DETERMINANTS OF INDONESIA'S FISHERY EXPORTS TO THE MAJOR IMPORTING COUNTRIES (JAPAN AND USA)

THESIS

Submitted in partial fulfillment of the requirements for the Degree of Master of Economics

M U S O K I B
0706180786

UNIVERSITY OF INDONESIA
FACULTY OF ECONOMY
MASTER OF PLANNING AND PUBLIC POLICY
INTERNATIONAL TRADE POLICY
DEPOK
JANUARY, 2009

STATEMENT OF AUTHORSHIP

This thesis is created by my self,
and all of sources for quotation or referential
has been asserted correctly by me.

Name	:	Musokib
Student Register Number	:	0706180786
Signature	:	
Date	:	January 2009

ENDORSEMENT

This thesis is proposed by	:	
Name	:	Musokib
Student Register Number	:	0706180786
Program	:	Master of Planning and Public Policy
Title of Thesis	:	Determinants of Indonesia's Fishery Exports to The Major Importing Countries (Japan and USA)

It has been defended to board of examiners and submitted in partial fulfillment of the requirements for the degree of Master of Economics in Master of Planning and Public Policy, Faculty of Economics, University of Indonesia.

BOARD OF EXAMINERS

Supervisor	:	Arianto Patunru, Ph.D.	(…………………………..)
Examiner	:	Hera Susanti, SE., M.Sc.	(…………………………..)
Examiner	:	Ayudha D. Prayoga, M.Sc.	(…………………………..)

Stipulated in : Depok

Date : ……………………

ACKNOWLEDGEMENTS

I would like to praise thank heavens to the Only and Almighty Allah SWT, because of His blessing I could complete this research that be entitled of: "Determinants of Indonesia's Fishery Export to The Major Importing Countries (Japan and USA)."

This research is a partial fulfillment of the requirements for the degree of Master of Economics in International Trade Policy, Master of Planning and Public Policy Program, Faculty of Economy, University of Indonesia. With the completion of this research, I would like to express my sincere gratitude to the following people who made this research possible:

1. Mr. Arianto Patunru, Ph.D., my supervisor, for his patience, guidance, constructive criticism and recommendations to me completed this study;
2. Mr. B. Raksaka Mahi, Ph.D., Head of the Program of Master of Planning and Public Policy, Faculty of Economics University of Indonesia;
3. Mrs. Hera Susanti, SE., M.Sc., Secretary of the Program of Master of Planning and Public Policy, Faculty of Economics University of Indonesia;
4. All of the Lecturers and thanks to Mbak Siti, Mbak Riska, Mbak Ira and Secretariat staffs of the Program of Master of Planning and Public Policy, Faculty of Economics University of Indonesia;
5. Ms. Srie Agustine, Head of SMEs Center Ministry of Trade, for her support to my study;
6. Mr. Roger Freeman and all of ITAP-USAID staffs, who have been very helpful in supporting all of our needs during the class;
7. My Parents and all of my families for your support and kindliness, especially for my wife Bismi Afiati Barkah and my daughter Amira Rahma An-Naura whose smiling face and warmth hand was always support me. I hopes it inspire you to become well-educated human;
8. All of my friends, in MITP batch 2, who have been great partners during I studied in MPKP-ITP class, thanks for the friendship and the competition.
9. All of my colleagues in Centre of SMEs, Ministry of Trade Republic of Indonesia;

10. All of the people who have helped and inspired me in completing this research and study on MPKP.

Finally, I believe that this research is still imperfect. Therefore, suggestions are welcome to enhance this research.

Depok, January 2009

Musokib

PAGE OF ASSERTION AGREEMENT ON THESIS PUBLICATION FOR ACADEMIC INTEREST

As civitas academica of University of Indonesia, I who signed on below:

Name	: M u s o k i b
Student Register Number	: 0706180786
Program	: Master of Planning and Public Policy
Department	: Economics
Faculty	: Economics
Kind of Opus	: Thesis

for development in science, I agree to give to University of Indonesia **a Non-Exclusive Royalty-Free Right** on my thesis in title:
"Determinants of Indonesia's Fishery Exports to the Major Importing Countries (Japan and USA)"

along with the available of sets of equipment (if needed). By a Non-Exclusive Royalty-Free Right, University of Indonesia has right to save, formatted, manage in database, maintain and publicize my thesis without ask the license from me as long as write down my name as writer/inventor and as owner of copyright.

Thus this statement I made truly.

Made in: Depok
Date: January2009

Musokib

ABSTRACT

Name : Musokib
Program : Master of Planning and Public Policy
Title : Determinants of Indonesia's Fishery Exports to The Major Importing Countries (Japan and USA)

Using a gravity model approach, this study analyzed the determinants of Indonesia's fish exports to main importing countries using annual data for the period 1976 to 2006. The model was estimated into pooled data analysis for Japan and USA as major importing countries in fishery commodity. The separate analysis, ordinary least square (OLS) approach, is used to explain Indonesia's fishery exports to each destination country. This approach used to capture exports behavior in Japan and USA which has different characteristic.

The analysis revealed that production capacity, real income per capita, nominal exchange rate, and relative price of export have a positive impact on the export of fish and fish products. Meanwhile, distance which is associated with a decrease in the export of fishery products statistically insignificant affects to Indonesia's fishery export. In separate analysis, by using ordinary least square approach, this study revealed that real income per capita, nominal exchange rate, and export price are positively affect on Indonesia's fishery exports to Japan while distance negatively determine Indonesia's fishery export to Japan. Indonesia's fishery export to United States positively determined by production capacity and real income per capita while the rest are insignificant.

Keywords:
Gravity model, determinants of exports, major importing countries, fishery commodity.

ABSTRAK

Nama : Musokib
Program Studi : Magister Perencanaan dan Kebijakan Publik
Judul : Faktor-Faktor yang Mempengaruhi Ekspor Perikanan Indonesia ke Negara Importir Utama (Jepang dan Amerika Serikat)

Penelitian ini bertujuan untuk mengkaji faktor-faktor yang berpengaruh terhadap ekspor komoditi ikan dan produk ikan Indonesia, khususnya ingin mengetahui seberapa besar pengaruh kapasitas produksi, pendapatan riil per kapita, jarak (proxy dari biaya transportasi), nilai tukar nominal, serta harga ekspor relatif terhadap ekspor perikanan Indonesia. Objek penelitian adalah Jepang dan Amerika Serikat yang merupakan negara tujuan ekspor utama untuk komoditi perikanan. Metode analisa menggunakan pendekatan model graviti, sementara data yang dipakai adalah data panel dengan periode penelitian tahun 1976-2006.

Hasil penelitian menunjukkan bahwa kapasitas produksi, pendapatan riil per kapita, nilai tukar nominal serta harga ekspor relatif secara statistik berpengaruh positif dan signifikan terhadap ekspor perikanan Indonesia. Adapun variabel jarak dari Indonesia ke negara tujuan secara statistik tidak signifikan mempengaruhi ekspor perikanan Indonesia. Dalam analisis yang terpisah, dengan menggunakan metode ordinary least square, penelitian ini menunjukkan bahwa ekspor perikanan Indonesia ke Jepang dipengaruhi oleh pendapatan riil per kapita, nilai tukar nominal, harga ekspor, dan jarak. Ekspor perikanan Indonesia ke Amerika Serikat hanya dipengaruhi oleh kapasitas produksi dan pendapatan riil per kapita.

Keywords:
Model gravity, faktor-faktor yang berpengaruh, negara tujuan utama, komoditi perikanan.

CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I
INTRODUCTION

1.1. Background

One of the fundamental economic questions is; how a country can achieve high economic growth? Possible answer is an international trade which has a significant role as engine of economic growth for most of countries. It related to the national absorption of labor, creates multiplier effects from upstream to downstream of sectors such as transportation, warehouse, insurances, etc. Besides that, an export activity is one of important sources of foreign exchange reserves and in the end it can reduce balance of payment problems. In short, export and its related activities becomes one of the backbones of economy including Indonesia.

Indonesia has an advantage as an agricultural and maritime country. This must be used efficiently. One of the sectors that rely on domestic resources and have the comparative advantage is agribusiness field whose components include fisheries sector. Based on the available potencies, the role of fisheries sector as one of growth engines appropriates to be empowered optimally. Therefore, it should being one of priority sectors for the development of investment.

According to the Ministry of Trade of the Republic of Indonesia, fisheries commodity is one of the ten potential export commodities. Its contribution occupies third rank of ten potential products in 2007. Table1.1 below shows the development of Indonesia's fisheries export during last four years (2004-2006). In general, it has increased trend. In 2003, export totals of fisheries commodities reach to the value US$ 1,551 billions and increased over the year up to reach the value US$ 1,959 billions in 2006. During range of time four years (2003-2006), Japan and U.S. are the major destination countries of Indonesia's fisheries exports. Exports value to United States tends to increase over the year while export to Japan tends to decrease in the same period (2003-2006).

Table 1.1
The Export Destination of Indonesia's Fish and Fish Product
(in thousand of US$)

No	Country	2003		2004		2005		2006	
		Value	%	Value	%	Value	%	Value	%
1	Japan	646,163	41.65	590,095	34.64	575,041	31.94	617,351	31.50
2	USA	364,687	23.51	530,278	31.13	593,639	32.97	689,096	35.16
3	Singapore	55,283	3.56	67,284	3.95	75,135	4.17	66,763	3.41
4	Belgium	52,983	3.41	63,605	3.73	73,968	4.11	88,079	4.49
5	Hong Kong	41,668	2.69	50,111	2.94	59,685	3.31	67,854	3.46
	RoW	390,717	25.18	401,990	23.60	423,011	23.49	430,644	21.97
	Total	1,551,503		1,703,366		1,800,481		1,959,790	

Source: Comtrade, processed.

The development of fisheries sector in other countries shows that the growth acceleration of fisheries activities has real contribution to Gross National Product (GNP). For example, China, Taiwan, Korea, Thailand, and Norway, their fisheries sector contributed to the national economy around 30 percent. In contrary with Indonesia, the contribution of fisheries sector to GDP only 3 percent. It has been known that geographically the sea area which is owned by these countries smaller than Indonesia. That's way, Indonesia's fisheries sector must be developed optimally and in the end it could become one of economic engines. It's not impossible if supported by the stakeholder's commitment. In addition, even though the fisheries' contribution to GDP only 3 percent, the empowerment of this sector contributes on reducing unemployment, income generation, and poverty alleviation.

As the biggest maritime country in South-East Asia which has coastal length more than 80,000 kilometers Indonesia has big opportunity becomes superior producer country on fisheries commodities. Based on Food and Agriculture Organization data (2007), Indonesia has occupied fifth rank as fisheries producer in 2004 while the first, second, third, and fourth rank respectively are China, Peru, United States, and Chile. Nevertheless, the Indonesia's contribution on international trade still low compared to the neighbor countries. In Asia, Indonesia only occupies fourth rank as fisheries exporter after China, Thailand, and Vietnam.

1.2. Problem

As the biggest maritime country Indonesia has abundant endowment in fisheries area. Ironically, the contribution of the fishery industry to gross domestic product (GDP) is still low. For instance, in 2007, Indonesia's capture fishery product reaches 4.94 million tons and aquaculture around 3.08 million tons but the contribution to GDP only 3 percent.

FAO estimated that the world total demand on fish and the fisheries product will increase almost 50 million tons, from 133 million tons in 1999/2001 to 183 million tons in 2015. The demand on sea food per capita per year has estimated increase from 16.1 kilograms in 1999-2001 to 18.4 kilogram in 2010, and 19.1 kilogram in 2015. It was counted that 70% of these value consume for food. However, FAO precisely saw that the demand for world's fresh fish increased around 45% every year. Unfortunately, from that number market share of Indonesia just 3.57% (DKP, 2005).

Competitiveness of Indonesia's product faces on tight world competition. There are some obstacles to expand the Indonesia's fishery export both internal factors and also external factors. The internal problems that hindered fisheries exports including shortage of the infrastructure, weakness of access to capital sources, low productivity and quality, increasing of illegal fishing, low of added value of fish commodities, contamination of residue and heavy metal, etc. Moreover, some external obstacles which are faced by Indonesia's exporters such as policies and conditions that imposed in destination countries. It includes both tariff barriers and non-tariff barriers. For instance, importing countries tend to tighten the condition for quality of imported product in connection with food safety issues; the obligation of certification for fish product which is exported to United States, it needs special efforts to get certificate on Turtle Excluder Device (TED), etc.

According to above explanation, it could be concluded that competitiveness of Indonesia's fishery export faces on tight world competition and there are so many factors affecting fishery export performance. The question of this study is; what are factors affecting on Indonesia's fishery export to major importing countries? Specifically, the questions as follow:

a) Are production capacity, real income per capita, distance, nominal exchange rate, and relative price of export determining Indonesia's fishery export?
b) What kind of policies could be recommended regarding Indonesia's fishery export performance improvement?

1.3. Research Objectives

The objective of this research is analyzing the factors determining exports of Indonesia's fishery commodity. More specifically, the objectives are:

a) To find out the significance and the elasticity of explanatory variables such as production capacity, real income per capita, distance, nominal exchange rate, and relative price of export to Indonesia's fishery export.
b) To give policy recommendations for increasing Indonesia's fishery exports performance.

1.4. Research Coverage

The study covers Indonesia's trade activities especially in export of fishery sector. The analysis for bilateral trade activity in this sector is derived from the main assumption that trade is determined by supply and demand, and each country has comparative advantage.

The trading partner are selected to support the assumption for the model tested, which gives a focus on the trade activities on fishery sector between Indonesia and the major importing countries for the period of 1976-2006. These periods of observation are considered sufficient to capture development of bilateral trade flows between Indonesia and selected partner countries. The partner countries being analyzed are the two most important markets for Indonesia.

Meanwhile, the commodity included in this study is fish and fish product. It occupies third rank in realization of export total for 10 potential products in 2007 which is reach US$714.9 millions, over than the target was stated by government that is US$554.2 million. Trade classification for commodity is based on the international trade classification (SITC) revision 1.

1.5. Research Hypotheses

One of determinants of Indonesia's fishery export is production capacity. Increasing on production will boost export supply of fishery commodity. Therefore, production capacity is expected has positive impact on Indonesia's fish export.

Another factor which affects to demand of Indonesia's fishery export is real income per capita in importing countries. The higher of consumer's income in importing countries, the more possibility of Indonesia's fishery commodities are demanded by consumer. So, consumer's income is expected has positive impact on Indonesia's fishery export. Moreover, nominal exchange rate reflects the price of foreign currency in term of domestic currency. Depreciation of domestic currency makes the prices of domestic goods, particularly fishery commodity, are cheaper for foreigner. Then, it generates increasing demand on fishery commodities. Therefore, nominal exchange rate is expected has a positive impact on Indonesia's fishery exports.

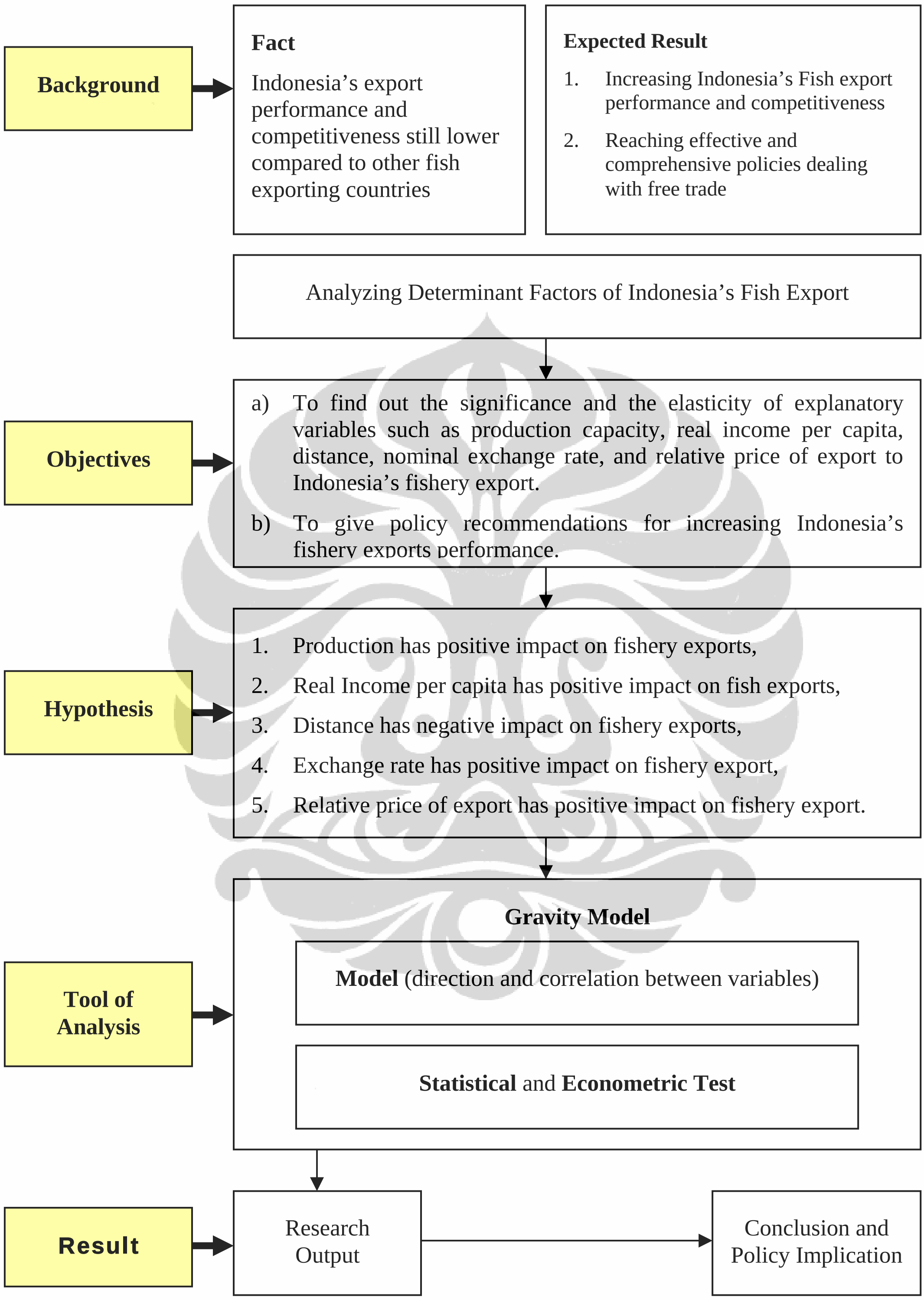
Distance reflects transportation cost. The longer distance between host country and partner country, the greater transportation cost must be paid. It will reduce the demand of products. So, distance is expected has a negative impact on Indonesia's fishery exports. Meanwhile, relative price between foreign price and domestic price attracts exporters to export more. Therefore, it is expected that relative price of export has positive impact on Indonesia's fishery exports.

1.6. Research Contribution

This research is expected give advantages either to academic society or related institution regarding Indonesia's fishery exports competitiveness, including:

1. This study contributes to academic society in order to analyze the factors affecting Indonesia's fishery exports competitiveness and what the best strategy regarding with trade liberalization.
2. This study can be used as one of references to design government policy for improving the Indonesia's fishery exports competitiveness and supporting the government policy in fishery revitalization program.

1.7. Conceptual Framework



CHAPTER II
LITERATURE STUDY

2.1. International Trade

International trade is the exchange of capital, goods, and services across international borders or territories. Without international trade, nations would be limited to the goods and services which are produced within their own borders. Moreover, for any nations, international trade is a major source of economic revenue.

In principle, the motivation and behavior of parties that involved in a trade international trade is not different from domestic trade. The main difference is international trade typically more costly than domestic trade. The reasons are a border typically imposes additional costs such as tariffs, time costs due to border delays and costs associated with country differences such as language, the legal system or a culture differences.

There are so many factors that cause international trade such as different endowments in every nations, lack in skilled human resources, etc. The following section will present some theories explain why international trade happened.

2.1.1. Absolute Advantage Theory

Adam Smith believed that for two nations to trade with each other voluntarily, so both nations must gain. If one nation gained nothing or lost, it would simple refuse to trade. According to Smith, trade between two nations is based on absolute advantage. When one nation is more efficient than (or has an absolute advantage over) another in the production of one commodity but is less efficient than (or has an absolute disadvantage with respect to) the other nation in producing a second commodity, then both nations can gain by each specializing in the production of the commodity of its absolute advantage and exchanging part of its output with the other nation for the commodity of its absolute disadvantage. By this process, resources are utilized in the most efficient way and the output of both commodities will rise. This increase in the output of both commodities measures the gains from specialization in production available to be divided between two nations through trade (Salvatore, 2007, p.35).

In this respect, a nation behaves no differently from an individual who does not attempt to produce all the commodities he needs. Rather, he produces only that commodity that he can produce most efficiently and then exchanges part of his output for the other commodities he needs or wants. This way, total output and the welfare of all individual are maximized (Salvatore, 2007, p.36).

2.1.2. The Law of Comparative Advantage

David Ricardo was presented the law of comparative advantage in his book; Principles of Political Economy and Taxation and published in 1817. According to the law of comparative advantage, even if one nation is less efficient than (has an absolute disadvantage with respect to) the other nation in the production of both commodities, there is still a basis for mutually beneficial trade. The first nation should specialize in the production of and export the commodity in which its absolute disadvantage is smaller (this is the commodity its comparative advantage) and import the commodity in which its absolute disadvantage is greater (this is the commodity of its comparative disadvantage) (Salvatore, 2007, pp.37-38).

The law of comparative advantage based on a number of simplifying assumptions: (1) there are only two nations and two commodities, (2) in free trade situation, (3) perfect mobility of labor within each country but immobility between the two countries, (4) constant cost of production, (5) there is no transportation cost, (6) there is no technical change, and (7) the labor theory of value. While assumptions one up to six can easily relaxed, assumption seven is not valid and should not be used for explaining comparative advantage (Salvatore, 2007, p.43).

Under the labor theory of value, the value or price of commodity depends exclusively on the amount of labor going into the production of the commodity. It implies (1) that either labor is the only factor of production or labor is used in the same fixed proportion in the production of all commodities and (2) that labor is homogeneous. Since neither of these assumptions is true, the explanation of comparative advantage can not based on this theory (Salvatore, 2007, p.43).

Specifically, labor is not the only factor of production, nor is it used in the same fixed proportion in the production of all commodities. For instance, much more capital equipment per worker is required to produce some products (such as steel) than to produce other products (such as textiles). In addition, there is usually some possibility of substitution between labor, capital, and other factors in the production of most commodities. Furthermore, labor is obviously not homogeneous but varies greatly in training, productivity, and wages (Salvatore, 2007, pp.43-44)

2.1.3. The Heckscher – Ohlin Theory

The first modern theory of international trade subject was proposed by Eli Heckscher and Bertil Ohlin (two Swedish economists), known as Heckscher - Ohlin Theorem (H-O Theory). Differ from the classical theory (absolute advantage and comparative advantage theorem) which expressing comparative advantage as the result of the difference in the productivity of labor, the H-O theory is more emphasizing on the relevancy between the difference of proportion of factors endowment in each country and difference of factors proportion used in producing commodity as the basic of comparative advantage, therefore this theory is also known as factor-endowment theory or factor-proportion theory (Salvatore, 2007).

The basic concept of H-O theory is factor endowment has an important role in determining the proportion of production factors which will be used in producing commodity. Moreover, factor endowments are differ considerably across countries. Differences in factor endowment proportion will create different relative factor prices in each countries, the more abundance the factor the lower its relative price. Therefore, the proportion of factors used in producing a commodity will differ in each country although the kinds of factors of production are same; it is depend on factor endowment. With identical technology in both countries, constant return to scale and a given factor-intensity relationship between final products, the country with capital abundant will produce and export relatively more of the capital-intensive goods, while the country with labor abundant will produce and export relatively more of the labor-intensive goods (Salvatore, 2007).

The H-O theorem could be concluded as follow: A country will specialize and export the commodity which relatively abundant and cheap factors in domestic and import the commodity which requires relatively scarce and expensive factor. For instance, Indonesia will export labor-intensive products like garment products or commodity which abundant in domestic like oil, coal, and fishery commodities, while import capital-intensive commodity like machine or luxurious cars, etc.

2.2. The Exchange Rate

The exchange rate definitions can be divided into nominal exchange rate and real exchange rate. Nominal exchange rate is the price of domestic currency in terms of foreign currency. From the view point of Indonesia, the nominal exchange rate between United States and Indonesia is the price of a dollar in term of rupiah. For example, US$ 1 equal to Rp 9.300,00. Real exchange rate is the relative price of domestic goods in term of foreign goods. So, it shows relative value of goods among two nations. It also called as term of trade (Blanchard, 2006).

The fluctuation of exchange rates could be divided in two kinds: appreciation and depreciation. Appreciation is an increase of value of domestic currency in term of a foreign currency and depreciation is a decrease of value of domestic currency in term of foreign currency. The appreciation of domestic currency will make domestic goods more expensive than foreign goods for foreigner; otherwise, depreciation of domestic currency will makes domestic goods cheaper for foreigner, *ceteris paribus*. So, demand for domestic goods will increase (Blanchard, 2006).

2.3. Gravity Model

The law of universal gravitation (gravity equation) which has been popular formula for statistical analyses of bilateral flows between different spatial entities was proposed by Isaac Newton in 1687. Basically, it held the attractive force between two objects *i* and *j*, given by:

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^2} \qquad \text{.. (2.1)}$$

where F_{ij} denotes the attractive force, M_{ij} denote the masses of different spatial entities, D_{ij} denotes the distance between two objects, and G denotes a gravitational constant depending on the units of measurement for mass and force.

The first applied of the gravity model to international trade did by Tinbergen (1962) and Poyhonen (1963). The model has been used to explain migration and other social flows in terms of gravitational forces of human interaction. As in physical science, the bigger and the closer the units are to each other, the stronger the attraction (Sagita, 2007).

The basic gravity equation explains the size of exports from origin country to destination country by three factors. The first indicates the total potential supply of the exporting country, the second one indicates the potential demand of the importing country, and the third includes factors which represents the resistance to trade flow between countries. In its basic form, exports from country *i* to country *j* are determined by their economic sizes (GDP), population, geographical distances and a set of dummies which incorporate some kind of institutional characteristics common to specific flows (Zarzoso and Lehman, 2003).

Although the gravity model performed very well in analyzing trade flows in the 1960s, its strong theoretical foundations were not produced until the end of the 1970s. Responding this situation many studies had been modified the original Newtonian gravity equation. Both of them are Anderson (1979) and Bergstrand (1985, 1989). They made it clear that the gravity model is a good representation irrespective of the structure of product markets.

2.4. Previous research on the gravity model approach and trade flows

As the first version of gravity model, Tinbergen (1962) and Poyhonen (1963) in Sanso et al. (1993) conclude that export are positively affected by income of trading countries and that distance can be expected to negatively affect exports (Sagita, 2007). Furthermore, Zarzoso and Lehmann (2003) applied the gravity trade model to assess Mercosur-EU Trade, and trade potential following the agreements reached between both trade blocs. The model is tested for a sample of 20 countries, the four formal members of Mercosur plus Chile and the fifteen members of EU. They used panel data analysis to disentangle the time invariant country-specific effect and to capture the relationship between the relevant variables over time. The result suggests that the fixed effect model is to be preferred to the random effect gravity model. Furthermore, a number of variables, namely, infrastructure, income differences and exchange rates are found to be important determinant of bilateral trade flows.

Filippini and Molini (2003) use the gravity equation model to analyze trade flows between East Asian industrializing countries and some developed countries in order to show the surprising trade performance of East Asian countries in the last 30 years. They introduced a new variable, the technological distance, in order to understand the relevance of the technological gap between countries in the determination of trade flows. The model is augmented by some dummy variables to capture the specific propensities to export/import of some regions (East Asia, China) and these dummies are interacted with time dummies and the technological distance. The purpose is to understand the dynamics of East Asian industrializing countries across sub-periods and to measure the impact of technological distance on trade flows. They concluded that technological distance has not been a barrier but an incentive to catch up and compete with more advanced countries.

Rahman (2005) applied the generalized gravity model in analyzing the Bangladesh's trade concludes that Bangladesh's trade is positively determined by the size of the economies, per capita GNP differential of the countries involved and openness of the trading countries. Bangladesh's exports are positively determined by the exchange rate, partner countries' total import demand and openness of the Bangladesh economy. Bangladesh's imports are determined by inflation rates, per capita income differentials, openness of the countries involved in trade and the border between India and Bangladesh. Multilateral resistance factors and transportation costs affect Bangladesh's trade positively and negatively respectively.

Jordan and Eita (2007) used gravity model to analyse the determinants of South African exports of raw hides and skins (other than fur skins) and leather

(H41) using annual data covering the period 1997 to 2004 for 32 main trading partners. The results show that importer's GDP, South Africa's GDP, importer's population, South Africa's population, infrastructure of South Africa and importing country and some regional trade agreements are the main determinants of raw hides and skins (other than fur skins) and leather exports.

CHAPTER III
INDONESIA'S FISHERY COMMODITY
IN THE INTERNATIONAL TRADE

3.1. Export of Fishery Commodity

The development of Indonesia's fishery export during seven years (2000-2006) always increases. In 2000, export total of marine products and fishery reach US$ 1.58 billions and increase over the year till US$ 1.95 billions in 2006. The biggest export destination countries of marine products and fishery commodities, respectively, are Japan, United States and Singapore. Japan and USA has been the major importing countries on Indonesia's fishery export commodities. The combination of these countries' market share more than 60% of export total of Indonesia's fishery export.

During in the period 2000-2006, the trend of Indonesia's fishery export value to United States tend to increase while the trend of Indonesia's fishery export to Japan going down. The Indonesia's fishery export value in USA start from US$ 323.4 millions (20.4%) in 2000 goes up by US$ 689.1 millions (35.2%) in 2006 while for Japan start from US$ 784.3 millions (49.38%) in 2000 going down to US$ 617.4 millions (31.50%) in 2006. So did with Singapore, export total in 2000 equal to US$ 81.9 millions (5.2%) decrease by US$ 66.8 millions (3.4%) in 2006. Whereas Indonesia's fishery export value to Hong Kong start from 2000 to 2003 decreased but since 2004 to 2006 increased from US$ 63.6 millions (3.73%) up to US$ 88.1 millions (4.5%). The other export destination countries which increase were Belgium, United Kingdom, Thailand, Malaysia, and China. Meanwhile, Indonesia's fishery exports to Netherland tend to decrease start from US$ 41.5 millions (2.6%) to US$ 22.3 millions (1.14%). The detailed picture in following table:

Table 3.1
The Export Destination of Indonesia's Fish and Fish Product
(in thousand of US$)

No	Country	2000		2001		2002		2003		2004		2005		2006	
		Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
1	Japan	784,250	49.4	755,648	49.1	724,875	48.6	646,163	41.6	590,095	34.6	575,041	31.9	617,351	31.5
2	USA	323,402	20.4	317,196	20.6	326,739	21.9	364,687	23.5	530,278	31.1	593,639	33.0	689,096	35.2
3	Singapore	81,857	5.2	64,010	4.2	64,010	4.3	55,283	3.6	67,284	4.0	75,135	4.2	66,763	3.4
4	Hong Kong	60,169	3.8	54,793	3.6	45,799	3.1	52,983	3.4	63,605	3.7	73,968	4.1	88,079	4.5
5	United Kingdom	45,294	2.9	45,799	3.0	44,378	3.0	41,668	2.7	50,111	2.9	59,685	3.3	67,854	3.5
6	Netherland	41,502	2.6	40,171	2.6	17,539	1.2	19,625	1.3	23,180	1.4	26,778	1.5	22,293	1.1
7	China	31,656	2.0	16,721	1.1	21,769	1.5	65,327	4.2	65,921	3.9	55,967	3.1	40,854	2.1
8	Thailand	23,777	1.5	21,315	1.4	28,414	1.9	35,912	2.3	23,110	1.4	12,747	0.7	42,402	2.2
9	Malaysia	21,197	1.3	31,870	2.1	36,443	2.4	35,021	2.3	38,121	2.2	32,982	1.8	31,698	1.6
10	Belgium	18,759	1.2	15,095	1.0	32,343	2.2	52,983	3.4	63,605	3.7	73,968	4.1	88,079	4.5
	RoW	156,197	9.8	175,267	11.4	149,018	10.0	181,846	11.7	188,051	11.0	220,566	12.3	205,315	10.5
	Total	1,588,066	100	1,537,889	100	1,491,331	100	1,551,503	100	1,703,366	100	1,800,481	100	1,959,790	100

Source: Comtrade, processed.

3.2. Competitors of Indonesia's Fishery Commodity Export

As maritime country which rich on oceanic resources, Indonesia has been one of the biggest exporter countries on fishery commodities. In 2000, Indonesia was occupied eighteenth as the biggest exporter country for fishery products with the contribution 1.5% of world's export total or equals to US$ 487 millions. Unfortunately, in 2005, the Indonesia's contribution was decreased only 1.4% or equals to US$ 671 millions.

During 2000-2005 periods, one of Indonesia's competitors is China. The export of China was increased start from US$ 2.4 billions or 7.5% of the world's export total in 2000 goes up by US$ 4.6 billions or 9.2% in 2005. Meanwhile Norway, United States, Chile, and Denmark, respectively, at the same periods occupied the big five of marine product and fishery exporters. Although it was occupied as third in contribution of world export, the contribution of Thailand decreased during 2000-2006 periods, from 17.2% in 2000 to 12.8% in 2006. The table 3.2 below shows that competition between exporting countries increase over the year in the period 2000-2006.

Table 3.2
The Exporting Countries of Marine Product and Fishery
(in thousand of US$)

No	Country	2000		2001		2002		2003		2004		2005	
		Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
1	Norway	3,340,377	10.6	3,229,614	9.7	3,446,939	10.3	3,510,966	9.4	4,002,008	8.9	4,787,833	9.6
2	China	2,369,145	7.5	2,593,405	7.8	2,745,517	8.2	3,014,770	8.1	3,912,239	8.7	4,579,823	9.2
3	USA	2,222,728	7.1	2,588,588	7.8	2,494,207	7.4	2,581,857	6.9	2,995,385	6.6	3,295,521	6.6
4	Chile	1,570,510	5.0	1,722,606	5.2	1,665,137	5.0	1,923,470	5.1	2,210,457	4.9	2,687,123	5.4
5	Denmark	1,542,983	4.9	1,683,881	5.0	1,752,940	5.2	1,905,725	5.1	2,047,806	4.5	2,205,906	4.4
6	Thailand	1,147,523	3.6	1,295,582	3.9	1,381,582	4.1	1,590,194	4.3	1,707,583	3.8	2,030,691	4.1
7	Spain	1,181,035	3.8	1,328,102	4.0	1,368,380	4.1	1,625,000	4.4	1,808,275	4.0	1,866,571	3.8
8	Iceland	1,081,690	3.4	1,127,399	3.4	1,265,097	3.8	1,341,796	3.6	1,554,392	3.4	1,641,081	3.3
9	Canada	1,260,783	4.0	1,271,833	3.8	1,305,152	3.9	1,334,608	3.6	1,408,242	3.1	1,565,927	3.1
10	Netherland	883,611	2.8	932,551	2.8	987,435	2.9	1,218,080	3.3	1,433,119	3.2	1,523,751	3.1
19	Indonesia	487,050	1.5	480,296	1.4	536,369	1.6	577,374	1.5	639,005	1.4	671,698	1.4
	RoW	14,401,267	45.7	15,130,522	45.3	14,645,513	43.6	16,727,825	44.8	21,418,992	47.5	22,867,308	46.0
	Total	31,488,701	100	33,384,380	100	33,594,269	100	37,351,665	100	45,137,502	100	49,723,234	100

Source: Comtrade, processed.

3.3. The Impediments of Fishery Export

Indonesia's fishery products competitiveness had been faced on the world's competition situation of which increasingly stringent. There are some factors impeding the expansion of Indonesia's fishery export either internal factors or external factors.

3.3.1. Internal Factors

There are some internal factor which impede the expansion of Indonesia's fishery export such as

a) The low of productivity.

   Most of Indonesian fishermen are traditional fishermen which has low level of education. This condition has been influence to the strategy of fish capturing. In contrast to foreign fishermen which use high technology to catch fish, Indonesian fishermen still use traditional tools like fish net and fishing rod. So, the productions scale of Indonesian fishermen less then foreigners. In addition, the low productivity also caused by the damage of marine ecosystem such as the damage of mangrove, coral reefs, and sea grass of which the habitat of fish and other marine organism.

b) Illegal fishing.

   Illegal fishing is not only generates hit for state but also menaces fishermen interest and industrial climate for national marine product and fishery. According to fishermen and businessman interest, illegal fishing threats availability of fish, reduce marine and fishery stock on a large scale. Meanwhile, from the industrial interest, it generates unfair business competition, bad image for national fishery, and the possibility of embargo threat from Indonesia's fishery importing countries.

   According to Ministry of Fishery and Marine Affairs, potential losses of illegal fishing equal to 9 trillions in 2000 up to 2003 and the subjects of illegal fishing are foreign fishermen which came from China, Thailand, and Philippines.

   Factors that cause illegal fishing are: (1) the control and responsible area which is not proportional with existing capabilities; (2) lack of supporting facilities and armada; (3) the weakness of human resources ability on Indonesia's fishermen and many businessmen who only hunt financial benefits and ignore other factors; (4)

inadequate of law and institution aspect; and (5) low of coordination and commitment between law enforcer.

c) Low of Fish Processing Utility

Recently, the result of fishery processed in Indonesia only 46.38%. In the fact, carrying capacity of processing industry is 3.85 million tons but only produced 1.78 million tons. The primary problem is lack of input which could be processed. Meanwhile the damages of marine and fishery product are caused by short durability of fish on the way from the sea to the port. It also generates low of fish processing utility. Improvement of this situation will increase availability of marine and fishery product to be processed.

d) The contamination of residue and heavy metal

Nowadays, Indonesia's fishery industry face depressing situation as the impact of contamination of residue and heavy metal on national fishery product. So, EU Committee does inspect to Indonesia's marine and fishery product. (Bisnis Indonesia, Friday, 5 January 2007).

e) Lack of capital access

Lack of investor's enthusiasm to invest on marine product and fishery sector becomes one of reasons the difficult of capital. Actually, many business areas related to fishery sector which can be developed. For example; fish captures, fish aquaculture, processing of fishery product, biotechnology industry, tourism industry, and shipping industry. By looking on supporting facilities required, investment value which is needed by this sector big enough especially supply of trawl ship with higher technology like detection equipment of fish existence. Another factor of capital difficult is banking sector has not been understand on fishery and oceanic analysis for their feasibility study.

f) Weak of marketing ability

It must be confessed that marketing capability on marine and fishery product still low either in domestic or foreign country. It could be showed by selling price which still be determined by buyers (*price taker*) so it unprofitable for producer. This situation is caused by weakness of market intelligent beside inadequate on supporting facilities such as transportation and communication system which could not support marine and fishery product distribution efficiently.

g) Fishery and oceanic resource potencies has not been exploited in an optimal fashion. There are so many fishery and oceanic resource potencies like sea grass, decorative fish and others which has not been exploited in an optimal fashion. Oceanic and fishery sector had been seen ecology point of view only and has not been seen from business perspective (Dahuri, 2004).

3.3.2. External Factors

External factors that become constraint and challenge at the same time to Indonesia's fishery export are rules and policies which are applied in destination countries. It includes

a) Application Plan of Zero Tolerance to Antibiotic residue. The application plan of this rule becomes impediment for Indonesia's fishery export since difficulties to detect antibiotic content in fishery product. Meanwhile, zero tolerance has been implemented on fishery and oceanic product export especially for Chloramphenicol and nitro furan element in European Union.

b) Environment, Health, and Social Issues. Environmental issue obstructs export expansion of fishery and oceanic product. For example, dolphin issue which make tuna export shake several years ago. In addition, protection issue on turtle population which push usage on Turtle Excluder Device (TED) in shrimp capture which will be exported to United States.

c) Country of Original Labeling (COOL). It had been implemented since 4th April 2005. This regulation valid for fish and cockles aquaculture (farm-raised fish and shellfish) and exported to United States in the form of fresh or frozen. If the exporter could not fulfill this rule, the consequence which must be received is rejection of product in admission port and penalty till US$ 10.000 to each exporter and importer for every case or mistake.

The rules application as mentioned above increase cost of production indirectly which must be counted by producer. As consequence, it will affect on product competitiveness. It must be note, besides non-tariff barriers export to destination countries; there are also tariff barriers which obstruct the expansion fishery and oceanic product export.

3.4. Export Development Policies

Indonesia's products competitiveness has been faced on tight world commerce competition. It has caused by several factors such as: quota which applied to Indonesia's certain products by developed countries; dumping and subsidy accusations; technical standards and requirements application; and most of developed countries use bilateral and regional forum for dispute settlement on trade which very often harms developing countries including Indonesia.

To respond above conditions and to increase product competitiveness on Indonesia's fishery and oceanic product, Government of Indonesia (GoI) through related department has prepared regulations related to fishery export. These including:

1) Ministry of Trade of Republic of Indonesia decree No. 17/2005 about Penerbitan Surat Keterangan Asal (Certified of Origin) for Indonesia's export commodity.
2) Director General of Foreign Trade decree No. 3/2005 about Exercise Rule of Certified of Origin for Indonesia Export Commodity.
3) Director General of Foreign Trade decree No. 4/2005 about Exercise Rule of Certified of Origin for Certain Goods Export.
4) Ministry of Marine and Fishery Decree No. Kep.34/2003 about Kewenangan Penerbitan dan Format Sertifikat Kesehatan di Bidang Karantina Ikan dan Sertifikat di Bidang Mutu dan Keamanan Pangan Hasil Perikanan.
5) Ministry of Marine and Fishery Decree No. Kep.01/2002 about Integrated Quality Management System of Fishery.

Most of these regulations had been implemented to anticipate expansion resistances on Indonesia's fishery export. These policies including issue of Certificate of Origin. It has been overcome by COOL (Country of Original Labeling) policy application. Moreover, every exported fishery and oceanic commodity must be completed by Certificate of Quality and/or Health Certificate. These issued by Laboratorium Pembinaan and Pengujian Mutu Hasil Perikanan which is owned by

Dinas Perikanan and Kelautan Provinsi. In line with that, Government also controls usage of pesticide and fish drug for fishery aquaculture.

3.5. Indonesia's Import on Fishery Commodity

Indonesia's import values for fish and fish product count US$ 79.87 millions in 2000 and increase till US$ 129.38 millions in 2006. Based on fishery product supplier, Peru is the biggest supplier country for Indonesia's fishery import. It was around 20.1% or equal to US$ 26 millions in 2006. It was smaller than its supply in 2000 which counted by US$ 39.60 millions (49.6%). So, during 2000-2006 periods Indonesia's fishery import from Peru has decrease trend. It equals to 52.33%.

Furthermore, the second and third supplier countries for Indonesia's fish import respectively are Chile and Thailand. The supply value from Chile is counted US$ 8.50 millions or equal to 10.6% from Indonesia's import value total in 2000 and goes up by US$ 21.09 millions or equal to 16.3% in 2006. So, it has increase trend around 59.67%. Meanwhile, supply from Thailand in 2000 around US$ 3.14 millions or equal to 3.9% from Indonesia's import value total and goes up by 77.20% becomes 13.76 millions (10.6%) in 2006. The following table (table 3.3) depicts the biggest suppliers on Indonesia's fishery imports.

Based on table 3.3, supply value on Indonesia's fishery imports which increase very fast is from Mexico. In 2000, supply value of Mexico's fish and marine product only US$ 38 thousands, even in 2001 there is no supply from Mexico. Nevertheless, since 2002 supply from this country goes up by 57 thousands and in 2006 increase by US$ 10.10 millions or equal to 7.8% from Indonesia's total import suddenly. Thereby, supply value of Mexico increase by 99.62% during six years. It brings Mexico become fifth country of fishery and marine product supplier for Indonesia.

Table 3.3

The Supplier Countries of Indonesia's Fishery Import

(US$)

No	Country	2000		2001		2002		2003		2004		2005		2006	
		Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
1	Peru	39,609,344	49.6	43,796,639	58.3	26,234,540	41.7	17,664,558	29.8	22,894,754	28.6	25,920,901	28.1	26,002,244	20.1
2	Chili	8,505,999	10.6	2,290,990	3.0	5,290,079	8.4	6,292,007	10.6	7,043,514	8.8	19,259,136	20.9	21,091,399	16.3
3	Thailand	3,138,532	3.9	2,242,662	3.0	1,681,324	2.7	2,303,145	3.9	3,440,610	4.3	2,720,448	2.9	13,766,594	10.6
4	China	2,373,325	3.0	1,050,118	1.4	3,210,989	5.1	2,400,938	4.0	4,062,106	5.1	2,521,367	2.7	10,883,237	8.4
5	Mexico	38,119	0.0	-	-	57,381	0.1	46,636	0.1	78,186	0.1	60,086	0.1	10,105,701	7.8
6	South Korea	3,364,362	4.2	2,846,738	3.8	2,931,824	4.7	2,515,931	4.2	3,805,394	4.8	4,654,462	5.0	8,113,832	6.3
7	Japan	3,029,793	3.8	3,480,326	4.6	2,243,514	3.6	3,233,756	5.4	4,956,643	6.2	5,950,124	6.4	5,511,261	4.3
8	Australia	1,186,641	1.5	1,263,648	1.7	1,095,903	1.7	1,723,329	2.9	3,602,952	4.5	4,537,195	4.9	5,066,666	3.9
9	Malaysia	1,748,330	2.2	2,631,404	3.5	3,094,290	4.9	5,183,618	8.7	8,750,290	10.9	6,212,065	6.7	5,039,609	3.9
10	Singapore	707,148	0.9	653,760	0.9	1,287,651	2.0	969,357	1.6	3,039,346	3.8	5,137,501	5.6	4,196,855	3.2
	RoW	16,167,586	20.2	14,927,810	19.9	15,835,974	25.2	17,031,616	28.7	18,381,980	23.0	15,338,054	16.6	19,604,784	15.2
	Total	79,869,179	100	75,184,094	100	62,963,469	100	59,347,891	100	80,064,775	100	92,347,339	100	129,382,146	100

Source: Comtrade, processed.

CHAPTER IV
METHODOLOGY

4.1. Model Specification

This research use the traditional gravity model augmented by some variables and with some modifications to better analyze the export performance of Indonesia's fishery commodity to Japan and USA as the major destination countries. A gravity model is a useful tool in determining the trade or export potential of a country. The gravity model has proven to be an effective tool in explaining bilateral trade flows as a function of exporter's and the importer's characteristics, together with factors that aid or restrict trade. In many instances, gravity models have significant explanatory power.

A gravity model states that the trade flows between two countries (exports, imports or the sum of exports and imports) can be explained by three kinds of variables. The first group of variables describes the potential demand of the importing country, the second one considers the supply conditions in the exporting countries and the third group consists of all the factors that may hinder or favor the bilateral trade flow (i.e., distance, common border, language, past colonial ties, religion, etc.). In general the applications of the gravity models, GDPs of the trading partners are the variables usually used as proxy of their demand and supply conditions. Furthermore, in the standard specifications of the gravity equation, geographical distance is used as proxy of transport costs and cultural dissimilarities.

The basic gravity equation explains the size of exports from country *i* to country *j* by three factors. The first indicates the total potential supply of the exporting country (*i*), and the second one indicates the potential demand of the importing country (*j*), and the third includes factors which represents the resistance to trade flow between countries. In its basic form, the gravity model is generally specified as:

$$\ln X_{ijt} = \alpha + \beta_1 \ln Y_i + \beta_2 \ln Y_j - \beta_3 \ln DIS_{ij} \quad \text{.........} \quad (4.1)$$

Besides the basic form above, this research augmented some variables like nominal exchange rate and relative price of export. So, the model becomes:

$$\ln X_{ijt} = \alpha + \beta_1 \ln Y_i + \beta_2 \ln Y_j - \beta_3 \ln DIS_{ij} + \beta_4 ER_{ij} + \beta_5 RP_{ij} + u_{ij} \quad \ldots\ldots (4.2)$$

where:

X_{ijt} = Indonesia's fishery exports to partners countries in *t* year (value)

Y_i = Indonesia's fishery production

Y_j = Real income per capita in partner countries

DIS_{ij} = Distance between capital countries

ER_{ij} = Nominal exchange rate between Indonesia and partner country

RP_j = Relative price of export which is faced by Indonesia's exporters

μ_t = Error term and is assumed to be normally distributed with mean zero

4.2. Data and Source

Data used for the estimation was balanced pooled data. This research use econometric model; pooled data regression approach which consists of time series and cross section data. The pooled data regression model is used because it gives more, more variability, less collinearity among variables, more degrees of freedom and more efficiency. Besides that, it is aimed to control individual heterogeneity and non stationary. The time series observation range from 1973 up to 2006 whiles the cross sectional entities are covered by Japan and United States as the major importing countries on Indonesia's fishery commodity. This research uses two digit of SITC revision 1 classification (03) therefore the unit measurement is in term of value.

Meanwhile, in the separate analysis this study use time series data to explain Indonesia's fishery export to each destination country by using ordinary least square (OLS) approach. This approach used to capture exports behavior in Japan and USA which has different characteristic.

This research uses secondary data. The data include the determinant factors of the Indonesia's fishery exports to Japan and USA as the major importing countries. The information required for gravity model estimation in analyzing Indonesia's export performance were: (1) Export value in term of US dollar and volume in term of Kg, from Indonesia to Japan and USA,; (2) Production capacity of Indonesia's fishery product (3) GDP of Japan and USA; (4) Geographical distance between capital countries in kilometers; (5) Population in Indonesia, Japan, and USA; (6) Aggregate export and import; and (7) Export price and relative export price faced by Indonesia's exporters; and (8) World crude oil price.

The data required was obtained from the following sources:

1) Comtrade (www.uncomtrade.org) statistic database for bilateral trade activities. Data has been aggregated to 2 and 3 digit of SITC rev.1;
2) International Financial Statistic, CD-ROM database of International Monetary Fund (IMF) for Gross Domestic Product of Indonesia and each destination countries (in term of US$), aggregate export and import, Wholesale Price Index, and total population of each destination countries.
3) Distance (www.indo.com) for distance between capital countries. Since the shipping of commodities which exports are usually use fuel and distance in this study is proxy of transportation cost, so the distances that counted are geographical distance between capitals countries multiplied by crude oil price (in term of nominal dollar per barrel). It is obtained from Energy Information Administration.

All of estimations are done using Eviews 5.1 data processor.

4.3. Estimation Method of Pooled Data

Pooled data is combination between time series data and cross section data. Special characteristic of time series data is numerical sequence which the intervals between observations to number of variables are constant. Meanwhile cross section data is an analysis to one particular point of certain time with observation to number of variables.

There are several benefits using pooled data. First, pooled data has been given solution for researchers because it could be enhance a number of observations so that it creates greater degree of freedom. Second, combining information between time series and cross section data could solve the problem as result of omitted variable (Widarjono, 2005). Due to this fact, many researchers applied this method in their research.

According to Baltagi (1995) in Gujarati (2003), there are some advantages of using pooled data that are:

1. The techniques of pooled data estimation could control the heterogeneity of each individual;
2. Pooled data give more informative data, more variability, reduce collinearity among variables, higher degree of freedom and more efficiency;
3. Pooled data are better suited to study the dynamic change of each variable;
4. Pooled data could better to detect and measure the impact that simply cannot be observed in pure time series or cross section data;
5. Pooled data enables researchers to study and examine more complicated behavioral model; and
6. Pooled data can minimize the bias that might result if we aggregate individuals into broad aggregates.

There are three kinds of method to estimate parameter of pooled data that are *pooled least square (PLS), fixed effects model (FEM), random effects model (REM)*. The first method, pooled least square, simply combine all of time series and cross section data then estimate model using ordinary least square (OLS) method. In the second method, fixed effect model, variables which cannot include in the model could be creating inconstant intercept. In other word, the intercept could be inconstant for each individual or time. That way, this idea becomes background to develop this model. If in fixed effects model dissimilarities inter individual and/or time are reflected in intercept, so in random effects model it is accommodated through error term. This method assumes that error correlate with time series and cross section.

4.3.1. Pooled Least Square Method

As we know that pooled data consists of cross section and time series data. Pooled data gives information about N as a number of cross section and T as a number of time series. By pooling all of observations as much N times T, so could be get function of pooled least square as follow:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it} \quad (4.3)$$

where, $i = 1,2,\ldots,N$ and $t = 1,2,\ldots,T$ in which i is *cross-section identifiers* and t is *time-series identifiers*.

The simplest approach to estimate pooled data is only combines time series and cross section data then just estimate usual ordinary least square (OLS) regression which so called common effects estimation. This approach disregards the space and time dimension.

It is assumed that the behaviors of data are similar between individual at variant time. Despite its simplicity the pooled least square regression may distort the true picture of the relationship between Y and X inter cross sections unit.

4.3.2. Fixed Effects Model Method

The biggest difficulty of pooled least square is the assumption of intercept and slope of the equation regression model which is reputed constant for all coefficient of across time and individual. This assumption is very strict, probably unreasonable and unrealistic because the characteristic of individuals are dissimilar. One of ways to observe cross section or time series unit is use dummy variable to allow differently value of parameter for cross section or times series unit. The way which most often applied is allow the variation intercept among cross section units but stay assumed that coefficient slope is constant among cross section units. This approach is so called *Fixed Effect Model (FEM)*. The equation of this approach as follow:

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it} \quad (4.4.)$$

Subscript i on intercept of equation (4.4) indicated that the intercept of cross section unit is different. Its difference could be caused by special characteristic of each cross section unit. Furthermore, the previous equation could be applied with dummy variables. So, the equation becomes:

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it} \quad \text{(4.5)}$$

where D_{2i} = 1 if observation is in the second of cross section and 0 if others; D_{3i} = 1 if observation is in the third of cross section and 0 if others; D_{4i} = 1 if observation is in the fourth of cross section and 0 if others. Therefore α_1 was represented intercept the first unit of cross section and α_2, α_3 and also α_4 at the differential intercept coefficients; that is how much the intercept of second, third and fourth cross section units different to the intercept of first unit. In this case, the first unit has being comparator. Because of using dummy variable this method sometimes so called *Least Square Dummy Variable (LSDV) Model*.

The LSDV model could be used if the regression equation has less cross section units; however, if that cross section unit is much using of LSDV model will decrease degree of freedom and finally will reduce the efficiency of estimated parameter. Fixed effect term comes from the fact that although intercept is probably different among individual, yet the intercept of each cross section unit has variation for long time; in other word, there was *time invariant*. If intercept is as α_{it}, it means that the intercept of each cross section unit is time variant. Furthermore, FEM assumed that the coefficient of regresses has not variation for inter time or among individual. The basic idea of FEM could begin from the equation as follow:

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + e_{it} \quad \text{(4.6.)}$$

and the value of intercept for each cross section unit could be written as follow:

$$\alpha_i = \alpha + u_i \qquad i = 1,2,....,N$$

where u_i is an unobservable individual effect. As follow, the compiling of equation:

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + u_i + e_{it} \quad \text{(4.7)}$$

In the FEM, u_i is assumed has correlation with regresses or in other word u_i has not random characteristic.

4.3.3. Random Effects Model Method

If in fixed effect model (FEM), u_i is assumed has correlated with regresses (X) but in random effect model (REM), u_i is assumed has not correlated with regresses or random character. The equation of REM as follow:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + u_i + e_{it} \quad \text{...} \quad (4.8)$$

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + E_{it} \quad \text{...} \quad (4.9)$$

Error term (E_{it}) in above equation is consist of u_i on *cross-section (random) error component*, while e_{it} on *combined error component*. Due to this fact, REM is often called as *Error Component Model (ECM)*.

There are several things related to estimation output of REM, include:

a. The summation of random effect value is zero, because component error (E_{it}) was constituted as the combination of time series error and cross section error;
b. The value of R^2 is taken from regression transformation of *Generalized Least Square (GLS)*, therefore REM could be estimated by GLS method.

4.4. Model Selection

There are several testing before the estimation model could be interpreted. It includes F-Test or Chow test, Hausmann test, LM test, statistical test, and classical assumption testing.

4.4.1. F-Test or Chow Test

F-test or Chow test has been applied to choose which model has better solution on data estimation through PLS or FEM model. It could be tested the best model formally. Here, PLS is restricted model which apply similar intercept for all cross section unit. As we knew, the same behaviors of each cross section sometime tend to unrealistic because of every cross section unit has different characteristic. So, to find it out could be applied *restricted F-Test* to examine the hypothesis:

H_0 : Model PLS (Restricted)

H_1 : Model Fixed Effect (Unrestricted) while restricted F-Test is formulated as follow:

$$F = \frac{(R_{UR}^2 - R_R^2)/m}{(1-R_{UR}^2)/df} \quad \text{.. (4.10)}$$

where R_R^2 is restricted R^2, it is taken from the equation of PLS model; R_{UR}^2 is unrestricted R^2, it is taken from the equation of FEM model; m is a number of restriction. The value of F Table consists of three kinds that are *df for numerator*, *df for denominator* and *confidence level*. If F-Statistic is more than F-Table, so reject H_0 and receive H_1.

An alternative way, it could apply *Chow Test*. The basic of rejection on H_0 is following F-Statistic distribution. The equation is formulated as follow:

$$CHOW = \frac{(RRSS - URSS)/(N-1)}{URSS/(NT-N-K)} \quad \text{... (4.11)}$$

where:

RRSS = *Restricted Residual Sum Square* (constitute Sum of Square Residual which taken from pooled least square/common intercept);

URSS = *Unrestricted Residual Sum Square* (constitute *Sum of Square Residual* which taken from data panel estimation with *fixed effect*);

N = a number of cross section data;

T = a number of time series data; and

K = a number of explanatory variable.

The testing is following F distribution that is F $_{N-1}$, NT-N-K. If value of the result of Chow Statistic (F-Stat) is more than F-Table, H_0 will be rejected with the result H_1 will be received or *fixed effect model* will be used.

4.4.2. Hausmann Test

Principally, the model selection consists of two kinds. First, back to the assumption has been made about correlation among *cross-section error component* *(u_i)* and *regresses (X)*. If it has assumed that u_i and X is *uncorrelated*, REM is appropriate to be applied. Otherwise, if it has assumed that u_i and X is *correlated*, FEM is appropriate to be applied. Second, REM assumed that u_i can be taken as random from the most population. It is often hard to fulfill this assumption.

Hausmann test has been applied to choose whether *FEM* or *REM* will be used. This testing follows Chi-Square distribution so model selection that chosen could be determined statistically. The examination is done through hypothesis as follow:

H_0 : *Random Effects Model*

H_1 : *Fixed Effects Model*

To making decision, compared result of Hausmann to chi-square table with degree of freedom as much as *k*, where *k* is a number of independent variables. If the result of Hausmann Test more than critical value so the appropriate model to be chosen is FEM, otherwise.

4.4.3. The Lagrange Multiplier Test (LM Test)

If the estimation use *fixed effect model (FEM),* so *LM (Lagrange Multiplier) Test* should be applied for estimator election of heterocedastic and homocedastic structure. The hypothesis has expressed in:

$H_0 : \sigma_i^2 = \sigma^2$ (homocedastic structure)

$H_1 : \sigma_i^2 \neq \sigma^2$ (heteroscedasticity structure)

Here, the testing is using LM criteria with chi-square distribution:

$$LM = \frac{T}{2}\sum_{i=1}^{n}\left[\frac{\sigma_i^2}{\sigma^2} - 1\right]^2 \quad \text{.......} (4.12)$$

Where:

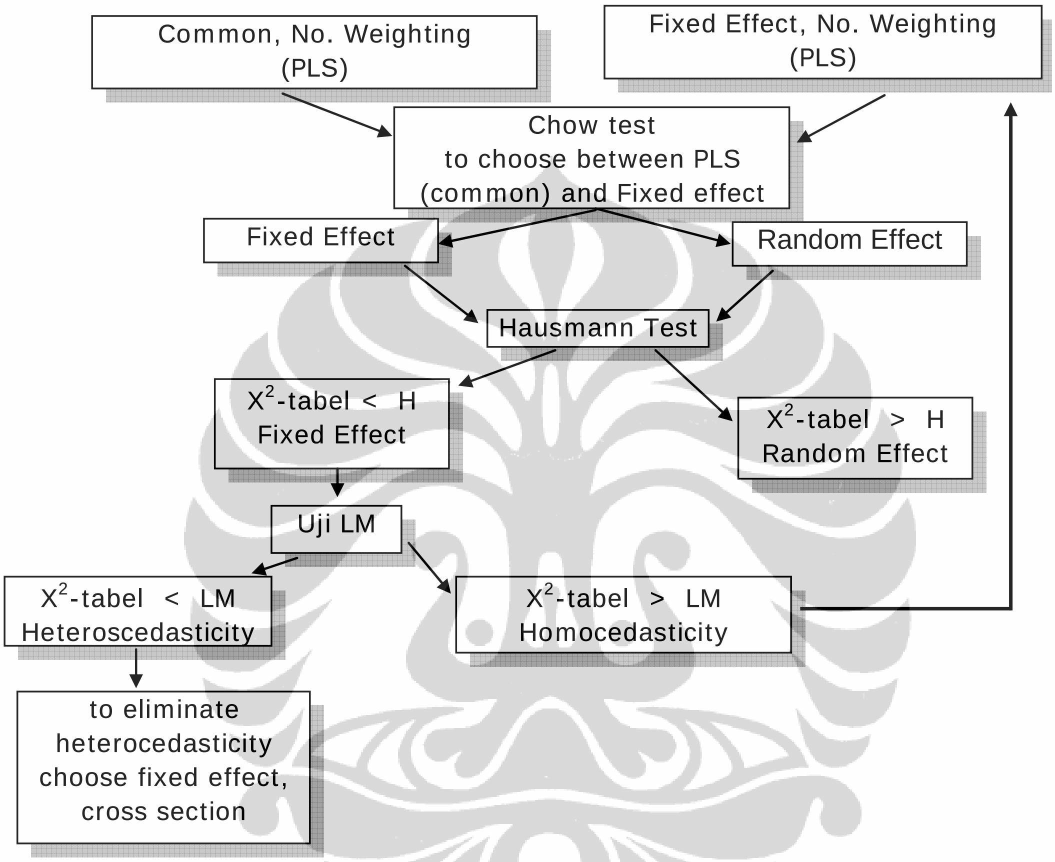
σ_i^2 = variant residual equation at *i* (the higher restriction equation)

σ^2 = sum square residual equation

4.4.4. Flow Chart of Model Selection

The following picture describes flow chart of pooled data estimation model selection:

Figure 4 The Flow Chart of Pooled Data Estimation Model



4.5. Statistical Test

The precision of sample regression to estimate actual value could be measured from its goodness of fit. Statistically, it could be measured from t statistic value, F statistic value, and coefficient of determination. Statistical computation can be called significant if its statistical value exist in critical area (area to refuse H_0), otherwise (Kuncoro, 2001).

4.5.1. T-Test

Basically the test to show how much explanatory variable affects to explain dependent variable variation individually. The hypothesis in this examination is:

H_0 : β = 0, its mean explanatory variable is insignificant to explain dependent variable.

H_1 : $\beta \neq 0$, its mean explanatory variable is significant to explain dependent variable.

The examination has been done by comparing t-statistic value with t table. If t-statistic > t table the decision is refuse H_0 and accept H_1. In other words, explanatory variable affects dependent variable individually, otherwise.

4.5.2. F-Test

Basically the test to show all of explanatory variables in the model can explain dependent variable simultaneously. The hypothesis in this examination is:

H_0 : $\beta_1 = \beta_2 = \ldots = \beta_k = 0$, its mean all of explanatory variable are insignificant to explain dependent variable simultaneously.

H_1 : $\beta_1 \neq \beta_2 \neq \ldots \neq \beta_k \neq 0$, its mean all of explanatory variable are significant to explain dependent variable simultaneously.

The examination has been done by comparing F-statistic value with F table. If F-statistic > F table the decision is refuse H_0 and accept H_1. It means all of explanatory variable affect dependent variable simultaneously and significantly, otherwise.

4.5.3. Coefficient of Determination Test (R^2)

It is accuracy testing which shows estimate how much percentage of explanatory variables' variation can explain dependent variable. This test can be shown by coefficient of determination value which exists between 0 and 1 ($0 < R^2 < 1$). The formula to calculate it is as follow:

$$R^2 = \frac{TSS - SSE}{TSS} = \frac{SSR}{TSS} \quad \text{.......... (4.13)}$$

where TSS is total sum of squares; SSE is sum of squares error; and SSR is sum of square due to regression.

4.6. The Classical Assumption Test

Problem which often appears in economical research is classical assumption testing (autocorrelation, heterocedasticity, and multicolinearity). Breach of classical assumption cause estimation model becomes inefficient. This detection is also applied to pooled data.

The first assumption is the model free of multicollinearity. Multicollinearity is linear relation among or all of independent variable within regression model significantly. The consequent of this problem, variant estimation tend to bigger and will decrease t-statistic value. The estimation's result unbiased but inefficient. One of method to detect indications of multicollinearity is the value of R^2 is highest and the value of F-test is significant but partial test of variable (t-test) statistically insignificant.

The second assumption, exist or absence the correlation among disturbances (autocorrelation). The existence of autocorrelation makes result of coefficient estimation is consistent and unbiased but big variant, in other word the result of interpretation is inefficient. Inefficient of variant parameter estimation would caused t-statistic tent to small and the result of examination tend to receive H_0 or there is no autocorrelation.

The general way which often applied to detect autocorrelation is *Durbin Watson Test (DW)*. The test has done by comparing DW statistical value with DW table. One of the way to overcome autocorrelation problem is putting *autoregressive* variable into equation. According to Nachrowi and Usman (2006), FEM do not need assumption model free from serial correlation so autocorrelation testing could be ignored.

The last assumption is a variant of each error term is constant and breach of this assumption called heterocedasticity. The existence of heterocedasticity cause inefficient in estimation process whiles the estimation's result consistent and unbiased. Heteroscedasticity would cause the result of t-test and F-test to be unused or probably mislead.

Heterocedasticity has been occurred on cross section data and rarely occurred on time series data. There are so many ways to detect the existence of heterocedasticity. It could be done by *White's General Test*, *the Goldfield Quandt*

Test or *the Breusch Pagan Test* (Nachrowi and Usman, 2006). Eviews 5.1 edition supply the way to eliminate this problem.

4.7. Estimation Method of Ordinary Least Square

The estimation procedure in this method including normality test for residual of the model, t-test, F-test, coefficient determination, classical assumption test, and Chow-test for structural change on variable's behavior.

CHAPTER V
DATA ANALYSIS AND ESTIMATION RESULT

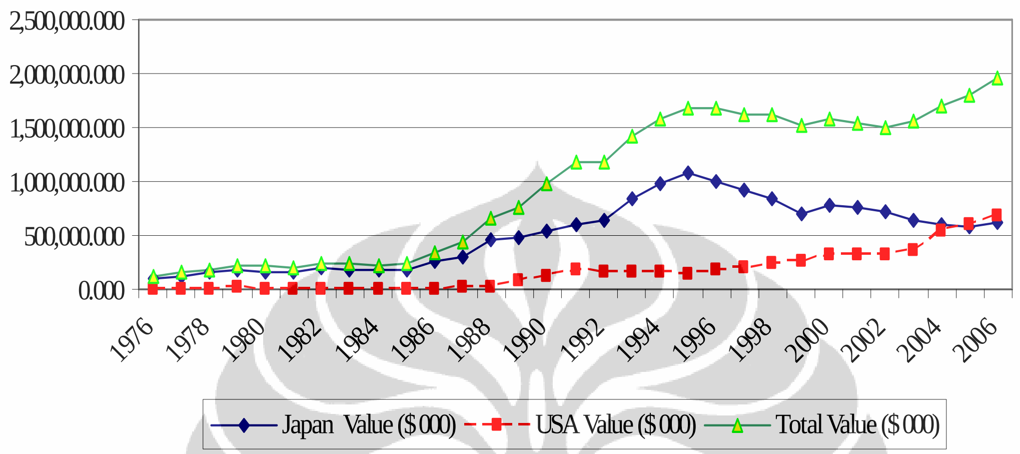
This chapter has four parts. First part presents the descriptive analysis which includes the development of Indonesia's fishery export, the production capacity movement of Indonesia's fishery, the real income per capita movement in partner countries, and nominal exchange rate movement between Indonesia and partner countries. Second part presents the empirical model of pooled data regression on Indonesia's fishery export which includes model selection, the results of statistical hypotheses tests, the capability of model in addressing factors that affect Indonesia's fish export to destination countries, the result of classical assumption tests, and the last explains the relation of explanatory variables on Indonesia's fish export. Third part presents the empirical model of ordinary least square regression on Indonesia's fishery export to Japan. The last part presents the empirical model of ordinary least square regression on Indonesia's fishery export to USA.

5.1. Descriptive Analysis

5.1.1. The Development of Indonesia's Fishery Export

During the scope of period of this study (1976-2006) the Indonesia's export has been fluctuated. Nevertheless, it has an increase trend totally. In Japan market as the first major importing country, from 1976-1995, Indonesia's fishery export has increase from US$ 102.11 millions to US$ 1.07 billions (1,048.17%) but in the following years up to 2006 it was decreased trend from US$ from 996.29 millions to US$ 617.35 (161.38%). Meanwhile, in USA market as the second major importing country, from 1976-1986, Indonesia's fishery export tends to decrease from US$ 8.50 millions to 5.57 millions (34.49%), the following years up to 1994, Indonesia's fishery export increase from US$ 11.70 millions to 168.18 millions (1,436.87%), in 1995 it decrease to US$ 131.1 millions (22.05%). Since 1996 up to 2006 Indonesia's fishery export has increase trend from US$ 185.97 millions to US$ 689.1 millions (370.51%) and since 2004 the USA lead as the first major importing country replace the Japan. Figure 5.1 below describes the development of Indonesia's fishery export from 1976-2006.

Figure 5.1 The Indonesia's Fishery Export to Japan and USA in million US$ 1976-2006



Source: WITS, processed.

This situation shows that Japan market was saturated whiles USA market has potential to be developed. Therefore, stakeholders should explore the causes of Indonesia's fishery export declining in Japan market i.e. requirements entering to that market, related regulations/policies, customers' preferences on fishery product, etc. Meanwhile, to maintain the existing market exporters must improve the product competitiveness.

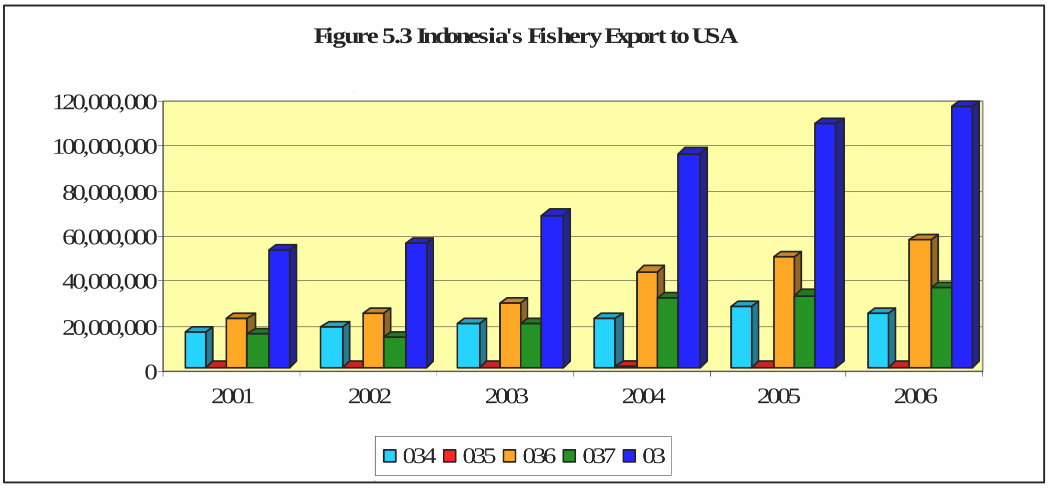
5.1.1.1. The Kind of Commodities which is Exported to Japan Market

In Japan market, during 2001 up to 2006, Crustaceans and Molluscs, fresh, chilled, frozen (SITC 036) are the majority commodity which is imported, from 64,778 metric tons (MT) to 51,776 MT. It was decreased around 20.07%. The following commodities respectively are Fish, fresh (live or dead), chilled or frozen (SITC 034) which increased from 37,225 MT to 39,735 MT (106.74%); Fish, crustaceans and molluscs, preparation or preservation (SITC 037) which increased from 10,192 MT to 10,301 MT (101.07%); and Fish, dried, salted or in brine; smoked fish (SITC 035) which increased from 5,802 MT to 11, 460 MT (197.53%). Figure 5.2 below shows the composition of fishery export to Japan.

Source: WITS, processed

5.1.1.2. The Kind of Commodities which is Exported to USA Market

During 2001 up to 2006, Crustaceans and Molluscs, fresh, chilled, frozen (SITC 036) are the majority commodity which is exported to USA market, same with Japan market, from 21,684 MT to 56,373 MT. It was increased around 259.97%. The following commodities respectively are Fish, crustaceans and molluscs, preparation or preservation (SITC 037) which increased from 15,012 MT to 35,056 MT (233.52%); Fish, fresh (live or dead), chilled or frozen (SITC 034) which increased from 15,304 MT to 24,124 MT (157.64%); and Fish, dried, salted or in brine; smoked fish (SITC 035) which increased from 39 MT to 65 MT (164.18%). In general, the Indonesia's Fishery export to USA market tends to increase. Figure 5.3 below depicts the Indonesia's fishery export to USA from 2001-2006.



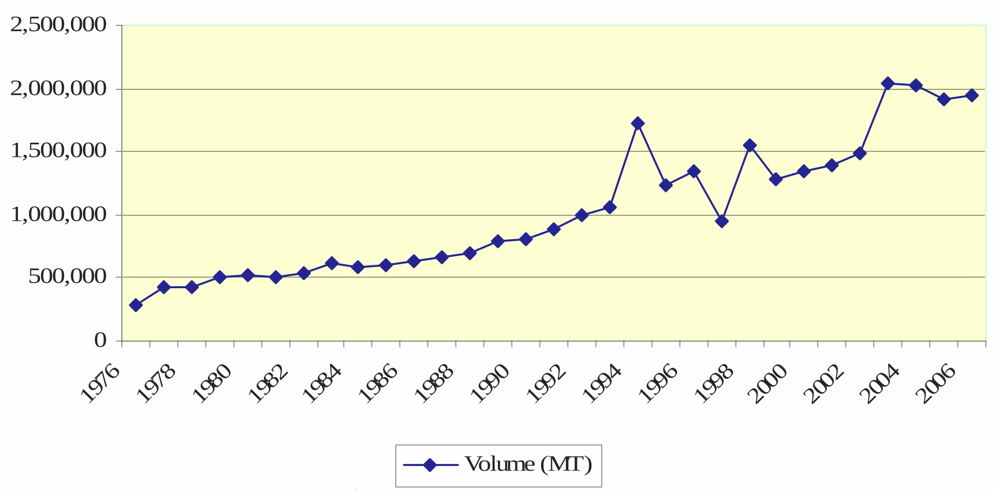
Source: WITS, processed.

5.1.2. The Production Capacity Movement of Indonesia's Fishery

Indonesia is maritime country which rich on fishery and oceanic resource. There are so many fishery and oceanic resource potencies like sea grass, decorative fish and others. Meanwhile, most of people has been seen fishery and oceanic resources from the ecology perspective and has not been seen from business perspective. So, it has not been exploited optimally.

Related to this issue, during 1976-2006, the production of Indonesia's fishery commodity has a significant increased in general. During the period of time 1976-1993 fishery production in Indonesia tend to increase from 290 thousands MT to 1.07 millions MT (367.81%) and the following year was increased to 1.72 millions MT (161.26%). In the period of time 1994-1997 the Indonesia's fishery production has decreased to 943 thousands MT (45.14%). The economic crisis and political situation are the main reason for the decreasing on fishery production. In 1998 fishery production was increased again to 1.54 millions MT (163.65%) and going to decrease again in 1999 up to 1.29 millions MT (16.67%). Since that time to 2003 the fishery production in Indonesia goes up respectively up to 2.03 millions MT (158.07%). It was the highest production capacity since the period of this study. The following years, 2004-2006, Indonesia's fishery production was decreased which equal to 0.42%, 5.76%, 4.5% respectively. Figure 5.4 below shows the trend on Indonesia's fishery production.

Figure 5.4 The Production of Indonesia's Fishery



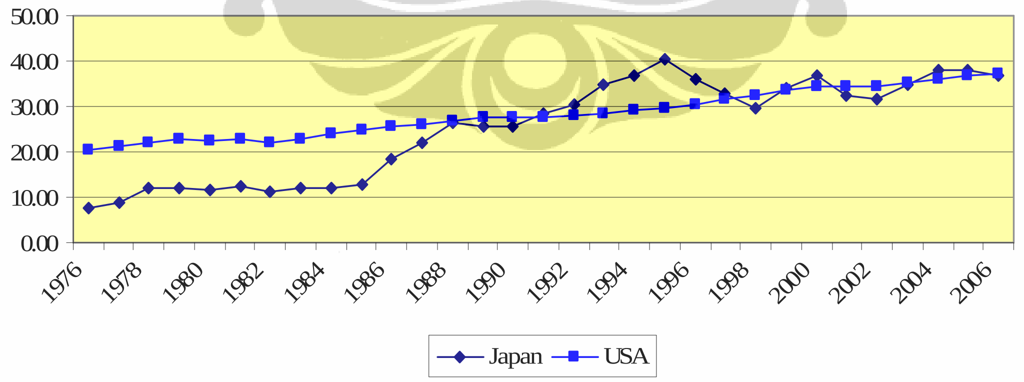
Source: FAO Fishstat+, processed.

5.1.3. The Real Income per Capita Movement in Partner Countries

Increasing on real income indicates prospects for economic of scale, high demand and absorptive capacity. So, it implies the potential market for Indonesia's product particularly fish commodity to expand the market. Moreover, the increase on real income per capita implies the increase on the average standard of living of the country. In general, citizens of that country are well-educated, have awareness on health, environment and consumerism issues. Therefore, the products which are exported to these markets must fulfill the requirements demanded, i.e. health standards, packaging standards, environment standards, etc.

In associated with that, in the period of time 1976-1995 the real income per capita in Japan has increased; nonetheless, it experienced decrease from 1996-1998. In 1999-2000, it increased again around 14.63% and 8.46% respectively. It decreased 11.35% and 2.98% respectively from 2001-2002. After 2002 up to 2005 it increased 20.45% and in 2006 it slightly decreased 3%. Meanwhile, the real income per capita in USA has increased trend. Only in 1982 it slightly decreased 2.93% and after that it tends to increased over the year. Figure below depicts the movement of real income per capita in partner country from 1976-2006.

Figure 5.5 The Income per capita movement in Japan and USA (US$) 1976-2006



Source: IFS, processed.

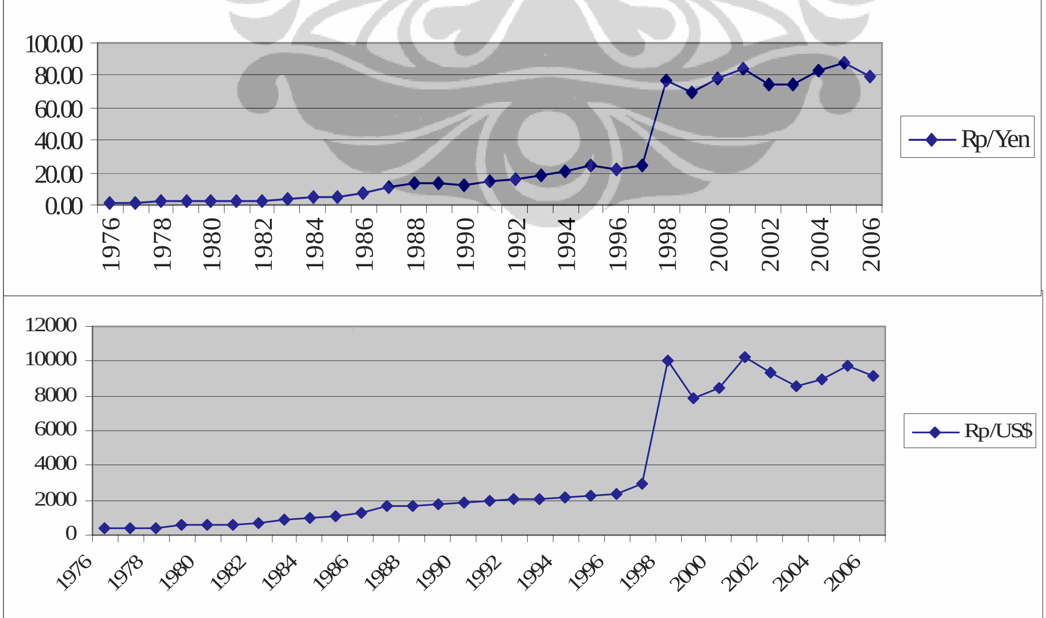
5.1.4. Nominal Exchange Rate Movement between Indonesia and Partner Country

Nominal exchange rate (NER) in this study is defined as the price of the foreign currency in terms of the domestic currency. During the period 1976-1986, the nominal exchange rate between Indonesia and Japan tend to depreciated. Start from 1.40 to 7.61 in the end of period. From 1987-1996, rupiah tends to depreciated with the highest exchange rate is 23.91 in 2005 and in the end of this period rupiah slightly appreciated 9.93% becomes 21.53. In the last period, from 1997-2006, due to the economic crisis rupiah depreciated seriously in the beginning of this period (1997-1998) up to 76.50 (318.12%) and the following years rupiah has fluctuated up till reached the value of 78.76 Rp/Yen.

Similar to the nominal exchange rate of rupiah to Yen, the nominal exchange rate of rupiah to US dollar also has depreciated trend. During 1976-1998, rupiah was depreciated over the year from 415 to 10,013.60 rupiah/US$. The highest depreciation was happened in the period 1997-1998 due to the economic crisis. Rupiah has experienced appreciation reached the value of 7,855.15 Rp/US$ in 1999. After that, during 2000-2006, rupiah has fluctuated up to 9159.32 in 2006.

In general, the fluctuation of rupiah to yen and US$ tends to depreciated. Depreciation of rupiah makes domestic goods cheaper for foreigner. So, demand for domestic goods leads to increase. The figure 5.6 below depicts the trend of nominal exchange rate between Indonesia and partner country.

Figure 5.6 Nominal Exchange Rate between Indonesia and Partner Country



Source: IFS, processed.

5.2. Current Condition on Indonesia's Fishery Exports

Indonesia's fishery sector plays an important role to ensure the social welfare of the fishermen and their affiliates. More than 30 million of fishermen and their families are dependent on fisheries as the main source of income and employment. Moreover, fisheries sector contribute significantly to the foreign exchange earnings through export trade flow. Among Indonesia's agricultural exports it ranks third after forest and estate crops commodities, especially crude palm oil.

In January 2008 up to March 2008 period, Indonesia's fishery export to USA increased around 27.8% compared to the same period in 2007. It has counted US$ 206.8 millions in 2007 and US$ 264.3 millions in 2008. Product that significantly increases is shrimp commodities which increase from US$ 94.2 millions to US$ 148.7 millions (57.7%). Meanwhile, since October 2008 to December 2008, it has slightly decrease trend regarding with global recession which is started in USA. It has indicated by decrease of export volume and contract renegotiation which is demanded by US importers. The real impact of global recession on Indonesia's fishery export will be felt in 2009. In general, exports volume to the main markets reached 70 percent or around US$ 1.82 billions in 2008 and it has predicted decrease by 15 percent to US$ 1.54 billions in 2009.

In line with decreasing of commodities prices due to decreasing of world crude oil price recently, it has predicted that Indonesia's fisheries export will not affected seriously by global recession. Therefore, Indonesia's fishery export in this year is predicted to be the same as 2008 which is amounted to US$ 2.6 billions although demands from the major markets like the US, the European Union, and Japan will decline due to the global financial crisis. It has predicted that global recession will end in the end of 2009 and the fishery sector recovered faster than others at the time since healthy food products are always in high demand. So, the Indonesia's fishery exports has forecasted positive trend in 2010. Therefore, stakeholders should prepare this moment to improve fishery competitiveness through efficiency production besides increasing the quality.

In order to cope with the decline in the major markets, the government should expand and diversify targeting countries like the Middle East as well as in Eastern and Central Europe. According to Ministry of Marine Affairs And Fisheries, exports to the Middle East in 2007 reached US$ 60 million, while exports to Eastern and Central Europe were US$ 12 million. These phenomenon shows that these markets are potential for the expansion of Indonesia's fishery export.

In addition, the fishery industry must diversify their products which have added-value such as from half-made products to ready-to-use ones. Meanwhile, recently the majority of Indonesian fishery products are categorized in half-made products, such as whole frozen shrimps, or skinned and headless shrimps.

5.3. The Empirical Model of Pooled Data Regression on Indonesia's Fishery Export

5.3.1. Model Selection

The best empirical model selection is needed to determine important implication in next activities sequence result of analysis. The first step to estimate pooled data is to choose the FEM or PLS model by Chow test. From the estimation's result like the one which appeared in appendix 4, the summary of Chow test as follow:

Table 5.1 Result of Chow-Test

H_0	Chow-Stat	F-Table		Result	Conclusion
		α	Value		
No Individual Effect	110.209	1%	7.119	Chow-stat > F-Table; H_0 is rejected	There is individual effect; FEM is preferred
		5%	4.016		
		10%	2.799		

The above table shows that Chow test value is 110.209. It is more than F-Table in any level of alpha (α) i.e. 1%, 5% and 10%. So, the decision that FEM is better than PLS to explain the empirical model.

The next step is to find out the best model between fixed effect and random effect model by Hausmann test. In this case, Eviews could not estimate random effect model (REM) because REM in Eviews 5.1 program only be done if the cross section units are more than the parameters. Because of that and following econometrician's rule of thumb (Nachrowi and Usman, 2006) the model which is used in this research is fixed effect model.

5.3.2. Statistical Hypothesis Tests

The estimation results are not far from what expected (presented in table 5.6). According to t-test, each explanatory variable affects significantly on dependent variable and the signs are correct which show that the model is relatively close to one predicted by the theory. Explanatory variable such as importer's GDP and exchange rate have significant effect on Indonesia's fish exports in 1 per cent level of alpha, while production capacity has significant effect in 5 per cent level of alpha, and relative price of export has significant effect in 10 per cent level of alpha. In contrast to other variables, distance as proxy of transportation cost has not significant effect on Indonesia's fish export even though the expected sign is appropriated. Moreover, the F-statistic is more than F-table. It means all of explanatory variables have significant power to explain the dependent variable simultaneously.

The coefficient of determination (R^2) value and adjusted R^2 value of the model are 0.8983 and 0.8872, respectively. It means variance of the export to major importing countries (Japan and USA) could be explained by the model as much as 88.72% while the rest could be explained by variables outside the model which are represented by the error term.

5.3.3. Model significance

The result of Wald test for coefficients restriction (presented in table 5.2) shows that model has explanatory power over explanatory variables (export flows). The F-statistics is 59.4336 while F-table 5 percent level of alpha is 2.34 (for 5 numerators and 55 denominators). It means that the restricted regression which assume all explanatory variables are equal to zero seem to be invalid. Therefore, the model is sufficient for further analysis on bilateral trade flows.

Table 5.2 Wald Test for Coefficients Restriction Results

Test Statistic	Value	df	Probability
F-stat	59.4336	(5, 55)	0.0000

5.3.4. Classical Assumption Test

The first assumption is that the model is free from multicollinearity problem. This study uses Klien's rule of thumb to test the multicollinearity problem. In accordance with the rule of thumb, which suggests that multicollinearity may be a trouble some problem only if the R^2 obtained from an auxiliary regression is greater than the overall R^2. The result of following table is the summary of the auxiliary regression results which is attached in appendix 8.

Table 5.3 Summary of the auxiliary regression results

Regression	**R^2 Auxiliary compared to R^2 Overall**	**Conclusion**
R^2 PROD, YCAPD, DIS, NER, RP	0.873 < 0.898	Low multicollinearity
R^2 YCAPD, DIS, NER, RP, PROD	0.879 < 0.898	Low multicollinearity
R^2 DIS, NER, RP, PROD, YCAPD	0.689 < 0.898	Low multicollinearity
R^2 NER, RP, PROD, YCAPD, DIS	0.866 < 0.898	Low multicollinearity
R^2 RP, PROD,YCAPD, DIS, NER	0.881 < 0.898	Low multicollinearity

The above table showed that there is no serious multicollinearity in the model (low multicollinearity).

The next assumption, there is no correlation among disturbances (autocorrelation). According to Nachrowi and Usman (2006), Fixed Effect Model does not require this assumption to hold, so the test could be ignored.

The last assumption is a variant of each error term is constant (homoscedasticity) and breach of this assumption called heteroscedasticity. To detect the heteroscedasticity problem this study use LM test and the results show that model has heteroscedasticity problem in any level of alpha (presented in table 5.4 below).

Table 5.4 The LM Test Results

LM-Stat	Chi-square table		Result	Conclusion
	α	χ^2 table		
30.014	1%	6.635	LM stat > χ^2 table	Heteroscedasticity
	5%	3.841	LM stat > χ^2 table	Heteroscedasticity
	10%	2.706	LM stat > χ^2 table	Heteroscedasticity

Eviews 5.1 provides feature to eliminate heteroscedasticity problem. It could be done by choosing White cross section in option feature. The summary of final estimation result after applied White cross section for heteroscedasticity correction is shown in table 5.6 below.

Table 5.5 Model for Export Analysis

Export to Major Importing Countries			
Variable (Ln)	**Coefficient**		
Production	0.866573	(2.135879)	**
Importer's Income	1.954392	(5.293494)	***
Distance	-0.282472	(-1.433015)	
Exchange Rate	1.039328	(9.833725)	***
Relative Price of Export	0.058916	(1.930516)	*
Constanta	-9.71466	-1.074463	
Fixed Effects (Cross)			
_JPN--C	2.390658		
_USA--C	-2.390658		
R^2	0.8983		
Adjusted R^2	0.8872		
SSR	18.2641		
DW stat	0.4899		

Notes: ***, **, and * means significant at 1%, 5%, and 10%
t-statistics are in parentheses

5.4. The Interpretation of the Estimation Result

According to the model estimation, some explanatory variables such as production capacity, importer's income, exchange rate, and relative price influence to Indonesia's fish export statistically significant and fit with hypotheses. Meanwhile, although the sign is correct the distance variable has not influence to Indonesia's fish export. Because of the estimation use double log model so the interpretation is elasticity of each explanatory variable to dependent variable. In detailed, the interpretation of each variable is described as under.

5.4.1. The Intercept of the Model

The empirical model being used in this study is FEM which intercepts for each cross section unit (country) are vary, but the slope coefficient is constant. Table 5.6 above shows that the intercept of the empirical model is insignificant at any level of alpha. The individual effect of each country respectively is 2.390658 for Japan and -2.390658 for USA of which it describes difference between one to other countries. Therefore, it could be concluded that the average of export change of Japan is higher than USA.

5.4.2. The Production on Indonesia's Fishery Commodity

Production has positive sign coefficient and affects on Indonesia's fish exports significantly. The model proves significant acceptance of the hypothesis at 5% level of alpha. It means that the increasing production on Indonesia's fish commodity increases Indonesia's fish export to Japan and USA as major importing countries. As the results show, the elasticity of Indonesia's fishery export to these countries related to production capacity on Indonesia's fishery commodity is about 0.87%. It means that if the production capacity on Indonesia's fishery commodity rises in 1%, on average, the Indonesia's fish export will increase amount 0.87% with the assumption ceteris paribus.

The elasticity coefficient of production on Indonesia's fish commodity is less than one. Due to this fact, the production capacity changing on Indonesia's fish exports has inelastic character. It indicates that although production is one of major factor which able to boost Indonesia fishery exports to partner countries;

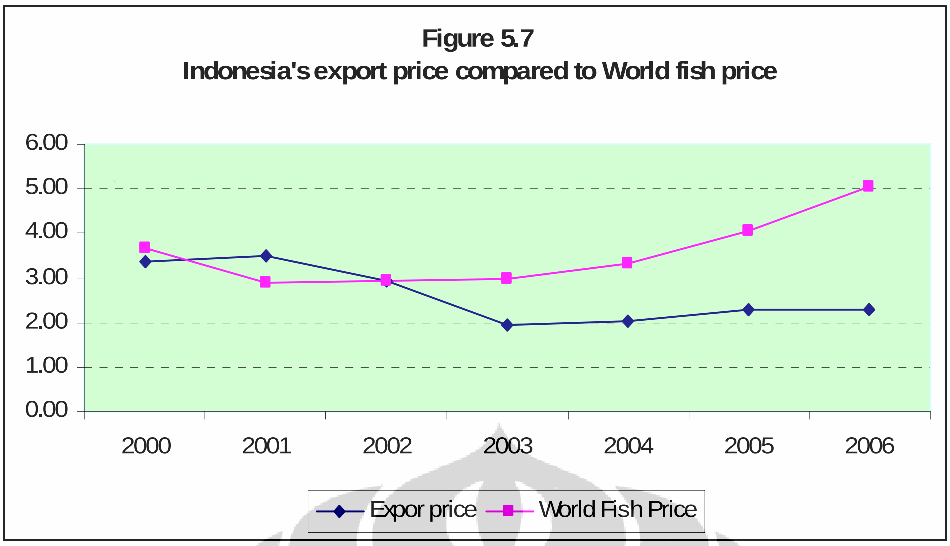
Indonesia’s fishery export is relatively less responsive to changes on production on Indonesia’s fishery commodity.

5.4.3. The Importers’ Real Income

Importer’s real income has positive sign coefficient and affects on Indonesia’s fish exports significantly. The model proves significant acceptance of the variable’s hypothesis at 1% level of alpha. The result shows that the elasticity coefficient of the Indonesia’s fishery export respect to importers’ real income is about 1.95%. It suggests that if importers’ real income rises in 1%, on average, the Indonesia’s fishery export will increase about 1.95% with the assumption ceteris paribus.

The elasticity coefficient of importer’s real income is more than one. It implies changing of real income in importing countries has elastic character to Indonesia’s fish exports which shows that Indonesia’s fishery export relatively more responsive to changes on consumers’ income in destination country. This condition is reasonable because the price of Indonesia’s fish commodity is lower than world price (presented in figure 5.7 as under).

Increasing on real income indicates high demand, prospects for economic of scale and absorptive capacity. So, it implies the potential market for Indonesia’s product particularly fish commodity to export more. Moreover, the increase on real income per capita implies the increase on the average standard of living of the country. Therefore, Indonesia’s exporters must fulfill the requirements to export these markets i.e. health standards, packaging standards, environment standards, etc.

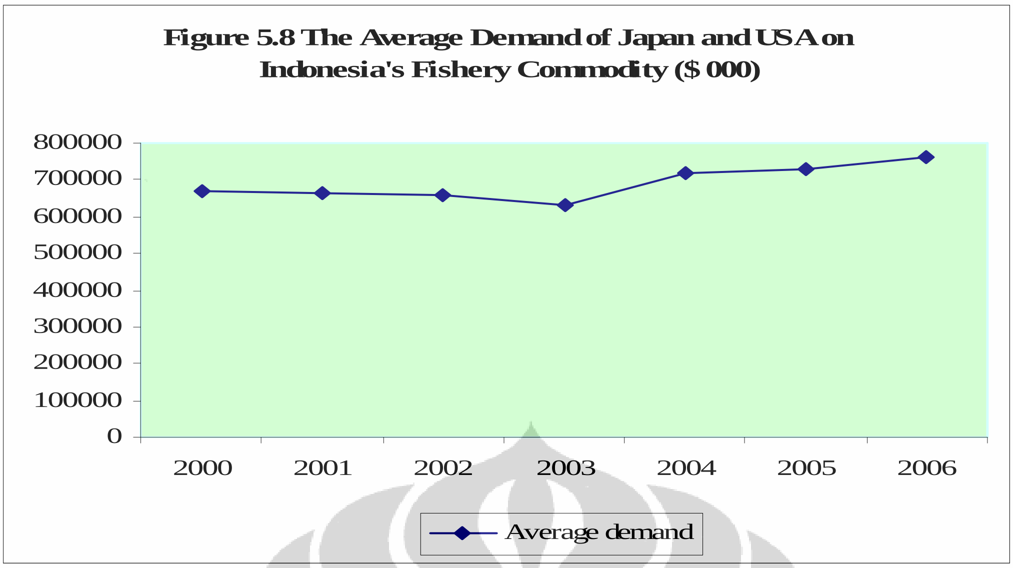


Source: IFS and FAO, processed.

5.4.4. Distance between Host Country and Destination Country

The distance variable as proxy of transportation cost statistically insignificant affects on Indonesia's fishery export flows to Japan and USA as major importing countries. It implies that these countries did not see distance as restriction on their trade activities. It might be affected by other variable such as consumers' income in importing countries which generates demand on Indonesia fish commodity. The figure 5.8 below shows average demand of these countries on Indonesia's fishery export increases on average.

The estimation result in line with Melitz (2005) who concluded that since World War II the impact of differences between North and South on bilateral trade has also been decreasing. It might be as consequence of the weakening of the influence of distance. The impact of distance clearly declined over recent decade. It might be caused by advancement of technology and information (ICT) which affects on transaction cost reduction.



Source: WITS, processed.

5.4.5. The Nominal Exchange Rate

The estimation result shows that the nominal exchange rate has appropriate sign with the hypothesis and statistically significant affects on Indonesia's fishery export. The model proves significant acceptance of the variable's hypothesis at 1% level of alpha. The result shows that the elasticity coefficient of the Indonesia's fishery export respect to nominal exchange rate is about 1.04%. It suggests that if nominal exchange rate goes up by 1%, on average, the Indonesia's fishery export will goes up by 1.04% with the assumption ceteris paribus.

The elasticity coefficient of nominal exchange rate is more than one. It means changing of nominal exchange rate has elastic character to Indonesia's fish exports which shows that Indonesia's fishery export relatively more responsive to changes on exchange rate. The depreciation on exchange rate causes the price of Indonesia's fish cheaper than before for foreign market. So, it generates the demand of this commodity.

5.4.6. Relative Price of Export

Relative price has positive sign coefficient and affects on Indonesia's fish exports to Japan and USA as major importing countries statistically significant. The estimated model proves the significant acceptance of the variable's hypothesis at 10% level of alpha. The result shows that the elasticity coefficient of the

Indonesia's fishery export respect to relative price of export is about 0.06%. It indicates that if relative price of export increases by 1%, it will increase Indonesia's fish export amount 0.06% with the assumption ceteris paribus.

It appropriates with the supply theory which said that increasing of price lead to increasing of supply and producers will get the gain from these condition. The elasticity coefficient of relative price of export shows that relative price has inelastic character. Although inelastic, the positive relation between relative price and Indonesia's fish export show that increasing of relative price of export will boost exporters to increase supply of Indonesia's fish commodity to destination countries.

5.5. The Empirical Model of Ordinary Least Square on Indonesia's Fishery Export to Japan

5.5.1. Model

The empirical model on Indonesia' fishery export to Japan is summarized in table 5.6 as follow:

Table 5.6 Estimation result of Indonesia' fishery export to Japan

Variable (Ln)	Coefficient		
C	-17.9712	(-2.184162)	**
Production	0.147253	(0.597289)	
Distance	-0.29986	(-3.542025)	***
Exchange rate	2.187751	(2.623273)	***
Export Price	-0.26749	(-1.874419)	*
Income per capita	2.577282	(3.961973)	***
R-squared	0.960325		
DW-statistic	1.045155		

Notes: ***, **, and * means significant at 1%, 5%, and 10%
t-statistics are in parentheses

According to t-test, the above table shows that production capacity statistically insignificant affects on Indonesia's fishery export to Japan in any level of alpha. Moreover, the distance variable, exchange rate, and real income per capita statistically significant affect on Indonesia's fishery export to Japan in 1% level of alpha while export price variable statistically significant affect on Indonesia's fishery export to Japan in 10% level of alpha. In addition, based on F-test all of explanatory variables have significant power to explain the dependent variable simultaneously. The coefficient of determination (R^2) value is 0.9603. It means variance of the Indonesia's fishery export to Japan could be explained by the model as much as 96.03% while the rest could be explained by variables outside the model which are represented by the error term. The model had been run in double log model and all of variables' sign are correct.

The *White Heterocedasticity test* shows that the model is free from heterocedasticity problem, since the Obs*R-squared result in estimation regression less than critical value (14.31 < χ^2 = 18.3070, where df=10, α = 5%). The result of heterocedasticity test is presented as under.

Table 5.7 White Heteroskedasticity Test

F-statistic	1.671591	Prob. F(10,23)	0.148606
Obs*R-squared	14.31016	Prob. Chi-Square(10)	0.159309

Since the Obs*R-squared result in estimation regression more than critical value (7.36 > χ^2 = 5.99, where df=2, α = 5%), the Breusch-Godfrey Serial Correlation LM test shows that the model has autocorrelation problem. The result of autocorrelation test is presented as under.

Table 5.8 Breusch-Godfrey Serial Correlation LM Test

F-statistic	3.589722	Prob. F(2,26)	0.04201
Obs*R-squared	7.356997	Prob. Chi-Square(2)	0.025261

By using correlation matrix, the multicollinearity test shows that the model has multicollinearity problem between explanatory variables. The following table explains the result of multicollinearity test.

Table 5.9 Correlation matrix

	LOG(PROD)	LOG(DIS)	LOG(NER)	LOG(XP)	LOG(YCAPD)
LOG(PROD)	1.00000	0.44343	-0.92218	0.57035	0.95125
LOG(DIS)	0.44343	1.00000	-0.23759	0.46685	0.30274
LOG(NER)	-0.92218	-0.23759	1.00000	-0.62045	-0.99321
LOG(XP)	0.57035	0.46685	-0.62045	1.00000	0.62860
LOG(YCAPD)	0.95125	0.30274	-0.99321	0.62860	1.00000

The above table shows that production, nominal exchange rate, and income per capita have high collinearity. So, for the following analysis this model must be corrected. Since these variables are main determinants on Indonesia's fishery export, dropping one of these variables is worried create specification bias/error. Therefore, the model is corrected by transforming the variables.

The summary of final estimation result after applied treatment for autocorrelation and multicollinearity correction is shown in table 5.10 below.

Table 5.10 Estimation Result of Indonesia' Fishery Export to Japan After Autocorrelation and Multicollinearity Correction

Variable (Ln)	Coefficient		
C	-0.08124	(-1.439)	
Production	1.65991	(1.482993)	
Distance	-0.18905	(-2.27697)	**
Exchange rate	3.11895	(2.903452)	***
Export Price	-0.73702	(-4.5567)	***
Income per capita	3.27884	(3.171613)	***
R-squared	0.627291		
DW-statistic	1.921335		

Notes: ***, **, and * means significant at 1%, 5%, and 10%
t-statistics are in parentheses

The next test is normality test. The Jarque-Bera (JB) statistic result in estimation regression is less than critical value ($0.482675 < \chi^2 = 11.0705$, where df=5, $\alpha = 5\%$). It means that the residual of the model has distributed normally. The result of normality test is enclosed in appendix 19.

The result of Chow test for structural change of variables' behavior (presented in table 5.11) shows that the F-statistics is 0.6561 while F-table 5 percent level of alpha is 2.58 (for 7 numerators and 18 denominators). It means that the model has not structural change regarding economic crisis in the end 1997. Therefore, the model is sufficient for further analysis on bilateral trade flows.

Table 5.11 Chow Breakpoint Test: 1997

F-statistic	0.656147	Prob. F(7,18)	0.705328
Log likelihood ratio	7.272626	Prob. Chi-Square(7)	0.401057

5.5.2. The Interpretation of the Estimation Result

According to the model estimation, some explanatory variables such as income per capita in importing country, exchange rate, export price, and distance are statistically significant influence to Indonesia's fishery export and appropriate with hypotheses. Meanwhile, although the sign is correct production capacity has not influence to Indonesia's fishery export. Because of the estimation use double log model so the interpretation is elasticity of each explanatory variable to dependent variable. In detailed, the interpretation of each variable is described as under.

5.5.2.1. The Income Per Capita

Real income per capita in Japan has positive sign and statistically significant affects on Indonesia's fishery exports to Japan at 1% level of alpha. The result shows that the coefficient of the Indonesia's fishery export respect to real income per capita is about 3.28. It suggests that if real income per capita rises in 1%, on average, the Indonesia's fishery export will increase about 3.28% with the assumption ceteris paribus.

The elasticity coefficient of importer's real income implies that changing on real income per capita in importing countries has elastic character to Indonesia's fishery exports. It shows that Indonesia's fishery export relatively more responsive to changes on consumers' income in destination country. This condition is reasonable because the prices of Indonesia's fishery commodities are relatively lower than world price (as presented in figure 5.7). Furthermore, increasing on real income indicates high demand, prospects for economic of scale and absorptive capacity. So, it implies the potential market for Indonesia's product particularly fishery commodities to export more. Moreover, the increase on real income per capita implies the increase on the average standard of living of the country. Therefore, Indonesia's exporters must fulfill the export requirements to Japan i.e. health standards, packaging standards, environment standards, etc.

5.5.2.2. Distance between Indonesia and Japan

The distance variable as proxy of transportation cost statistically significant affects on Indonesia's fishery export flows to Japan. Since the shipment of export commodities use fuel, the distance in this study multiplied by world crude oil price. So, it is hoped represent the transportation cost. The negative sign of this variable implies that distance as proxy of transportation cost restrict on bilateral trade activities.

The result shows that the coefficient of the Indonesia's fishery export respect to distance is about 0.19. It suggests that if transportation cost increase by 1%, on average, the Indonesia's fishery export will decrease about 0.19% with the assumption ceteris paribus.

Although inelastic, the negative relation between distance and Indonesia's fishery export show that increase on transportation cost will reduce consumer demand on Indonesia's fishery commodity in Japan market. Increasing on world oil price influence to the transportation cost. It will increase cost of production and in the end will increase the price of commodities. By assuming constant purchasing power, importer will reduce quantity demanded on Indonesia's fishery commodities regarding increasing on transportation cost and price of commodity.

5.5.2.3. The Nominal Exchange Rate

The estimation result shows that the nominal exchange rate has appropriate sign with the hypothesis and statistically significant affects on Indonesia's fishery export at 1% level of alpha. The result shows that the coefficient of the Indonesia's fishery export respect to nominal exchange rate is about 3.12%. It suggests that if nominal exchange rate goes up by 1%, on average, the Indonesia's fishery export will goes up by 3.12% with the assumption ceteris paribus.

The nominal exchange rate has elastic character. It means that Indonesia's fishery export relatively more responsive to the change on exchange rate. The depreciation on exchange rate causes the price of Indonesia's fishery commodities cheaper than before for Japanese. So, it generates the demand of this commodity increase.

5.5.2.4. The Export Price

Export price has negative sign coefficient and statistically significant affects on Indonesia's fishery exports to Japan at 1% level of alpha. The result shows that the coefficient of the Indonesia's fishery export respect to export price is about 0.74. It means that if export prices increases by 1%, the Indonesia's fishery export goes up by 0.74% with the assumption ceteris paribus.

It appropriates with the demand theory which said that increasing of price lead to decreasing of quantity demanded and consumer will substitute it with cheaper product. The elasticity coefficient of exports price shows that it has inelastic character. Although inelastic, the negative relation between export price and Indonesia's fishery export show that increase of export price will reduce consumer demand on Indonesia's fishery commodity in Japan market.

5.5.2.5. The Production on Indonesia's Fishery Commodity

Production has positive sign coefficient. Although the production capacity on Indonesia's fishery exports has elastic character, it statistically insignificant affects on Indonesia's fishery exports. It means that increase on Indonesia's fishery production did not determine Indonesia's fishery export to Japan.

The estimation result shows that although supply capacity is one of the main aspects on trade activities, there are so many factors which are determine bilateral trade flow. These factors divided into two categories that are tariff barriers and non-tariff barriers (NTBs) such as political issues, environmental issues, health and technical standard, etc.

5.6. The Empirical Model of OLS Regression on Indonesia's Fishery Export to United States of America (USA)

5.6.1. Model

The summary of estimation result on Indonesia' fishery export to USA is presented in following table.

Table 5.12 Estimation Result of Indonesia' Fishery Export to USA

Variable (Ln)	Coefficient		
C	-107.9856	-3.307862	***
Production	1.702954	0.799256	
Distance	-0.15987	-0.505472	
Exchange rate	-1.12094	-1.850353	*
Export Price	-1.477287	-2.240975	**
Income per capita	9.811807	1.54503	
R-squared	0.796217		
DW-statistic	0.990253		

Notes: ***, **, and * means significant at 1%, 5%, and 10%
t-statistics are in parentheses

Based on t-test, the above table shows that production capacity, distance, and real income per capita are statistically insignificant affect on Indonesia's fishery export to USA in any level of alpha. Meanwhile, exchange rate and export price are statistically significant affect on Indonesia's fishery export to USA, respectively, in 10% and 5% level of alpha. In addition, related to F-test all of explanatory variables have significant power to explain the dependent variable simultaneously. The coefficient of determination (R^2) value is 0.7962. It means variance of the Indonesia's fishery export to Japan could be explained by the model as much as 79.62% while the rest could be explained by variables outside the model which are represented by the error term. The model had been run in double log model and all of variables' sign are correct except nominal exchange rate. It implies that the J curve was run. The depreciation of domestic currency to US dollar is not responded by increase on Indonesia's fishery exports automatically since it needs adjustment time. The fishery commodities production needs long time. It needs more than three months.

The White Heterocedasticity test shows that the model is free from heterocedasticity problem, since the Obs*R-squared result in estimation regression less than critical value (11.91 < χ^2 = 18.3070, where df=10, α = 5%). The result of heterocedasticity test is presented as under.

Table 5.13 White Heteroskedasticity Test

F-statistic	1.240054	Prob. F(10,23)	0.31867
Obs*R-squared	11.90994	Prob. Chi-Square(10)	0.291129

Since the Obs*R-squared result in estimation regression more than critical value (11.46 > χ^2 = 5.99, where df=2, α = 5%), the Breusch-Godfrey Serial Correlation LM test shows that the model has autocorrelation problem. The result of autocorrelation test is presented as under.

Table 5.14 Breusch-Godfrey Serial Correlation LM Test

F-statistic	6.607969	Prob. F(2,26)	0.004782
Obs*R-squared	11.45814	Prob. Chi-Square(2)	0.00325

The multicollinearity test which uses correlation matrix shows that the model has multicollinearity problem between explanatory variables. The following table explains the result of multicollinearity test.

Table 5.15 Correlation matrix

	LOG(YCAPD)	LOG(PROD)	LOG(NER)	LOG(DIS)	LOG(XP)
LOG(YCAPD)	1.000000	0.991146	0.978317	0.439413	0.531598
LOG(PROD)	0.991146	1.000000	0.964387	0.443433	0.569894
LOG(NER)	0.978317	0.964387	1.000000	0.402935	0.447552
LOG(DIS)	0.439413	0.443433	0.402935	1.000000	0.466917
LOG(XP)	0.531598	0.569894	0.447552	0.466917	1.000000

The above table shows that production, nominal exchange rate, and income per capita have high collinearity. So, for the following analysis this model must be corrected. Since these variables are main determinants on Indonesia's fishery export, dropping one of these variables is worried create specification bias/error. Therefore, the model is corrected by transforming the variables.

The summary of final estimation result after applied treatment for autocorrelation and multicollinearity correction is shown in table 5.16 below.

Table 5.16 Estimation Result of Indonesia' Fishery Export to USA After Multicollinearity and Autocorrelation Treatment

Variable (Ln)	Coefficient		
C	-0.86837	-3.20139	***
Production	14.96650	3.50495	***
Distance	-0.45613	-1.40682	
Exchange rate	0.46419	1.26563	
Export Price	-0.17080	-0.28027	
Income per capita	11.73625	2.85160	***
R-squared	0.5256		
DW-statistic	1.86058		

Notes: ***, **, and * means significant at 1%, 5%, and 10%
t-statistics are in parentheses

The normality test shows that the residual of the model has distributed normally. The Jarque-Bera (JB) statistic result in estimation regression is less than critical value (1.412 < χ^2 = 11.0705, where df=5, α = 5%). The result of normality test is enclosed in appendix 25.

The Chow test result for structural change of variables' behavior shows that the F-statistics is 0.28 while F-table 5 percent level of alpha is 2.61 (for 7 numerators and 17 denominators). It means that the model has not structural change regarding economic crisis in the end 1997. Therefore, the model is sufficient for further analysis on bilateral trade flows (presented in table 5.17).

Table 5.17 Chow Breakpoint Test: 1997

F-statistic	0.280414	Prob. F(7,17)	0.953037
Log likelihood ratio	3.387408	Prob. Chi-Square(7)	0.847003

5.6.2. The Interpretation of the Estimation Result

According to the model estimation, some explanatory variables such as production capacity and income per capita in importing country statistically significant affect on Indonesia's fishery export and appropriate with hypotheses. Meanwhile, although the sign is correct the export price, distance, and exchange rate variables has not influence to Indonesia's fishery export. The interpretation in this study is elasticity of each explanatory variable to dependent variable since the model is estimated in double log model. In detailed, the interpretation of each variable is described as under.

5.6.3. The Production on Indonesia's Fishery Commodity

Production has positive sign coefficient and affects on Indonesia's fishery exports significantly at 1% level of alpha. It means that increasing on Indonesia's fishery production will increase Indonesia's fishery export to USA. The elasticity of Indonesia's fishery export to USA related to production on Indonesia's fishery commodity is about 14.97%. It means that if the production capacity on Indonesia's fishery commodity goes up by 1%, on average, the Indonesia's fishery export goes up by 14.97% with the assumption ceteris paribus.

The production capacity on Indonesia's fishery exports has elastic character which indicates that production is one of major factors which able to boost Indonesia fishery exports to partner countries. Therefore, Indonesia's fishery export is relatively more responsive on changing of Indonesia's fishery production.

5.6.4. The Income Per Capita

Real income per capita in USA has positive sign and statistically significant affects on Indonesia's fishery exports to USA at 1% level of alpha. The estimation shows that the coefficient of Indonesia's fishery export respect to real income per capita is about 11.74. It suggests that if real income per capita rises in 1%, on average, the Indonesia's fishery export increase about 11.74% with the assumption ceteris paribus.

Real income per capita has elastic character on Indonesia's fishery exports. It shows that Indonesia's fishery export relatively more responsive to changes on consumers' income in USA. This condition is reasonable because the export prices of Indonesia's fishery commodities are relatively lower than world price (as presented in figure 5.7). Furthermore, increasing on real income indicates high demand, prospects for economic of scale and absorptive capacity. So, it implies the potential market for Indonesia's product particularly fishery commodities. Moreover, increase on real income per capita implies increase on the living standard average. Therefore, Indonesia's exporters must fulfill the export requirements to USA markets such as health standards, packaging standards, environmental standards, etc.

5.6.5. Distance between Indonesia and USA

The distance variable as proxy of transportation cost statistically insignificant affects on Indonesia's fishery export flows to USA. It implies that this country did not see distance as restriction on bilateral trade activities. Trade flows might be affected by other variables such as consumers' income in importing countries which generates demand on Indonesia fishery commodity, free trade agreement and others.

The estimation result in line with Melitz (2005) who concluded that since World War II the impact of differences between North and South on bilateral trade has also been decreasing. It might be as consequence of weak of distance's influence trade flows. The impact of distance clearly declined over recent decade. It might be caused by advancement of technology and information (ICT) which affects on transportation and transaction cost reduction.

5.6.6. The Nominal Exchange Rate

Although the estimation result shows that the nominal exchange rate has appropriate sign with the hypothesis, this variable statistically insignificant affects on Indonesia's fishery export. The depreciation on exchange rate which causes the price of Indonesia's fishery cheaper than before for USA is not major consideration to import Indonesia's fishery commodities. This finding is appropriate with Chow test result which explains that there is not structural change on Indonesia's fishery exports behavior to USA regarding on Indonesia's economic crisis in the end of 1997.

5.6.7. The Export Price

Although export price has correct sign, this variable statistically insignificant affects on Indonesia's fishery exports to USA. The negative sign shows that it appropriates with the demand theory which said that increase on price lead to decreasing of quantity demanded and consumer will substitute it with cheaper product. In this case, consumers in USA has not see export price as main consideration to consume Indonesia' fishery commodity. Moreover, the estimation result shows that although price is one of the main considerations on trade activities, there are other factors which are determine bilateral trade flow between Indonesia and USA such as political issues, environmental issues, health and technical standard, etc.

5.7. Other Factors

There are so many factors that affect on Indonesia's fishery export beside factors which are explained above. These factors are divided into two groups; tariff barrier and non tariff barriers. Many countries use tariffs as main tool to protect their national interests. Tariffs have been seen effective tools prevent foreign products to enter domestic market.

In line with globalization on trade, the tariff barriers tend to decrease recently. Meanwhile, as consequence of tariff reduction many countries replace tariffs by non tariff barriers to protect their national interest. This phenomenon develops almost in every country rapidly. The non tariff barriers include:

1. **Political issues.** Generally, this issue is used by powerful countries to impose their interest to partner country. It has used as tool to stressing their hegemony. By using their power they influence other country to reduce trade flow with

partner country if the partner country has not follow their interest. Indonesia was experienced in 1960s.

2. **Environmental issues.** Nowadays, it has actual issue on non tariff barriers. Environment damage becomes actual issue to impede bilateral trade flow. For example, anti fishpond shrimp campaign by Global Aquaculture Alliance is one of external factors which obstruct the expansion of Indonesia's fishery exports. According to their reason, making of fishpond shrimp will break mangrove forest and ecosystem. Increasing demand of fishery product push opening farm for fishery aquaculture and in the end push natural damage widely due to over food stuff or drugs beside lessen of mangrove forest. Moreover, forest damage which has been occurred in Indonesia becomes one of reasons for country partner which reduces bilateral trade flow. These situations harm Indonesian exporters.
3. **Health and technical standards.** Other factors that become constraint and challenge at the same time to Indonesia's fishery export are rules and policies which are applied in destination countries. Policies and regulations that applied in every country are different. It depends on situation and characteristics in destination countries.

   a) **Japan**

   Law and regulations that applied in Japan related to fishery product trade are very typical and specific like the one that applied internationally. So, product selling to Japan market should consider requirements such as content measurement, form, and taste.

   There are two standards which are applied in Japan. First, Japan Agriculture Standard (JAS) which is applied on agriculture, fishery, and forestry products. JAS and Label Quality released by Japan Ministry of Agriculture, Fishery, and Forestry. It is especially addressed to product which conducting in bio organic, pesticide or other chemicals. Second, Japan Industry Standard (JIS) that applied for industrial products. It was released by Japan Ministry of Industrial and Trade as a tool to protect consumer, safety and security secure on its use. Moreover, Japan would apply "Traceability System" continuously and clamp down on antibiotic usage beside existence of microbiology standard.

b) USA

Export expansion of Indonesia's fishery commodities to United States face various constraints especially non-tariff barriers such as the impact of Anti-Dumping Petition and Product Certification application. Moreover, fishery and marine products, fruits, vegetables and nuts must fulfill import clauses like size, quality and packaging which will be investigated and certified by Food Safety and Quality Service, US Department of Agriculture. There are several rules in United States such as **Bioterrorism Act 2002.** It has been applied since 12th June 2002 as an effort of United States government to prevent international terrorism. It includes:

1. **Application Plan of Zero Tolerance to Antibiotic residue**. The application plan of this rule becomes impediment for Indonesia's fishery export since difficulties to detect antibiotic content in fishery product. Meanwhile, zero tolerance has been implemented on fishery and oceanic product export especially for Chloramphenicol and nitro furan element in European Union.
2. **Environment, Health, and Social Issues**. Environmental issue obstructs export expansion of fishery and oceanic product. For example, dolphin issue which make tuna export shake several years ago. In addition, protection issue on turtle population which push usage on Turtle Excluder Device (TED) in shrimp capture which will be exported to United States.
3. **Country of Original Labeling (COOL).** It had been implemented since 4th April 2005. This regulation valid for fish and cockles aquaculture (farm-raised fish and shellfish) and exported to United States in the form of fresh or frozen. If the exporter could not fulfill this rule, the consequence which must be received is rejection of product in admission port and penalty till US$ 10.000 to each exporter and importer for every case or mistake.

The rules application as mentioned above increases cost of production indirectly which must be counted on producer. So, it will affect on product competitiveness in destination country.

CHAPTER VI
CONCLUSION AND SUGGESTION

6.1. Conclusion

According to explanation in the previous chapter about the results and analysis of Indonesia's fishery exports, it could be concluded that:

a. In general, Indonesia's fishery export activities to the major importing countries are determined by:
   - Indonesia's fish production which represent supply capacity. Increasing on production will increase possibility of Indonesia's fish export to major importing countries.
   - Real income per capita in importing countries. The higher real income per capita, the more possibility of Indonesia's fish export to major importing countries.
   - Nominal exchange rate. The depreciation of rupiah to partner countries' currency makes Indonesia's fishery commodity cheaper for foreigner. It generates the demand of Indonesia's fishery commodity.
   - Relative price of exports. The higher relative price of export attracts exporters to export more to major importing countries.
   - Distance as proxy of transportation cost. Increasing on transportation cost will reduce the demand of Indonesia's fishery commodities from major importing countries.

b. The Indonesia's fishery export flows to Japan are determined by income per capita of Japanese, distance, exchange rate, and export price. Meanwhile, although production capacity is one of primary determinants, in this study, this variable statistically insignificant affects on Indonesia's Fishery exports.

c. The Indonesia's fishery export flows to USA are determined by income per capita and production capacity while distance variable, exchange rate, and export price statistically insignificant affect on Indonesia's Fishery exports.

d. The other factors which determine bilateral trade flow on fishery commodities between Indonesia and country partner outside above variables are political issues, environmental issues, health and technical standard, etc.

6.2. Policy Implications

Regarding to the results of the study some recommendations for stakeholders, including:

a. Fishery commodity is one of the potential commodities which contribute to get more foreign exchange. Therefore, availability of supply must be increased to maintain export market share of this commodity. Furthermore, increasing of added value of fishery products should be done by producers to develop existing market share beside efficiency of production and increasing quality of products.
b. In line with increasing of real income per capita in destination countries, Indonesian producers must fulfill export requirements to destination market regarding health standards since health products will create high demand. In the end, it will increase market share of Indonesia's fishery exports in country partner.
c. Because of several limitations in this research, it is recommended for further research:
   - In a fact, there are several trade barriers. It includes tariff barriers and non tariff barriers (NTBs). Moreover, infrastructure is one of requirements to attract investment in this sector. Therefore, it is better to do an analysis using these variables. Putting these variables may give different result.
   - This research only put two destination countries to analysis the behavior of Indonesia's fish export while more than two countries in the fact. So, the further research should put the other destination countries in the model.

References

Abou-Stait, F. (2005). Are Exports the Engine of Economic Growth? An Application of Co-integration and Causality Analysis for Egypt, 1977-2003. *Economic Research Working Paper Series*, Tunis: African Development Bank.

Anderson, J.E. (1979). A theoretical foundation for the gravity equation. *The American Economic Review*, 69, 106-116.

Aisya, Lia Kamelia. (2003), Analisis pengaruh kebijakan moneter, terhadap ekspor perikanan Indonesia, *Tesis*, Program Pascasarjana Bidang Ilmu Ekonomi, Universitas Indonesia.

Ayu, Sagita., (2007), Standard and technical regulation in agriculture: impact on indonesia export to countries of the EU, *Thesis*, Master of Planning and Public Policy, University of Indonesia.

Baltagi, Badi H. (1995). *Econometric analysis of panel data*. New York: John Wiley and Sons.

Bergstrand, J.H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. *The Review of Economics and Statistics*, 67, 474-481.

Blanchard, Oliver. (2006). *Macroeconomics*. Singapore: Pearson Prentice Hall.

Breusch, F. and Egger. (1999). How reliable are estimations of east-west trade potentials based on cross-section gravity analyses. *Empirica*, 26(2), 81-99.

Deardoff, A. (1995). Determinants of bilateral trade: does gravity work in a neo-classical world? *NBER Working Paper 5377.* December.

Deardorff, Alan V. (1998). Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World? In Jeffrey A. Frankel, ed., *The Regionalization of the World Economy*. Chicago: University of Chicago Press.

Departemen Kelautan dan Perikanan. (2005). P*eta komoditi utama sektor primer, dan pengkajian peluang pasar serta peluang investasinya di Indonesia,* Jakarta: DKP.

Fakhrudin, Umar, et.al. (2007). *Info Komoditi Prioritas*. Jakarta: Balitbang Depdag,

Feenstra, Robert.C., Markusen, James R., and Rose, Andrew K. (2001). Using the gravity equation to differentiate among alternative theories of trade. *Canadian Journal of Economics*, 34 (2), 430-447.

Grahadyarini, BM Lukita. (2008, April 10). Menyikapi Kemelut Perikanan, www.kompas.com

Gujarati, D N. (2003). *Basic Econometrics* (4th ed.). New York: McGraw-Hill.

Jordaan, André C. and Eita, Joel Hinaunye. (2007). Determinants of south africa's exports of leather products. *Working Paper: 2007-21*, University of Pretoria.

Kuncoro, Mudrajad., (2001). *Metode kuantitatif, teori dan aplikasi untuk bisnis dan ekonomi*. Jogjakarta: UPP AMP YKPN.

Melitz, J., (2005). North, south and distance in the gravity model. *Working Paper No. 2005-11*, CREST-INSEE, University of Strathclyde, U.K. 1-18.

Nachrowi, N. Djalal., and Usman, Hardius. (2006). *Pendekatan populer dan praktis ekonometrika untuk analisis ekonomi dan keuangan*. Jakarta: Lembaga Penerbit FE UI.

Oguledo, V.I. and Macphee, C.R. (1994). Gravity models: a reformulation and an application to discriminatory trade arrangements. *Applied Economics*, 26, 107-120.

Pöyhönen, P. (1963) "A tentative model for the volume of trade between countries, *Weltwirtschaftliches Archiv*, 90, 93-99.

Rahman, Mohammad Mafizur. (2005) The determinants of bangladesh's trade: evidence from the generalized gravity model. *Working Papers ECON 2005-3*, School of Economics and Political Science, University of Sidney, Australia.

Salvatore, Dominick. (2007). *International Economics*. NJ: John Willey & Sons.

Sanso, M., Cuairan, Rogelio. and Sanz, Fernando. (1993). Bilateral trade flows, the gravity equation, and functional form, the review of economics and statistics, 75(2), pp.226-275.

Tinbergen, J. (1962). *Shaping the World Economy: Suggestions for an International Economic Policy*. New York: The Twentieth Century Fund.

Tsen, W.H. (2006). Granger causality tests among openness to international trade, human capital accumulation and economic growth in china: 1952-1999. *International Economic Journal*, 20(3), 285-302.

www.economy.okezone.com/index.php/ReadStory/2008/10/13/19/153612/ekspor-perikanan oktober desember tak menentu.

www.tempointeractive.com/hg/nasional/2009/01/07/brk,20090107-154277,uk. htmls shrimps.

Zarzoso, I Martinez. and Lehmann, F Nowak. (2003). Augmented gravity model: an empirical application to mercosur-european union trade flows, *Journal of Applied Economics*, 6(2), 291-316.

Appendix 1
The data of study

Country	Year	PROD	YCAPD	NER	DIS	RP
_JPN	1976	817,965,308	7.743	1.40	70,081	21.51
_JPN	1977	1,342,702,577	8.915	1.55	76,368	19.50
_JPN	1978	1,459,021,928	11.849	2.10	76,657	17.71
_JPN	1979	1,913,020,898	11.869	2.84	115,764	12.43
_JPN	1980	1,569,489,468	11.793	2.77	186,710	11.27
_JPN	1981	1,548,294,812	12.392	2.86	202,745	10.28
_JPN	1982	1,547,612,689	11.195	2.66	184,691	9.61
_JPN	1983	1,911,088,733	11.851	3.83	160,408	8.11
_JPN	1984	2,054,830,012	12.137	4.32	159,197	7.31
_JPN	1985	2,023,097,646	12.625	4.66	149,045	6.91
_JPN	1986	2,351,571,012	18.313	7.61	72,215	6.44
_JPN	1987	2,422,349,982	22.028	11.37	96,268	5.23
_JPN	1988	2,879,973,738	26.443	13.15	76,426	4.96
_JPN	1989	3,001,849,760	25.757	12.83	97,422	4.66
_JPN	1990	2,657,259,963	25.738	12.73	117,494	4.29
_JPN	1991	2,725,022,905	28.488	14.48	97,422	4.13
_JPN	1992	2,964,317,096	30.489	16.03	96,729	3.89
_JPN	1993	3,074,157,364	34.689	18.77	84,847	3.69
_JPN	1994	5,316,075,565	36.726	21.14	81,790	3.44
_JPN	1995	3,947,748,358	40.565	23.91	90,500	3.07
_JPN	1996	4,139,839,858	35.968	21.53	111,438	2.80
_JPN	1997	2,785,302,312	32.757	24.05	97,710	2.58
_JPN	1998	4,022,588,966	29.552	76.50	62,064	1.26
_JPN	1999	3,276,427,011	33.876	68.96	94,999	1.12
_JPN	2000	4,408,075,592	36.742	78.15	151,525	1.00
_JPN	2001	4,790,339,608	32.572	84.43	118,013	0.86
_JPN	2002	4,230,263,496	31.601	74.26	130,530	0.81
_JPN	2003	3,878,600,185	34.632	73.98	149,160	0.78
_JPN	2004	3,989,745,530	38.075	82.62	194,670	0.73
_JPN	2005	4,280,270,469	38.064	88.05	274,557	0.65
_JPN	2006	4,431,243,170	36.922	78.76	328,949	0.58

(continued)

Country	Year	PROD	YCAPD	NER	DIS	RP
_USA	1976	817,965,308	20.434	415.00	198,713	10.84
_USA	1977	1,342,702,577	21.177	415.00	216,540	10.09
_USA	1978	1,459,021,928	22.145	442.05	217,358	9.93
_USA	1979	1,913,020,898	22.625	623.06	328,245	7.47
_USA	1980	1,569,489,468	22.353	626.994	529,411	6.72
_USA	1981	1,548,294,812	22.688	631.76	574,878	6.60
_USA	1982	1,547,612,689	22.023	661.42	523,687	6.27
_USA	1983	1,911,088,733	22.782	909.27	454,833	5.39
_USA	1984	2,054,830,012	24.168	1,025.94	451,398	4.97
_USA	1985	2,023,097,646	24.906	1,110.58	422,613	4.71
_USA	1986	2,351,571,012	25.504	1,282.56	204,765	4.48
_USA	1987	2,422,349,982	26.092	1,643.85	272,965	3.85
_USA	1988	2,879,973,738	26.889	1,685.70	216,704	3.82
_USA	1989	3,001,849,760	27.551	1,770.06	276,236	3.69
_USA	1990	2,657,259,963	27.773	1,842.81	333,151	3.48
_USA	1991	2,725,022,905	27.431	1,950.32	276,236	3.31
_USA	1992	2,964,317,096	28.039	2,029.92	274,273	3.17
_USA	1993	3,074,157,364	28.480	2,087.10	240,582	3.10
_USA	1994	5,316,075,565	29.307	2,160.75	231,914	2.98
_USA	1995	3,947,748,358	29.720	2,248.61	256,610	2.77
_USA	1996	4,139,839,858	30.493	2,342.30	315,979	2.63
_USA	1997	2,785,302,312	31.530	2,909.38	277,054	2.41
_USA	1998	4,022,588,966	32.502	10,013.60	175,980	1.16
_USA	1999	3,276,427,011	33.595	7,855.15	269,367	1.06
_USA	2000	4,408,075,592	34.463	8,421.78	429,646	1.00
_USA	2001	4,790,339,608	34.362	10,260.90	334,623	0.89
_USA	2002	4,230,263,496	34.552	9,311.19	370,114	0.84
_USA	2003	3,878,600,185	35.057	8,577.13	422,940	0.85
_USA	2004	3,989,745,530	35.964	8,938.85	551,981	0.84
_USA	2005	4,280,270,469	36.651	9,704.74	778,498	0.79
_USA	2006	4,431,243,170	37.296	9,159.32	932,726	0.72

Source: Compiled from IFS, FAO, IEA, and www.distance.com

Appendix 2
Pooled least square model

Dependent Variable: LOG(EX?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:44
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(PROD?)	3.810491	0.626411	6.083048	0.0000
LOG(YCAPD?)	-1.24763	0.728412	-1.71281	0.0923
LOG(DIS?)	-0.93538	0.323154	-2.89453	0.0054
LOG(NER?)	-0.07991	0.126125	-0.63354	0.5290
WPID?/WPIO?	0.030246	0.080372	0.376327	0.7081
C	-48.1369	15.64322	-3.07717	0.0032

R-squared	0.694604	Mean dependent var	18.83162
Adjusted R-squared	0.667337	S.D. dependent var	1.716081
S.E. of regression	0.989784	Akaike info criterion	2.909105
Sum squared resid	54.8616	Schwarz criterion	3.114956
Log likelihood	-84.1823	F-statistic	25.4737
Durbin-Watson stat	0.78408	Prob(F-statistic)	0.00000

Appendix 3
Fixed effect model

Dependent Variable: LOG(EX?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:32
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.71466	9.815475	-0.98973	0.3266
LOG(PROD?)	0.866573	0.46005	1.883652	0.0649
LOG(YCAPD?)	1.954392	0.522381	3.741317	0.0004
LOG(DIS?)	-0.28247	0.198156	-1.42551	0.1597
LOG(NER?)	1.039328	0.129455	8.028487	0.0000
WPID?/WPIO?	0.058916	0.046873	1.256926	0.2141
Fixed Effects (Cross)				
_JPN--C	2.390658			
_USA--C	-2.39066			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.89833	Mean dependent var	18.83162
Adjusted R-squared	0.887239	S.D. dependent var	1.716081
S.E. of regression	0.576259	Akaike info criterion	1.841487
Sum squared resid	18.26411	Schwarz criterion	2.081648
Log likelihood	-50.0861	F-statistic	80.99419
Durbin-Watson stat	0.489883	Prob(F-statistic)	0.00000

Appendix 4
Chow test result

$$CHOW = \frac{(RRSS - URSS)/(N-1)}{URSS/(NT-N-K)} \quad = 110.209$$

F table = 4.016

Fstat > Ftab --> to explain model fixed effect better than PLS

CHOW TEST :

$$CHOW = \frac{(RRSS - URSS)/(N-1)}{URSS/(NT-N-K)}$$

RRSS adalah Sum Square Residual Pooled Least Square
URSS adalah Sum Square Residual Fixed Effect
N adalah banyaknya cross section
T adalah banyaknya series
K adalah banyaknya variable bebas
F stat mengikuti distribusi F dengan df N-1; NT-N-k

Appendix 5
Wald test result

Wald Test:
Pool: POOL01_REV

Test Statistic	Value	df	Probability
F-statistic	59.4336	(5, 55)	0.0000
Chi-square	297.168	5	0.0000

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.866573	0.46005
C(2)	1.954392	0.522381
C(3)	-0.28247	0.198156
C(4)	1.039328	0.129455
C(5)	0.058916	0.046873

Restrictions are linear in coefficients.

Appendix 6
Lagrange multiplier test

LM TEST to detect Heteroscedasticity

	_JPN	_USA
_JPN	0.036984	-0.00551
_USA	-0.00551	0.552181

SSR_FE 18.26411

	_JPN	_USA
_JPN	0.995954	1.000603
_USA	1.000603	0.940448

Sum diagonally
= 1.936402

Number of time series (T)
= 31

Number of cross section (n)
= 2

LM = T/2 *(sum of diagonal)

30.01423104

Chi-square (n-1=1)

X^2-tabel=	6.634897	$\alpha = 0.01$
X^2-tabel=	3.841459	$\alpha = 0.05$
X^2-tabel=	2.705544	$\alpha = 0.10$

Hypotesis
If Chi-square < LM, the estimation has heteroscedasticity, otherwise.
So, from the result above, it is concluded that the estimation has heteroscedasticity

Appendix 7
Repaired model after heteroscedasticity treatment

Dependent Variable: LOG(EX?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:35
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.71466	9.041412	-1.07446	0.2873
LOG(PROD?)	0.866573	0.405722	2.135879	0.0372
LOG(YCAPD?)	1.954392	0.369206	5.293494	0.0000
LOG(DIS?)	-0.28247	0.197117	-1.43302	0.1575
LOG(NER?)	1.039328	0.10569	9.833725	0.0000
WPID?/WPIO?	0.058916	0.030518	1.930516	0.0587
Fixed Effects (Cross)				
_JPN--C	2.390658			
_USA--C	-2.39066			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.89833	Mean dependent var	18.8316
Adjusted R-squared	0.887239	S.D. dependent var	1.71608
S.E. of regression	0.576259	Akaike info criterion	1.84149
Sum squared resid	18.26411	Schwarz criterion	2.08165
Log likelihood	-50.0861	F-statistic	80.9942
Durbin-Watson stat	0.489883	Prob(F-statistic)	0.00000

Appendix 8
Auxiliary regressions

Dependent Variable: LOG(PROD?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:49
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.99234	0.995683	20.07903	0.0000
LOG(YCAPD?)	0.517948	0.135031	3.835785	0.0003
LOG(DIS?)	-0.07185	0.056752	-1.2661	0.2107
LOG(NER?)	0.18106	0.028785	6.290138	0.0000
WPID?/WPIO?	-0.04374	0.012296	-3.55736	0.0008
Fixed Effects (Cross)				
_JPN--C	0.30173			
_USA--C	-0.30173			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.872844	Mean dependent var	21.71828
Adjusted R-squared	0.861491	S.D. dependent var	0.44976
S.E. of regression	0.167386	Akaike info criterion	-0.64526
Sum squared resid	1.569012	Schwarz criterion	-0.43941
Log likelihood	26.00314	F-statistic	76.8811
Durbin-Watson stat	1.370832	Prob(F-statistic)	0.00000

(continued)

Dependent Variable: LOG(YCAPD?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:50
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.72161	2.46116	-1.51214	0.1361
LOG(DIS?)	-0.06428	0.049957	-1.28669	0.2035
LOG(NER?)	-0.12041	0.028944	-4.16023	0.0001
WPID?/WPIO?	-0.04827	0.010108	-4.77526	0.0000
LOG(PROD?)	0.401718	0.104729	3.835785	0.0003
Fixed Effects (Cross)				
_JPN--C	-0.25454			
_USA--C	0.254538			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.87887	Mean dependent var	3.219409
Adjusted R-squared	0.868055	S.D. dependent var	0.405826
S.E. of regression	0.147413	Akaike info criterion	-0.899387
Sum squared resid	1.216919	Schwarz criterion	-0.693535
Log likelihood	33.881	F-statistic	81.26272
Durbin-Watson stat	0.646059	Prob(F-statistic)	0.00000

(continued)

Dependent Variable: LOG(DIS?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:52
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.90865	5.936628	3.69042	0.0005
LOG(NER?)	0.091378	0.086443	1.057097	0.2950
WPID?/WPIO?	-0.08967	0.02925	-3.06559	0.0033
LOG(PROD?)	-0.3873	0.305897	-1.2661	0.2107
LOG(YCAPD?)	-0.44672	0.347184	-1.28669	0.2035
Fixed Effects (Cross)				
_JPN--C	-0.3607			
_USA--C	0.360695			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.687856	Mean dependent var	12.2013
Adjusted R-squared	0.659986	S.D. dependent var	0.66645
S.E. of regression	0.388613	Akaike info criterion	1.03930
Sum squared resid	8.457111	Schwarz criterion	1.24515
Log likelihood	-26.2183	F-statistic	24.6809
Durbin-Watson stat	0.504293	Prob(F-statistic)	0.00000

(continued)

Dependent Variable: LOG(NER?)
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:53
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-39.7262	8.630032	-4.60325	0.0000
WPID?/WPIO?	0.022152	0.048294	0.458687	0.6482
LOG(PROD?)	2.286625	0.363525	6.290138	0.0000
LOG(YCAPD?)	-1.9607	0.471296	-4.16023	0.0001
LOG(DIS?)	0.214101	0.202537	1.057097	0.2950
Fixed Effects (Cross)				
_JPN--C	-1.44872			
_USA--C	1.448723			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.865617	Mean dependent var	6.34346
Adjusted R-squared	0.853619	S.D. dependent var	1.554756
S.E. of regression	0.594847	Akaike info criterion	1.89074
Sum squared resid	19.8152	Schwarz criterion	2.096592
Log likelihood	-52.613	F-statistic	72.14387
Durbin-Watson stat	0.619492	Prob(F-statistic)	0.00000

(continued)

Dependent Variable: WPID?/WPIO?
Method: Pooled Least Squares
Date: 12/19/08 Time: 00:54
Sample: 1976 2006
Included observations: 31
Cross-sections included: 2
Total pool (balanced) observations: 62

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	134.1777	21.48406	6.245454	0.0000
LOG(PROD?)	-4.21383	1.184539	-3.55736	0.0008
LOG(YCAPD?)	-5.99504	1.255438	-4.77526	0.0000
LOG(DIS?)	-1.60258	0.522763	-3.06559	0.0033
LOG(NER?)	0.168969	0.368375	0.458687	0.6482
Fixed Effects (Cross)				
_JPN--C	-0.28306			
_USA--C	0.283061			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.881015	Mean dependent var	4.87845
Adjusted R-squared	0.870391	S.D. dependent var	4.563374
S.E. of regression	1.642872	Akaike info criterion	3.922535
Sum squared resid	151.1456	Schwarz criterion	4.128387
Log likelihood	-115.599	F-statistic	82.92922
Durbin-Watson stat	0.466877	Prob(F-statistic)	0.00000

Appendix 9
Indonesia's fishery export to destination countries

Year	Japan	USA	RoW	Total
	Value ($ 000)	Value ($ 000)	Value ($ 000)	Value ($ 000)
1976	102,105.912	8,498.938	13,607.390	124,212.240
1977	127,869.872	8,191.727	16,913.745	152,975.344
1978	153,302.400	7,448.498	19,498.510	180,249.408
1979	183,215.008	11,482.767	26,385.777	221,083.552
1980	163,908.416	8,790.839	38,466.265	211,165.520
1981	160,483.440	7,080.022	35,597.690	203,161.152
1982	191,367.040	1,922.784	38,109.408	231,399.232
1983	187,067.344	5,158.366	41,771.522	233,997.232
1984	180,481.488	6,545.706	40,278.630	227,305.824
1985	188,782.560	4,445.962	39,657.430	232,885.952
1986	256,449.232	5,567.681	68,300.079	330,316.992
1987	309,420.384	11,704.860	111,517.220	432,642.464
1988	453,785.856	28,962.190	169,550.578	652,298.624
1989	475,440.000	74,604.000	206,608.992	756,652.992
1990	543,043.904	113,096.256	317,233.344	973,373.504
1991	608,855.168	178,653.136	388,584.496	1,176,092.800
1992	631,918.464	162,235.264	382,578.688	1,176,732.416
1993	848,332.480	152,504.384	419,879.296	1,420,716.160
1994	986,495.424	168,183.440	430,279.728	1,584,958.592
1995	1,070,241.984	131,100.536	471,663.304	1,673,005.824
1996	996,290.624	185,986.800	501,023.184	1,683,300.608
1997	923,400.256	192,175.616	506,549.696	1,622,125.568
1998	839,863.424	246,006.864	533,143.088	1,619,013.376
1999	695,275.783	254,930.418	579,286.863	1,529,493.064
2000	784,250.907	323,402.744	480,412.543	1,588,066.194
2001	755,648.384	317,196.288	465,044.480	1,537,889.152
2002	724,875.736	326,739.255	439,716.276	1,491,331.267
2003	646,163.411	364,687.230	540,652.732	1,551,503.373
2004	590,095.382	530,278.700	582,992.902	1,703,366.984
2005	575,041.466	593,639.170	631,800.911	1,800,481.547
2006	617,351.721	689,096.307	653,342.578	1,959,790.606

Source: WITS, processed.

Appendix 10
The percentage of indonesia's fishery export to destination countries

Year	Japan Market	USA Market	RoW	Total
1976	82%	7%	11%	100%
1977	84%	5%	11%	100%
1978	85%	4%	11%	100%
1979	83%	5%	12%	100%
1980	78%	4%	18%	100%
1981	79%	3%	18%	100%
1982	83%	1%	16%	100%
1983	80%	2%	18%	100%
1984	79%	3%	18%	100%
1985	81%	2%	17%	100%
1986	78%	2%	21%	100%
1987	72%	3%	26%	100%
1988	70%	4%	26%	100%
1989	63%	10%	27%	100%
1990	56%	12%	33%	100%
1991	52%	15%	33%	100%
1992	54%	14%	33%	100%
1993	60%	11%	30%	100%
1994	62%	11%	27%	100%
1995	64%	8%	28%	100%
1996	59%	11%	30%	100%
1997	57%	12%	31%	100%
1998	52%	15%	33%	100%
1999	45%	17%	38%	100%
2000	49%	20%	30%	100%
2001	49%	21%	30%	100%
2002	49%	22%	29%	100%
2003	42%	24%	35%	100%
2004	35%	31%	34%	100%
2005	32%	33%	35%	100%
2006	32%	35%	33%	100%

Source: WITS, processed.

Appendix 11
Production capacity of Indonesia's fishery

Year	Production	
	Value ($)	Volume (MT)
1976	817,965,308	289,887
1977	1,342,702,577	424,471
1978	1,459,021,928	434,302
1979	1,913,020,898	499,994
1980	1,569,489,468	514,896
1981	1,548,294,812	499,958
1982	1,547,612,689	539,737
1983	1,911,088,733	616,364
1984	2,054,830,012	582,439
1985	2,023,097,646	603,116
1986	2,351,571,012	627,550
1987	2,422,349,982	660,914
1988	2,879,973,738	689,209
1989	3,001,849,760	786,944
1990	2,657,259,963	812,266
1991	2,725,022,905	880,521
1992	2,964,317,096	989,747
1993	3,074,157,364	1,066,244
1994	5,316,075,565	1,719,452
1995	3,947,748,358	1,227,783
1996	4,139,839,858	1,340,045
1997	2,785,302,312	943,274
1998	4,022,588,966	1,543,651
1999	3,276,427,011	1,286,287
2000	4,408,075,592	1,338,703
2001	4,790,339,608	1,397,720
2002	4,230,263,496	1,493,973
2003	3,878,600,185	2,033,236
2004	3,989,745,530	2,024,599
2005	4,280,270,469	1,916,168
2006	4,431,243,170	1,941,680

Source: FAO, 2008,

Appendix 12
Indonesia's fishery export to Japan

Year	Japan Market									
	SITC 034		SITC 035		SITC 036		SITC 037		SITC 03	
	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)
1979	1,691.011	1,875,187	4,176.210	162,647	176,642.112	28,133,344	705.677	101,984	183,215.010	30,273,162
1980	1,824.974	1,392,875	6,663.183	328,124	155,027.952	25,534,848	392.313	98,855	163,908.422	27,354,702
1981	3,405.161	3,391,499	2,917.550	200,929	150,747.296	22,627,140	3,413.428	577,187	160,483.435	26,796,755
1982	11,578.157	12,300,268	5,100.716	236,585	174,233.904	23,540,398	454.257	79,995	191,367.034	36,157,246
1983	7,101.390	10,197,733	4,077.731	182,492	175,885.264	23,409,554	2.956	1,875	187,067.341	33,791,654
1984	5,283.879	4,999,316	4,011.497	224,464	171,186.112	23,498,340	0.000	0	180,481.488	28,722,120
1985	8,336.674	8,524,444	2,798.841	202,160	177,645.232	25,616,932	1.816	613	188,782.563	34,344,149
1986	9,292.401	8,216,917	2,326.236	169,429	244,801.872	30,094,078	28.729	13,687	256,449.238	38,494,111
1987	21,833.840	16,865,206	2,895.213	188,643	284,546.048	32,681,906	145.299	38,128	309,420.400	49,773,883
1988	37,545.296	20,107,584	7,157.026	436,792	408,940.128	45,342,896	143.406	48,972	453,785.856	65,936,244
1989	56,307.000	25,940,170	6,995.000	594,388	410,824.992	78,589,488	1,313.000	776,753	475,439.992	105,900,799
1990	73,367.656	42,142,204	11,406.944	1,424,644	457,085.024	60,012,924	1,184.291	545,562	543,043.915	104,125,334
1991	102,787.240	47,946,268	16,906.472	2,250,420	487,493.504	54,923,992	1,667.969	767,831	608,855.185	105,888,511
1992	109,405.720	44,448,364	21,301.280	3,811,415	498,470.656	59,468,896	2,740.837	1,305,304	631,918.493	109,033,979
1993	173,188.208	67,684,872	29,667.928	4,333,458	641,094.400	64,826,424	4,381.929	2,114,110	848,332.465	138,958,864
1994	141,244.912	60,205,288	61,597.640	7,397,175	776,662.464	67,921,312	6,990.385	3,889,608	986,495.401	139,413,383
1995	155,261.648	55,953,936	46,255.600	6,034,916	854,163.968	69,260,480	14,560.776	7,406,811	1,070,241.992	138,656,143
1996	125,670.664	51,316,368	62,012.928	7,777,112	787,832.896	69,532,304	20,774.116	7,760,696	996,290.604	136,386,480
1997	138,647.104	55,348,936	48,495.600	16,299,841	708,312.320	57,569,156	27,945.226	7,884,185	923,400.250	137,102,118
1998	115,431.368	55,257,624	47,645.660	6,611,845	642,174.912	90,934,400	34,611.472	10,733,448	839,863.412	163,537,317
1999	102,999.337	40,546,271	36,163.166	6,968,322	525,120.501	53,062,659	30,992.779	11,220,670	695,275.783	111,797,922
2000	104,997.300	33,020,423	30,986.632	6,187,595	621,577.116	58,163,730	26,689.859	10,357,123	784,250.907	107,728,871
2001	113,860.656	37,224,876	37,253.344	5,802,006	577,783.808	64,778,116	26,750.548	10,191,993	755,648.356	117,996,991

(Continued)

2002	127,257.709	49,763,288	55,738.555	8,539,061	513,909.879	62,947,019	27,969.593	10,540,782	724,875.736	131,790,150
2003	106,912.560	39,793,714	31,235.105	7,794,755	479,148.833	62,693,106	28,866.913	10,371,737	646,163.411	120,653,312
2004	122,151.422	41,555,625	33,928.970	7,241,557	393,312.438	51,006,720	40,702.552	12,535,379	590,095.382	112,339,281
2005	110,397.090	38,994,107	46,103.350	9,526,674	376,074.272	48,717,293	42,466.754	10,085,972	575,041.466	107,324,046
2006	113,904.587	39,734,983	42,338.733	11,460,539	422,413.202	51,776,112	38,695.199	10,301,267	617,351.721	113,272,901

Source: WITS, processed.

Appendix 13
The percentage of Indonesia's fishery export to Japan

Year	Japan Market									
	SITC 034		SITC 035		SITC 036		SITC 037		SITC 03	
	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume
1979	0.92%	6.19%	2.28%	0.54%	96.41%	92.93%	0.39%	0.34%	100%	100%
1980	1.11%	5.09%	4.07%	1.20%	94.58%	93.35%	0.24%	0.36%	100%	100%
1981	2.12%	12.66%	1.82%	0.75%	93.93%	84.44%	2.13%	2.15%	100%	100%
1982	6.05%	34.02%	2.67%	0.65%	91.05%	65.11%	0.24%	0.22%	100%	100%
1983	3.80%	30.18%	2.18%	0.54%	94.02%	69.28%	0.00%	0.01%	100%	100%
1984	2.93%	17.41%	2.22%	0.78%	94.85%	81.81%	0.00%	0.00%	100%	100%
1985	4.42%	24.82%	1.48%	0.59%	94.10%	74.59%	0.00%	0.00%	100%	100%
1986	3.62%	21.35%	0.91%	0.44%	95.46%	78.18%	0.01%	0.04%	100%	100%
1987	7.06%	33.88%	0.94%	0.38%	91.96%	65.66%	0.05%	0.08%	100%	100%
1988	8.27%	30.50%	1.58%	0.66%	90.12%	68.77%	0.03%	0.07%	100%	100%
1989	11.84%	24.49%	1.47%	0.56%	86.41%	74.21%	0.28%	0.73%	100%	100%
1990	13.51%	40.47%	2.10%	1.37%	84.17%	57.64%	0.22%	0.52%	100%	100%
1991	16.88%	45.28%	2.78%	2.13%	80.07%	51.87%	0.27%	0.73%	100%	100%
1992	17.31%	40.77%	3.37%	3.50%	78.88%	54.54%	0.43%	1.20%	100%	100%
1993	20.42%	48.71%	3.50%	3.12%	75.57%	46.65%	0.52%	1.52%	100%	100%
1994	14.32%	43.18%	6.24%	5.31%	78.73%	48.72%	0.71%	2.79%	100%	100%
1995	14.51%	40.35%	4.32%	4.35%	79.81%	49.95%	1.36%	5.34%	100%	100%
1996	12.61%	37.63%	6.22%	5.70%	79.08%	50.98%	2.09%	5.69%	100%	100%
1997	15.01%	40.37%	5.25%	11.89%	76.71%	41.99%	3.03%	5.75%	100%	100%
1998	13.74%	33.79%	5.67%	4.04%	76.46%	55.60%	4.12%	6.56%	100%	100%
1999	14.81%	36.27%	5.20%	6.23%	75.53%	47.46%	4.46%	10.04%	100%	100%
2000	13.39%	30.65%	3.95%	5.74%	79.26%	53.99%	3.40%	9.61%	100%	100%
2001	15.07%	31.55%	4.93%	4.92%	76.46%	54.90%	3.54%	8.64%	100%	100%
2002	17.56%	37.76%	7.69%	6.48%	70.90%	47.76%	3.86%	8.00%	100%	100%

(Continued)

2003	16.55%	32.98%	4.83%	6.46%	74.15%	51.96%	4.47%	8.60%	100%	100%
2004	20.70%	36.99%	5.75%	6.45%	66.65%	45.40%	6.90%	11.16%	100%	100%
2005	19.20%	36.33%	8.02%	8.88%	65.40%	45.39%	7.38%	9.40%	100%	100%
2006	18.45%	35.08%	6.86%	10.12%	68.42%	45.71%	6.27%	9.09%	100%	100%

Source: WITS, processed.

Notes: The information uses SITC revision 2: 034 Fish,fresh (live or dead), chilled or frozen, 035 Fish, dried, salted or in brine; smoked fish; 036 Crustacean and Molluscs, fresh, chilled, frozen etc; 037 Fish, crustaceans and molluscs, prepar. or preservation.

Appendix 14
Indonesia's fishery export to USA

Year	USA Market									
	SITC 034		SITC 035		SITC 036		SITC 037		SITC 03	
	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)	Value ($ 000)	Volume (kg)
1979	1,691.011	3,849,250	0.000	0	8,898.524	2,782,687	0.000	0	10,589.535	6,631,937
1980	4,121.636	4,212,003	0.000	0	4,669.203	1,547,562	0.000	0	8,790.839	5,759,565
1981	4,731.892	4,770,875	9.000	2,500	2,105.190	630,187	233.940	169,027	7,080.022	5,572,589
1982	142.665	197,507	0.000	0	1,111.824	348,250	668.295	369,750	1,922.784	915,507
1983	766.957	1,104,647	0.000	0	2,322.662	429,000	2,068.747	1,069,125	5,158.366	2,602,772
1984	144.741	72,874	0.000	0	4,179.705	533,812	2,221.260	1,107,062	6,545.706	1,713,748
1985	389.210	104,764	0.000	0	3,175.818	482,062	880.934	478,577	4,445.962	1,065,403
1986	452.222	137,171	0.000	0	4,242.623	574,375	872.836	478,929	5,567.681	1,190,475
1987	1,120.703	585,312	9.430	1,687	8,480.839	1,112,937	2,093.888	1,005,750	11,704.860	2,705,686
1988	2,103.344	1,016,374	65.686	1,062	17,093.504	1,895,812	9,699.655	3,724,187	28,962.189	6,637,435
1989	3,450.000	1,351,160	23.000	214	47,375.000	8,194,626	23,756.000	15,378,908	74,604.000	24,924,908
1990	3,731.598	1,183,051	304.090	84,936	81,141.936	8,804,052	27,918.632	9,851,803	113,096.256	19,923,842
1991	7,412.326	2,269,851	1,829.273	441,437	114,766.960	13,035,205	54,644.568	29,285,308	178,653.127	45,031,801
1992	11,409.933	3,582,947	1,802.774	475,252	121,604.256	15,454,774	27,418.310	14,697,040	162,235.273	34,210,013
1993	16,869.792	5,175,300	1,058.173	284,124	96,533.656	11,076,055	38,042.760	16,393,717	152,504.381	32,929,196
1994	28,070.916	8,562,997	28.979	5,187	96,653.888	10,675,502	43,429.664	14,767,120	168,183.447	34,010,806
1995	27,122.432	8,256,768	291.024	41,792	53,948.476	5,313,274	49,738.604	16,394,105	131,100.536	30,005,939
1996	26,326.476	7,993,596	179.852	41,949	109,551.496	10,003,512	49,928.976	16,347,575	185,986.800	34,386,632
1997	27,430.332	6,460,119	743.308	118,220	138,930.016	11,138,134	25,071.958	7,674,054	192,175.614	25,390,527
1998	26,970.328	7,836,695	445.615	229,088	174,537.056	16,357,793	44,053.868	15,434,399	246,006.867	39,857,975
1999	37,421.446	10,705,547	303.954	85,073	179,093.255	18,338,061	38,111.763	15,042,320	254,930.418	44,171,001
2000	59,302.594	15,121,459	1,199.843	272,118	217,565.545	20,767,202	45,334.762	17,136,408	323,402.744	53,297,187
2001	57,428.376	15,303,625	350.748	39,601	212,273.152	21,683,992	47,144.036	15,012,060	317,196.312	52,039,278

(Continued)

2002	74,872.018	18,153,406	371.071	54,986	216,193.758	23,757,470	35,302.408	13,128,902	326,739.255	55,094,764
2003	79,523.124	19,493,782	3.034	470	237,002.563	28,751,184	48,158.509	19,331,536	364,687.230	67,576,972
2004	85,810.507	21,416,112	168.787	117,248	317,268.207	42,474,852	127,031.199	30,950,794	530,278.700	94,959,006
2005	96,595.594	27,004,326	279.287	71,168	343,977.036	49,287,897	152,787.253	31,920,806	593,639.170	108,284,197
2006	90,092.250	24,123,907	180.032	65,015	406,709.119	56,372,528	192,114.906	35,055,801	689,096.307	115,617,251

Source: WITS, processed.

Notes: The information uses SITC revision 2: 034 Fish,fresh (live or dead), chilled or frozen, 035 Fish, dried, salted or in brine; smoked fish; 036 Crustacean and Molluscs, fresh, chilled, frozen etc; 037 Fish, crustaceans and molluscs, prepar. or preservation.

Appendix 15
The percentage of Indonesia's fishery export to USA

Year	USA Market									
	SITC 034		SITC 035		SITC 036		SITC 037		SITC 03	
	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume
1979	15.97%	58.04%	0.00%	0.00%	84.03%	41.96%	0.00%	0.00%	100%	100%
1980	46.89%	73.13%	0.00%	0.00%	53.11%	26.87%	0.00%	0.00%	100%	100%
1981	66.83%	85.61%	0.13%	0.04%	29.73%	11.31%	3.30%	3.03%	100%	100%
1982	7.42%	21.57%	0.00%	0.00%	57.82%	38.04%	34.76%	40.39%	100%	100%
1983	14.87%	42.44%	0.00%	0.00%	45.03%	16.48%	40.10%	41.08%	100%	100%
1984	2.21%	4.25%	0.00%	0.00%	63.85%	31.15%	33.93%	64.60%	100%	100%
1985	8.75%	9.83%	0.00%	0.00%	71.43%	45.25%	19.81%	44.92%	100%	100%
1986	8.12%	11.52%	0.00%	0.00%	76.20%	48.25%	15.68%	40.23%	100%	100%
1987	9.57%	21.63%	0.08%	0.06%	72.46%	41.13%	17.89%	37.17%	100%	100%
1988	7.26%	15.31%	0.23%	0.02%	59.02%	28.56%	33.49%	56.11%	100%	100%
1989	4.62%	5.42%	0.03%	0.00%	63.50%	32.88%	31.84%	61.70%	100%	100%
1990	3.30%	5.94%	0.27%	0.43%	71.75%	44.19%	24.69%	49.45%	100%	100%
1991	4.15%	5.04%	1.02%	0.98%	64.24%	28.95%	30.59%	65.03%	100%	100%
1992	7.03%	10.47%	1.11%	1.39%	74.96%	45.18%	16.90%	42.96%	100%	100%
1993	11.06%	15.72%	0.69%	0.86%	63.30%	33.64%	24.95%	49.78%	100%	100%
1994	16.69%	25.18%	0.02%	0.02%	57.47%	31.39%	25.82%	43.42%	100%	100%
1995	20.69%	27.52%	0.22%	0.14%	41.15%	17.71%	37.94%	54.64%	100%	100%
1996	14.16%	23.25%	0.10%	0.12%	58.90%	29.09%	26.85%	47.54%	100%	100%
1997	14.27%	25.44%	0.39%	0.47%	72.29%	43.87%	13.05%	30.22%	100%	100%
1998	10.96%	19.66%	0.18%	0.57%	70.95%	41.04%	17.91%	38.72%	100%	100%
1999	14.68%	24.24%	0.12%	0.19%	70.25%	41.52%	14.95%	34.05%	100%	100%
2000	18.34%	28.37%	0.37%	0.51%	67.27%	38.96%	14.02%	32.15%	100%	100%
2001	18.10%	29.41%	0.11%	0.08%	66.92%	41.67%	14.86%	28.85%	100%	100%

(Continued)

2002	22.91%	32.95%	0.11%	0.10%	66.17%	43.12%	10.80%	23.83%	100%	100%
2003	21.81%	28.85%	0.00%	0.00%	64.99%	42.55%	13.21%	28.61%	100%	100%
2004	16.18%	22.55%	0.03%	0.12%	59.83%	44.73%	23.96%	32.59%	100%	100%
2005	16.27%	24.94%	0.05%	0.07%	57.94%	45.52%	25.74%	29.48%	100%	100%
2006	13.07%	20.87%	0.03%	0.06%	59.02%	48.76%	27.88%	30.32%	100%	100%

Appendix 16
Export model to Japan

Dependent Variable: LOG(EX)
Method: Least Squares
Date: 01/04/09 Time: 23:07
Sample: 1973 2006
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.97119	8.227957	-2.184162	0.0375
LOG(PROD)	0.147253	0.246535	0.597289	0.5551
LOG(DIS)	-0.299859	0.084658	-3.542025	0.0014
LOG(NER)	2.187751	0.833978	2.623273	0.0139
LOG(XP)	-0.267489	0.142705	-1.874419	0.0713
LOG(YCAPD)	2.577282	0.650505	3.961973	0.0005

R-squared	0.960325	Mean dependent var	17.9871
Adjusted R-squared	0.95324	S.D. dependent var	0.70481
S.E. of regression	0.152408	Akaike info criterion	-0.76573
Sum squared resid	0.65039	Schwarz criterion	-0.49637
Log likelihood	19.01732	F-statistic	135.546
Durbin-Watson stat	1.045155	Prob(F-statistic)	0.00000

Appendix 17
Multicollinearity test

Correlation matrix

	LOG(PROD)	LOG(DIS)	LOG(NER)	LOG(XP)	LOG(YCAPD)
LOG(PROD)	1.00000	0.44343	-0.92218	0.57035	0.95125
LOG(DIS)	0.44343	1.00000	-0.23759	0.46685	0.30274
LOG(NER)	-0.92218	-0.23759	1.00000	-0.62045	-0.99321
LOG(XP)	0.57035	0.46685	-0.62045	1.00000	0.62860
LOG(YCAPD)	0.95125	0.30274	-0.99321	0.62860	1.00000

Appendix 18
Heteroskedasticity test

White Heteroskedasticity Test:

F-statistic	1.671591	Prob. F(10,23)	0.14861
Obs*R-squared	14.31016	Prob. Chi-Square(10)	0.15931

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/04/09 Time: 23:12
Sample: 1973 2006
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-61.66029	61.9687	-0.995023	0.3301
LOG(PROD)	6.566798	6.944396	0.945626	0.3542
(LOG(PROD))^2	-0.147251	0.156938	-0.938276	0.3579
LOG(DIS)	-1.124287	0.615804	-1.825723	0.0809
(LOG(DIS))^2	0.047382	0.026331	1.799474	0.0851
LOG(NER)	0.54261	3.575005	0.151779	0.8807
(LOG(NER))^2	-0.092784	0.371248	-0.249924	0.8049
LOG(XP)	-0.073188	0.204396	-0.358073	0.7236
(LOG(XP))^2	0.024753	0.063583	0.389297	0.7006
LOG(YCAPD)	-0.642578	4.220974	-0.152235	0.8803
(LOG(YCAPD))^2	1.29E-02	2.03E-01	0.063402	0.95

R-squared	0.420887	Mean dependent var	0.01913
Adjusted R-squared	0.169099	S.D. dependent var	0.02886
S.E. of regression	0.026305	Akaike info criterion	-4.1819
Sum squared resid	0.015915	Schwarz criterion	-3.68808
Log likelihood	82.09234	F-statistic	1.67159
Durbin-Watson stat	1.907251	Prob(F-statistic)	0.14861

Appendix 19
Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.589722	Prob. F(2,26)	0.04201
Obs*R-squared	7.356997	Prob. Chi-Square(2)	0.02526

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/04/09 Time: 23:21
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.64478	7.629218	0.346665	0.7316
LOG(PROD)	-0.161847	0.238364	-0.678989	0.5031
LOG(DIS)	0.05956	0.080976	0.735532	0.4686
LOG(NER)	-0.097855	0.767224	-0.127545	0.8995
LOG(XP)	-0.10816	0.138997	-0.778145	0.4435
LOG(YCAPD)	8.77E-02	0.600816	0.145935	0.8851
RESID(-1)	0.441127	0.196964	2.239639	0.0339
RESID(-2)	0.110905	0.2036	0.544718	0.5906

R-squared	0.216382	Mean dependent var	5.63E-15
Adjusted R-squared	0.005408	S.D. dependent var	0.14039
S.E. of regression	0.140008	Akaike info criterion	-0.89191
Sum squared resid	0.509658	Schwarz criterion	-0.53277
Log likelihood	23.1625	F-statistic	1.02564
Durbin-Watson stat	1.932997	Prob(F-statistic)	0.43717

Appendix 20

Correction model for multicollinearity and autocorrelation problem

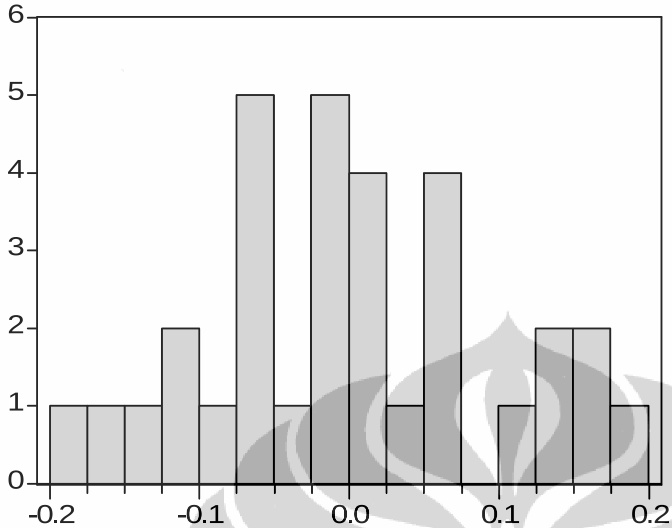
Dependent Variable: D(LOG(EX))
Method: Least Squares
Date: 01/06/09 Time: 15:39
Sample (adjusted): 1975 2006
Included observations: 32 after adjustments
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.08124	0.056454	-1.438998	0.1626
D(LOG(YCAPD))	3.278842	1.033809	3.171613	0.004
D(LOG(PROD))	1.659906	1.119295	1.482993	0.1506
D(LOG(NER))	3.118948	1.07422	2.903452	0.0076
D(LOG(XP))	-0.73702	0.161744	-4.556704	0.0001
D(LOG(DIS))	-0.18905	0.083027	-2.276965	0.0316
AR(1)	-0.01198	0.169374	-0.070708	0.9442

R-squared	0.627291	Mean dependent var	0.044907
Adjusted R-squared	0.53784	S.D. dependent var	0.160533
S.E. of regression	0.109134	Akaike info criterion	-1.40184
Sum squared resid	0.297756	Schwarz criterion	-1.08121
Log likelihood	29.42943	F-statistic	7.012734
Durbin-Watson stat	1.921335	Prob(F-statistic)	0.000184

Inverted AR Roots	-0.01

Appendix 21
Normality test



Series: Residuals	
Sample 1975 2006	
Observations 32	
Mean	-5.88E-12
Median	-0.003621
Maximum	0.196757
Minimum	-0.189087
Std. Dev.	0.098005
Skewness	0.106682
Kurtosis	2.437432
Jarque-Bera	0.482675
Probability	0.785576

Appendix 22
Export model to USA

Dependent Variable: LOG(EX)
Method: Least Squares
Date: 01/04/09 Time: 23:54
Sample: 1973 2006
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-107.986	32.64515	-3.307862	0.0026
LOG(YCAPD)	9.811807	6.350561	1.54503	0.1336
LOG(PROD)	1.702954	2.130673	0.799256	0.4309
LOG(NER)	-1.12094	0.605798	-1.850353	0.0748
LOG(DIS)	-0.15987	0.316279	-0.505472	0.6172
LOG(XP)	-1.47729	0.659216	-2.240975	0.0331

R-squared	0.796217	Mean dependent var	16.32285
Adjusted R-squared	0.759827	S.D. dependent var	1.515169
S.E. of regression	0.742546	Akaike info criterion	2.401321
Sum squared resid	15.43848	Schwarz criterion	2.670679
Log likelihood	-34.8225	F-statistic	21.88018
Durbin-Watson stat	0.990253	Prob(F-statistic)	0.00000

Appendix 23
Multicollinearity test

Correlation matrix

	LOG(YCAPD)	LOG(PROD)	LOG(NER)	LOG(DIS)	LOG(XP)
LOG(YCAPD)	1.000000	0.991146	0.978317	0.439413	0.531598
LOG(PROD)	0.991146	1.000000	0.964387	0.443433	0.569894
LOG(NER)	0.978317	0.964387	1.000000	0.402935	0.447552
LOG(DIS)	0.439413	0.443433	0.402935	1.000000	0.466917
LOG(XP)	0.531598	0.569894	0.447552	0.466917	1.000000

Appendix 24
Heteroskedasticity test

White Heteroskedasticity Test:

F-statistic	1.240054	Prob. F(10,23)	0.31867
Obs*R-squared	11.90994	Prob. Chi-Square(10)	0.291129

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 01/05/09 Time: 00:55
Sample: 1973 2006
Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	700.086	1406.016	0.497922	0.6233
LOG(YCAPD)	322.0769	450.4695	0.714981	0.4818
(LOG(YCAPD))^2	-15.8643	22.24232	-0.713249	0.4829
LOG(PROD)	-211.212	211.8418	-0.997029	0.3291
(LOG(PROD))^2	4.752413	4.850805	0.979716	0.3374
LOG(NER)	12.72486	8.576812	1.483636	0.1515
(LOG(NER))^2	-0.72106	0.504553	-1.4291	0.1664
LOG(DIS)	-7.84161	15.6147	-0.502194	0.6203
(LOG(DIS))^2	0.32082	0.60753	0.528072	0.6025
LOG(XP)	5.166808	6.613672	0.781231	0.4426
(LOG(XP))^2	-1.32346	1.937733	-0.682991	0.5014

R-squared	0.350292	Mean dependent var	0.454073
Adjusted R-squared	0.067811	S.D. dependent var	0.697612
S.E. of regression	0.673544	Akaike info criterion	2.303667
Sum squared resid	10.43423	Schwarz criterion	2.797489
Log likelihood	-28.1623	F-statistic	1.240054
Durbin-Watson stat	1.628487	Prob(F-statistic)	0.31867

Appendix 25
Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	6.607969	Prob. F(2,26)	0.004782
Obs*R-squared	11.45814	Prob. Chi-Square(2)	0.00325

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 01/05/09 Time: 01:03
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.866695	27.91177	0.353496	0.7266
LOG(YCAPD)	4.250151	5.703971	0.745121	0.4629
LOG(PROD)	-2.41929	1.996173	-1.211963	0.2364
LOG(NER)	0.308471	0.51997	0.593248	0.5581
LOG(DIS)	-0.28615	0.279649	-1.023263	0.3156
LOG(XP)	0.465131	0.573038	0.811693	0.4243
RESID(-1)	0.420068	0.186689	2.250094	0.0331
RESID(-2)	0.330523	0.202352	1.633407	0.1144

R-squared	0.337004	Mean dependent var	2.75E-14
Adjusted R-squared	0.158505	S.D. dependent var	0.683983
S.E. of regression	0.627438	Akaike info criterion	2.107981
Sum squared resid	10.23565	Schwarz criterion	2.467125
Log likelihood	-27.8357	F-statistic	1.887991
Durbin-Watson stat	1.976093	Prob(F-statistic)	0.112639

Appendix 26
Correction model for multicollinearity and autocorrelation problem

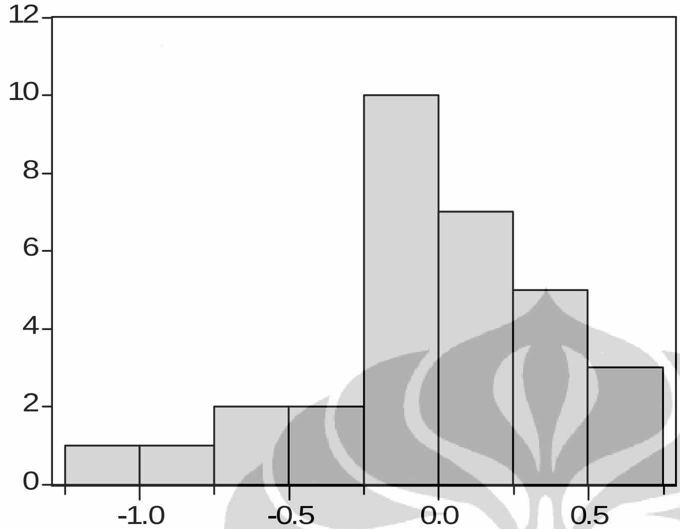
Dependent Variable: D(LOG(EX))
Method: Least Squares
Date: 01/07/09 Time: 00:25
Sample (adjusted): 1976 2006
Included observations: 31 after adjustments
Convergence achieved after 18 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.86837	0.271249	-3.20139	0.0038
D(LOG(YCAPD))	11.73625	4.115681	2.851595	0.0088
D(LOG(PROD))	14.9665	4.270105	3.504948	0.0018
D(LOG(NER))	0.464188	0.366765	1.265628	0.2178
D(LOG(XP))	-0.1708	0.609394	-0.28027	0.7817
D(LOG(DIS))	-0.45613	0.324228	-1.40682	0.1723
AR(2)	0.466833	0.167757	2.782792	0.0103

R-squared	0.525603	Mean dependent var	0.151321
Adjusted R-squared	0.407004	S.D. dependent var	0.593339
S.E. of regression	0.456908	Akaike info criterion	1.467012
Sum squared resid	5.010365	Schwarz criterion	1.790815
Log likelihood	-15.7387	F-statistic	4.431762
Durbin-Watson stat	1.860583	Prob(F-statistic)	0.003749

Inverted AR Roots	0.68	-0.68

Appendix 27
Normality test



Series: Residuals
Sample 1976 2006
Observations 31

Mean	-2.01E-11
Median	-0.001680
Maximum	0.727900
Minimum	-1.071326
Std. Dev.	0.408671
Skewness	-0.487584
Kurtosis	3.377199
Jarque-Bera	1.412089
Probability	0.493593