manufacturing. In terms of percentage change of imports, the significant changes come from the following industries: food products and beverages, transportation machinery, pulp, paper and paper products, and other manufacturing.

Table 8 Estimated Trade Expansion by Indonesia as Importer under ACFTA Framework

Industry	Trade Creation (USD million)	Trade Diversion (USD million)	Trade Expansion (USD million)	`% Change of Imports
Agriculture	0.6	0.0	0.6	0.1%
Forestry	4.7	0.0	4.7	3.7%
Fishing	0.0	0.0	0.0	0.0%
Mining	178.7	29.9	208.5	1.8%
Food products and beverages	186.0	21.1	207.1	27.9%
Textiles and footwear	436.0	0.7	436.7	15.2%
Pulp, paper, and paper products	38.7	3.9	42.6	9.6%
Chemicals	66.9	39.3	106.2	2.3%
Iron, steel, and metal products	309.9	31.0	340.9	5.8%
Transportation machinery	806.7	37.3	844.0	23.1%

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Electronic equipment	95.7	2.9	98.7	0.9%
General machinery	105.9	10.4	116.3	1.0%
Other manufacturing	303.1	29.1	332.2	6.6%
Total	2,533.3	205.8	2,739.1	

Source: author's calculation

Looking at the Indonesia's trading partners; again China might be the biggest import supplier as depicted in figure 13. Indonesia might increase the imports from China by as much as USD 1,231.1 million. Indonesia might also increase the imports from Singapore, Thailand, and Vietnam by USD 876.3 million, USD 582.6 million, and USD 49.1 million respectively.
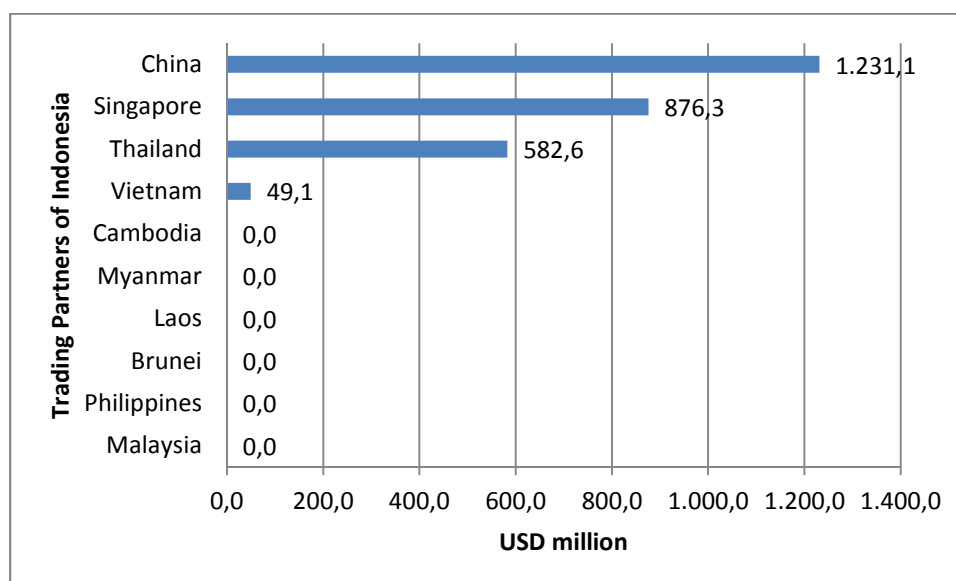
Figure 13 Import Suppliers of Indonesia's Trade Expansion under ACFTA Framework

Source: Author's calculation

Again, the results indicate that the trade creation is still bigger than trade diversion. Based on the simulation, ACFTA will create an additional trade amounting to USD 16.9 billion, while estimated total trade diversion amounts to USD 2.1 billion. The simulation results also indicate Indonesia will increase its imports from the ACFTA members more than it will be able to export to them. As an exporter, there might be an increase by USD 1.2 billion of export. While as an importer, there might be an increase by USD 2.7 billion of import. In terms of absolute USD value, the Indonesian industries that might experience more import expansion than export expansion are as follows: textile and footwear, pulp, paper, and paper products, chemicals, iron, steel and metal products, transportation machinery, electronic equipment, general machinery, other manufacturing, and others as shown in table 9. The net-percentage changes of expansion are -14.9%, -38.7%, -2.5%, -13.3%, -76.7%, -1.5%, -1.5%, -16.3%, and -0.6% respectively. The negative sign indicates the percentage change of Indonesia's export is lower than the percentage change of Indonesia's import. Since the estimated import expansion might be higher than the estimated export expansion in these sectors, Indonesia's trade deficit in these sectors will get bigger overtime assuming the net-

percentage change of expansion will still be negative. The other sectors that will likely have negative net-percentage changes of expansion include forestry (-3.2%), mining (-18.2%), and food products and beverages (-68.3%). In these sectors, Indonesia will likely have higher export expansion than import expansion under ACFTA. But, the import value will catch up the export value assuming the negative net-percentage change of expansion will still be negative. Agriculture and fishery are the sectors that might have positive net-percentage changes of expansion amounting 13.3% and 5.5% respectively. Taken together, the net-percentage change of expansion for Indonesia under ACFTA is still negative, -12.5%.

It is interesting that the Indonesia's import from China in pulp, paper, and paper products will likely be negative, USD -1 million, while its import from ASEAN might increase by USD 43.6. it suggest that the ASEAN has comparative advantage in this sector against their Chinese counterparts. Other interesting sector is mining. Although there will be notable expansion of Indonesia's export to China (USD 182.8 million), there will also be significant expansion of Indonesia's import from ASEAN (USD 208.2 million). Notable increase of Indonesia's import from both ASEAN and China might exist in iron, steel and metal products, transportation machinery, general machinery, and other manufacturing. China might be more dominant than its ASEAN counterparts in Indonesia market for textiles and footwear and electronic equipment. ASEAN on the other hand might dominate Indonesian market for mining, food products and beverages, pulp, paper and paper products, and chemicals.

Generally speaking, every members of ACFTA will likely expand their export and import in every sector. So, different country will expand their export and import for the same industry (e.g. electronic equipment). One of the explanations is the limitation of the partial equilibrium approach which treats each sector in the specific country without considering what is going on in the other sectors and countries. The model also does not consider competition at the micro level. The buying decision of consumer cannot also be captured by the model. As supposed the consumer might be able to buy cheaper goods under ACFTA, some possible outcomes might occur. First, the consumers might spend their whole budget for the goods. Second, the consumers might spend their remaining budget for other goods.

Expansion of export and import can be observed from the GE model as well (see Urata and Kiyota (2003)). The plausible explanation might be the varieties of goods even though they belong to the same industry.

Back to the numbers, it might suggest Indonesia's trade balance will deteriorate overtime. The higher rate of import expansion over rate of export expansion shows the inability of Indonesia to deal with trade openness. It indicates Indonesian products cannot compete with their ASEAN and Chinese counterparts, in terms of production costs and prices.

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Table 9 Net Changes of Indonesia's Trade Expansion under ACFTA Framework

Industry	Export Expansion to		Total Export	% Change of Export	Import Expansion from		Total Import	% Change of Import	Total % Change
	ASEAN	China			ASEAN	China			
Agriculture	79.1	6.1	635.8	13.4%	0.5	0.1	487.6	0.1%	13.3%
Forestry	2.5	7.3	279.4	3.5%	0.1	4.6	69.8	6.7%	-3.2%
Fishery	23.5	0.0	424.7	5.5%	0.0	0.0	22.2	0.0%	5.5%
Mining	44.0	182.8	10,549.1	2.2%	208.2	0.4	1,025.3	20.3%	-18.2%
Food products and beverages	122.8	122.1	4,677.1	5.2%	188.7	18.4	281.5	73.6%	-68.3%
Textiles and footwear	35.1	25.4	887.8	6.8%	12.9	423.9	2,007.6	21.8%	-14.9%
Pulp, paper, and paper products	28.0	19.8	1,445.4	3.3%	43.6	-1.0	101.4	42.0%	-38.7%
Chemicals	47.9	27.9	1,995.0	3.8%	90.5	15.7	1,674.4	6.3%	-2.5%
Iron, steel, and metal products	51.6	1.8	5,257.8	1.0%	188.0	152.9	2,376.0	14.3%	-13.3%
Transportation machinery	167.4	1.2	934.4	18.0%	509.4	334.6	891.0	94.7%	-76.7%
Electronic equipment	45.7	23.3	4,197.1	1.6%	17.1	81.6	3,095.2	3.2%	-1.5%
General machinery	45.7	9.6	3,136.3	1.8%	65.9	50.5	3,591.1	3.2%	-1.5%
Other manufacturing	68.5	34.8	2,087.3	4.9%	182.7	149.5	1,561.0	21.3%	-16.3%
Others	0.0	0.0	12.6	0.1%	0.4	0.0	65.7	0.6%	-0.6%
Total	761.9	462.1	36,519.8	3.4%	1,508.0	1,231.1	17,249.8	15.9%	-12.5%

Source: Author's calculation

Let us take a look specifically to China because that economy will gain in importance as Indonesia's trading partner. Besides, the simulation results suggest Indonesia might increase the value of trade (both export and import) with China. Figure 11 and 12 show how important China is as export market and as source of goods. The increase of Indonesia's export will be concentrated in mining, food products and beverages, other manufacturing, and chemicals, in terms of US$ value. It shows that the industries that currently have a big portion of export (e.g. mining, food products and beverages, and chemicals) will likely have big trade creation. The export of other manufacturing industry of Indonesia might expand because of substantial trade diversion amounting to USD 15.5 million. Significant percentage change of Indonesia's export will be experienced by transportation machinery, textiles and footwear, food products and beverages, and other manufacturing. The increase of export value for mining is still dominant because mining is currently the biggest exporter to China among other industries. In the case of food products and beverages, the big trade expansion might be caused the significant decrease of tariffs. The initial tariffs before the ACFTA were in the range of 0% to 25% in the industry. The significant amount of trade expansion might come from Indonesia's oil palm industry. The export of other manufacturing industry of Indonesia might expand because of the notable trade diversion amounts to USD 15.5 million. The expansion of Indonesia's export in the other manufacturing category might mainly come from plastic industry.

Table 10 Indonesia's Estimated Trade Expansion as Exporter and Importer with China as Partner

Industry	Trade Expansion by Indonesia as Exporter to China (USD million)	`% Change of Exports to China	Trade Expansion by Indonesia as Importer from China (USD million)	% Change of Import from China
Agriculture	6.1	4.5%	0.1	0.0%
Forestry	7.3	4.6%	4.6	6.6%
Fishery	0.0	0.0%	0.0	0.0%
Mining	182.8	3.2%	0.4	0.0%
Food products and beverages	122.1	5.9%	18.4	6.5%
Textiles and footwear	25.4	8.3%	423.9	21.1%
Pulp, paper, and paper products	19.8	2.6%	-1.0	-1.0%
Chemicals	27.9	3.5%	15.7	0.9%
Iron, steel, and metal products	1.8	0.2%	152.9	6.4%
Transportation machinery	1.2	21.6%	334.6	37.6%
Electronic equipment	23.3	2.2%	81.6	2.6%
General machinery	9.6	1.4%	50.5	1.4%
Other manufacturing	34.8	5.9%	149.5	9.6%
Total	462.1		1,231.1	

Source: Author's calculation

Indonesia mainly expands imports from China in the following industries: textiles and footwear, transportation machinery, iron, steel and metal products, and other manufacturing. There is a

significant increase of percentage change of imports from China in these industries as well. Indonesia is currently importing a significant value of textiles and footwear products from China so that a small change of tariff in this sector will create additional imports. For transportation machinery industry, the increase of Indonesia's import is caused by the removal of relatively high tariffs up to 50%. The tariffs are mainly imposed on spare parts of motor vehicles. The increase of Indonesia's import for other manufacturing products belongs to plastic and stone/cement/ceramics industry.

Fishery is the only industry that has zero trade expansion between Indonesia and China. Indeed, China is not the most favourite export destination for the fishery industry, but Japan is. There are only small varieties in Indonesia's export and import with China in fishery industry and the current data shows that the tariffs are already zero for the traded fishery products between Indonesia and China before the ACFTA. The electronic equipment might also experience expansion of export and import with China. It seems Indonesia most likely expands the export of consumer electronic products. The expansion of Indonesia's import might come from other range of electronic products, such as microchip and computer, because Indonesia lacks of domestic production in these product categories. The industries that might have small export expansions include agriculture, forestry, iron, steel and metal products, and general machinery; industries experiencing small import expansions include agriculture, forestry, mining, and pulp, paper and paper products.

3.4   Welfare Effect of the ACFTA

The tariffs removal will benefit consumers in the importing country through cheaper products due to the removal of tariff barriers. At the same time, producers will loss in the importing country due to the lower prices. The concept of consumer surplus and producer surplus will be used to explain the welfare effect.

Consumer surplus measures the amount a consumer gains from a purchase by the difference between the price he actually pays and the price he would have been willing to pay. For example, a consumer would have been willing to pay USD 9 for a book but the price is only USD 5, so the consumer surplus is USD 4. Producer surplus is a similar concept. A producer would have been willing to sell USD 3 for a goods but receiving a price of USD 8, so the producer surplus is USD 5.

Figure 14 presents the effect of tariff removal in the importing country. P_{FT} represents price of free trade, P_T^{IM} represents price with tariff in the importing country, and P_T^{EX} represents price with tariff in the exporting country. The tariff removal might shift down the price from P_T^{IM} to P_{FT} in the importing country, while it might shift up the price from P_T^{EX} to P_{FT} in the exporting country. The decrease of price in the importing country might level up the demand from consumers and level down the supply from producers. The consumer surplus should be positive because consumers can have cheaper products, while producer loss so that the producer welfare is negative because producers have to supply the goods at the cheaper price. As a result, the producers should reduce the supply. If the producers in the importing country have intense competition from the foreign product, then the producer losses will likely be even bigger. The consumer surplus in the importing country is equal to $A + B + C + D$. The producer loss is equal to area $-A$. The net-welfare effect is

the summation of consumer and producer loss. In this case, the net-welfare effect is equal to $B + C + D$. In figure 13, the government revenue will be the summation of area C and G if the government impose tariff.
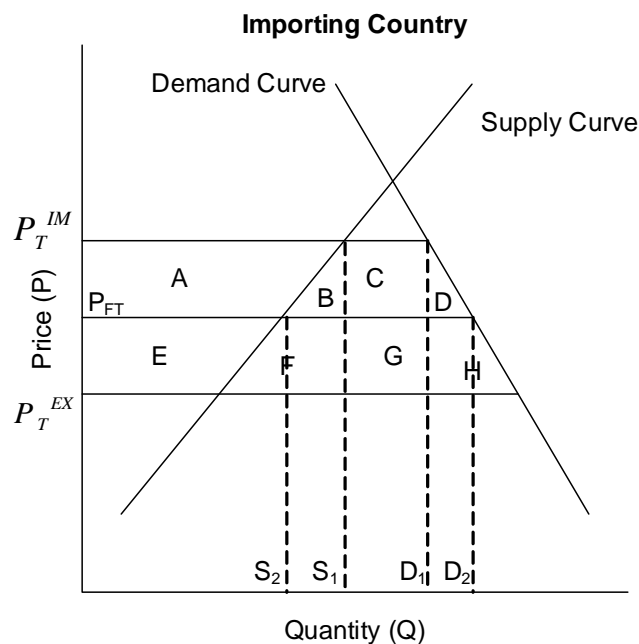
Importing Country

Figure 14 The Welfare Effect of Tariff Removal in Importing Country

Source: Krugman and Obstfeld (2008)

In the exporting country, the tariff removal might shift down the supply from producers and shift up the demand from consumers as depicted in figure 15. The consumers might loss because the price is getting higher so that the consumer welfare is negative. The consumer loss is equal to $-e$. The producers might gain because the producers can sell the products at the higher price. The producer surplus is the equal to $e + f + g + h$. The net-welfare effect is the summation of consumer loss and producer surplus, which is equal to $f + g + h$.

In summary, table 11 presents the net-welfare effect in both importing and exporting country.

Table 11 Net-Welfare Effect of Tariff Removal in the Importing and Exporting Country

	Importing Country	**Exporting Country**
Consumer surplus	$A + B + C + D$	$-e$
Producer surplus	$-A$	$e + f + g + h$
Government revenue	$-(C + G)$	0
Net-welfare	$B + D - G$	$f + g + h$
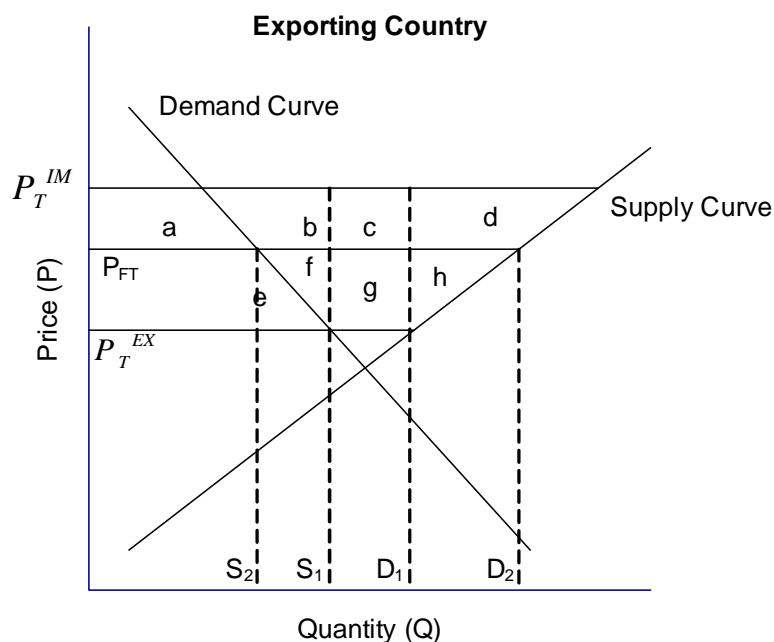
Exporting Country

Figure 15 The Welfare Effect of Tariff Removal in Exporting Country

Source: Krugman and Obstfeld (2008)

In the context of ACFTA, every country has positive welfare gains as shown in table 12, except Singapore which had eliminated tariff barrier before the implementation of ACFTA so that there is no change in the level of its tariffs. Thailand, Indonesia, Vietnam, Lao PDR, China, and Philippines are among the ACFTA members that might have notable welfare gains. Modest welfare gain is experienced by Cambodia, Malaysia, Myanmar, and Brunei. However, if we calculate the welfare gain in the proportion of their GDP, the welfare gain is almost negligible for China, Malaysia, Brunei, Myanmar, Indonesia, Philippines, and Vietnam. The other ACFTA members, including Lao PDR, Thailand, and Cambodia, have slightly significant welfare to GDP ratio. Indonesia in particular has consumer welfare USD 299.4 million from the ACFTA. Dividing the consumer welfare with the population of Indonesia (= 228.5 million people), the consumer gain from the ACFTA per capita amounts to USD 1.31 per person.

Table 12 Consumer Welfare Effect of ACFTA

Country	Welfare (USD million)	Percentage of GDP
Indonesia	299.4	0.1%
Singapore	0.0	0.0%
Malaysia	43.2	0.0%
Philippines	128.1	0.1%
Thailand	723.1	0.3%
Brunei	1.6	0.0%
Vietnam	217.0	0.2%
Lao PDR	212.0	4.0%
Myanmar	8.6	0.0%

*TU*Delft

Cambodia	43.7	0.4%
China	192.1	0.0%
Total	**1,868.8**	

Source: Author's calculation

Indonesia's trade expansion is quite substantial, but the welfare effect seems small. Based on the previous discussion, the export and import expansion also indicate the import expansion rate might be faster than export expansion rate. Overtime this situation will deteriorate Indonesia's trade balance. As a result, the net-welfare effect might be negative. Of course, the consumers will gain from lower import prices, but the producers lose because of intense competition from the foreign products. Some might argue the net-welfare effect might be negative because of producers losses might exceed consumers gains and indeed, it could happen. However, the welfare effect using partial equilibrium approach based on the model Laird and Yeats (1986) still show positive welfare. The explanation is the welfare effect based on Laird and Yeats (1986) only captures the consumer welfare effect, assuming the elasticity of export supply is infinite. If it is not the case, the import expansion will be less and the welfare effect should be interpreted as the summation of consumer and producer surplus.

3.5   Industrial Analyses and the Way Forward

The model used in the simulation is a simple linear model based on a number of restrictive assumptions. For example, trade creation depends on current imports, import demand elasticity, current tariffs, and future tariffs. According to the model, there will always be trade creation as long as the future tariffs are less than current tariffs. And, the trade creation tends to be notable if the current import is big. The assumptions behind these results are: there are unlimited supplies of goods and the consumers use their whole budget to spend at the particular goods. However, it is not always the case because if the consumers can afford the same goods with cheaper goods, then they will either spend their budget on the same goods or spend some portions of their budget on other goods. It seems like the latter will likely take place in reality. The ability of the producers to supply goods is also limited because in reality there are existence of production bottlenecks (e.g. energy shortage, lack of credit, etc). The literature review also suggests that trade policy cannot be a standalone policy, but rather need to be supported by other policy as well, e.g. industrial policy. Therefore, it is useful to interpret the simulation results differently by looking at the other resources to enrich the analysis.

As an exporter, the biggest Indonesia's trade expansion might be mining industry. If we look closer, petroleum (HS code 27) is the only contributor to the trade expansion since the rest of mining products already had zero tariffs before the ACFTA. Indonesia's total oil reserves are decreasing; reserves amounted to 9.61 billion barrel and 8 billion barrel in 2000 and 2009 respectively (ESDM, 2010). Only 50% of this figure is proven oil reserves. This situation made Indonesia a net-importer of oil in 2004 and it culminated in the withdrawal of Indonesia from OPEC in 2008. The export expansion of oil might only happen if Indonesia can find and explore new proven oil reserves.

Indonesia seems optimistic to be a net-exporter of oil again in 2020 through investment in oil exploration activities (Folkmanis, 2010).

Indonesia might also expand the export of food products and beverages to China. Looking closely to this category, the trade expansion is mainly contributed by crude palm oil (CPO). Among ACFTA members, Malaysia and Indonesia are the first and second producers of CPO in the world respectively. Combined production of these countries accounted for about 90% of total world CPO production. So, future trade expansion of the industry in China market is also affected by the competition with Malaysia, which is also the ACFTA member. In terms of production value, Indonesia might be able to overtake Malaysia as the first producer of CPO if it can maintain current production growth (USDA, 2007). However, the production value is highly dependent on weather conditions. As an example, the production of CPO could not meet the targeted output of 23.3 million tons and could only achieve 22 million tons because of long rainy season in 2010. The imported goods in the industry from China might have small expansion. Indonesia's current import from China is small and might still be small in the future. The reason is the hygiene issue as reported by the Drug and Food Monitoring Agency (BPOM) of Indonesia in 2008, some Chinese-based foods sold in Indonesia contain toxic ingredients (Maulia, 2008). This may be the main reason that consumers in Indonesia are hesitant to consume foods imported from China.

It is interesting to see trade expansion in iron, steel and metal products, textiles and footwear, general machinery, and electronic equipment, because according to a recent Ministry of Industry survey (Malik, 2011), these industries experienced a 50% decline in production. The survey also found that the majority of industries, accounting for 44.2% of surveyed industries, stated that the ACFTA is the cause of this poor performance. Before the ACFTA, the number of companies in these sectors has declined since 2006. According to the BPS, the number of companies in iron, steel and metal products declined from 276 companies in 2006 to 218 companies in 2009. The number of textiles and footwear companies even had a steep decline from 2809 companies in 2006 to 1949 companies in 2009. The same thing happened to the number of electronic equipment companies that decreased from 279 companies in 2006 to 261 companies in 2009. The closure of the companies means layoffs. Indeed, the unemployment data from these sectors also show an increase. So, these industries performed poorly before the ACFTA. ACFTA might worsen the performance of these industries. Indeed, Indonesia is experiencing fierce competition in these industries. China is among the top five of metal (e.g. steel) producers. For textiles and footwear, China is the biggest exporter as well. China is also top exporter of machinery and electronic equipment, with the total export amounted to USD 933 billion and accounted for 60% of the total export in 2010 (CBN, 2010). For electronic equipment, Indonesia also competes with other ASEAN countries since the others are also bases of some electronic manufacturers. Indonesia has the least varieties of electronic products compared to other ASEAN countries as described in table 13.

Table 13 Varieties of Electronic Products in ASEAN Countries

Product Range	Indonesia	Malaysia	Philippines	Singapore	Thailand
Consumer electronic	X	X			X
Semiconductors		X	X	X	
Electronic data processing			X		
Data storage				X	

Office equipment					X
Precision engineering				X	

Summarized from Santiago, 2007 (note: X refers to the availability of the industry)

However, it is unfair to blame ACFTA as the only reason of the poor performance. The other factors that might affect the performance of these industries include:

- **Energy supply for industry.** The industries have inadequate supply of gas to run their production machine. It is projected the industries will experience gas shortage of 277 million metric standard cubic feet per day in 2011. Now, the industries still wait for the signing of gas supply guarantee among the industries, Ministry of Industry, and National Gas Company (PGN). The government might import the gas to fill the gap between supply and demand. But, it will not solve the problem, because the infrastructure to distribute the gas is unavailable. Therefore, some industries are using coal to fulfil the energy requirement.

- **Infrastructure.** As discussed under the previous point, lack of infrastructure can create energy scarcity for industries so that they switch to other primary energy sources. Lack of infrastructure in logistics can also be treated as trade barrier because it imposes additional costs to actors in the whole supply chain operation. Indonesia ranks 75th and China ranks 27th for logistics performance index (LPI) (Arvis, Mustra, Ojala, Shepherd, & Saslavsky, 2010). The LPI among ACFTA members can be seen in the figure 16.
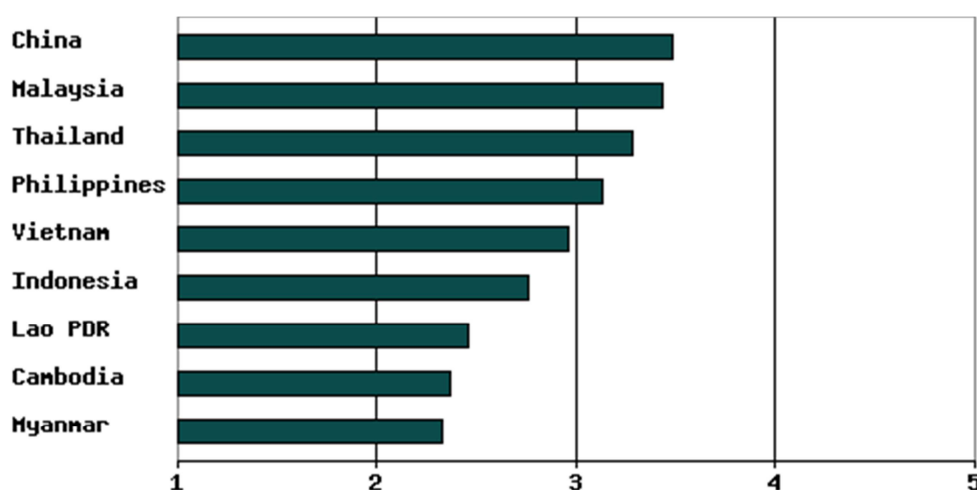
Figure 16 LPI of ACFTA members

Source: Arvis, Mustra, Ojala, Shepherd, & Saslavsky (2010)

Thus, Indonesia performed poorly, only slightly better than Lao PDR, Cambodia, and Myanmar.

- **Competition from non-members of ACFTA in the case of textiles and footwear.** The passing out of Multi Fibre Arrangement (MFA) at the end of 2004 can also be a factor of increase competition of Indonesia textile, apparels, and footwear industries with other key players, mainly China as the biggest shippers of these products. MFA is a textile and clothing quota

system designed to protect the importing countries from the cheap imports from abroad. So, the Indonesia textile, apparels, and footwear has experienced intense competition, not only from China but also from other countries (e.g. Bangladesh, Turkey, India, and Mexico) before the implementation of ACFTA.

- *Access to Loans.* Textiles and footwear is one of the industries that are considered high risk from a banking perspective because of high closure of companies in the last couple of years. The banks also perceive this sector might compete head-to-head with Chinese products, according to the Bank of Indonesia survey. Loans are needed to revitalize the production machine to get better efficiency and productivity.

- *Quality of institutions.* Low quality of institutional aspects might also create high cost economy in Indonesia (Kementerian Perdagangan Republik Indonesia, 2010) that at the end, affects the competitiveness of Indonesian products. Further in the report, kementerian Perdagangan Republik Indonesia (2010) stated that the business community still perceives Indonesia has high corruption, low investment security, and inconsistency of regulation implementation.

- *Investments.* The flow of foreign investment remained relatively low in the last three years. Total foreign direct investment to Indonesia amounted to USD 4,877 million in 2009; the numbers are lagged behind Singapore, Vietnam, Thailand, and Philippines. The future might be good as projected by UNCTAD (2010), Indonesia ranks 9th for the FDI destination, while China and Vietnam rank 1st and 8th respectively. However, we cannot neglect the drawbacks of FDI inflow that may lead to the closure of domestic firms since both foreign and domestic firms will compete in the market. One way to minimize the adverse effect of FDI inflow is to regulate the investment, choose wisely the form of FDI, and decide which industries might be appropriate for FDI.

Although there are many factors that influence the performance of Indonesia's industries, the ACFTA is still considered as a prime cause of industries' poor performance. Indonesia might create non-tariff barrier (NTB) as replacement of tariffs. As an example, some electronic equipment sold in Indonesian market must have labelling from Indonesia Standardization Agency (SNI). But, it might not be effective in the long run, because Chinese exporters are also very aggressive in learning these regulations by buying up standardization documents from SNI (Emrald, 2011). The Ministry of Trade and Ministry of Industry of Indonesia also conducted investigations to reveal unfair trade and implement safeguards if the import goods injure local industries. Based on recent investigations, M.S. Hidayat, the Minister of Industry, said there were at least 38 reports of alleged dumping of goods from China (Pasandaran, 2011). Other means to support domestic industries include regulations and the recent regulations are listed in table 14.

Table 14 Recent Regulations related to Struggling Industries in Indonesia

Regulator	Number and Date	Remarks
Ministry of Industry	123/M-PER/11/2010 dated 30 November 2010	Machines revitalization and development program for textile and footwear industries
Ministry of Finance	51/PMK.011/2010 dated 24 February 2010	The government will pay for import tariffs for raw materials of electronic components in fiscal year 2010

Ministry of Finance	54/PMK.011/2010 dated 24 February 2010	The government will pay for import tariffs for raw materials of telecommunication equipment in fiscal year 2010
Ministry of Trade	03/M-DAG/PER/1/2010 dated 27 January 2010	Strategic Plan of Ministry of Trade in 2010-2014
Ministry of Trade	02/M-DAG/PER/1/2010 dated 26 January 2010	Obligation for verification for some imported textile products
Ministry of Trade	62/m-DAG/PER/12/2009 dated 21 December 2009	Obligation to attach label for every products
Ministry of Trade, Ministry of Industry, Indonesia Foreign Investment Board	60/m-DAG/PER/12/2009 dated 16 December 2009	Acceleration of services in investment permit
Ministry of Industry	86/M-IND/PER/9/2009 dated 24 September 2009	National standardization for industry by National Standardization Agency (SNI)

Summarized from www.kemendag.go.id and www.kemenperin.go.id

However, these initiatives will not be effective without the participation of the business community. The companies must work on efficiency, productivity, and performance improvement. If they do not do it, then the regulation will be useless, since it only protects the inefficient industries.

In the past, Indonesia's export contributed well to economy growth (Hill, 2000). And, Indonesia has been able to diversify its exports, in terms of export destination and product ranges. The exports will still be the main strategy to maintain growth in the near future. President of Indonesia expects the realization of ASEAN-EU economic integration during the first business summit between ASEAN and EU in Jakarta in 2011 (Simamora, 2011). Indonesia itself negotiates the possibilities of free trade with Iran and Pakistan as well. It shows that Indonesia will maintain an open trade regime.

However, the open trade regime of Indonesia will not be sustained if Indonesia keeps exporting primary products with low productivity without investing in its capability to produce high-productivity goods. Indeed, Indonesia has a comparative advantage in primary products because of the richness of its natural resource endowments. However, Indonesia should consider itself as not rich in natural resources, because the data shows proven oil reserves are being rapidly depleted. Otherwise, Indonesia is not in the top list of world mining producers, and Indonesia's agricultural production may face serious problems due to deterioration of environment quality. Besides, Indonesia has to be able to move its comparative advantage to produce more diverse higher value-added goods other than primary products without neglecting the benefits of its open trade regime. Some actions that might be beneficial for Indonesia include:

- ***Investment to boost industrial development.*** The investment can be used for revitalization of production machine, research and development (R&D), and export-related activities. The investment can include government subsidies, access of loans from local banks, and tax relief. The investment package must be targeted to the appropriate industries that might be the next Indonesia's comparative advantage. The investments are expected to create positive externalities in the domestic market, especially investment in R&D. As the empirical research suggests that protection of high technology industries and investment in R&D might create positive externalities (Nunn & Trefler, 2010). Let us take telecommunication

industry as an example. The number of mobile and internet subscribers keeps growing overtime. But, the domestic telecommunication equipment company is not a profitable business, looking at PT INTI (an Indonesian telecommunication equipment company) that keeps losing money in the last decade. Indonesia relies on imported products for the telecommunication equipment. Indonesia can benefit further from this sector by attracting FDI. However, FDI also needs to be regulated further to ensure the knowledge spill over and technology transfer through local content regulation and obligation for joint venture.

Some might argue that it is expensive to have investment in the manufacturing plants and equipment as well as in research and development. But, Indonesia does not have other choices and must invest on these areas to put the foundation of industrialization. Experiences from East Asian[13] countries indicated that high rates of investment can sustain productivity growth (Storm & Naastepad, 2005).

- **Protection for domestic industries.** But, protection is not enough. The government has to set measures to evaluate which industries and companies need to be incentivized. If the companies cannot meet certain standards, then the incentives will be reduced or will even be taken out. Since the system has a long time delay, the companies must be assessed carefully. As long as there are performance improvements (although without profit; it needs quite long time to have profitable companies), then incentives can still be given. Other areas that can be considered to build industrial capability in the long run include human resource development and marketing skills.

  Protection of infant industries might change the economic structure of a country overtime. It might shift its industrial capability from labour intensive to technology intensive of production and export. East Asian experiences suggested import substitution in combination with measures to promote investment were linked to the establishment of domestic capital and intermediate goods industries and technological upgrading (Storm & Naastepad, 2005).

- **Expansion of Infrastructure.** Learning from Singapore, infrastructure can support the open trade regime as part of growth strategy (Young, 1992). The recent World Bank report shows that Indonesia has poor logistic performance. It might become the internal trade barrier for Indonesia. The logistic costs could drive up the costs of goods so that reduce the competitiveness with other countries in terms of product prices. Expansion of seaports is also needed to support the open trade regime. Indonesian trading partners ship their goods to Indonesia via Singapore port before and then, the goods are distributed to whole Indonesian islands. The reason is Indonesian seaports do not have capacity to handle large and complicated ships. The other reason could be the unclear export-import regulation (e.g. unofficial fees imposed to exporters). If Indonesia is willing to invest in seaports, then the goods can be shipped directly to Indonesia, which might increase the revenues in infrastructure service industries. Moreover, it can take some market share from Singaporean seaports as well.

  Again, it is expensive to build infrastructure. Although it is expensive, Indonesia still has to expand the infrastructure to support its economic development. The government can step in to take over the infrastructure expansion as China did (Naughton, 2010). China's development experience also shows that the development of infrastructure that exceed the

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[13] According to Storm and Naastepad (2005), East Asia referred to first-tier newly-industrializing economies (NIEs) South Korea, Taiwan, and Singapore, and the second-tier NIEs Indonesia, Malaysia, and Thailand.

demands can sustain economic growth in the long run while maintaining domestic saving rate close to investment rate to avoid inflation and balance-of-payment problems (Storm & Naastepad, 2005; Naughton, 2010).

- *Negotiating Trade Regulation with the WTO.* I think renegotiation with WTO is possible since the agreements under WTO are not as strict as other agreements under other international institutions (e.g. loans from the World Bank and IMF). The Indonesia's experiences during financial crisis 1998 suggested that IMF loans were bundled with obligations (e.g. trade liberalization for agriculture and abandoning local content regulations) that were inappropriate with Indonesian needs. The negotiation topics might include the privilege to neglect Trade Related Aspects of Intellectual Property Rights (TRIPS) and to increase tariffs for certain industries under multilateral agreement. Storm and Naastepad (2005) and UNIDO (2005) argued that TRIPS is not compatible with the East Asia's industrialization principle. TRIPS might impose high cost during the acquisition of advanced technology. It is especially true for Indonesia that has dependence on technologies from developed countries. By abandoning TRIPS, the costs of technology licensing could be reduced and the investments could be allocated for other productive things. Indonesia's position as an emerging economy, chair of ASEAN, and member of G20 might help in negotiating agreements with the WTO. Indonesia must be able to transform these positions into bargaining power. Of course, negotiation skills of Indonesian diplomats are necessary and indeed, the renegotiation with the WTO and other leading countries might improve the diplomats' negotiation skills.

- *Careful assessment of the bilateral and multilateral FTA.* Terms and conditions in the FTAs seem stricter than the agreements inside the WTO. However, the FTAs can still be renegotiated. Again, the negotiation skills of Indonesian diplomats are necessary and play important role, especially for the FTAs that include leading power, such as Japan, China, and the U.S.

Some of the recommendations are particularly based on China's experiences. However, it might not be easily copied by other countries (including Indonesia) as development strategy. The reasons are: China has large potential domestic market, which fosters competition and attracts foreign interest and investment; China has abundant labour and China has been investing human resources development; and China retained a hierarchical authoritarian political system which it actively deployed in the new market economy environment (Naughton, 2010).If Indonesia copies China's strategy, then the results will not produce the same impacts as in China because of these initial conditions.

3.6   Lessons

Trade liberalization under ACFTA framework will likely expand bilateral trade between Indonesia and China. But, the results might be asymmetric because Indonesia might have more import expansion rate than export expansion rate. In the long run, it could deteriorate Indonesia's trade balance with China.

Indonesia's export expansion to China might significantly come from primary products. And the second biggest contributor of Indonesia's trade expansion is manufacturing sectors. In the manufacturing sectors, Indonesia will likely have to compete against China in domestic and overseas markets. A country which specializes in primary products might not be good to sustain its economic performance because an economy is better off producing goods that rich countries export (Rodrik, 2007).

The comparison between results of partial equilibrium and general equilibrium approach shows that the differences are big between them, although qualitatively both results show that most of the estimated effect has the same sign, except mining. This strongly suggests that the second-round and higher-rounds effects of ACFTA are big. This is particularly true for food products & beverages, transportation machinery and general machinery, which is precisely sectors featuring relatively strong backward production linkages with other sectors. What this means, for example, is that the demand for transportation machinery is likely to grow not only directly (due to more demand from China) but also indirectly because the exports of all other sectors to China are growing (and need more transport equipment).

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Chapter 4   Estimating the Increase of Energy Demands and CO_2 Emissions due to ACFTA using Input-Output Analysis

In 2009, Indonesia's industrial sector had the biggest demand for energy, accounting for 51.9% of the total energy demand. The biggest share of energy supply came from fossil fuel, which accounted for 95.2% of the total energy supply. The remaining energy supply came from hydropower and geothermal. It has been discussed in the previous chapter that the participation of Indonesia in ACFTA is likely to expand the exports and this means that production output will grow as well. Consequently the export expansion will lead to an increase in energy demand, because more energy is needed to produce the exported goods. Since Indonesia relies almost completely on fossil fuels, the expansion of export will increase the CO_2 emissions as well.

This chapter discusses the effect of export expansion due to ACFTA on energy demand and CO_2 emissions. Based on the simulation results in the previous chapter, I estimate the direct and indirect increase in Indonesia's energy demand and CO_2 emissions. The estimation is based on the Indonesia's export expansion with China under the ACFTA framework using input-output analysis. Sections 1 and 2 of this chapter discuss the methodology and data, and simulation results respectively. Then, the policy implications of the simulation results are discussed in the last section of this chapter.

4.1   Methodology and Data

As indicated in the previous chapter, ACFTA will expand the trade value between Indonesia and China. The economic expansion will increase the energy demand and CO_2 emissions both in Indonesia and China. In this analysis, the increase of energy demand and CO_2 emissions will be estimated only for Indonesia. The method of the estimation is based on the input-output (IO) model. The IO model captures the flows of goods and services in the interrelated industries activities and it can be used to trace the direct and indirect energy use of industry activities and the resulting CO2 emissions.

The IO data of Indonesia in 2005 will be used for the calculation because it is the newest input-output data of Indonesia. We assume that there have been no significant changes in Indonesia's economic structure in the last five years. The energy intensity data are based on ESDM (2010). The conversion of energy data to carbon figure will be based on IPCC (2006).

There are 175 sectors in the IO table. First of all, the data must be aggregated into 15 sectors (=14 sectors based on the categorization of sectors in the previous chapter and the services sector). Since

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the analysis of ACFTA is limited to trade in goods, the service sector is excluded during the analysis although it is considered in the whole calculation. The aggregated matrix can be seen in appendix 5 using the following equation.

$$Z^* = SZS^T \tag{1}$$

Z represents 175x175 sectors matrix, while Z^* represents 15x15 aggregated sectors matrix. S is the aggregation matrix, to be a $k \; x \; n$ matrix of ones and zeros, where k is the number of sectors in the to-be-created aggregated version of the input-output table and n is the number of sectors in the existing un-aggregated version of the table. The locations of ones in a row of matrix S specify which sectors of the un-aggregated table will be grouped together as sector i in the aggregated table. S^T is the transpose of matrix S.

The same procedure is done to create aggregated matrix of output (X) and final demand (Y).

$$X^* = SX \tag{2}$$

To compute the input-output coefficient matrix and the Leontief inverse matrix, we have

$$A^* = Z^*(X^*)^{-1} \tag{3}$$

Leontief inverse matrix = $(I - A^*)^{-1}$ (4)

Using the energy intensity data, we have the matrix of energy intensity of 15 sectors.

$$\varepsilon = \begin{bmatrix} \varepsilon_1 \\ \vdots \\ \varepsilon_{15} \end{bmatrix} \text{ and in diagonalized form, } \varepsilon = \begin{bmatrix} \varepsilon_1 & 0 & \dots & 0 \\ 0 & \varepsilon_2 & 0 & \vdots \\ \vdots & 0 & \ddots & \vdots \\ 0 & \dots & \dots & \varepsilon_{15} \end{bmatrix} \tag{5}$$

The energy intensity matrix and Leontief inverse matrix can be used to estimate the effects of changes of final demand on energy demand (E).

$$E = \varepsilon(I - A^*)^{-1}Y^* = VY^* \tag{6}$$

From this calculation, total energy intensity, direct energy intensity, and indirect energy intensity can be obtained.

Y^* is the aggregated matrix of final demand and can be calculated through the following procedure.

$$Y^* = SY \tag{7}$$

To quantify the increase of energy demand caused by ACFTA (E^{ACFTA}), we need only the component of export in the final demand since we are only interested in the export expansion. The increase of energy demand can be obtained by multiplying the matrix Y^* with the value of direct and indirect energy intensity for each sector.

Once the total increase of energy demand is calculated, the increase of the CO$_2$ emissions can be estimated. The estimation of the increase of CO$_2$ emissions can be done by knowing the composition of energy sources for each industry in Indonesia. However, the data of composition of energy sources for the industries in Indonesia are very limited at the disaggregated level. The only available

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data is based on ESDM (2010), which provides the composition of energy sources at the national level. Therefore, I assume the composition of energy sources at the national level is the same with all of the industries in Indonesia.

According to the ESDM (2010), the energy sources comprise 28% of oil, 36% of coal, 28% of natural gas, and 8% of biomass. These figures give the average CO$_2$ emissions amounts to 21 kg/GJ. The total CO$_2$ emissions caused by the unitary change in export can be calculated as follows.

$$C_{Total}^{ACFTA} = \gamma V \qquad (9)$$

Then, the direct CO$_2$ emissions caused by a unitary change in export can be calculated as follows.

$$C_{Direct}^{ACFTA} = \gamma \varepsilon \qquad (10)$$

4.2   Results

Using Indonesia IO table, the coefficient matrix A and Leontief matrix can be defined. In the simple manner, the coefficient matrix can be presented as follows.

$$A = \begin{bmatrix} A_{ij} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

While, Leontief matrix can be presented as follows.

$$(I - A)^{-1} = \begin{bmatrix} \propto_{ij} \end{bmatrix} = \begin{bmatrix} \propto_{11} & \propto_{12} & \dots & \propto_{1n} \\ \propto_{21} & \propto_{22} & \dots & \propto_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \propto_{n1} & \propto_{n2} & \dots & \propto_{nn} \end{bmatrix}$$

Throughout the calculation, both coefficient matrix A and Leontief matrix is 15 x 15 matrixes. The coefficient A_{ij} in the coefficient matrix A is the direct increase of industry j due to an increase in final demand for sector i by one unit. The coefficients of Leontief matrix, $\propto_{ij}$, show the total (direct + indirect) increase in output of industry j due to an increase in final demand for sector i by one unit.

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The coefficient matrix A is shown in table 15.

Table 15 Coefficient Matrix A of Indonesia (IO Data 2005)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.0630	0	0.0003	0	0.4968	0.0223	0.0019	0.0111	0	0	0	0	0.0518	0	0.1242
2	0.0025	0.0158	0.0016	0.0022	0.0146	0.0025	0.4972	0.0133	0.0004	0.0011	0	0	0.0074	0	0.4289
3	0	0	0.0493	0	0.3059	0	0	0.0002	0	0	0	0	0.0007	0.0025	0.1120
4	0	0	0	0.0956	0.0013	0.0008	0.0006	0.3569	0.0765	0.0001	0.0001	0.0001	0.0416	0	0.1355
5	0.0410	0	0.0078	0	0.1829	0.0080	0.0011	0.0039	0	0	0.0001	0	0.0001	0	0.1579
6	0.0018	0.0002	0	0.0005	0.0007	0.3255	0.0024	0.0017	0.0014	0.0013	0.0016	0.0006	0.0113	0	0.0436
7	0.0014	0.0005	0.0004	0.0012	0.0333	0.0066	0.2911	0.0058	0.0077	0.0023	0.0133	0.0009	0.0111	0.0001	0.3749
8	0.0659	0.0017	0.0081	0.0190	0.0204	0.0750	0.0476	0.1078	0.0464	0.0052	0.0437	0.0041	0.1362	0.0001	0.4746
9	0.0037	0.0010	0.0001	0.0005	0.0030	0.0029	0.0041	0.0026	0.2358	0.0724	0.0474	0.0523	0.0163	0.0156	0.7488
10	0	0	0.0029	0	0	0	0	0	0.0005	0.3795	0	0	0	0	0.3048
11	0	0	0	0.0022	0	0.0002	0.0004	0.0001	0.0011	0.0206	0.2277	0.0162	0.0014	0	0.1063
12	0.0072	0.0094	0.0024	0.0766	0.0080	0.0288	0.0228	0.0118	0.0107	0.0257	0.1159	0.5270	0.0259	0	0.3406
13	0.0005	0.0002	0.0010	0.0002	0.0131	0.0100	0.0057	0.0046	0.0056	0.0227	0.0608	0.0040	0.0723	0.0002	0.5218
14	0	0	0	0	0	0.0136	0.0004	0.0002	0.0003	0	0.0019	0.0002	0.0016	0.0157	0.0006
15	0.0081	0.0008	0.0004	0.0065	0.0090	0.0083	0.0072	0.0052	0.0065	0.0036	0.0084	0.0017	0.0072	0.0002	0.1898

Source: author's calculation

Note:

1 = agriculture

2= forestry

3 = fishery

4 = mining

5 = food products and beverages

6 = textiles and footwear

7 = pulp, paper, and paper products

8 = chemicals

9 = iron, steel, and metal products

10 = transportation machinery

11 = electronic equipment

12 = general machinery

13 = other manufacturing

14 = others

15 = services

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The Leontief matrix is shown in table 16.

Table 16 Leontief Matrix of Indonesia (IO Table 2005)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.1019	0.0004	0.0064	0.0035	0.6786	0.0527	0.0104	0.0209	0.0056	0.0062	0.0119	0.0032	0.0687	0.0002	0.3773
2	0.0177	1.0174	0.0034	0.0119	0.0719	0.0286	0.7264	0.0312	0.0196	0.0152	0.0298	0.0086	0.0314	0.0006	0.9651
3	0.0204	0.0002	1.0554	0.002	0.4106	0.0093	0.0038	0.0046	0.0027	0.0021	0.0038	0.0014	0.0049	0.0028	0.2419
4	0.042	0.0019	0.005	1.1233	0.0536	0.0675	0.0437	0.4564	0.1485	0.0338	0.0584	0.0266	0.1304	0.0026	0.7501
5	0.0586	0.0003	0.0106	0.0024	1.2671	0.0216	0.0059	0.009	0.0033	0.0026	0.0049	0.0017	0.0074	0.0001	0.2773
6	0.0045	0.0004	0.0002	0.002	0.006	1.4852	0.0071	0.0046	0.0044	0.0054	0.007	0.0031	0.0202	0.0001	0.1097
7	0.0134	0.0015	0.0018	0.0086	0.076	0.0273	1.4214	0.0179	0.023	0.0152	0.0387	0.0097	0.0276	0.0007	0.7427
8	0.0951	0.0033	0.0115	0.0342	0.1094	0.1495	0.0933	1.1446	0.0846	0.0374	0.1019	0.0283	0.1881	0.0017	1.0047
9	0.0227	0.0041	0.0023	0.0254	0.04	0.0359	0.0329	0.0257	1.3283	0.1763	0.1267	0.1572	0.0463	0.0214	1.456.
10	0.0066	0.0006	0.0054	0.005	0.0137	0.0092	0.0076	0.006	0.0075	1.617	0.0089	0.0036	0.0069	0.0003	0.6354
11	0.0029	0.0006	0.0005	0.0088	0.0054	0.0061	0.0054	0.0057	0.0058	0.0475	1.3055	0.0463	0.0066	0.0001	0.2202
12	0.04	0.0219	0.0081	0.1944	0.0728	0.1261	0.1076	0.1166	0.0704	0.1218	0.3568	2.1412	0.1028	0.0014	1.3124
13	0.0102	0.0011	0.0021	0.008	0.0345	0.0292	0.0193	0.0141	0.017	0.0506	0.0991	0.0175	1.0886	0.0007	0.7849
14	0.0001	0	0	0.0001	0.0002	0.0207	0.0008	0.0004	0.0006	0.0003	0.0029	0.0007	0.0022	1.016	0.0052
15	0.132	0.0012	0.0009	0.0102	0.0239	0.0187	0.0153	0.0122	0.0131	0.0106	0.018	0.007	0.0139	0.0005	1.2889
Column Sum	1.4492	1.0548	1.1136	1.4398	2.8638	2.0876	2.5008	1.8698	1.7344	2.1422	2.1743	2.4561	1.7459	1.0491	10.1718

Note:

1 = agriculture

2= forestry

3 = fishery

4 = mining

5 = food products and beverages

6 = textiles and footwear

7 = pulp, paper, and paper products

8 = chemicals

9 = iron, steel, and metal products

10 = transportation machinery

11 = electronic equipment

12 = general machinery

13 = other manufacturing

14 = others

15 = services

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Based on the coefficient matrix A, agriculture has the strongest direct backward production linkage with chemicals. The coefficient matrix suggests there is 0.0659 increase in output of agriculture due to an increase in final demand for chemicals by one unit. This strong direct backward production linkage indicates agriculture uses significant amount of chemicals as production inputs (e.g. pesticide and fertilizer). Other industries that have strong direct backward production linkage with chemicals include textiles and footwear, and other manufacturing. Textiles and footwear may use chemicals as production inputs for making motive and design of products. The reason other manufacturing has also strong direct backward production linkage with chemicals might be the inclusion of rubber manufacturers as the significant users of chemicals in this category. Most of the chemicals use crude oil as the raw material so that we can expect chemicals industry has strong direct backward production linkage with mining industry, which in Indonesia case, the mining is dominated by petroleum. Indeed, the coefficient matrix suggests there is 0.3569 increase in output of chemicals due to an increase in final demand for mining by one unit. Iron, steel, and metal products have also strong direct production linkage with mining industry. There is 0.0765 increase in output of iron, steel, and metal products due to an increase in final demand for mining by one unit. It explains the iron, steel, and metal products as energy intensive industry. Transportation machinery, electronic equipment, and general machinery have strong direct production linkage with iron, steel, and metal products. The increases of output are 0.0724, 0.0474, and 0.0523 respectively due to an increase in final demand for iron, steel, and metal products. There is also strong direct backward production linkage between electronic equipment and general machinery.

We now turn to the Leontief matrix. Agriculture has total (direct + indirect) backward production linkage with chemicals and mining. According to coefficient matrix A, there is low direct backward production linkage between agriculture and mining. It indicates that agriculture has strong indirect backward production linkage with mining dominated by petroleum. Indeed, agriculture uses products made of petroleum as raw material, such as pesticide and fertilizer. Industries that have strong total backward production linkage with mining include chemicals, and iron, steel, and metal products. There is 0.4564 and 0.1485 total increase of output of chemicals, and iron, steel and metal products industry respectively due to an increase in final demand for mining industry by one unit. Industries that have strong backward production linkage with chemicals include fishery, textiles and footwear, and other manufacturing. There are 0.0115, 0.1495, and 0.1881 total increase of output of fishery, textiles and footwear, and other manufacturing industry due to an increase in final demand for chemicals industry by one unit. Transportation machinery, electronic equipment, and general machinery have strong total backward production linkage with iron, steel, and metal products industry. The Leontief matrix indicates there are 0.1763, 0.1267, and 0.1572 total increase of output of transportation machinery, electronic equipment, and general machinery respectively due to an increase in final demand for iron, steel, and metal products by one unit. The interesting thing is almost all of industries have strong total backward production linkage with general machinery, except fishery and others industry. For others industry, it make sense because it consists of goods that do not necessarily require production machines (e.g. arts). For fishery industry, it might indicate the industry does not use modern production machines (still traditional) or the industry still depends on imports for the production machines.

At the end of table 16, there is the column sum of the Leontief matrix. It represents the aggregate backward linkage, which means the total increase in output of industry *j* (see column) due to an

increase of all sectors in the economy by one unit. The higher the values of column sum of the Leontief matrix, the stronger the aggregate backward linkages. Referring to table 16, the industries that have strong (> 2) aggregate backward linkages are: food products and beverages, textiles and footwear, pulp, paper and paper products, transportation machinery, electronic equipment, general machinery, and services.

Coefficient matrix A and Leontief matrix provide good overview of Indonesia economic structure. It will be beneficial for further analyses related to energy demand and CO_2 emissions. Table 17 presents the direct and indirect energy intensity of industries in Indonesia. These figures are measured in koe[14]/USD. The industries that have a relatively small proportion of direct energy intensity include forestry (35%), agriculture (36%), general machinery (37%), fishery (38%), mining (44%), and transportation machinery (47%). It shows these industries have strong indirect backward energy linkages with other industries. In contrast, the industries that have a relatively high proportion of direct energy intensity include other manufacturing (73%), food products and beverages (71%), iron, steel and metal products (68%), pulp, paper and paper products (61%), textiles and footwear (57%), chemicals (52%), and electronic equipment (52%).

Table 17 Energy Intensities of Industries in Indonesia

Industry	Direct Energy Intensity (koe/USD)	Indirect Energy Intensity (koe/USD)	Total Energy Intensity (koe/USD)
Agriculture	0.022 (36%)	0.039 (64%)	0.061
Forestry	0.022 (35%)	0.041 (65%)	0.063
Fishery	0.022 (38%)	0.036 (62%)	0.058
Mining	0.020 (44%)	0.025 (56%)	0.045
Food products and beverages	0.247 (71%)	0.101 (29%)	0.348
Textiles and footwear	0.247 (57%)	0.186 (43%)	0.433
Pulp, paper, and paper products	0.247 (61%)	0.159 (39%)	0.406
Chemicals	0.039 (52%)	0.036 (48%)	0.075
Iron, steel, and metal products	0.367 (68%)	0.170 (32%)	0.537
Transportation machinery	0.247 (47%)	0.278 (53%)	0.525
Electronic equipment	0.247 (52%)	0.226 (48%)	0.473
General machinery	0.247 (37%)	0.422 (63%)	0.669
Other manufacturing	0.247 (73%)	0.093 (27%)	0.340

Source: author's calculation

Note: the values in the bracket is the percentage of the direct energy intensity and indirect energy intensity over total energy intensity

In terms of total energy intensity, the industries that have high total energy intensity include general machinery, iron, steel and metal products, and transportation machinery, which have energy intensities of 0.669 koe/USD, 0.537 koe/USD, and 0.525 koe/USD respectively. Indeed, the nature of iron, steel and metal products is energy intensive and therefore, it has high proportion of direct

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[14] koe = kilogram oil equivalent

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energy intensity. General machinery and transportation machinery has high total energy intensity, because they have high proportion of indirect energy intensity. It is caused by large amount inputs of steel and metal to these industries. In other words, it indicates that these industries have strong backward energy linkages with iron, steel, and metal products. Other industries that have high total energy intensity include electronic equipment, textiles and footwear, and pulp, paper and paper products, where energy intensities amount to 0.473 koe/USD, 0.433 koe/USD, and 0.406 koe/USD. From the figure of total energy intensity, we can expect that the energy demand of Indonesia will likely increase if there are export expansions under ACFTA framework since the industries are important in generating revenue from export.

Based on the value of the total energy intensity, the increase of energy demand due to the export expansion under ACFTA framework can be estimated as shown in table 18. The export expansion and the increase of energy demand are measured in USD million and ktoe[15] respectively. The total increase of energy demand due to the export expansion amounts to 103.6 ktoe. Looking at the specific industries, the high increase of energy demand will likely happen in food products and beverages, other manufacturing, electronic equipment, and textiles and footwear. On the one hand, these industries have high total energy intensity. On the other hand, these industries will expand most in export values under ACFTA framework. Mining and chemicals have low total increase of energy demand, even though these industries might experience large export expansion under ACFTA because their total energy intensity is low.

It is interesting to note that mining and chemicals belong to low energy intensive industries. But, one would expect these industries are among the high intensity industries as for the case in EU and the U.S. In Indonesia, the chemicals industry is only basic chemicals industry, meaning the production output of the industry will be used as production input for other industries (e.g. plastic manufacturing and pulp, paper and paper products). The production outputs of one chemicals industry are not used by other chemicals industry, but by other industries. In addition, the production outputs of basic chemicals are exported to other countries. In other words, there are weak industry linkages inside the chemicals industry. It could be the plausible reason that chemicals are among the low energy intensity industries in Indonesia. For the case of mining, there are many traditional mining productions in Indonesia. However, it might not be the reason that mining are among the low energy intensity industries because one would argue the production output of modern mining will easily exceed production output of traditional mining. The explanation of low energy intensity in mining could be the condition of mining industry that is currently in expansion mode. The production outputs of mining keep growing (except petroleum) while the industry can halt the increase of energy demand due to its expansion.

Table 18 The Estimated Increase of Energy Demand due to ACFTA

Industry	Export Expansion of Indonesia to China (USD million)	Increase of Direct Energy Demand (ktoe)	Increase of Indirect Energy Demand (ktoe)	Total Increase of Energy Demand (ktoe)
Agriculture	6.1	0.13	0.24	0.37
Forestry	7.3	0.16	0.30	0.46

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[15] ktoe = kiloton oil equivalent

Fishery	0.0	0.00	0.00	0.00
Mining	182.8	3.66	4.58	8.24
Food products and beverages	122.1	30.16	12.39	42.55
Textiles and footwear	25.4	6.27	4.72	11.00
Pulp, paper, and paper products	19.8	4.90	3.15	8.05
Chemicals	27.9	1.09	1.01	2.10
Iron, steel, and metal products	1.8	0.66	0.31	0.97
Transportation machinery	1.2	0.29	0.32	0.61
Electronic equipment	23.3	5.75	5.27	11.02
General machinery	9.6	2.37	4.05	6.42
Other manufacturing	34.8	8.60	3.23	11.82
Total	462.1	64.03	39.57	103.60

Source: Author's calculation

The increase of energy use will increase CO_2 emissions, especially because Indonesia has a high dependence on fossil fuel with the 98% of energy sources come from fossil fuel (ESDM, 2010). The adoption of renewable energy (e.g. hydropower and geothermal) has received significant attention in the last decade. However, the capacity generated from these renewable energy resources is still limited and has not gained a significant proportion in national energy consumption.

Table 19 presents the CO_2 emissions of industries in Indonesia. The trend of CO_2 emissions is similar to the energy intensity in the table 17. The industries that have a low proportion of direct CO_2 emissions including mining (18 tons CO_2/USD), agriculture (19 tons CO_2/USD), forestry (19 tons CO_2/USD), fishery (19 tons CO_2/USD), transportation machinery (218 tons CO_2/USD), and general machinery (218 tons CO_2/USD). The remaining industries have a high proportion of direct CO_2 emissions, including iron, steel and metal products (323 tons CO_2/USD), food products and beverages (218 tons CO_2/USD), textiles and footwear (218 tons CO_2/USD), pulp, paper and paper products (218 tons CO_2/USD), electronic equipment (218 tons CO_2/USD), other manufacturing (218 tons CO_2/USD), and chemicals (34 tons CO_2/USD).

Table 19 The Estimated CO₂ Emissions per Unit of Production

Industry	Direct CO₂ Emissions (tons CO₂/USD)	Indirect CO₂ Emissions (tons CO₂/USD)	Total CO₂ Emissions (tons CO₂/USD)
Agriculture	19	34	54
Forestry	19	36	56
Fishery	19	31	51
Mining	18	22	40
Food products and beverages	218	89	307
Textiles and footwear	218	164	382
Pulp, paper, and paper products	218	140	358

Chemicals	34	32	66
Iron, steel, and metal products	323	150	473
Transportation machinery	218	246	463
Electronic equipment	218	200	417
General machinery	218	373	590
Other manufacturing	218	82	300

Source: Author's calculation

General machinery has the highest total CO$_2$ emissions per unit of production, amounting to 590 tons CO$_2$/USD. Iron, steel and metal products and transportation machinery have the second and third highest CO$_2$ emissions per unit of production with 473 tons CO$_2$/USD and 463 tons CO$_2$/USD. Other industries that have high CO$_2$ emissions per unit of production include electronic equipment (417 tons CO$_2$/USD), textiles and footwear (382 tons CO$_2$/USD), and pulp, paper and paper products (358 tons CO$_2$/USD).

Based on the result of CO$_2$ emissions per unit of production, the increase of CO$_2$ emissions due to trade expansion under ACFTA can be estimated as shown in table 20. Again, the trend is similar to the results in table 18. The sectors that have a high increase in energy demand also have high increases in CO$_2$ emissions. The total increase of CO$_2$ emissions due to trade expansion with China under ACFTA might amount to 91,376 tons. Food products and beverages might have the highest increase of CO$_2$ emissions, amounting to 37,529 tons CO$_2$ (more than one-third of the total CO$_2$ increase), because it might have the second highest export expansion as well. While, the biggest trade expansion will come from mining, the rise in CO$_2$ emissions, amounting to 7,268 tons CO$_2$, is modest because mining is among the low energy intensive industries.

Other manufacturing, electronic equipment, and textiles and footwear will increase CO$_2$ emissions by 10,430 tons, 9,716 tons, and 9,698 tons. Other big increases of CO$_2$ emissions occur in general machinery, and pulp, paper and paper products, amounting to 5,659 tons and 7,097 tons respectively. The results indicate the big increase of CO$_2$ emissions come from high energy intensive industries which experience high export expansion. Only chemicals will have modest increase of CO$_2$ emissions, although it will be among the winners of ACFTA because it is low energy intensive industry. Industries that feature low increases of CO$_2$ emissions include agriculture (327 tons), forestry (408 tons), transportation machinery (541 tons), iron, steel and metal products (855 tons), and chemicals (1,849 tons). Even though iron, steel, and metal products are high energy intensive energy, the increase of CO$_2$ emissions might be among the lowest because it has low export expansion. Fishery might have zero ton of increase of CO$_2$ emissions because the export expansion might amount to zero.

Table 20 The Estimated Increase of CO$_2$ Emissions due to ACFTA

Industry	Export Expansion of Indonesia to China (USD million)	Increase of Direct CO$_2$ Emissions (tons)	Increase of Indirect CO$_2$ Emissions (tons)	Total Increase of CO$_2$ Emissions (tons)
Agriculture	6.1	118	209	327
Forestry	7.3	142	266	408
Fishery	0.0	0	0	0
Mining	182.8	3225	4,043	7,268
Food products and beverages	122.1	26,604	10,925	37,529
Textiles and footwear	25.4	5,530	4,167	9,698
Pulp, paper, and paper products	19.8	4,320	2,778	7,097
Chemicals	27.9	958	891	1,849
Iron, steel, and metal products	1.8	584	271	855
Transportation machinery	1.2	254	287	541
Electronic equipment	23.3	5,072	4,644	9,716
General machinery	9.6	2,088	3,571	5,659
Other manufacturing	34.8	7,581	2,849	10,430
Total	462.1	56,477	34,900	91,376

Source: Author's calculation

The simulation results are restricted to the assumption that the composition of energy input for the industries consists of 28% of oil, 35% of coal, 28% of natural gas, and 8% of biomass. Recent development shows that Indonesia is more and more depending on coal for energy resources because of lack infrastructure to distribute gas to the industries. Some of the industries that rely on coal to fulfil more than 50% of energy requirement include paper industry (Hapsari, Teguh, & Suryobroto, 2011) and steel industry (Hapsari, 2011). So, the figures of CO$_2$ emissions from these industries might be doubled since the carbon content of coal is almost twice that of natural gas. The carbon content of coal and natural gas are 26.6 kg/GJ and 15.3 kg/GJ respectively.

The utilization of coal is endorsed by the national energy policy. According to Presidential Decree 5/2006, the government will focus on reducing the consumption of oil and on increasing the consumption of coal as the future energy resources. Therefore, it might lead to more CO$_2$ intensity and CO$_2$ emissions in the future. However, it might not be the case if Indonesia can manage to shift toward renewable energy. The other good component of this Presidential Decree is the encouragement to increase the national usage of renewable energy up to 12% of total national energy sources consists of 5% of biofuel, 5% of geothermal power, biomass, nuclear, hydro, and wind, and liquefied coal at 2%.

If we use CO$_2$ emissions as the only indicator of environment quality, then we will consider the high polluters as the contributors of adverse effect of ACFTA to the environment. Based on the simulation, the high polluters might include food products and beverages, other manufacturing,

electronic equipment, and textiles and footwear. However, CO$_2$ is only one of many indicators of environment quality. Agriculture, fishery, and mining might have small adverse effect to the air pollution, but these industries might pollute more to land. Agriculture and forestry use chemical products as their production inputs that might pollute the land. The effects of trade liberalization for these industries-related inputs might less harmful to the environment because local products might be dirtier than foreign products (Abimanyu, 2000). However, he noted that the Indonesian government will subsidize the local products as production inputs (e.g. fertilizers) so that the farmers will choose the local products than the foreign ones. Mining activities might also reduce the land quality and pollute the land. Mining activities will likely lead to deforestation since it is usually located in the forest areas. If the CO$_2$ emissions due to deforestation (involving mining activities) are considered, then the increase of CO$_2$ emissions from mining will likely increase. As indicated by PEACE (2007), Indonesia is among the top-five CO$_2$ emitters if CO$_2$ emissions due to deforestation are included. Fishery might produce less air pollutions under ACFTA framework, but it might produce more water pollution. Therefore, further studies related to environment quality that are beyond the scope this research must be conducted.

4.3   Policy Implications

On January 2010, Indonesia submitted an emissions cut target to the UN. Indonesia targeted a 26% cut of emissions with its own effort or up to 41% with the support of international effort by 2020. This target will be achieved only if there is a significant shift from fossil fuel to renewable energy or if there is technological change that can reduce energy intensity in the industries. However, the target might be difficult to achieve because Indonesia uses its abundant reserves of coal to fulfil domestic energy requirements and the development of renewable energy remains sluggish.

As indicated in the simulation results, free trade arrangement might lead to trade expansion. In the end, it will increase the CO$_2$ emissions as well. Indonesia will maintain its open trade regime in the future. The negotiations of more FTAs with other countries (e.g. Japan, Korea, India, Australia, New Zealand, and European Union) are still on-going. So, if all this leads to more exports and more growth, then the further increase of CO$_2$ emissions would be unavoidable.

Fossil fuels will likely the main energy source in the next two decades. Based on the national energy plan, the total share of renewable will likely be about 15% in 2025. Carbon Capture and Storage (CCS) seems a promising technology to reduce the emissions in the power generations and industries. As a niche technology, the users might be hesitant to adopt CCS in their current power generations or industries operation and there might be public resistance, especially if the project is nearby the residential areas. If it is necessary to implement CCS at the national scale, then the incentives need to be designed and improving public awareness is necessary.

The development of renewable energy sources (e.g. geothermal, hydropower, wind, and tidal wave) is necessary. However, the development is sluggish. I think the main reasons of sluggish development might be low public acceptance and awareness, lack of investment, low mastery of renewable technology, and lack of incentives. According to the survey by GE Energy Indonesia, Indonesians lack knowledge in renewable energy and not more than 30% can mention renewable

energy. Investors might be hesitant to invest because the costs of renewable energy are high, while the pricing of power generation is determined by the government. Therefore, the appropriate incentives have to be defined as well. Technology transfer in renewable energy is needed. Related to FTAs at the regional level, the FTA must include the cooperation in technology transfer, especially related to renewable energy. At the global trade level, Indonesia has to renegotiate the terms and conditions in TRIPS to ensure knowledge diffusion from global community and low down the costs of niche technology in renewable energy.

The energy intensive industries will likely expand its production through the implementation of FTAs. Energy audit could be the first step in making the energy usage more efficient. Then, the industries are obliged to implement energy audit results. The challenges during the implementation include difficulties in monitoring and evaluation. The industries might be reluctant to conduct energy audits, because they might perceive it as costs without any advantages and incentives. It is especially true for low energy intensive industries. For high energy intensive industries, it might work because every penny spent on energy counts. However, monitoring, evaluation, and incentives are necessary.

4.4   Lessons

Export expansion due to ACFTA will likely increase the energy demands. At the same time, it will likely increase the CO_2 emissions because Indonesia has high dependency on fossil fuels. The significant increase of energy demands and CO_2 emissions will likely come from industries that have high export expansion (> USD 20 million). These industries include food products and beverages, textiles and footwear, electronic equipment, and other manufacturing. Although mining and chemicals are among the industries that have high trade expansion, they might not have high increase of energy demands and CO_2 emissions because they have low energy intensity. However, these industries have high energy intensity in the OECD countries. The plausible explanation could be: the chemicals industry is only basic chemicals industry, meaning the production output of the industry will be used as production input for other industries (e.g. plastic manufacturing and pulp, paper and paper products). The production outputs of one chemicals industry are not used by other chemicals industry, but by other industries. In addition, the production outputs of basic chemicals are exported to other countries. In other words, there are weak industry linkages inside the chemicals industry. For the case of mining, there are many traditional mining productions in Indonesia. However, it might not be the reason that mining are among the low energy intensity industries because one would argue the production output of modern mining will easily exceed production output of traditional mining. The explanation of low energy intensity in mining could be the condition of mining industry that is currently in expansion mode. The production outputs of mining keep growing (except petroleum) while the industry can halt the increase of energy demand due to its expansion. The increase of energy demands and CO_2 emissions from iron, steel, and metal products industry is negligible, although this industry has the highest energy intensity. It is caused by the very small amount of trade expansion from this industry.

In analysing total energy intensity and total CO_2 emissions, it will be necessary to consider the direct energy intensity and indirect CO_2 emissions. Some industries could have low direct energy intensity and CO_2 emissions, but these industries have bigger share of indirect energy intensity and CO_2

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emissions. In the case of Indonesia, these industries include agriculture, forestry, fishery, mining, transportation machinery, and general machinery. It shows that there are strong indirect backward production linkages with other industries.

Logically, the increase of CO$_2$ emissions is caused by the increase of energy demands. Unless, there is significant change of national energy input structure (e.g. larger utilization of renewable energy resources). It shows that the Environmental Kuznets Curve (EKC) does not exist in the case of CO$_2$.

Last but not least, the CO$_2$ emissions might not a representative indicator for environment quality. It might be true for the case of mining. According to the simulation results, mining industry might have negligible increase of CO$_2$ emissions although it has the highest value of trade expansion. This industry might create bigger environmental destruction because mining activities usually take place in a forestry area. Besides, once a land is part of mining activities, it is difficult to recover the land quality.

Chapter 5   Conclusions and Discussion

In this chapter, I provide key findings and answers for each research questions. Later, I present the implication of this research to the existing literature and the relevance with the policymakers. At the end, I identify the research limitations and recommendations for future research.

5.1   Trade Expansion and Consumer Welfare Effect due to ACFTA

ACFTA is an economic cooperation between ASEAN and China to liberalize trade between them by removing tariffs and non-tariffs barriers. Chinese Premier Zhu Rongji proposed the establishment of ACFTA in 2000 during the ASEAN informal meeting on December 2000 in Singapore. Then, ASEAN and China signed the agreement on during the ASEAN Summit on November 2002 in Cambodia. The implementation of ACFTA has several phases. It was started with the Early Harvest Program (EHP) in 2006 and trade liberalization for goods in 2010 for ASEAN-6 and China. The newer members of ASEAN, including Cambodia, Myanmar, Lao PDR, and Vietnam will liberalize their trade for goods under ACFTA framework in 2015.

Tariffs removal under ACFTA framework will likely expand bilateral trade (export and import) between Indonesia and China. Indonesia might increase its export to China by USD 462.1 million. Indonesia might increase its import from China as well by USD 1,231.1 million. It shows that Indonesia's import expansion rate might be faster than Indonesia's export expansion rate. In the long run, it might deteriorate Indonesia's trade balance with China.

Trade diversion will likely be negligible under ACFTA framework. It shows that only small trade values will likely be diverted from efficient producers outside ACFTA to non-efficient producers of ACFTA members. It suggests that the establishment of ACFTA will not create regionalism. In other words, it will likely have small trade effect to non-members of ACFTA.

Indonesia's industries that might incur significant gains (> USD 20 million) include mining, food products and beverages, textiles and footwear, chemicals, electronic equipment and other manufacturing. Some of these industries will likely also have fierce competition from their Chinese counterparts in Indonesian local market. These industries include textile and footwear, electronic equipment, and other manufacturing. Other Chinese industries that might flood Indonesian local market include iron, steel, and metal products, and general machinery.

From consumers' point of view, the consumers will have positive consumer welfare effect because they can access to cheaper products. Total consumer welfare effect might amount to USD 1,868.8 million. For Indonesia in particular, the consumer welfare effect might equal to USD 299.4 million. Dividing the consumer welfare with the population of Indonesia (= 228.5 million people), the consumer gain from the ACFTA per capita might amount to USD 1.31 per person.

5.2   Energy Demands and CO_2 Emissions

Trade expansion under ACFTA framework will likely increase the energy demands and CO_2 emissions. The increase might exist for almost all industries, except fishery. This industry might have zero increase of energy demands and CO_2 emissions because it might have zero trade expansion. Total increase of energy demands and CO_2 emissions might equal to 103.6 ktoe and 91,376 tons CO_2. Industries that have high increase of energy demands (> 10 ktoe) and CO_2 emissions (> 9,000 tons CO_2) include food products and beverages, textile and footwear, electronic equipment, and other manufacturing.

Although mining and chemicals industries might have high trade expansion, but these industries might have only small increase of energy demands and CO_2 emissions, although they might have high trade expansion because they have low energy intensity. In Indonesia, the chemicals industry is only basic chemicals industry, meaning the production output of the industry will be used as production input for other industries (e.g. plastic manufacturing and pulp, paper and paper products). The production outputs of one chemicals industry are not used by other chemicals industry, but by other industries. In addition, the production outputs of basic chemicals are exported to other countries. In other words, there are weak industry linkages inside the chemicals industry. It could be the plausible reason that chemicals are among the low energy intensity industries in Indonesia. For the case of mining, there are many traditional mining productions in Indonesia. However, it might not be the reason that mining are among the low energy intensity industries because one would argue the production output of modern mining will easily exceed production output of traditional mining. The explanation of low energy intensity in mining could be the condition of mining industry that is currently in expansion mode. The production outputs of mining keep growing (except petroleum) while the industry can halt the increase of energy demand due to its expansion.

5.3   Geopolitical Implications

The rising (economic) power of China might change geopolitical landscape in the East Asia. The region has been under domination of Japan and the U.S. since 1970s. Indonesia in particular also aligned with Japan and the U.S. during this period. However, Japan and the U.S. might have to share their dominance in the region with China.

From trade perspective under ACFTA framework, ASEAN and China trade keep increasing in the last decade. China's trade (export and import) with Indonesia in particular has exceeded the United States. And, China is among the top five trading partner of Indonesia. China ranked higher than the United States and only behind Japan and Singapore. Indonesia has geopolitical importance for China as supplier of natural resources. Even, China has imposed zero tariffs for most of the Indonesia's natural resources before the implementation of ACFTA. However, Indonesia should not consider itself as a resource-rich country anymore because Indonesia is not among the top producer of mining products and is net-importer of oil. Instead of exporting primary energy resources, Indonesia has to reserve it secure future security of energy supply. On the other hand, China will still need

Indonesia as market for their abundant products that need to be marketed to other countries. China is also dumping their products. WTO reported that China is the most frequent subject of dumping investigation in the first half of 2010 (WTO, 2010). Indonesia also found dumping practice related to imported products from China (Pasandaran, 2011). It causes Indonesian products cannot compete against Chinese products in the local market. It is no surprise that the import expansion rate is higher than the export expansion rate.

There will be an intense flow of investment from China to ASEAN. China has agreed to be an investor in the development of Singapore Kunming Rail Link (SKRL) (ASEAN, 2011). This infrastructure project is part of Master Plan on ASEAN Connectivity that will connect Malaysia, Thailand, Lao PDR, Cambodia, Vietnam, and China. It is aimed to provide alternative transportation for goods that might be more reliable, faster, and cheaper transportation. China will get further benefit from this initiative because China can market its products to ASEAN at lower price, assuming this infrastructure will low down transportation costs. Through SKRL, China might dominate ASEAN land (Myanmar, Thailand, Lao PDR, Cambodia, Malaysia, and Vietnam). Intra-ASEAN trade might be deteriorated because of China's domination. China's domination can also be seen through the appointment of Chinese national to be the director of ASEAN+3[16] Macroeconomic Research Office (AMRO), which will support the Chiang Mai Initiative Multilateralisation (CMIM)[17].

From Indonesian perspective, it will likely be difficult for Indonesia to compete with China in ASEAN market, especially in the countries where SKRL will be built. Chinese investment will also flow to Indonesia, mainly in building power plant. Indonesia needs power plants because of electricity shortages. The plausible scenario that might happen is China could utilize their investment in power plants to improve its bargaining position against Indonesia for other issues.

China has long disputed border around Spratly island in South China sea with some ASEAN countries. In the early 2000s, China agreed to solve the Spratly issue in multilateral fora and Declaration of Conduct (DOC) to reduce tension in the disputed islands was signed in 2002 by the claimants (Ba, 2003). At that time, ASEAN and China just agreed to establish ACFTA and it could be the reason of de-escalation of Spratly issue (Emmers, 2007). However, China recently insisted to solve this issue through bilateral talks with each claimant. The other claimants retaliated China's action by conducting military practices with the U.S. (BBC, 2010; The China Post, 2011). The U.S. is needed to balance China and besides, the U.S. has interests to maintain security in South China sea to secure energy supply from the Middle-East.

Although Indonesia is not involved in the Spratly Islands dispute, Indonesia has assertively challenged the claim of China for almost all of South China Sea. Indonesia sent a letter to the United Nations on 8 July 2010 to argue that China's claim clearly lacks international legal basis. It shows a bold move of Indonesia to challenge a new emerging power, China. Indonesia's intervention suggests three things: first, Indonesia can be a neutral and honest third party since Indonesia does not have any claim over Spratly Islands; second, the letter shows a degree of worry by the China's approach: third, Indonesia shows a bit of assertiveness in its own diplomacy (The Economist, 2010).

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[16] ASEAN, China, Japan, and South Korea
[17] CMIM is a multilateral currency swap among ASEAN, China, Japan, and Korea, amounting to USD 240 billion

The condition in South China sea is unstable and further conflict might happen. Legal binding of Declaration of Conduct is needed to ease the tension in the region. In this case, the U.S. can be a major player in bringing China back to negotiation table. Indonesia as chair of ASEAN can also play role to unite ASEAN countries to strengthen its position against China.

5.4   Discussion

Looking at the Indonesia's export expansion figure, Indonesia will likely have export expansion in primary products. It can be explained that Indonesia has comparative advantage in this sector. However, comparative advantage must keep evolving along with the capability in mastering technology. In this case, Indonesia will step in to acquire capability in manufacturing sectors. Indeed, the manufacturing sectors are the second biggest contributors of trade expansion. However, Indonesian manufacturing sectors will likely have competition from their Chinese counterparts. As a consequence, there could be the degradation of manufacturing capability because the Indonesia's industries might keep losing from China.

However, the trade expansion figure also suggests that Indonesia's import expansion from China might come from machineries. It shows that Indonesia is investing money on machineries to upgrade the production capability. As a result, investment in machineries is part of efforts in sustaining productivity growth as experienced by East Asian industrialization (Storm & Naastepad, 2005). Besides, profitability of investment is important to attract further investment in capital goods and boost exports (Rodrik, 1997). Importing machineries can also be interpreted as an effort to build domestic manufacturing capability. The knowledge spill over through importation of machinery might also benefit the importing country in building capability in manufacturing sectors.

Indonesia and China might exchange products in the same categories. The explanation could be the product differentiation. The simulation only provides 13 aggregated sectors. Every sector consists of many HS codes and each country might export the same products each other in the same products category, but actually the products could belong to different HS code. The other reason is the modularization of products and mass customization of products that affects global supply chain operation (Doran, 2003; Fixson, 2005). For example, Indonesia exports an electronic spare part (e.g. integrated circuit (IC)) to China and China exports it back in the form of electronic equipment (e.g. DVD player). These goods belong to the same product category, but in reality, it is different products.

5.4.1   Implications to the Literature

The contributions of this research to the existing literature are as follows.

- The use of partial equilibrium (PE) approach in quantifying trade expansion and consumer welfare effect complements the existing research that uses general equilibrium (GE) approach. How does this help? The comparison between the results of PE and GE approach are made in this research. It will help us to understand how big the difference between

these two approaches. If the results of GE approach have much greater values than the results of PE approach, then the second round and higher round effect of ACFTA are big.

- The qualitative analysis from other data is also used to enrich the simulation results on trade expansion.

- The estimation of the increase of energy demands and CO_2 emissions due to ACFTA contributes to the literature related to ACFTA and the environment. So far, the only research about ACFTA and the environment came from Vutha and Jalilian (2008), discussing CO_2 emissions of Cambodia and China under ACFTA framework.

- In this research, I broaden the analysis to the geopolitical level derived from the economic and environmental analysis as well as analysis on existing literature.

5.4.2 The Relevance for Policymakers

This research brings several implications for policymakers. The analysis on ACFTA is multifaceted and the simulation should be used by considering other factors that are not included in the model as well. The policymakers might have difficulties in deciding on which industries might they focus on to compete with China. It will be better if the policymakers do not try to pick the "winner" because it is problematic. However, it might be beneficial to remove the inefficient and unproductive industries as it might be more doable.

The removal of tariffs barrier under ACFTA framework will likely expand trade between Indonesia and China. In the short run, Indonesia seems depending on primary products, while the manufacturing sectors that are the second contributors of trade expansion will likely have competition against China in domestic and overseas markets. In the long run, Indonesia should not rely on primary products and has to build manufacturing capability as future source of economic development. Investment on infrastructure and machineries, protection of selective industries (e.g. high technology industries), negotiation with WTO on some rules (e.g. TRIPS) that can restrict national development policies and cautiously evaluating the free trade agreement could be some steps toward the next step of development. In relation to ACFTA, Indonesia should take actions that could use ACFTA to be compatible with its national interests.

They would also face difficulties in balancing the economic benefits of ACFTA and possible adverse effect of ACFTA on the environment. In the short run, Indonesia will still rely on primary products exports, which it will likely bring adverse effect to the environment. For example, the increase demand of palm oil exports might lead to deforestation (PEACE, 2007). The industrial development might shift Indonesia's export baskets to more technology intensive products. However, it will likely still bring adverse effect to the environment as experienced by China during its development of heavy industries, such as iron, steel, and metal products, electronic equipment, and machineries (UN, 2007).

Related to energy in particular, the policymakers can expect that the involvement of Indonesia in FTAs will likely increase energy demands and subsequently increase CO_2 emissions if there is no significant change in national energy structure. The exploration of renewable energy, such as geothermal, is a must if Indonesia wants to achieve its targeted CO_2 emissions cut. Joint venture with private parties to do geothermal (or other renewable energies) exploration could be an option. In

the joint venture, there should be some measures to ensure that there will be technology transfer. Other channel of technology transfer include importation of technology, licensing, technical assistance, and reverse engineering.

Although Indonesia does not have advanced capability in renewable energy, it does not mean that Indonesia cannot use opportunity to achieve economic development because of environmental reasons. At the same time, Indonesia has to utilize abundant energy resources (e.g. coal and natural gas) for development, although it might create more adverse effect to the environment. In the meantime, some measures on energy efficiency and environmental regulation might help to decelerate the environmental destruction.

In a current state of development, economic development might be more important than environmental for Indonesia. One of the reason is economic development is important to improve geopolitical position of Indonesia in the region. Furthermore, economic development might suppress separatist movement and terrorism inside the country. Cohen (2009) argued that separatist movement and terrorism might be triggered by economic disparities across different regions in Indonesia. If domestic political stability can be achieved, the it will likely go along with economic development.

5.5   Research Limitations

This research has several limitations. Firstly, the analysis is limited to the bilateral trade between Indonesia and China under ACFTA framework for 13 aggregated sectors. If other ACFTA members were included in the analysis, then the analysis could be different. The winning and losing industries would be different as well. Besides, the model does not capture the products competition at the micro level. It creates difficulties in analysing products competition. The model also does not explicitly capture the producer welfare effect.

Secondly, this research only analyses trade in goods and removal of tariffs barrier, while service industry and non-tariffs barrier are beyond the scope of this research. The reason of exclusion of service industry and non-tariffs barriers is the difficulties to find these data. If I can include the service industry and non-tariffs barriers, then it might enrich the analysis.

Thirdly, the energy input structure is assumed to have same value for the whole industries in Indonesia. However, it is not the case in reality. The data availability is the issue because Central Bureau of Statistics (BPS) or other department in Indonesia does not have the data.

Fourthly, the geopolitical implications are derived from the economic and environmental analysis in addition to existing literature. If experts in geopolitics are interviewed for this research, then it will enrich the overall analysis.

5.6   Recommendation for Future Research

To address several weaknesses above and enrich current analysis, future research should discuss the following issues. China will likely be an important trading partner for Indonesia under ACFTA framework. However, intra-ASEAN trade will likely also important for Indonesia since ASEAN has a plan to have closer economic cooperation among the members. Therefore, it will be important to analyse Indonesia's trade with other ASEAN countries under ACFTA framework. Furthermore, the research should address the products competition at micro level. In depth analysis on the specific industries will also be more beneficial to gain better understanding of the impacts of ACFTA on the micro level. In addition to this, the inclusion of service sector into the analysis will create better picture of the ACFTA impacts on overall Indonesian economy.

The development of the ACFTA will be very dynamic. After the members of ACFTA dismantle the tariffs barrier, some members might raise non-tariffs barrier to protect their industries. The update of non-tariffs barrier from Indonesian perspective will be beneficial to take necessary actions against strategic behaviour of other ACFTA members. However, this research might not be an easy task because it is difficult to identify non-tariffs barrier.

The estimation results on the increase of energy demands and CO_2 emissions were under a very strict assumption on the Indonesia national energy resources structure. The research to obtain energy resources structure for every industry will improve the accuracy of the estimation. The research could be started from the industries that tend to have potential increase of energy demands and CO_2 emissions.

Lastly, interview, discussion, or workshop with the experts in geopolitics will enrich the analysis. it might be used as validation and update for current research because the geopolitical analysis in this research is only based on the economic and environmental analysis as well as literature analysis.

All suggestions for future research will require considerable efforts. The reason is this topic is dynamic so that it will keep changing overtime and need up-to-date analysis. The other reason is it is a big topic so that it will be even bigger if some want to make an analysis at the micro level. However, it does not mean that it is an impossible task. All in all, current research will provide insights for policymakers in directing their strategies related to ACFTA for national interests.

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Appendix 1 Classification of Sectors by HS Code

Sectors	HS Code
Agriculture	HS 1-2, 4-16
Forestry	HS 44-46
Fishing	HS 3
Mining	HS 25-27
Food products and beverages	HS 15-24
Textiles and footwear	HS 50-67
Pulp, paper, and metal products	HS 47-49
Chemicals	HS 28-38
Iron, steel, and metal products	HS 71-83
Transportation machinery	HS 86-89
Electronic equipment	HS 85
General machinery	HS 84
Other manufacturing	Plastics (HS 39), rubber products (HS 40), hides and leather (HS 41-43), musical instruments (HS 90-92), and miscellaneous (HS 93-96)
Others	HS 97

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Appendix 2   Export and Import among the ACFTA Members in 2010

Table 22 Intra-ASEAN-China Export and Import in 2010 (in million USD)

		Importer											Total
		Indonesia	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	
Exporter	Indonesia		11,506.2	6,455.3	-	3,728.3	-	1,728.6	-	-	78.6	13,022.8	23,497.0
	Singapore	34,861.0		13,506.6	4,925.6	5,695.5	860.9	7,195.6	25.3	1,230.5	142.4	17,696.1	68,443.4
	Malaysia	-	28,167.3		1,966.8	8,497.8	428.9	2,593.4	7.0	303.9	77.2	31,791.1	42,042.3
	Philippines	-	5,003.0	1,109.0		1,772.7	10.0	388.9	0.7	10.9	4.4	11,941.2	8,299.6
	Thailand	5,758.9	8,123.1	7,429.2	3,022.0		122.5	4,889.6	1,754.8	1,317.6	230.8	23,472.7	32,648.5
	Brunei	-	91.8	66.6	-	109.2		1.5	-	-	0.0	282.1	269.1
	Vietnam	715.2	2,268.9	2,055.4	-	1,348.9	4.5		152.5	32.6	168.6	4,655.8	6,746.6
	Lao	-	0.2	0.1	-	438.1	-	273.0		-	0.3	366.0	711.7
	Myanmar	-	115.6	143.7	-	220.4	-	75.6	-		0.2	623.0	555.4
	Cambodia	-	423.4	14.1	-	68.2	0.0	209.9	0.8	1.4		28.9	717.8
	China	17,184.2	25,686.1	17,094.3	8,580.9	16,340.4	130.5	15,583.6	267.2	1,977.7	341.0		103,185.9
Total		58,519.3	81,385.5	47,874.2	18,495.3	38,219.4	1,557.2	32,939.8	2,208.3	4,874.7	1,043.6	103,879.6	

Source: Author's calculation

Table 23 Indonesia's Export to ACFTA Members in 2010 (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	298.6	82.1	-	64.2	-	55.3	-	-	0.0	135.6	635.8
Forestry	56.0	38.2	-	5.9	-	20.0	-	-	0.0	159.2	279.4
Fishing	114.0	103.2	-	140.5	-	18.7	-	-	0.0	48.3	424.7
Mining	2,265.1	1,309.5	-	1,222.2	-	81.7	-	-	4.0	5,666.6	10,549.1

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Food products and beverages	344.7	1,785.5	-	90.5	-	349.7	-	-	45.7	2,061.1	4,677.1
Textiles and footwear	282.0	106.3	-	74.3	-	104.7	-	-	15.0	305.5	887.8
Pulp, paper, and paper products	155.9	289.0	-	93.9	-	143.5	-	-	6.2	756.9	1,445.4
Iron, steel, and metal products	271.1	389.2	-	375.6	-	148.6	-	-	3.6	806.8	1,995.0
Transportation machinery	2,610.5	1,009.1	-	569.7	-	289.4	-	-	0.1	779.0	5,257.8
Electronic equipment	227.1	290.1	-	278.8	-	133.0	-	-	0.0	5.4	934.4
General machinery	2,347.8	397.7	-	308.7	-	103.0	-	-	0.6	1,039.3	4,197.1
Other manufacturing	1,795.6	226.3	-	327.5	-	120.5	-	-	0.6	665.8	3,136.3
Others	725.9	428.5	-	176.4	-	160.5	-	-	2.7	593.3	2,087.3
Total	11.9	0.6		0.0		0.0			0.0	0.0	12.6

Source: Author's calculation

Table 24 Indonesia's Import to ACFTA Members in 2010 (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	96.2	-	-	167.7	-	24.8	-	-	-	487.6	776.4
Forestry	27.8	-	-	28.4	-	1.4	-	-	-	69.8	127.5
Fishing	9.0	-	-	5.4	-	4.3	-	-	-	22.2	40.9
Mining	10,201.2	-	-	217.2	-	162.0	-	-	-	1,025.3	11,605.7
Food products and beverages	356.9	-	-	87.9	-	15.9	-	-	-	281.5	742.3
Textiles and footwear	597.9	-	-	184.4	-	74.3	-	-	-	2,007.6	2,864.1
Pulp, paper, and paper products	227.6	-	-	108.3	-	7.6	-	-	-	101.4	444.9
Iron, steel, and metal products	2,409.8	-	-	516.7	-	44.3	-	-	-	1,674.4	4,645.1
Transportation	2,747.3	-	-	507.4	-	228.8	-	-	-	2,376.0	5,859.5

machinery										
Electronic equipment	1,042.5	-	-	1,695.8	-	20.0	-	-	-	891.0	3,649.3
General machinery	7,197.5	-	-	342.9	-	34.4	-	-	-	3,095.2	10,669.9
Other manufacturing	7,340.2	-	-	1,108.8	-	16.0	-	-	-	3,591.1	12,056.1
Others	2,574.4	-	-	788.0	-	81.5	-	-	-	1,561.0	5,004.8
Total	32.8	-	-	0.0	-	0.0	-	-	-	0.1	32.9

Source: Author's calculation

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Appendix 3 Partial Equilibrium Model

Equilibrium is a constellation of selected interrelated variables so adjusted to one another that no inherent tendency to change prevails in the model which they constitutes (Machlup, 1958). Chiang (1984) explained further the words selected, interrelated, and inherent. The word "selected" highlights the fact that the analyst has to select which variables should be included in the analysis. Addition and omission of variables will produce different state of equilibrium. The word "interrelated" suggests all variables in the model must be in the state of equilibrium simultaneously. If there is a variable change, then the other variables will be changing as well and the equilibrium does not exist. The word "inherent" suggests that the state of equilibrium is only considered the balancing of the internal forces in the model and the external forces are assumed to be fixed. It means that the external variables are assumed constant. And if there are changes of external variables, then the equilibrium will not be changing unless the external variables are included in the model, which it will create the new state of equilibrium.

In partial equilibrium model, the model focuses on one market at a time and neglects the interactions between markets. The model is intended to measure the first-round effects of policy changes, assuming the second-round effects are small. The model is simple and transparent as it relies on a few key parameters.

The equations based on Laird and Yeats (1986) is discussed below.

Trade Creation

Trade creation captures trade expanding aspects of liberalization that leads to the replacement of expensive domestic production by cheaper import from more efficient trading partners in a given preferential trading area. The derivation of trade creation equation is as follows.

A simplified import demand function for country *j* from country *k* of commodity *i*:

$$M_{ijk} = f(Y_j, P_{ij}, P_{ik}) \tag{1}$$

The export supply function of commodity *I* of country *k* can be simplified as:

$$X_{ijk} = f(P_{ikj}) \tag{2}$$

The equilibrium in the trade between the two countries is the standard partial equilibrium equation:

$$M_{ijk} = X_{ikj} \tag{3}$$

In a free trade environment, the domestic price of commodity *I* in country *j* from country *k* would change with the change in an ad valorem tariff as follows:

$$P_{ijk} = P_{ikj}(1 + t_{ijk}) \tag{4}$$

To derive the trade creation formula, Laird and Yeats (1986) proceed as follows. First, the price equation (4) is totally differentiation to get:

$$dP_{ijk} = P_{ijk}dt_{ijk} + (1 + t_{ijk})dP_{ikj} \qquad (5)$$

Equation (4) and (5) are then substituted into the elasticity of import demand equation[18] to get:

$$\frac{dM_{ijk}}{M_{ijk}} = \eta_i^m \left(\frac{dt_{ijk}}{(1+t_{ijk})} + \frac{dP_{ijk}}{P_{ikj}} \right) \qquad (6)$$

From the identity in equation (3), $\frac{dM_{ijk}}{M_{ijk}} = \frac{dX_{ikj}}{X_{ikj}}$ this can be used to derive the following expression for elasticity of export supply:

$\frac{dP_{ikj}}{P_{ikj}} = \frac{1}{\gamma_i^e} \frac{dM_{ijk}}{M_{ijk}}$ which when used in equation 6, allows the computation of the trade creation effect, which from equation (3) is equivalent to exporting country *k's* growth of exports of commodity *I* to country *j*:

$$TC_{ijk} = M_{ijk}\eta_i^m \frac{dt_{ijk}}{\left((1+t_{ijk})\left(1-\frac{\eta_i^m}{\gamma_i^e}\right) \right)} \qquad (7)$$

If $\gamma_i^e \to \infty$, then equation (7) can be simplified as follows:

$$TC_{ijk} = \eta_i^m M_{ijk} \frac{(1+t_{ijk}^1)-(1+t_{ijk}^0)}{\left(1+t_{ijk}^0\right)} \qquad (8)$$

Where TC_{ijk} is the sum of trade created in millions of dollar over *i* commodities affected by tariff change and η_i^m is the elasticity of import demand for commodity *I* in the importing country from the relevant trading partner. M_{ijk} is the current level of import demand of the given commodity *I*. t_{ijk}^0 and t_{ijk}^1 represent tariff rates for commodity *I* at the initial and end periods respectively.

Trade Diversion

Trade diversion is the replacement of cheaper initial imports from lower cost producers outside a free trade area to less efficient producers in member countries. Considering ACFTA as an example, the efficient producers from rest of the world (ROW) could be displaced by the less efficient producers from the ACFTA members.

The elasticity of substitution can be expressed as the percentage change in relative shares of imports from two different sources due to a one percent change in the relative prices of the same product from these two sources:

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[18] The elasticity of import demand $\frac{\Delta M_{ijk}}{M_{ijk}} = \eta_i^m \frac{\Delta P_{ijk}}{P_{ijk}}$

$$\sigma_M = \frac{\Delta\left(\frac{\Sigma_k M_{ijk}}{\Sigma_K M_{ijK}}\right)/\left(\frac{\Sigma_k M_{ijk}}{\Sigma_K M_{ijK}}\right)}{\Delta\left(\frac{P_{ijk}}{P_{ijK}}\right)/\left(\frac{P_{ijk}}{P_{ijK}}\right)} \tag{9}$$

Where *k* denotes imports from ACFTA and *K* demotes imports from the rest of the world. Equation 9 can be expanded, and through substitutions and rearrangements be used to obtain the expression for trade diversion which is expressed as:

$$TD_{ijk} = \frac{M_{ijk}}{\Sigma_k M_{ijk}} \frac{\Sigma_k M_{ijk} \Sigma_K M_{ijK} \frac{\Delta(P_{ijk}/P_{ijK})}{P_{ijk}/P_{ijK}}\sigma_M}{\Sigma_k M_{ijk} + \Sigma_K M_{ijK} + \Sigma_k M_{ijk}\frac{\Delta(P_{ijk}/P_{ijK})}{P_{ijk}/P_{ijK}}\sigma_M} \tag{10}$$

Trade diversion in equation 10 can be simplified into as follows:

$$TD^{ACFTA} = \frac{M^{ACFTA}M^{ROW}\left(\frac{1+t^1_{ACFTA}}{1+t^0_{ACFTA}}-1\right)\sigma_M}{M^{ACFTA}+M^{ROW}+M^{ACFTA}\left(\frac{1+t^1_{ACFTA}}{1+t^0_{ACFTA}}-1\right)\sigma_M} \tag{11}$$

M^{ACFTA} and M^{ROW} are the current imports into ASEAN and China from the ASEAN-China and ROW respectively. t^1_{ACFTA} and t^0_{ACFTA} are respectively the end and initial periods import tariffs imposed on China imports in the destination of ASEAN with $t^1_{ACFTA} < t^1_{ACFTA}$. σ_M is the elasticity of substitution between China and the ROW imports into the concerned country.

`

The Welfare Effect

Increase imports leads to a net welfare gain which can be thought as the increase in consumer welfare and is measured as the increase of import value times the average of difference between the initial tariffs and future tariffs.

$$w_{ijk} = 0.5\left(\Delta t_{ijk}\Delta M_{ijk}\right) \tag{12}$$

It is assumed the elasticity of export supply is infinite. The import expansion will be less if the elasticity of export supply is less than infinity. In this case, the welfare effect is interpreted as a combination of consumer surplus and producer surplus (Laird & Yeats, 1986).

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Appendix 4 Estimated Trade Expansion based on the ACFTA Framework

Table 25 Estimated Trade Creation based on ACFTA Framework using Partial Equilibrium Model (in million USD)

| | | Importer | | | | | | | | | | |
		Indonesia	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Exporter	Indonesia		0.0	46.8	-	262.1	-	156.7	-	-	53.7	378.6	898.0
	Singapore	696.7		60.9	32.6	939.5	15.2	515.6	13.2	58.4	55.0	858.4	3,245.5
	Malaysia	-	0.0		24.5	462.0	3.3	176.5	5.0	14.5	7.4	630.1	1,323.4
	Philippines	-	0.0	2.1		482.5	0.1	29.9	0.1	1.0	0.5	59.5	575.7
	Thailand	505.4	0.0	59.4	818.3		0.8	419.5	868.3	80.9	82.3	713.3	3,548.1
	Brunei	-	0.0	1.5	-	0.1		0.0	-	-	0.0	0.0	1.6
	Vietnam	38.6	0.0	57.5	-	74.4	0.1		60.8	2.4	77.3	84.3	395.5
	Lao	-	0.0	0.0	-	20.8	-	2.7		-	0.1	68.1	91.7
	Myanmar	-	0.0	0.8	-	24.6	-	2.0	-		0.0	19.0	46.4
	Cambodia	-	0.0	0.3	-	57.2	-	108.4	0.2	0.0		5.6	171.9
	China	1,292.5	0.0	281.0	1,031.6	1,620.5	2.6	2,084.7	48.1	217.2	58.8		6,637.2
	Total	2,533.3	0.0	510.4	1,907.0	3,943.8	22,036.7	3,496.1	995.8	374.3	335.1	2,817.0	

Source: Author's calculation

Table 26 Trade Creation by Indonesia as Exporter based on ACFTA Framework (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	0.5	-	-	0.0	-	0.0	-	-	-	0.1	0.6
Forestry	0.0	-	-	0.0	-	0.0	-	-	-	4.6	4.7
Fishing	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Mining	176.6	-	-	1.3	-	0.1	-	-	-	0.7	178.7

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Food products and beverages	153.1	-	-	5.6	-	4.5	-	-	-	22.7	186.0
Textiles and footwear	11.0	-	-	0.1	-	0.4	-	-	-	424.5	436.0
Pulp, paper, and paper products	23.9	-	-	12.2	-	2.2	-	-	-	0.4	38.7
Iron, steel, and metal products	35.7	-	-	9.9	-	0.8	-	-	-	20.5	66.9
Transportation machinery	106.8	-	-	6.4	-	24.3	-	-	-	172.4	309.9
Electronic equipment	28.6	-	-	436.2	-	0.7	-	-	-	341.2	806.7
General machinery	7.5	-	-	3.0	-	0.3	-	-	-	84.8	95.7
Other manufacturing	38.3	-	-	8.3	-	0.0	-	-	-	59.4	105.9
Others	114.4	-	-	22.3	-	5.4	-	-	-	161.2	303.1
Total	0.4	-	-	0.0	-	0.0	-	-	-	0.0	0.4

Source: Author's calculation

Table 27 Trade Creation by Indonesia as Importer based on ACFTA Framework (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	0.5	-	-	0.0	-	0.0	-	-	-	0.1	0.6
Forestry	0.0	-	-	0.0	-	0.0	-	-	-	4.6	4.7
Fishing	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Mining	176.6	-	-	1.3	-	0.1	-	-	-	0.7	178.7
Food products and beverages	153.1	-	-	5.6	-	4.5	-	-	-	22.7	186.0
Textiles and footwear	11.0	-	-	0.1	-	0.4	-	-	-	424.5	436.0
Pulp, paper, and paper products	23.9	-	-	12.2	-	2.2	-	-	-	0.4	38.7
Iron, steel, and metal products	35.7	-	-	9.9	-	0.8	-	-	-	20.5	66.9
Transportation	106.8	-	-	6.4	-	24.3	-	-	-	172.4	309.9

machinery											
Electronic equipment	28.6	-	-	436.2	-	0.7	-	-	-	341.2	806.7
General machinery	7.5	-	-	3.0	-	0.3	-	-	-	84.8	95.7
Other manufacturing	38.3	-	-	8.3	-	0.0	-	-	-	59.4	105.9
Others	114.4	-	-	22.3	-	5.4	-	-	-	161.2	303.1
Total	0.4	-	-	0.0	-	0.0	-	-	-	0.0	0.4

Source: Author's calculation

Table 28 Estimated Trade Diversion based on ACFTA Framework using Partial Equilibrium Model (in million USD)

		Importer											
		Indonesia	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Exporter	Indonesia		0.0	46.8	-	262.1	-	156.7	-	-	53.7	378.6	898.0
	Singapore	696.7		60.9	32.6	939.5	15.2	515.6	13.2	58.4	55.0	858.4	3,245.5
	Malaysia	-	0.0		24.5	462.0	3.3	176.5	5.0	14.5	7.4	630.1	1,323.4
	Philippines	-	0.0	2.1		482.5	0.1	29.9	0.1	1.0	0.5	59.5	575.7
	Thailand	505.4	0.0	59.4	818.3		0.8	419.5	868.3	80.9	82.3	713.3	3,548.1
	Brunei	-	0.0	1.5	-	0.1		0.0	-	-	0.0	0.0	1.6
	Vietnam	38.6	0.0	57.5	-	74.4	0.1		60.8	2.4	77.3	84.3	395.5
	Lao	-	0.0	0.0	-	20.8	-	2.7		-	0.1	68.1	91.7
	Myanmar	-	0.0	0.8	-	24.6	-	2.0	-		0.0	19.0	46.4
	Cambodia	-	0.0	0.3	-	57.2	-	108.4	0.2	0.0		5.6	171.9
	China	1,292.5	0.0	281.0	1,031.6	1,620.5	2.6	2,084.7	48.1	217.2	58.8		6,637.2
	Total	2,533.3	0.0	510.4	1,907.0	3,943.8	22,036.7	3,496.1	995.8	374.3	335.1	2,817.0	

Source: Author's calculation

Table 29 Trade Diversion by Indonesia as Exporter based on ACFTA Framework (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	0.0	0.3	-	1.7	-	1.4	-	-	0.0	1.7	5.1
Forestry	0.0	0.1	-	0.3	-	0.0	-	-	0.0	1.1	1.6
Fishing	0.0	0.0	-	6.4	-	0.8	-	-	0.0	0.0	7.2
Mining	0.0	6.8	-	0.7	-	1.2	-	-	0.1	17.0	25.7
Food products and beverages	0.0	1.1	-	10.2	-	4.9	-	-	0.6	1.9	18.7
Textiles and footwear	0.0	0.0	-	6.5	-	2.8	-	-	1.0	8.6	18.9
Pulp, paper, and paper products	0.0	4.3	-	1.7	-	2.5	-	-	0.1	9.8	18.4
Iron, steel, and metal products	0.0	2.1	-	18.8	-	1.6	-	-	0.4	9.3	32.3
Transportation machinery	0.0	7.7	-	11.4	-	1.6	-	-	0.0	0.9	21.6
Electronic equipment	0.0	2.6	-	67.9	-	5.5	-	-	0.0	0.6	76.6
General machinery	0.0	0.7	-	18.4	-	2.0	-	-	0.0	12.4	33.4
Other manufacturing	0.0	0.4	-	21.0	-	1.6	-	-	0.0	4.7	27.7
Others	0.0	5.4	-	14.5	-	3.3	-	-	0.2	15.5	38.9
Total	0.0	31.5	0.0	179.5	0.0	29.1	0.0	0.0	2.5	83.4	

Source: Author's calculation

Table 30 Trade Diversion by Indonesia as Importer based on ACFTA Framework (in million USD)

Industry	Singapore	Malaysia	Philippines	Thailand	Brunei	Vietnam	Lao	Myanmar	Cambodia	China	Total
Agriculture	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Forestry	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Fishing	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Mining	29.9	-	-	0.2	-	0.0	-	-	-	-0.3	29.9
Food products and	18.5	-	-	6.3	-	0.7	-	-	-	-4.3	21.1

beverages											
Textiles and footwear	1.1	-	-	0.1	-	0.2	-	-	-	-0.6	0.7
Pulp, paper, and paper products	4.6	-	-	0.6	-	0.1	-	-	-	-1.4	3.9
Iron, steel, and metal products	34.6	-	-	9.2	-	0.3	-	-	-	-4.8	39.3
Transportation machinery	36.8	-	-	6.3	-	7.4	-	-	-	-19.5	31.0
Electronic equipment	10.3	-	-	33.1	-	0.5	-	-	-	-6.6	37.3
General machinery	3.9	-	-	1.9	-	0.4	-	-	-	-3.3	2.9
Other manufacturing	14.2	-	-	5.1	-	0.0	-	-	-	-8.9	10.4
Others	25.7	-	-	14.2	-	0.8	-	-	-	-11.7	29.1
Total	179.6	0.0	0.0	77.1	0.0	10.5	0.0	0.0	0.0	-61.4	205.8

Source: Author's calculation

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Appendix 5 Aggregated Input-Output Table of Indonesia

Table 31 Aggregated Matrix of Indonesia input-output table 2005

Industry	Commodities Matrix (IDR million)
Agriculture	
Forestry	24113381 0 128574 0 190206330 8540784 734816 4245622 842 0 28 262 19840083 100 47557243
Fishing	68723 429278 42525 60291 396259 68212 13474657 359583 10548 30828 0 397 200933 1205 11622297
Mining	601 0 3585985 0 22256220 42 0 12677 0 0 0 0 48676 179925 8150477
Food products and beverages	318 0 0 37011327 509043 308754 231009 138228394 29620564 26932 38061 20801 16121811 7207 52475441
Textiles and footwear	22463286 0 4293488 0 100284580 4379610 591867 2140370 67 0 31204 192 75463 168 86576877
Pulp, paper, and paper products	407951 43785 6135 117626 149919 74166234 549268 389252 315071 288415 367586 137740 2585609 1927 9936696
	247232 84990 63442 212548 5998945 1184088 52460920 1037703 1392525 415282 2399682 163247 2000228 10598 67546992
Chemicals	$Z^* =$ 25420029 653974 3126935 7328122 7883817 18947973 18356999 41607041 17894070 1993398 16858255 1563060 52560265 45944 183145308
Iron, steel, and metal products	571975 149770 12814 84806 466892 449601 635214 397744 36545052 11226471 7338997 8101243 2520132 2410888 116056031
	349 0 466007 1580 0 0 145 2765 81128 60203660 0 0 15 0 48348329
Transportation machinery	1674 5674 118 387268 1343 36007 69457 18222 184368 3593968 39788179 2831900 249760 731 17761363
Electronic equipment	694146 913251 230015 7431110 779078 2789633 2206473 1148144 1032855 2490677 11238079 51096123 2511018 65 33025062
General machinery	102090 456333 193479 32626 2574574 1965717 1127235 909305 1108516 4452149 11929561 787533 14197189 32676 102438872
Other manufacturing	0 0 0 0 0 57479 1636 759 1443 0 8194 890 6679 66362 2697
Others	21686128 2228379 1127098 17414413 24225670 22377839 19353181 14027856 17486450 9591664 22591077 4476857 19289690 418682 510584944
Services	

Source: Author's calculation

Aggregated total output matrix (X^*) in IDR million.

$$X^* = \begin{bmatrix} 382842874 \\ 27099931 \\ 72761159 \\ 387251332 \\ 548333250 \\ 227848574 \\ 180188434 \\ 385910682 \\ 154979055 \\ 158620415 \\ 174756572 \\ 96961742 \\ 196323155 \\ 4222048 \\ 2690175060 \end{bmatrix}$$

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Appendix 6 Energy Intensity and Export Expansion Matrix

Energy intensity matrix ε in ktoe/USD.

$$\varepsilon = \begin{bmatrix} 0.022 \\ 0.022 \\ 0.022 \\ 0.02 \\ 0.247 \\ 0.247 \\ 0.247 \\ 0.039 \\ 0.3667 \\ 0.247 \\ 0.247 \\ 0.247 \\ 0.247 \\ 0.01 \\ 0.012 \end{bmatrix}$$

The matrix of Indonesia's export expansion to China due to ACFTA (Y^{ACFTA}) in USD million.

$$Y^{ACFTA} = \begin{bmatrix} 6.1 \\ 7.3 \\ 0 \\ 182.8 \\ 122.1 \\ 25.4 \\ 19.8 \\ 27.9 \\ 1.8 \\ 1.2 \\ 23.3 \\ 9.6 \\ 34.8 \\ 0 \\ 0 \end{bmatrix}$$

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Curriculum Vita

Kukuh Kurniawan was born in Indonesia. In 2001, he graduated from Taruna Nusantara High School, a boarding school under supervision of Department of Defense of Indonesia, in Magelang, Indonesia. After completing his high school, he enrolled to University of Indonesia and graduated with bachelor degree in electrical engineering in 2005. While pursuing his bachelor degree, he actively participated in various organization and social activities inside and outside university. Then, he gained professional experiences by joining Unilever as part of supply chain management team taking care of engineering procurement department and Cisco Systems as part of account management team taking care of telecommunication sector. After four years of hard-work in the multinational companies, he decided to go back to school on summer 2009 to pursue master degree in Economics and Management of Network Industries (EMIN). In this program, he spent one semester at Université Paris-Sud XI, France, and three semesters (including his thesis) at Delft University of Technology, the Netherlands.