DO GEOGRAPHIC CHARACTERISTICS REALLY MATTERS IN INFLUENCING FIRM MANUFACTURING EXPORTS?

A case study of Indonesia

A Research Paper presented by:

Ririh Kusuma Permatasari

(Indonesia)

In partial fulfillment of the requirements for obtaining the degree of

MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:

Economic of Development

(ECD)

Members of the Examining Committee:

Prof. Dr. Peter van Bergeijk

Dr. Anirban Dasgupta

The Hague, The Netherlands

August 2015

Disclaimer:

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

Postal address:
Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

Location:
Kortenaerkade 12
2518 AX The Hague
The Netherlands

Telephone: +31 70 426 0460
Fax: +31 70 426 0799

ACKNOWLEDGEMENTS

Infinite gratitude to Jesus Christ God Almighty who has given an exceptional opportunity for me to achieve my goal to get the scholarship and study abroad, especially in Netherlands. Next, I would like also to acknowledge the support and contributions of the following persons towards the completion of my study, especially for this Research Paper.

A bundle of thanks goes to Prof. Dr. Peter van Bergeijk, my supervisor, for all his supports, encouragement, and critical contributions during my research preparation until the end. His guidance has helped me to concern on the topic and has finished into its present form. I also would like to acknowledge, Dr. Anirban Dasgupta, for his valuable comments and advice for me to improve my research paper.

My gratitude also goes to Dr. Lorenzo Pellegrini, as ECD's convenor for his motivation and encouragement. I also would like to thanks to all the staff of International Institute of Social Studies of Erasmus University of Rotterdam and all of staff of University of Indonesia for their excellent assistance during my study.

I would like to acknowledge with thanks to NUFFIC-NESO Scholarship and Ministry of Trade for financing my study in Indonesia and the Netherlands. I would also to thanks to my institution, Commodity Futures Trading Agencies (BAPPEBTI), Ministry of Trade of Indonesia,that gives permission and an opportunity to continue my further study.

I would like to thanks to all my colleagues and fellows in Economic and Development major and especially for Indonesian group. I really appreciate for all your supports, our togetherness, and our real family environment throughout our study in Indonesia and in the Netherlands. I would also particularly thanks to ***Desiwanti Astuti (Desi), Aldila Thahjasari (Dila), Ristiana Malik Jani Jaleha (Eha), Citra Christina (Citra), Firdhan Aria Wijaya (Idhan), Rio Widianto (Rio), Zunansyah Falanni (Dani), Denny Vissaro (Denny) and R.Tommy Pratama (Tommy)*** as my beloved and best friends who always give me supports, kindness, and encouragement during my study in the Hague. I give thanks to God for all our precious and unforgettable moments when we're always share the time filled of joy and happiness.

I would like to thanks to my beloved grandmother, ***Ibu Soekardji,*** who always pray for me from a far. I also would like to thanks for my big family who can't be mentioned one by one. A bundle of thanks to my beloved husband ***Ernest Silvanus*** and my little sunshine ***Riera Holly Jensen Silvanus (Rara)*** who always support and encourage me during my study. This study would not be possible without their prayers and sacrifice.
May Jesus Christ always bless all of you.

Contents

List of Tables

List of Figures

List of Diagram

List of Appendices

List of Acronyms

ACFTA	ASEAN-China Free Trade Agreement
AMS	Annual Manufacturing Survey
ASEAN	Association of Southeast Asian Nations
ATT	Annual Total Trade Table
BAPPENAS	Badan Perencanaan Pembangunan Nasional
BBM	Bahan Bakar Minyak
BPS	Badan Pusat Statistik
FDI	Foreign Direct Investment
FNG	First-Nature Geography
FO	Foreign Ownership
FTP	Fast Track Program
GDP	Gross Domestic Products
GIS	Geographic Information System
HME	Home Market Effects
ISIC	International Standard Industrial Classification
LPM	Linear Probability Model
NEG	New Economy Geography
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PLN	Perusahaan Listrik Negara
PMK	Pembangunan Manusia dan Kebudayaan
R&D	Research and Development
RRI	Radio Republik Indonesia
RUKN	Rencana Umum Ketenagalistrikan Nasional
STATA	Statistics and Data
SNG	Second-Nature Geography

Abstract

There are still few studies which tried to examine firm-level and geographic characteristics as the determinants of export propensity simultaneously. Therefore, this study is trying to investigate what kind of characteristics that is really matters in influencing exports propensity in manufacturing firms in Indonesia. This study, specifically, focuses on the role of geography characteristics in affecting likelihood of a firm to export. Thus, this study attaches the micro and macro data obtained from Central Bureau of Statistics of Indonesia (BPS) for the period 2012. Foreign ownership, total capital stock and productivity of a firm are chosen as firm-level variables. While, surface area represents first-nature geography; and location, export spillovers, education, population, electricity, road density and *home market effects* represent second-nature geography. All of those explanatory variable are analyzed by using Probit and Logit test. By analyzing Goodness of Fit test and Odds Ratio, this research finds that geographic characteristics really matters in affecting export propensity rather than firm-level characteristics. Second-nature characteristics, which represents by location, education, export spillovers, and road density, holds an important role compares with first-nature geography. Hence, some policy recommendations are applied to improve those kind of endowment factors of a region to enhance export performance.

Keywords: firm-level, geographic, first-nature, second-nature, characteristics, Probit, Logit, manufacturing, exports, propensity, Indonesia

Relevance to Development Studies

This study of the role of firm and geographic characteristics in influencing regional manufacturing exports attempts to analyze the effects of those determinants to the propensity of manufacturing exports in 2012. Thus, this paper also provides the overview of geographic characteristics that contains of two elements, first-nature and second nature geography characteristics, in Indonesia. Then, the goals of enhancing regional exports will be determined; therefore, some policy recommendations will be offered to the province's state and also private sectors. By identifying the effect of each elements which are firm-level and geographic characteristics, it is expected that this study could encourage the regional government and private sectors to focus on some important factors such as infrastructure development. Hence, it will provide some valuable information for policy makers to enhance manufacturing exports, encourage the better development in regional level and increase the revenue of both regional and national level in order to achieve economic growth.

Keywords

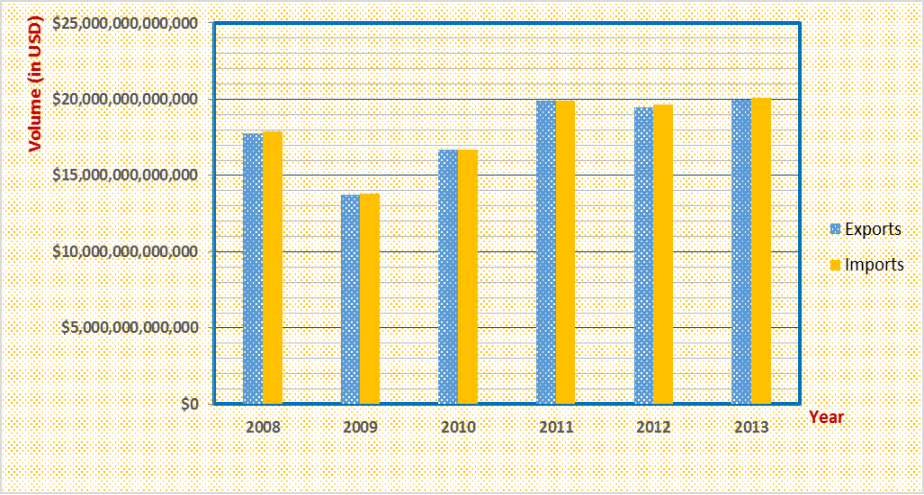
Indonesia, provinces, manufacturing, firm, first-nature geography, second-nature geography, provinces, development, propensity, exports, firm-level characteristics, 2012

Chapter 1
Introduction

1.1 Background

Globalization has big impacts on a country due to the openness of trade giving a country the opportunity to harness their potential market in export destinations. One of globalization's impact is the world's export-import flows that relatively are high despite being dropped in 2009 and 2010. Based on UN Comtrade Annual Totals Trade Table (ATT) 2000-2013 8th edition (unstats.un.org, accessed on Wednesday, 21st July, 2015), in 2008, the value of exports was 17.768 billion USD, and the value of imports was 17.867 billion USD. Meanwhile, in 2013 the export volume reached 19.940 billion USD and the import value was equal to 20.089 billion USD. That number shows that the volume of exports increases 2.172 billion USD or around 10.89% and volume of import increases 2.222 billion USD or around 11.06%. It can be concluded that the trade among countries around the world has increased more than 10% in just six years. Figure 1.1 depicts the change in capturing the clearly description.

Figure 1.1 Volume of Exports and Imports in the World 2008 – 2013



Source: unstat.un.org (accessed on Wednesday, 21th July 2015, processed by the author)

Along with the improvement of world exports, Indonesian exports also increased quite rapidly. Figure 1.2 describes that the flow of trade in Indonesia over the course for six years, on average, has been increasing by 27.8%. However, the contribution of manufacturing exports to non-oil exports has declined, whereas the contribution of mining commodity exports increased (see Figure 1.3). In 2004, the value of manufacturing exports reached 48.7 billion USD, with a large proportion of the total contribution of 87% of non-oil exports. Whereas in 2009, the value of manufacturing exports reached 73.4 billion USD, which accounted for

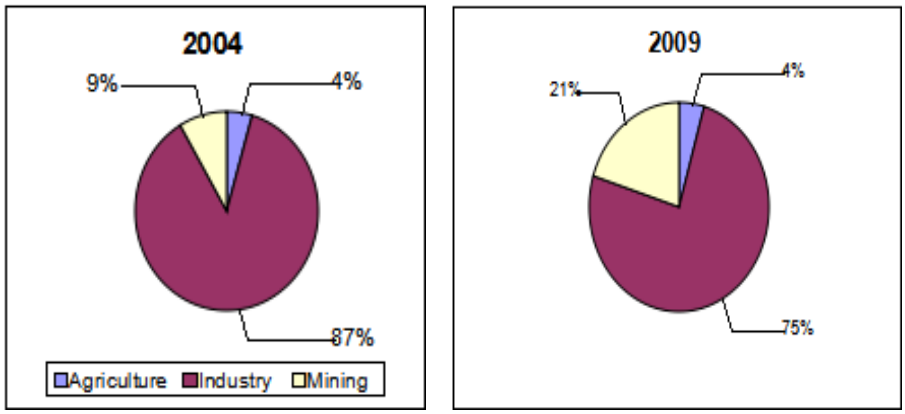
75.3% of total non-oil exports (Central Bureau of statistics of Indonesia).

Figure 1.2 Volume of Exports - Imports in Indonesia 2008 – 2013

Source: unstats.un.org (accessed on Wednesday, 21th July 2015, processed by the author)

However, although the value of exports from the manufacturing industry continues to experience an increase along with the increasing value of non-oil exports, the share of manufacturing in total non-oil exports decreased.

Figure 1.3 The comparison of non-oil export composition of Indonesia 2004 and 2009



Source: Central Bureau of Statistics (accessed on Wednesday, 21th July 2015, processed by the author)

Manufacturing has an important role in Indonesia's economic growth and development also due to: (1) employment creation; (2) fulfilling the basic needs within the community; (3) processing of agriculture and natural resources; and (4) have the potential for export development. Regardless of fluctuations in industrial development, manufacturing activity still had a positive impact through the creation of follow-up

activities that expand labor absorption while providing value added in the economy of a region.

Narrowing the studies on the export performance of Indonesia's manufacturing firms, Farole, et al.(2013:225) showed that Indonesia became one of the developing countries that had the higher share of manufacturing exports throughout the world in 1990s and early 2000s based upon the data from World Development Indicators (around 50% and exceeding Brazil & India), especially in textile and clothing, office machines and telecommunication merchandises, chemical, electrical equipment and semi-manufactures.

Therefore, the manufacturing sector is a very important area to be concerned about due to its large contribution to exports and growth in Indonesia. However, the lack of attention from the government for this sector has decreased in the past two years and as a consequence, this sector is only made up around 2-2.5% to the GDP (Ministry of Industry, 2011). As a result, this sector is relatively underdeveloped compared with ASIAN countries such as Malaysia and Singapore.

Based on those facts, we can see that export performance of manufacturing firms is the consequential issue to be concerned due to its potential role in the development process. There are several determinants that could be categorized as the prominent factors to enhance the exports level of the firms. Many studies had been conducted to analyze this issue, and most of them only focused on the firm's characteristics without concern for the geographic characteristics, such as where the firms are located or the natural endowment of a region. The study by Farole, et al. (2013) found there was another important thing that we have to consider beyond the essential role of manufacture exports in Indonesia, namely, the possible factors that are considered as the engine of export tendencies themselves. By using Hecksman Two Selection Model and interaction terms among all 26 provinces in Indonesia, they found that firm and geographic characteristics were really matters in affecting export propensity and intensity in Indonesia during 1990-2005. They also mentioned that the export's possibility and market share were included as the two of the important factors to drive the manufacturing exports in Indonesia by looking at internal factors (foreign ownership/FO, capital stock, and productivity) and external factors (first and second nature geographic).

David and Weinstein (1999) argued that geographic is really matters since it gives significant effects to regional production structure in OECD countries. They found that among nineteen manufacturing sectors in OECD countries, eight of them were significantly affected by geographic conditions, including the important sectors like transportation, iron and steel, and electrical machinery. Matthee and Naude (2008) showed that in South Africa, the geographic conditions have a significant impact on the manufactured exports by looking at the distance to ports and surface area of a region.

Hence, investigating the determinants of manufacturing exports in Indonesia by looking at the firm's characteristics and geographic characteristics will provide the real picture of what extent the geographic characteristics play a role in affecting the export performance at the regional level of Indonesia. It would also provide an empirical rationale for the recent issue in exports and international trade because there is still limited research that focus on geographic economy as one of the essential tools of analysis. It will also provide crucial insight to the government for concerning on regional development for supporting the exports performance such as improvement of infrastructure (i.e. roads and electricity).

1.2 Research Objectives and Research Questions

1.2.1 Research Objectives

The purpose of this research is to investigate the important elements of manufacturing exports propensity in Indonesia by looking at the internal (firm-level characteristics) and external (geographic characteristics) factors. We want to gather the empirical evidence that captures about the determinants of manufacturing exports in some countries, especially the studies that focus on the firm-level characteristics (internal) and geographic characteristics (external).

1.2.2 Research Questions

- The main research question:
  What kind of firm's and geographic characteristics that have possibility become the important elements in influencing the propensity of manufacturing exports in Indonesia?

- The specific questions of the research are:
  1) What are the factors that really matter to influence the manufacturing firm propensity to export? Firm's characteristics or geographic characteristics? Or both of them?

  2) What kind of geographic characteristics which have significant value to influence manufacturing firms to exports in Indonesia? First-nature geographic or second-nature geographic? Or both of them?

1.3 Scope and Limitation

The limited studies combined firm-level and geographic characteristics as the important determinants of exports, especially in Indonesia, is the main concern of the author to pay attention of this issue. Hence, this study takes a case study of Indonesia in order to get more description about how important both of them in influencing manufacturing exports propensity. Furthermore, even though, the methodology of this study adopts from three previous studies (Farole, et.al. 2013; Matthee and Naude, 2008; and Nicolini, 2003) but it has a little bit differences with those studies. First, this study only trying to capture the firm's propensity to exports by combining firm characteristics and geography characteristics of a region where a firm located, while the

previous study by Farole, et.al. (2013) did both propensity and intensity of firms to exports. Therefore, the researcher will use only Probit and Logit Model in this study, meanwhile Farole, et.al (2013) use Heckman Two Stage Selection Model to analyze their research.

Second, this research uses the different time frame with Farole, et.al. (2013). In this paper, author uses time frame 2012 as her objective of the analysis due to the latest data which is available on the Central Bureau of Statistics (BPS). Third, there is a little bit changes in first-nature geographic characteristics (this research will use only one element which is surface area of a region to capture transportation costs). Meanwhile, Farole, et.al. (2013) used distance to coast to capture the transportation costs.

Third, the researcher faces some difficulties in interpreting regression analysis because there are only few studies that related with this issue; hence, the author faces the difficulty on finding the possible explanations of each results, especially on the expected sign of each variables. In addition, the numbers of micro data which have to be put by the author is about 23.564 firms, means that is not the simple work to be done in a short time. By considering the large number of observations that have to be clustered by the author, then she chooses to use cross section data rather than panel data. In addition, due to the limited data of firm level (some of the data is micro data which is not published), hence, the researcher have to do field work to obtain those data.

Last, there are several manufacturing firms of AMS 2012 which hadn't fill in all the questions. Therefore, in this research, there is some missing data of productivity that cause number of observation which is estimated in firm level model (N=21896) is less than geographic characteristics model (N=23559). However, the results of those model's regression can still be used as the tool of analysis of this research.

1.4 Organizations of The Paper

This paper is divided into six sections. Chapter 1 is an introductory chapter which gives readers a brief explanation on the background of the study. Moreover, this chapter also provides the main problem of the study which is simplified into one main research question and will be specified into two sub-research questions. Chapter 2 reviews the theoretical framework which contains the concept of exports, firm characteristics, first-nature and second-nature characteristics and empirical evidence that is related to this research. This section emphasizes the geographic characteristics more than firm characteristics since the research questions are more focused on this issue. Chapter 3 provides an overview of the manufacturing sector in Indonesia and gives a vivid picture about the first and second-nature geographic of each provinces. In addition, this section also reviews some policies that are already imposed at the regional and national level which related to the infrastructure improvements. Thereafter, Chapter 4 will present the data and methodology, the methods used by the author in acquiring the micro and macro data, as well as models that are already built

to solve the research problems. Regression results will be presented in the chapter 5 in order to give a brief resume of the econometric analysis, including the descriptive statistics explanation. Chapter 6 will be the concluding remarks which will contain a brief conclusion of the current findings and also offer some policy recommendations that would be applicable for local government and private sectors.

Chapter 2

Theoretical Framework and Empirical Evidence

2.1 Concept of Firm Characteristics to Export Propensity

The basic motive of economic players or individuals in doing business is to minimize their costs in order to achieve the highest benefits. Similarly, a firm will do the same things in order to maximize their profit in the production process to fulfill the domestic and foreign market's demand. Sjöholm (2003) said that a firm would base their export activity on those two considerations while also paying attention to the quality of product. He defined that there are some firm characteristics which are potential factors in influencing export propensity namely foreign ownership, productivity, and capital stock.

Several researches have been done to analyze those factors. The first one is the reciprocal connection between productivity and propensity to exports. Wagner (2007) defined those two relationships by giving rationale explanation for each connection. The first one is the notion that exports would generate higher productivity. Plausible explanation behind those kind of connection is caused by the existence of international trade that encourages a firm to enter those markets. Obviously, it is not a simple work to enter the international market because a firm needs more costs to be paid such as transportation, production, marketing and labor costs (usually called "sunk entry costs of exporting") in order to compete with the other players in the markets. Second, the inversely link that productivity would promote exports propensity or performance. As a consequence, they have to improve their production capability and increase their productivity.

As a consequence, they have to improve their production capability and increase their productivity. The rationale explanation that was argued by Wagner (2007) is that the inclusion of a firm in the international market, leads to the better knowledge and technology that they could achieve in those market. Those knowledge and innovative technology doesn't only come from competitors but also comes from buyers. As a result, those firms which are involved in international market would be more experienced in production because they don't only have domestic targeting but also foreign targeting of market segmentation. Therefore, the author puts this variable into the model since it is considered to influence exports propensity significantly.

In addition, Gomes (1997:159) defines the productivity as ratio of output to input where input can include production and equipment costs, while output could be defined as sales, revenue, and rejected products. Productivity has to be optimized in order to maintain the viability of a company. It represents how a firm or company has the ability to cultivate their resources to produce maximum output. Therefore, they will have a higher capacity to export their product/output beyond the compliance of domestic demand.

Like productivity, FO is also noticed as the potential variable in influencing export propensity since it closely related with the international market issue and networking. Sjöholm (2013) in Farole, et.al. (2013) argued that foreign ownership is supposed to result in at positive impact on export likelihood of a firm. The other research by Aitken, et.al. (2007) showed that foreign ownership significantly enhances the likelihood of a firm to export. By considering those facts, the author decided to include this element into the model as one the independent variable.

Capital stock is rated as the important elements in influencing export propensity since some studies show the positive impact of this variable to the export performance. In enhancing the company's performance, capital stock is needed to improve the firm's capacity to produce more goods for fulfilling the higher market demand. Additional capital stock is expected in line with the additional unit of production. Hence, in some research it was found that capital stock gives positive impact to production of goods as well as to export propensity of a firm (The Economic and Social Research Institute, 2006).

By combining FO and productivity factors, Chang and Van Marrewijk (2013) did a research in Latin America countries. One of their finding was foreign ownership has an important role in all sectors, even for domestic and exporting firms.

2.2 Concept of Economy Geography

2.2.1 Concept of Economies of Scale

The consideration about concept of geographic economy was triggered by Paul Krugman (1991) who is called as the founder of New Economy Geography (NEG) theory. He said that geographic economy became an important subject for concern since there were, at least, three key issues, namely: the different on location of economy activity among countries, the biased limitation between international and regional economics in several ways, and the different 'intellectual and empirical laboratory' in different time. Furthermore, He said that *"issue of the market structure with the shape of market areas on the idealized landscape, or with the optimal sitting of facilities given market and resources, in particular literature, have been ignored"* (Krugman 1991:5).

Furthermore, He opined that there is closed relationship between international trade and geographic economy that were considered as a separated discipline beginning a long time ago. Then, he formulated those two theories into one theory namely *economies of scale* which was trying to capture the effect of free trade and the causes of global migration. Even further, the creation of Krugman about economics of scale is not only became the new theory in international trade but also in geographic economy where location of

factors production and economic activity can be analyzed in an integrated manner within a framework of equilibrium models are commonly used for economic analysis. His analysis focuses on the impact of economies of scale on trade and business locations. The concept of economies of scale derived from the analysis that ends at the conclusion that the great number of goods and services produced in the same factory, the slower the production costs will be incurred. He argued that the market will not compete perfectly as stated by the creator of the theory of international trade earlier.

Moreover, Krugman said that the theory of comparative advantage, found by David Ricardo in 19th, is no longer able to answer the phenomenon of international trade at the moment. Comparative advantage theory states that each country should seek specialization of production that the process of 'barter' occurs and revenue rises. However, in fact, trading the 20th and 21st century world dominated by only a handful of countries that turned out to trade in similar products. On his theory, Krugman assumed that the price differentiation among each good would lead the consumer to buy some different goods. Hence, the more a firm produces the same goods, the cheaper production costs should be. As a result, the new plant will enter the market by increasing product variety. In other words, the production costs can be reduced if the unit production reaches a certain amount. However, production costs may also increase if the number of returned goods production was up or economies of scale are no longer achieved.

Krugman also added that in order to increase economies of scale, a new plant will look for other countries or regions that are able to support the existence of production units in large numbers. With the support of the advancement of technology, transportation, and information, the plant will move their production processes with ease, therefore, it will encourage labor migration. He said that there was a trend of workers migrating to the region's largest labor center that eventually will create a very diverse product variations. In other words, the concentration occurs in the case of goods and services produced and the location of the goods are made.

2.2.2 Concept of Spatial Economy

For this concept, Krugman pointed out that spatial aspects remain a blind spot for the majority of the economy due to the inability of economists to create a model that explains the various aspects of industrial location. Meanwhile, geography is the study of spatial patterns on the surface of the earth, which answers the question *where (*in which human activity is) and *why* (why the location of the company or industry be there). In the perspective of geographic economy, aspects of the spatial pattern of economic activity as a core concern with the use of Geographic Information Systems (GIS) to answer the central question in a regional economy that is "where" location industry is and "why" geographic concentration of manufacturing industry occurred. The role of sub-national territory in view of the influence of the county or city to the location of economic activity seems to be increasingly important in the study of economic geography.

Explanation of the 'classic' spatial concentration of economic activity generally refers to two kinds of economics externalities, which is named as saving of localization (localization economies) and the savings of urbanization (urbanization economies) (Henderson, 1997; O'Sullivan, 1996). Both kinds of savings, that are often called agglomeration economies, implicitly showing the relationship between industrialization and urbanization in the development process. The savings results occurs when the production company's location in a production decreases as the total industrial production increases. In short, when conveniently located near other company in the same industry, a company may enjoy some of the benefits. Saving locations associated with companies that have activities related to each other, has led to the phenomenon of industrial clusters or is often called as industrial cluster or industrial district. Industrial cluster is basically a group of production activities are spatially very concentrated and generally specialize in only one or two main industries. This is called *Marshallian industrial district.*

Conversely, urbanization economies occurs when the cost of production of a company decreases as production throughout the company in the same urban areas increased. The savings due to being located in urban areas caused by large-scale urban economy, not the result of some kind of industrial scale. Thus, savings of urbanization provides benefits to all companies throughout the city, not only companies in a particular industry. Therefore, the high spatial inequality of economic activity encouraging the emergence of various theories and studies to understand the industrial site.

2.2.3 Concept of Home Market Effects (HME)

Krugman (1980) continued the concept of external economies of scale that is related with geographic economy, namely "home market effects". Based on economies of scale, industries will tend to be concentrated in large cities. Concentration of production in a specific region (in this case the urban areas), enabling economies of scale can be realized because the proximity to the market will minimize transportation costs. As a result of the concentration, regions within a country eventually divided into two core regions which are urban areas as science and technology development center and the periphery areas. This model was developed from the choice of location of factories and individuals. Factories choose urban to increase its production scale at the same time save on transportation costs. Individuals are also keen to migrate to urban areas that offer higher wages and more diverse products. This trend increases the capacity of the market and spurs factories and individuals to migrate to the city at once. As a result, this creates a circle of cause and effect and also forms a new equilibrium.

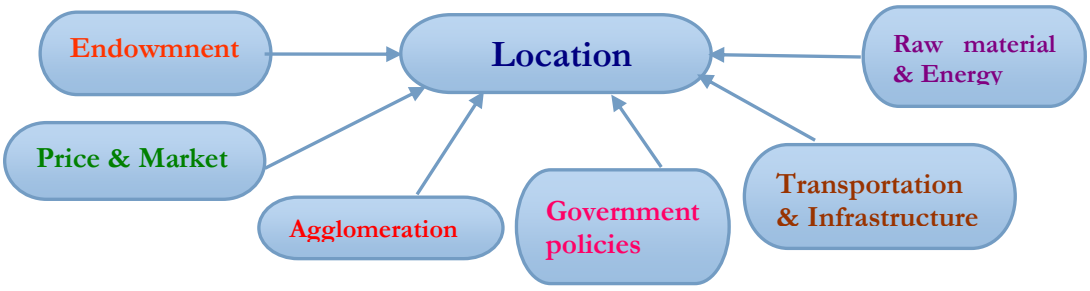
Specifically, he also argued that the main consideration for producers, obviously, is the location selection which is concentrated on the location near the source of demand; it is also rich in natural resources for supporting their production activity. In addition, the producers also can get more advantages if they locate their factories inside industrial area. For example, it will be easier to get transfer knowledge from other firms inside an industrial area as compared with firms which are located outside the industrial area. Inversely, the producers that still remain outside industrial area or market would bear the

disadvantages such as the larger trade costs and less ability to compete with the producers that located inside industrial area or market.

In addition, regarding to Kusumaningrum (2006), there are at least six factors that have been considered for a firm or producer to locate their production activity, namely endowment, price and market, agglomeration, government policies, transportation or infrastructure and the availability of raw material & source of energy in a region (see Figure 2.1). Land, capital and labor are included into the endowment factor of a region or location. Related with the market and price, the rigidity of the market structure that tends to be monopolized will also cause the rigidity for new player to enter a region or certain location.

Meanwhile, for the agglomeration factor, it is believed that it will create the savings from the similar industry or related industries at the same location, as well as savings from the location of industries in urban areas. This fact is inherent with Kuncoro (2002) that stated private investors tend to favor economic expansion in urban areas or regions that already have facilities to support their economic activities, such as transportation facilities, good access to electricity, and the availability of labor. He also said that investors also prefer to select urban areas that offer cost savings due to the ease of accessibility and the presence of the city's infrastructure. This phenomenon is referred to by Kuncoro (2002) as localization economies. The next consideration is that of government policies which is closely related to licensing or regulation that provide facilities and incentives for economic agents. While the latter factor, or sixth, is the cost of transport/freight.

Figure 2.1 Determinants of Industrial Location



Source: Kusumaningrum (2006)

From the previous explanation, we can conclude that there is closed relationship between concept of geographic economy and concept of agglomeration economies in terms of site or location selection.

2.2.4 Concept of New Geography Economy (NEG), First-Nature (FNG) and Second-Nature Geography (SNG)

Farole, et.al (2013) already mentioned about first-nature and second-nature characteristics as representative of geographic economy on their research. Talking about those two characteristics, Gonzalez and Pueyo (2009) stated that first-nature characteristics cover the physical aspects of a region,

such as rainfall, access to navigable conduit, temperature, access to the sea or coast or ports (or we can say it as "distance"), the availability of natural resources. In short, first-nature geographic is everything that is inherited from the nature. While, second-nature characteristics encompass the human and economy activities and also physical infrastructure of a region, such as knowledge spillovers or education, migration, and access to the electricity.

Further, Gonzalez and Pueyo (2009) argued that there is a basic assumption in the NEG which stated first-nature characteristics are appointed as the controlling variables since they are assumed to be identical characteristics for all region. It leads to the less study that concerned on the first-nature characteristics, although in reality this factor holds the potential role in affecting economy activities and economic growth such as export performance of a region. They used the North-South relationship that doing trade each other with the assumption that labor is immobile among countries but it is very mobile within regions in a country. In shortly words, the concept of NEG in the economic activities is developed on the combination of first-nature geographic and second-nature geographic concepts.

Moreover, NEG is the concept that emphasizes the assumption that imperfect markets and economic of scale are the important factors which affects the presence of location selection. Starting the path with the assumption that trade costs and transportation costs within regions is very high so that each region would be maximizing their location. In other words, NEG defines that due to increasing returns to scale and transportation costs occurring in the regional trade or economic activity, the agglomeration pattern also automatically formed.

2.3 Empirical Studies on the Relationship between Firm-level Characteristics and Exports

There is some research that has been done to analyze the kind of relationship between firm-level characteristics and export performance in terms on both propensity and intensity. Farole, et.al. (2013) found that capital stocks produces a positive relationship to export propensity but surprisingly, it gives a negative impact to export intensity of a firm by using Heckman Two-Stage Selection Model. They argue that a firm that is capital-intensive would export less than their output shares, hence capital stock display negative effects to export intensity. Meanwhile, foreign ownership produces the positive sign in influencing export propensity and export intensity in Indonesia. It is in line with the concept of foreign ownership which gives a positive effect to export performance. On the other hand, productivity displayed the same result with capital stock which is negatively significant on influencing export intensity. The possibility explanation that was argued is the likelihood of manufacturing firms in Indonesia to produce their goods by using lower scale of technology.

Study by Ramstetter (1999), which concerned on Indonesia, showed that the firms with foreign ownership in manufacturing firms would be easier to gain international market for their products and automatically leads to the lower transaction costs. A multinational company, with wider connection in the international market, would be have the easier way to penetrate foreign market. It is believed that since a firm is owned by foreign with various proportion, then they will be able to diminish their transaction costs. In the short words, the advantages of foreign ownership is expanding the network that can be owned by a company that simplify the process of marketing and distribution of their products.

In addition, Berry et.al. (2002) with the study about *Firm and Group Dynamics in the Small and Medium Enterprise Sector in Indonesia* argued that a large number of labor intensive manufacturing firms in Indonesia, which are intended to export, have a higher capital stock than the companies that are targeted for the domestic market. Referred to this finding, the author put capital stock as one of explanatory variable in the model.

2.4 Empirical studies on the Relationship Between Geography Characteristics and Exports

A long with the phenomena of the importance of the geographic economy concept to explain regional and international trade and also export performance and export capability, then it is essential to examine how far the economy geography could explain exports performance and capability in a country. A recent study by Matthtee and Naude (2008) found that surface area of region and distance to nearest ports exports are the important variable in representing geography characteristics due to both of them show significant effect to export propensity of manufacture firms in South Africa. They employ data gathered from 354 managerial districts in South Africa and use the Tobit regression type I and II to analyze their research. It is concluded that those two variables have significant role in affecting exports especially in some developing countries like South Africa. On the other hands, they underline that from previous study, distance is not really matters in influencing exports especially in developed countries such as United States.

Another research by Krugell and Matthee (2009) showed that there was positive relationship between export capabilities and export performance in South Africa by using geographic economy approach. Their study found a number of front-runner magisterial districts along with those high capability but low performance that stand to benefit most from industrial policy interventions. Particularly, they mentioned that location where an exporters located holds important role in affecting export accretion.

Nicolini (2003) implies that exports from a region are determined by geographic characteristics particular to each region, HME of each region, and specific regional features. By using GDP per region divided by surface area of a region (GDP per km^2) as the proxy of market size, she found that HME produces positive significant effects on trade flows in European regions. On the other hands, by employing geographic components of a country to represent the transport costs which is surface area of the region (as

representative of FNG), she found that surface area gives negative significant effects on trade flows.

Farole, et.al. (2013) in the study of *Geography and The Determinants of Firm Exports In Indonesia* examine both factors which are firm-level characteristics and geographic characteristics in influencing likelihood to exports and firm's intensity to exports of manufacturing firms by employing Heckman Two-Stage Selection Model. In order to achieve the specific output of the research, they were trying to combine those two characteristics by separated off geographic characteristics into two groups which are FNG and SNG in order to find out which one of firm-level characteristics and geographic characteristics matters in influencing export performance in Indonesia during 1990-2005. They gave the special treatment for SNG by adding interaction terms for each of the variables of SNG. They found that both of them are really matters in affecting a firm's export propensity and intensity. They conclude that SNG is more matters than FNG due to interaction among regions while doing exports activity. Moreover, SNG is considered to be more relevant since it relates with agglomeration effects, HME and endowment factors such as education, infrastructure and access to electricity.

To sum up, some empirical evidences done by scholars show that firm-level characteristics and geographic characteristics have closed relationship with export performance in terms of export propensity and export intensity, especially in some developing countries such as Indonesia and South Africa. However, some of those studies do not show the same results even though they were addressed for the same objective. It is probably caused by a unique landscape of each country, heterogeneous characters that is owned by each firms and also diverse endowments of each region. Moreover, some of the sign's directions also show inversely with the theory said. It implies that there is unpredictable factors which have opportunity to change the direction of expected sign in the opposite direction. For clearly description, the author has already compile all of findings of both empirical evidences in a briefly summary table below (see Table 3.1).

Table 2.1. Summary of Empirical Evidence Findings

Elements	Study	Author	Years	Country	Method	Key Findings
Firm-Level Characteristics	Trade Propensities and Foreign Ownership Shares in Indonesia Manufacturing	Ramstetter, E.D.	1999	Indonesia	Tobit Estimators	Foreign ownership gives positive significant effects to export propensity of manufacturing firms
	Firm and Group Dynamics in the Small and Medium Enterprise Sector in Indonesia	Berry, et.al.	2002	Indonesia	Qualitative Analysis	Capital stock leads to likelihood of a firm to export
	Geography and the Determinants of Firm Exports in Indonesia	Farole, et.al.	2013	Indonesia	Heckman Two Stage Selection Model	Foreign ownership, capital stock and productivity of a firm produce positive significant effects in influencing export propensity
						Foreign ownership displays positive significant effects to export propensity; while capital stock and productivity produce negative significant effect on export intensity
FNG	On the Determinants of Regional Trade Flows	Rosella Nicolini	2003	European Regions	Cross section method with Gravity model approach	Surface area produces negatively effects in affecting trade flows
	The Determinants of Regional Mnufactured Exports from A Developing Country	Matthee and Naude	2008	South Africa	Panel Data Analysis and Tobit	Surface area of a region produces negative significant effects to exports
SNG	On the Determinants of Regional Trade Flows	Rosella Nicolini	2003	European Regions	Cross section method with Gravity model approach	HME provides positive significant effects to trade flows
	Measuring the Export Capability of South Africa Regions	Matthee and Krugell	2009	South Africa	PCA	Location gives significant effect on export growth
	Geography and the Determinants of Firm Exports in Indonesia	Farole, et.al.	2013	Indonesia	Heckman Two Stage Selection Model	Location, export spillovers, and road density give positive significant effects on both export propensity and intensity
						Education and electricity provide negative significant effects on export propensity and intensity

Chapter 3

Potential Geography, Portrait of Manufacturing Firms and Overview of Physical Infrastructure in Indonesia

3.1 Potential Geography of Indonesia

Regarding to Worosuprodjo (2007) Indonesian resources in the region is strongly influenced by the geographical aspects of space, the environment and the region. As an island nation with a vast number of islands have a lot of marine resources and land resources that need to be managed in an integrated manner. Aspects of climatology, geological/geomorphology, hydrology, biotic and human with their social-diverse cultures are crucial studied in managing resources for the welfare of the nation's territory.

The nature and characteristics of the geographic Indonesia in terms of aspects of climate is the humid tropical countries that affect the lives of plants, animals and humans. Diverse human resources, ethnicity, religion, tradition and culture as well as language are a social cultural asset important geographic developed as an asset of local wisdom in regional development and resource management and the environment. Indonesia's geographic position between Australia and the Asian continent is the global spatial aspects that can be used as the attractiveness of cooperation between countries along with ASEAN countries.

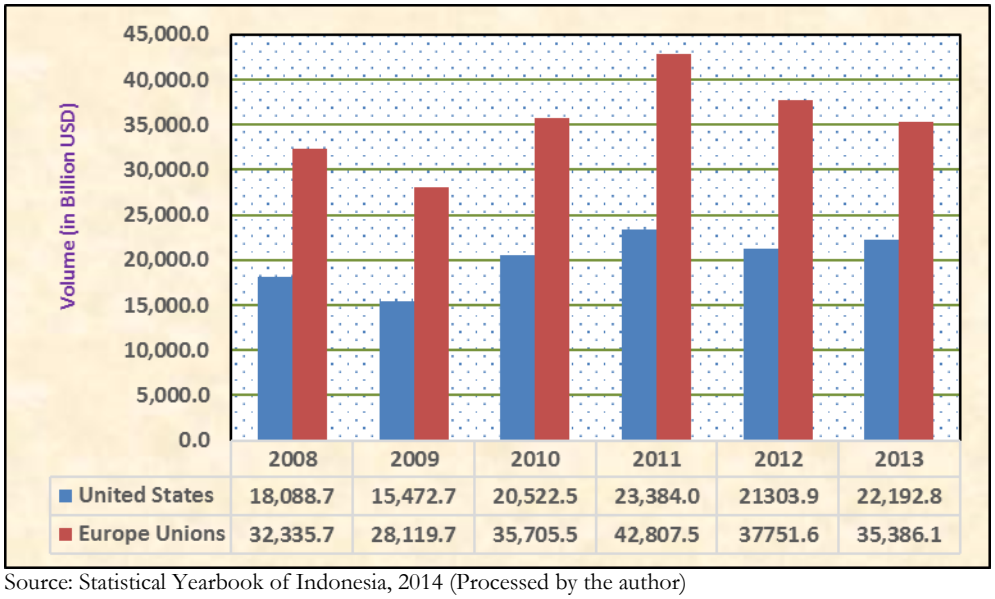
Obviously, Indonesia has a strategic position among nations since it is located near Malacca Strait. Waterway indeed plays a very important, not only for the countries that are in the vicinity, but also for the countries in the world given its existence as the second busiest ocean trade lanes in the world after the Strait of Hormuz. Although the philosophical awareness of the advantages of this position from since the ancestors until now, but there is a tendency that today Indonesia has not significantly take advantage of this position. Hence, there are many challenges which have to be faced by Indonesia.

3.2 Performance of Indonesia's Manufacturing Firms

Since government policy no longer rely on oil and gas exports, the manufacturing industry has played an important role in Indonesia. Manufacturing sector, which is increasingly export-oriented, has been supporting the Indonesian economy. Export of manufacturing industry accounts for no less than 83-85% of non-oil exports and about 64-57% of the total Indonesian exports during 1994-2005. Even the contribution of exports of this industry has surpassed the export of agricultural and oil and gas sector since the early 1990s (BPS, 2012, accessed on Wednesday, 21th July, 2015).

Based on Statistics Yearbook of Indonesia (2014), a decrease in the production capacity of the manufacturing industry occurred as the weakening export performance because during the marketing of products manufacturing industry still relies on traditional export markets such as the US and Europe that have sharply reduced their demand for national export commodities especially in 2009 and 2012 (see Figure 3.1 below).

Figure 3.1 Volume Exports by Country of Destination (2008 & 2013)



	2008	2009	2010	2011	2012	2013
United States	18,088.7	15,472.7	20,522.5	23,384.0	21303.9	22,192.8
Europe Unions	32,335.7	28,119.7	35,705.5	42,807.5	37751.6	35,386.1

Source: Statistical Yearbook of Indonesia, 2014 (Processed by the author)

In addition, declining in the growth of manufacturing industry in Indonesia is not only triggered solely by fluctuations in the exchange rate against the US dollar exchange rate that is erratic but also caused by several factors. Some factors contributed to the decline in the performance of the manufacturing industry are downsizing of production market, intense competition following a similar over-production of various countries, mortgage interest costs, and increasing in the minimum wage of workers.

There are two kinds of fundamental problems faced by the manufacturing industry, which is structurally and organizationally. Since this study more focused on geography characteristics, then the author will focused only on the structural problems which has a closed relation with geography characteristics such as infrastructure (i.e. port, road and access to electricity) and human capital (represented by education). On the following sub-section, the author will try give briefly explanation about those issues specifically.

3.3 Structural Problems of Manufacturing Sector in Indonesia

The Global Competitiveness Report 2013-2014 reports Indonesia has some problems with inadequate supply of infrastructure which ranked on third place (9.1%) as the most problems in doing business in Indonesia after corruption (19.3%) and inefficient government bureaucracy (15%). As the second pillars of global competitiveness, infrastructure in Indonesia ranks 82th out of 148 countries in the world.

For the case of port, the competitiveness of ports in Indonesia condition continued to decline compared with ports in several countries in Southeast Asia refers to the data released by The Global Competitiveness Report 2013-2014. The competitiveness of ports in Indonesia is ranked 89th out of 148 countries surveyed.

Those facts tells us indirectly that the main problems lies in the regional level. Infrastructure facilities in the form of port, road, and access to electricity are really important to be concerned in supporting export activity. Infrastructure problems have closed correlation with region that has a high poverty rate because it is influenced by energy, water resources, transportation especially sea transportation. Some scholars already done their studies and researches to examine how deep the infrastructure problems faced in Indonesia. Broadly, they argue Indonesia has to give more concern to overcome this problem in order to compete with other countries in the worlds.

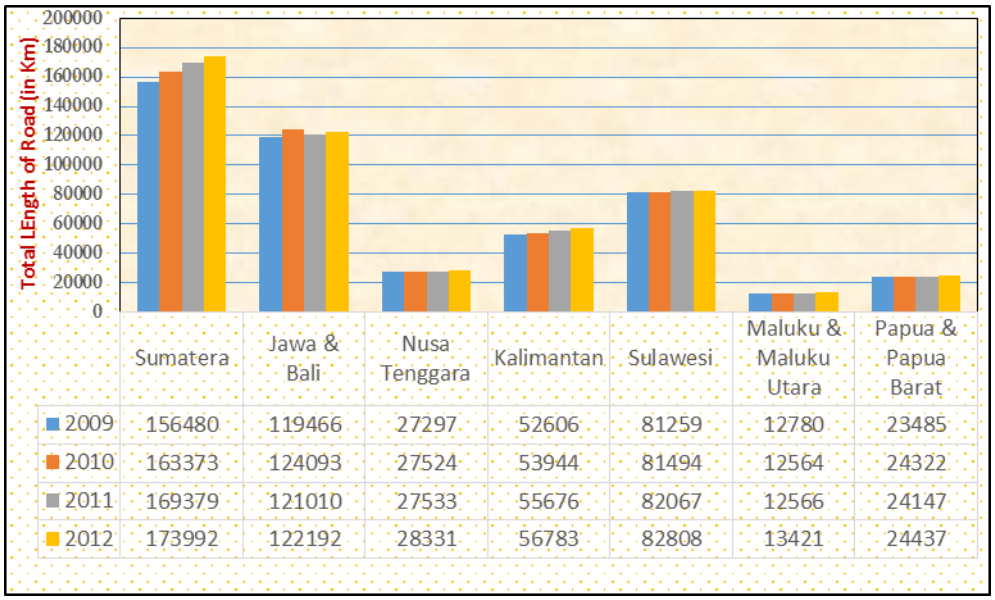
3.3.1 Overview of Road Condition in Indonesia

Road is one of physical infrastructure that is needed for supporting economy and trade activity. As part of land transportation, road serves as a liaison within the territory of the other. In the context of economic and trade, the road network is necessary for the smooth flow of factors of production and marketing. Road is also an essential infrastructure to facilitate the distribution of goods and factors of production between regions and to improve the mobility of people.

In general, the condition of road infrastructure in Indonesia is still very low compared with other neighboring countries. In fact, the spread of the construction of the road network in Indonesia is also uneven which still tend to be concentrated in Java, Bali and Sumatra. Despite the ongoing road construction projects, but so far, the road construction is more focused in the Western Region of Indonesia. This is supported by the data from Statistical Yearbook of Indonesia published by Central Bureau of Statistics of Indonesia(2012 - 2014) which showed that the increasing trend of total length of road of Java, Bali and Sumatra during 2009-2012 is still above the other five big islands (see Figure 3.3). In percentage, total length of road in Java, Bali and Sumatra reaches 58% of the total length of road in Indonesia during four years (see Appendix 1a-d). While, classification of seven big islands in Indonesia is presented on Appendix 2. Those description tells us that road condition in Indonesia is not quite good enough to support manufacturing exports in all region since it is only focused on Eastern of Indonesia.

In addition to the low level of development of the road network in Eastern Indonesia, road network system which is the main traffic in each of the islands in eastern Indonesia, especially in Kalimantan (Borneo) and Sulawesi, has not been connected. Appendix 3a-d also provide the important information about the total length of road based on its condition and road stability in 2012 (good, moderate, slightly damaged and severely damage) on number and percentage (Transportation Statistics of Indonesia 2012 published by Ministry of Public Works of Indonesia). It is shown that there are still exists the damaged road in some provinces in Indonesia. If this continues then this will disrupt activities in the sectors of the economy and trade (mainly manufacturing exports) which requires adequate infrastructure, which in turn will hamper economic growth.

Figure 3.2 Trend of Total Length of Road by Seven Big Islands in 2009 - 2012



	Sumatera	Jawa & Bali	Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Maluku Utara	Papua & Papua Barat
2009	156480	119466	27297	52606	81259	12780	23485
2010	163373	124093	27524	53944	81494	12564	24322
2011	169379	121010	27533	55676	82067	12566	24147
2012	173992	122192	28331	56783	82808	13421	24437

Source: Statistical Yearbook of Indonesia 2012-2014 (processed by Author)

3.3.2 Portrait of Education Problems in Indonesia

Education is one of main elements which needs to be concerned since it is related with human capital stock. Adam Smith (1777/1976) stated that combination between knowledge and skills, obtained from education, is really important as human capital investment. Different level of education of people leads to the difference on their human capital. Hence, in the context of people as one of factor production, one hour of labor input will produce the different output among them. Higher education will generate higher human capital through labor productivity and income enhancement.

In detail, He stated on his book as follows:

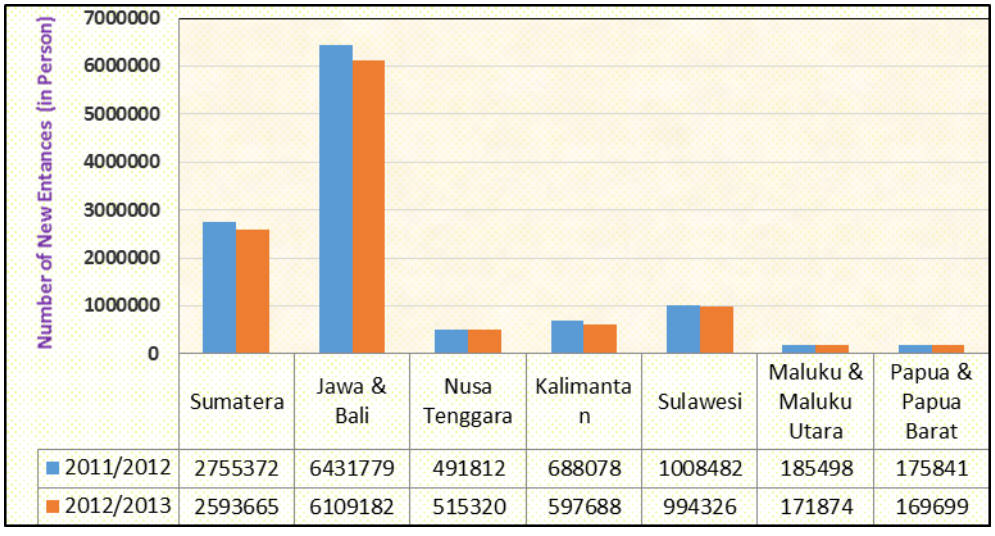
"A man educated at the expence of much labor and time to any of those employment which require extraordinary dexterity and skill, may be compared to [an] expensive machin[e]. The work which he learns to perform, it must be expected, over and above the usual wages of

common labor, will replace to him the whole expence of his education, with at least the ordinary profits of an equally valuable capital".
(Adam Smith, 1776/1976. p.118)

One of main cause of the education problems in Indonesia is the high cost of education that leads to the decreasing of new entrants on school, especially in Sumatra, Java and Bali Islands (see Figure 3.4). The data obtained from Indonesia Educational Statistics in Brief 2012/2013 shows that number of new pupils in Indonesia decreased evenly in each provinces along with the increasing cost of education (see Appendix 4). It is worsened when the cost of schooling progressively increase year to year is not followed by increasing of household's income.

Moreover, as an expensive cost of schooling, then a worker who is graduated from graduate program and above will be charge a high standard of their salary because they have spent a lot of money to finance their college. In addition, skilled labor in Indonesia tends to choose to be placed at R&D department or managerial position rather than at production process. Hence, they will have a little bit difficulty to find a job, especially in a manufacturing firms which is still follow labor intensive goods' pattern for their production. As consequence, they prefer to become temporary unemployment rather than become a labor with lower salary (below their standard value of human capital). On the other hands, a firm would prefer to hire semi-skilled labor with lower wages for their production process. This unbalanced demand and supply problem, indeed, will influence a decision of a firm to exports.

Figure 3.3 Number of New Entrants on School in Seven Big Islands in Indonesia, Academic Year 2011/2012 and 2012/2013



	Sumatera	Jawa & Bali	Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Maluku Utara	Papua & Papua Barat
2011/2012	2755372	6431779	491812	688078	1008482	185498	175841
2012/2013	2593665	6109182	515320	597688	994326	171874	169699

Source: Indonesia Educational Statistics in Brief (processed by the author)

3.3.3 Overview of Access to Electricity in Indonesia

Electrical energy currently has a vital and strategic role to support national development. Therefore, electricity must be realized in a reliable, safe, and environmentally friendly. But in reality, there are many problems occurred in

the management of the national electricity system. Those problems include electricity production costs which higher than the selling price of electricity, uncertainty of the supply of primary energy sources, especially natural gas supplies, existence of fuel-fired power plants as a source of primary energy, as well as the geographical condition of Indonesia which consists of many islands complicate the process transmission and distribution of electrical energy.

World Bank's Reports (2005) has forecast that more than 70 million people in Indonesia would not be able to access electricity. Even worse, they reports that 80% of it are living in rural area and more than 50% of those people are living outside an economy center like Sumatra and Bali. By reviewing those condition they argued that, on average, 3 of 4 poor people still live in remoteness area. It leads to a condition where access to electricity become a big concern to be solved by local and central government. In a short words, electricity becomes one main of big issue in terms of infrastructure problems in rural area, especially in remoteness islands and western region of Indonesia. Their report noted that government has already reacted those problems by having a plan to enlarge the access to electricity up to 90% of total population in Indonesia by 2020. As a consequence, government should provide 1.3 million of new connection a year for achieving those plan.

Further, regarding to the General Plan of The National Electricity (RUKN) 2015, ratio of electrified villages are defined as the ratio of the number of electrified villages divided by the total number of villages in a region. In accordance with the micro data concerning potential villages (PODES) that obtained from the BPS 2011, ratio of electrified villages has reached 75477 villages, or approximately 96.02% of the total villages in Indonesia, amounting to 78609 villages. This means there is still 3132 villages or equivalent with 4% of the total villages in Indonesia are yet to get access to electricity. This data were obtained from the electrified villages micro data concerning potential villages (PODES) BPS issued regularly in every 3 years.

Bappenas GIZ (2012) has reported that government has took an action to overcome unbalanced demand and supply problems of electricity by establishing a program for the Acceleration Phase One (Fast Track Program/FTP I)[1] in 2007 through PLN. This program has been started by building a number of coal power plants with a total power of 10 GW with details 7 GW is installed in Java and 3 GW is installed in Sumatra, Kalimantan, etc. The following program is taken in 2010 by making additions 10 GW power project called FTP II. This program more concerned on geothermal projects which 4 GW of total installation is developed by private sectors. However, construction of the power plant encountered many obstacles, such as the licensing process which does not have a basic standard, the difficulty of financing and land acquisition. The land issue became one of the main obstacles in the development of coal power plants. Then, the problem does not only occur in the upstream sector or power generation but also in

[1] FTP is a program that is initiated by State Electrical Company (PLN) which purposed for accelerate diversification of energy in Indonesia to energy other than fossil fuels i.e. Coal, renewable energy and gas. FTP phase 1 is constituted by Presidential Decree No. 71 of 2006.

transmission and distribution infrastructure. It is become an experiencing problem, especially difficulty in obtaining land for tower footprint, dealing with land prices which is too expensive as well as the reaction of the people who do not want the house passed transmission lines.

Further, in the case of large-scale development of renewable energy, such as hydro power and geothermal power plants, also encountered many obstacles. Hydro power is highly dependent natural conditions where water availability is difficult to predict because of the uncertain climate and natural damage is severe enough, can't be built in any place and in general is built in the altitude/mountain views and large development costs. While geothermal power problems generally associated with the existence of geothermal resources are located in protected forests as well as low rates of electricity purchases by State Electricity Company (PLN) thus making payback project to be very long.

Another main problems related with electricity is about monopoly power of PLN as a main provider of electricity in Indonesia. It is convinced with the publication of Law No. 30 of 2009 about electrification in Indonesia. It is stated that state and regional government are given the authority as the provider of electricity for people. Then, they designate PLN as the main provider of electricity in Indonesia. This leads to the condition where PLN become a monopoly company of electricity. Further PLN has charged the low tariff of electricity during their rule since 2003 and this action, as a consequence, has declined the participation of private sector and new entrants in power market (Bappenas GIZ 2012).

Chapter 4
Data and methodology

4.1 Data

As this research will use secondary data, the researcher will try to use both relevant and reliable data which was published by trusted institution (BPS/Central Bureau of Statistics of Indonesia). Thus, this research will be conducted in compliance with ethical consideration. The micro and macro data of Indonesia's manufactured exports was gathered from the Central Bureau of Statistics of Indonesia (BPS). In order to give the description of manufacturing firms' progress, this research will analyze the export propensity of manufacturing firm on year 2012 and putting the firm level data (5 ISIC digits) on 33 provinces in Indonesia combined with geographic data of each provinces.

In order to obtain the micro data on firm level, the researcher conducted fieldwork for approximately three weeks (at the end of April until mid of May 2015) due to the BPS requirement for buying that data directly. In addition, those data collection is achieved from Annual Manufacturing Survey (AMS) 2012 which contains of several questions, therefore the researcher has to choose directly which kind of items would be preferred to be picked up for supporting her research. After the researcher got the raw data from BPS, the author clustering those data based on provinces category and per 5 ISIC digit. This step has to be done in order to get the real description about exports propensity of manufacturing firms and its possible determinants Then, the author will regress the data in accordance with the established model (see equation 3 -7 below) by using STATA 13.0 as the econometric tools.

The purpose of choosing 2012 as the time frame is also intended to distinguish this research from the previous study done by Farole, et.al. (2013) that used year 1990-2005 as their time frame. In addition, this research takes the time frame 2012 because it is the newest data that can be obtained during the fieldwork which have great advantage to us for giving the latest overview of the manufacturing firms on doing exports and investigate the regional and/or national policies related with those issue. Moreover, they did not include the new provinces data on their research because of the limited data (they only gathered data from 26 provinces in total); whereas, the researcher is trying to include the 7 new provinces (approximately 33 provinces in total, except Northern Borneo) in order to examine whether there are differences in the results of the previous studies. In terms of data source, Farole, et.al. (2013) used the Manufactured Census for their research (those census is being conducted in every 10 years), while the researcher uses the AMS data from BPS.

4.2 Methodology

In this study, the author tries to determine the relationship between firm-level characteristics and geography characteristics with export propensity first by using linear probability model or LPM (Probit model) since the dependent variable is a binary response (exports or not exports). The following step that the author will do is give the explanation about the binary dependent variable by using Logit Model and then making a comparison between Probit and Logit model to choose the appropriate model in describing firm's export propensity in Indonesia.

According to Wooldridge (2012), LPM is a simple technique to use for estimating binary response but there are more difficult things in terms of interpreting the regression results compared with OLS results. There are two disadvantages of LPM which are the possibility of fitted value of probabilities that could be more than one or lower than zero and also the semi-effect of each independent variables (arising in the form of rate) tends to be stable.

Basic formulation of binary model according to Wooldridge (2012) is:

$$\mathbf{P\ (y = 1 \mid x) = P\ (y = 1 \mid x_1, x_2, \dots x_k)} \qquad \textit{equation (1)}$$

Where, x = complete set of all independent variables

While the specific form of binary model is:

$$\mathbf{P\ (y = 1 \mid x) = } \boldsymbol{G\ (ß_0 + ß_1X_1 + \dots + ß_kX_k) = G\ (ß_0 + xß)} \qquad \textit{equation (2)}$$

Where the benchmark of G is strictly more than zero and less than one ($0< G_{(z)}< 1$), for all numbers z.

This study uses cross section data (one year only) which combines the methodology that was used by Farole, et.al. (2013), Matthee and Naude (2008) and Nicolini (2003). By looking at the mixed factors (firm-level characteristics and geographic characteristics), this research is conducted to see how those two factors influence the propensity of manufacturing exports in Indonesia especially in 2012. The hypothesis of this research is that geography characteristics (FNG and SNG) are really matters in influencing manufacturing exports in Indonesia.

The methodology of this research adopts the similar empirical model from Farole, et.al. (2013) which is trying to get a full picture of the combination between firm's characteristics and geographical characteristics. In addition, the shorter distance to ports as the one of explanatory variables is adopted from Matthee and Naude (2008) because it is considered more applicable to be put in the equation due to the unique condition of Indonesia. While, regarding to the study conducted by Nicolini (2003), the author also put surface area of the region and GDP per region divided by surface area of a region as the geography characteristics in order to measure *home market effects* of each region. Additional consideration for HME measurement is based on Krugman Theory

about NEG which has been explained on the previous section (see Chapter 2).

In this study, the researcher will try to do goodness of fit test by looking at Error Type I and Type II and robustness check. It is purposed to get the appropriate model which could describe the determinants of export propensity. In addition, she also provides odds ratio test to investigate the magnitude of explanatory variable in affecting export propensity. Specifically, the researcher also makes the restricted model in order to investigate whether the first-nature geographic and second-nature geographic influence the likelihood of manufacturing firms to export. These method is used to examine the most significant nature of geographic factors that really matters in affecting export propensity in Indonesia provinces in 2012. (see Diagram 4.1)

4.2.1 Restricted Model for Firm-Level vs. Geographic Characteristics

The two following equations (eq. 3 and 4) are a restricted model which is developed to find out a clear answer the first research question whether firm-level characteristics or geography characteristics that really matters in influencing export propensity in Indonesia. Then, the author also makes two kinds of separation models which contains of firm-level characteristics and both geographic characteristics.

$$\mathbf{Exp_{ir} = ß_1 fo_{ir} + ß_2 cap_{ir} + ß_3 prod_r + v_{ir}} \quad \textbf{.....} \textit{\textbf{(Equation 3)}}$$

$$\mathbf{Exp_{ir} = ß_1 surf\_n_r + ß_2 loc_{ir} + ß_3 pop_r + ß_4 exspil\_n_{ir} + ß_5 educ_r + ß_6 elec_r + ß_7 roden_r + ß_8 hme_r + v_{ir}} \quad \textbf{.....} \textit{\textbf{(Equation 4)}}$$

4.2.2 Restricted Model for FNG vs. SNG

Next two model (eq. 5 and 6) are developed to point out separate analysis which concerned on the role of FNG and SNG in influencing exports propensity separately.

$$\mathbf{Exp_{ir} = ß_4 surf\_n_r + v_{ir}} \quad \textbf{.....} \textit{\textbf{(Equation 5)}}$$

$$\mathbf{Exp_{ir} = ß_1 loc_{ir} + ß_2 pop_r + ß_3 exspil\_n_{ir} + ß_4 educ_r + ß_5 elec_r + ß_6 roden_r + ß_7 hme_r + v_{ir}} \quad \textbf{.....} \textit{\textbf{(Equation 6)}}$$

Where:

Exp_{ir}	= Exports propensity which is defined by dummy variable, 1 = firm decide to export, and 0 = otherwise
fo_r	= the percentage of firm *i,* in region *r,* in foreign hands
cap_{ir}	= total capital stock of firm *i,* in region *r* (Rp million)
$prod_r$	= captures the productivity of a firm *i* (Rp)
$surf\_n_r$	= the proximity of surface area of a region *r* (in km^2)

loc_{ir} = the firms *i* that is located inside or outside the industrial area at region *r* that is defined by dummy variable where 1= inside the industrial area and 0 = otherwise

pop_r = number of population on each region *r* at time *t* (in person)

$exspil\_n_{ir}$ = a region's number of exporters as a percentage of the region's total number of firm *i*

$educ_r$ = regional education endowment of region *r* which is measured by number of graduates of graduate program (in person)

$elec_r$ = describes the accessibility of a region *r* to electricity which is measured by installed capacity by state electricity company/PT. PLN (in MW)

$roden_r$ = total length (in kilometers) of national, province, and district roads divided by the size of the region (in squared-kilometers)

hme_r = home market effects as the proxy of size of local market of region *r* (GDP per km^2)

v_{ir} = composite the error term

4.2.3 Exports

The dependent variable of this research is exports propensity of manufacturing firms in Indonesia in 2012. It represents the decision of the manufacturing firms whether they would like to export their products or not. A dummy variable is being used to describe this measurements which 1 is the propensity of a firm to export, while 0 is otherwise.

4.2.4 Firm-Level Characteristics

4.2.4.1 Foreign Ownership

The one important variable of the firm level is foreign ownership. This variable is very important to be put in the model since some research shows that this indicator is positively significant in affecting the propensity and intensity of exports. Rasiah (2005) showed that the firms in Indonesia which are owned by foreigners have a higher capacity to exports as compared with the domestic/local one, especially in auto parts, garments and electronics. The other study by Aitken, et.al. (1997) showed that foreign ownership leads to an increase of export propensity of manufacturing firms in Mexican. Hence, the hypothesis that could be developed for this variable is foreign ownership has positively affect the propensity of firm to exports.

4.2.4.2 Capital Stock of a Firm

The author put this variables into the model because the studies that have been done in Colombia, Mexico and Morocco showed that the higher the value of capital stock, the greater the tendency of exporting (Clerides, et.al., 1998). For the case of Indonesia, the author expects that this variable also has the essential role in influencing manufacturing firms to exports. This fact is supported by previous research done by Berry et.al. (2002) which shows that a large number of labor intensive manufacturing firms in Indonesia that are intended to export have a higher capital stock than the companies that are targeted for the domestic market.

In this research, in accordance with Farole, et.al. (2013) method, the capital stock is represented by total capital stock (land, building, machinery and equipment, vehicles and others) that was constructed by using a depreciation method except for land). A null hypothesis for this variable is positively significant in influencing exports propensity.

4.2.4.3 Productivity

This variable is one of the important elements that has to be considered into the model since it represents the efficiency of a firm to produce. In recent years, the relationship between this elements and exports has become an interesting issue since it is useful for making policy recommendation and developing a firm. In the context of production, this variable is measured by total output per worker or can be calculated by the ratio of total output to total input. The null hypothesis for this variable is positively significant to export propensity.

4.2.5 Surface Area of a Region as Representative of First-Nature Geographic (FNG) Characteristics

This factor is classified as the first-nature geographic because it is given as the natural endowments of a province/region. Nicolini (2003) conducted a research on European Regions and used a model with this variable as its one of independent variable. She put this factor to observe whether the size of a region is representative to capture the transportation costs in sending their products abroad. She found that this variable gave the negative significant value to the trade flows in European Regions. It means that the larger size of a region, the more transportation costs that should be paid by a firm. Hence, the researcher also puts this variable in order to see whether this factor will give the same impact to the export propensity in Indonesia. A null hypothesis is surface area has negative significant in influencing export propensity of a firm.

4.2.6 Second-Nature Geographic (SNG) Characteristics

4.2.6.1 Location of a Firm

In accordance with the theory of geographic concentration by Paul Krugman (1991:14-15), location of the firms engaged with the transportation costs, regional endowments and market size which have the significant role for influencing a firm's decision to exports. Based on Naude (2009:2) this variable is included as the second-nature geographic because this variable is not a heritage but it is more like the preferences of a firm to be located in.

In addition, it is also still included in the geographic characteristics context due to the availability of the natural resources in those locations. In addition, the density of firms which are located in a current area will create the agglomeration area of industry. It will be give the possibility of the emergence of agglomeration effects.

Due to the limitation of the data, this research will only pursing the location of the manufacturing firms whether it is inside of the industrial area[2] or not. Therefore, I use the dummy variable to represent this factor which are 1 = inside industrial area and 0 = otherwise. Hypothesis for this variable is positive significant in influencing export propensity. It is expected that a firm which is located inside the industrial area would be more likely to export compared with the company which is located outside the industrial zone.

4.2.6.2 Population

Naude (2009:2) not only classified the location of the firm but also the number of population in a region as the second-nature geographic. This variable can also be extended into the forms of the rate of migration. This variable is purposed to capture the urbanization effects on the export performance of manufacturing firms. It is expected that this variable will be produced the positive significant effect to the exports propensity. Those allegation is in line with Cobb Douglas Production Function which shows that production of a firm is might be determined by number of labor that is hired by a firm. The higher dense of the population in a region because of migration, the more possibility for a firm to hire more labor which leads to the likelihood of a firm to exports.

4.2.6.3 Export Spillovers

This aspect is also classified as the second-nature geographic because this variable shows how many manufacturing firms in a province that exports their products compares with the total number of manufacturing firms in that province. It is expected that this variable would be produce the positive significant value which means the higher percentage of manufacturing firms among total firms that doing exports in a region, the higher probability on generating other firms to exports. The author adopts this variable by considering research from Farole, et.al. (2013) who found that this factor is significant to influence export propensity since it indicates the advantage of agglomeration effects in Indonesia during 1990 - 2005.

4.2.6.4 Education

Education is the one of essential variable which have to be analyzed in this research because it describes the regional endowments. Since the manufacturing firms employ the labor, they would consider this aspect as the main requirement for the labor. In this research, the author will use the number of graduates of graduate program/bachelor degree by provinces in 2012 which is obtained from Indonesia Educational Statistics on Brief 2012/2013 published by Center for Educational Data and Statistics 2013, Ministry of Educational and Culture of Indonesia. Those data is used in order to get the real description about the availability of a region in providing human capital endowments in terms of skilled labor stock.

[2] According to Krugman (1991), it is described that a firm which is located in this area, will have the possibility to achieve the lower transportation costs.

Ghemawat (2007) defined this variable as the one of important elements to measure export propensity since the semi-skilled labor is related with the input costs when a firm decide to hire labor. In order to minimize the cost for labor, they would be hire less skilled labor than semi-skilled labor for their production process. Hence, the hypothesis that could be developed is this factors negatively affects propensity of a firm to exports. It means the higher number of human capital stock graduated from bachelor degree which is represented by number of graduate program, then the lower possibility for a firm to exports.

4.2.6.5 Access to Electricity

This variable is purposed to capture the infrastructure endowments of a region. This research takes this factor because the electricity is the one of important endowments for a region to support their development, including the manufacture firms in doing exports. Ghemawat (2007) has explained that electricity is categorized as physical infrastructure beside road. Since the proxy of this variable is represented by installed capacity by state electricity company/PT. PLN, then it is expected that the higher installed capacity by state electricity company/PT. PLN in a region will lead to the higher propensity of a firm to exports. Therefore, the hypothesis of this factors is positive significant in affecting exports propensity of manufacturing firms.

4.2.6.6 Road Density

This variable is also classified as the second-nature geographic. Based on Ghemawat (2007), this variable is also included as physical infrastructure. To capture road density, the author will use the same measurement with previous study by Farole, et.al. (2013). While, null hypothesis that is developed of this variable is positive significant in affecting export propensity of manufacturing firms in Indonesia. It means that the more available of total length of the road of a region will encourage a firm would be more likely to exports.

4.2.6.7 Home Market Effects (HME)

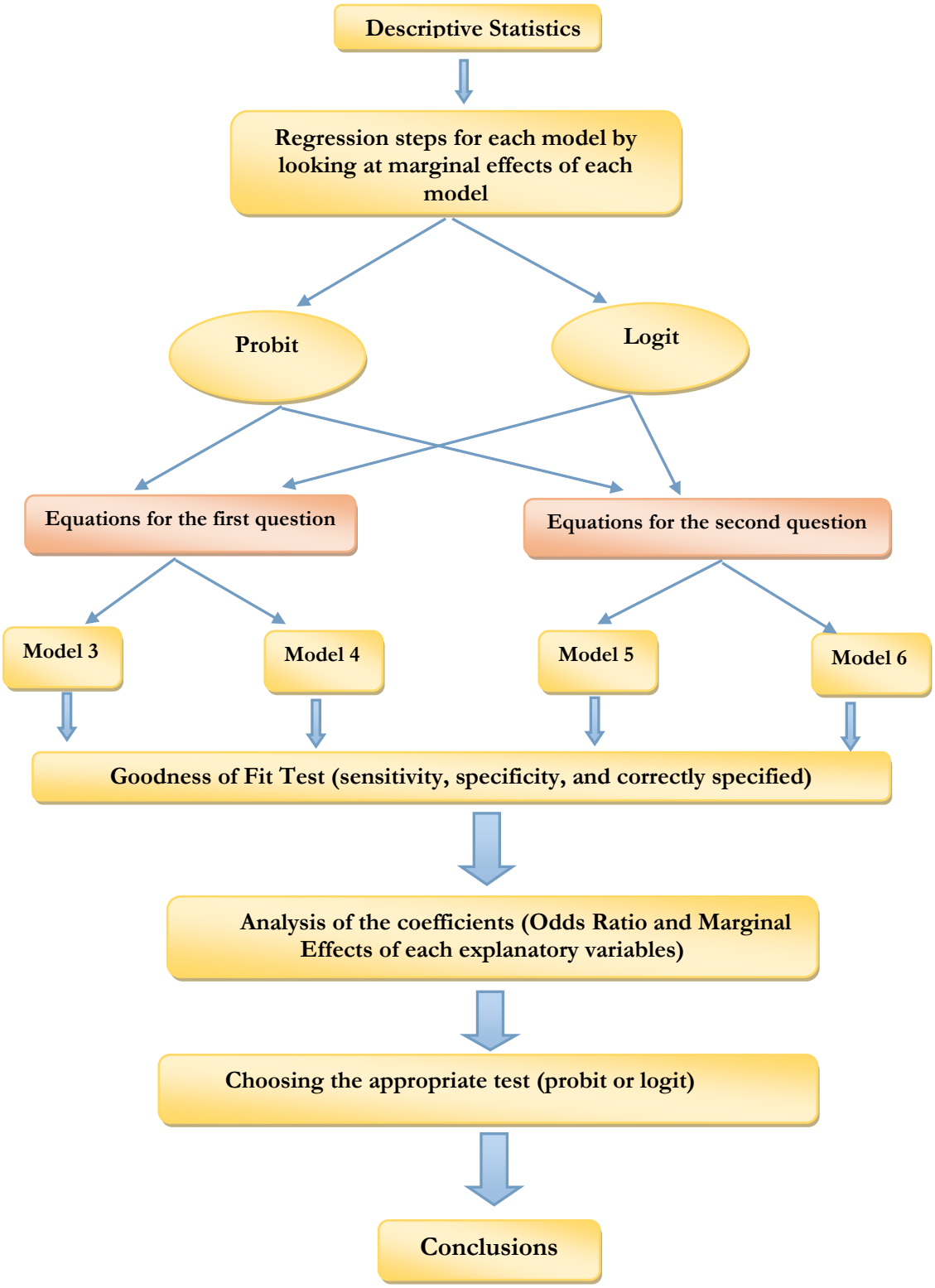
Home market effects is measured by GDP per region divided by surface area to capture the size of domestic market of a region. The aim of putting this variable is based on the study by Nicolini (2003). She included this variable into the model and found that this variable was significant to influence the trade flows of regional level in European regions. She includes this variable in order to capture increasing returns to scale of each regions or the levels of production effectiveness of firm that are assembled in each regions. The author put this factor into the model in order to observe whether HME really matters to influence export propensity of manufacturing firms in Indonesia by using the hypothesis that this variable is negatively significant in influencing export propensity. It means that the more GDP per capita achieved in a region, then less likelihood of a firm to exports.

Briefly description about the expected sign of each variables will be presented on the following table (see Table 4.1).

Table 4.1 Expected Sign of Explanatory Variables

No.	Categories	Variable	Expected sign
1	Firm Level	Foreign Ownership	Positive
2		Capital Stock	Positive
3		Productivity	Positive
4	FNG	Surface Area	Negative
5	SNG	Location	Positive
6		Population	Positive
7		Export Spillovers	Positive
8		Education	Negative
9		Electricity	Positive
10		Road Density	Positive
11		HME	Negative

Diagram 4.1 Regression Schematic of the research



Source: Methodology in this research (processed by the author)

Chapter 5
Results and analysis

5.1 Descriptive Statistics

To obtain the determinants of manufacturing firms in Indonesia by looking at firm characteristics and geographic characteristics of region, some of techniques are used which are Probit test Logit test, marginal effects of each variables, robustness check and goodness of fit test. STATA 13.0 is employed as software analysis in this research. The empirical results of this regression will be used to answer the research questions.

In this chapter, the results and analysis will be divided into two classifications since this research examines the two types of regressions which are Probit and Logit test. First, it will describe the result and analysis of exports propensity from firm's characteristics and geographic characteristics by using Probit test. Second, it will describes the result of determinants of export propensity by using Logit test. The aim of those approaches is to determine the most suitable test for explaining the export propensity of manufacturing firms in Indonesia during 2012 by examining two factors.

Table 5.1 Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.
exp	0.201706	0.4012823	0	1
fo	8.154543	26.23626	0	100
cap	1.11E+08	6.71E+09	0	9.16E+11
prod	1.11E+08	7.51E+08	100	3.78E+10
surf_n	37355.28	23425.3	664.01	319036.1
loc	0.2021051	0.4015787	0	1
exspil_n	0.167963	0.0888345	0.004	0.502
educ	270900.2	128808.2	9916	382918
pop	2.59E+07	1.61E+07	1985616	1.64E+08
roden	1.356253	2.362568	0.05	10.683
elec	555.1898	2129.916	0.2	8995.59
hme	116.2085	388.1215	0.198	1654.358

Source: Author computation using STATA 13.0 (2015)

Descriptive statistics of the data set which contain of value of mean, standard deviations, minimum and maximum values is represented in Table 5.1. Number of observation of this research is 23564 (N=23564), except for productivity (N=21896), surface area (N=23563), location and export spillovers (N=235620. If we look at the mean of exports, we can say that in the year 2012, the proportion of the firms that have willingness to exports is 20.2%

of total manufacturing firms in all provinces in Indonesia. Then, by looking at the FO status of the company, we obtain that from all the number of firms which are observed during year 2012, 815 of them is owned by foreign.

From the value of capital stock, we can get the description that the average value of total capital stock of manufacturing firms in Indonesia during 2012 is 111 million rupiah. Like capital stock, the manufacturing firms at that time have the average value of productivity equal to 111 million rupiah. While, surface area statistics is equal to 37355.28 which means that the average size of surface area of all provinces in Indonesia is 37355.28 km^2.

In terms of location, we can see that among all manufacturing firms in 33 provinces in Indonesia, 20.2% of them are located in industrial area. While, the value of export spillovers displays that the number of exporters among of all total number of manufacturing firms in each regions on average is equal to 16.7%. Value of education that is captured by number of graduates of graduate program (bachelor degree) is equal to 60903. It means that in year 2012, on average, the number of graduated students from graduate program (Program Sarjana/S1) in all provinces in Indonesia is around 60903.

Further, the accessibility to electricity on average in 2012 is 555.1898 MW, while the average population size in Indonesia is equal to 25.9 million or closed to 26 million. For the value of road density, it is shown that on average in 2012 the road density in Indonesia is equal to 1.35625 per km^2. Last, the result for HME which represents the size of domestic size is equal to 116.2 Rp/km^2.

5.2 Results and Analysis

5.2.1 Firm-Level Characteristics

In this model, author only analyze firm-level characteristics to investigate whether this elements are really matters in giving an effect on likelihood to exports. Further, the analysis of this model also compares between two specification test which are Probit and Logit. This regression results is presented on the following table (see Table 5.2).

The results on Table 5.2 displays that the Likelihood Ratio of Probit and Logit test, which is shown by P-value, is less than 0.005. This has an interpretation that the hypothesis, which stated that independent variables can not explain the dependent variable, is refuted. It can also means export propensity can be estimated by the model which uses firm-level characteristics. Further, there is another measurement to see the relationship between dependent variable and its explanatory variable namely Pseudo R^2 value. Those value show the counterfeit of R^2 because there is the absence of equivalent measurement of R^2 OLS in the Probit model.

Table 5.2 Regression Result of Firm-Level Characteristics Model

Variable	Probit Marginal Effect	Logit Marginal Effect
fo	0.0190*** (0.000379)	0.0315*** (0.000677)
cap	1.97e-12 (3.16e-12)	2.71e-12 (5.23e-12)
prod	1.23e-10*** (1.23e-11)	3.67e-10*** (4.05e-11)
_cons	-1.014***	-1.704***
	(0.0108)	(0.0198)
Number of Obs.	21896	
Prob > Chi2 (P-value)	= 0.0000	= 0.0000
Pseudo R2	= 0.1428	= 0.1441
Standard errors in parentheses ="* p<0.05	** p<0.01	*** p<0.001"

Source: Author computation using STATA 13.0 (2015)

Nevertheless, the comparatively lower value of pseudo R^2 does not guarantee that the model is not considered good enough. According to Greene (2000), even though pseudo R^2, which the value is 0 up to 1, shows the low value, we don't have to worry because it is not the real interpretation. It only shows the cloning R^2 for replacing the R^2 OLS on Probit model. This argument is also supported by Gujarati (2003) who argued that in the logistic regression model, the important things which are should be noticed are: indicator of significance, significance of independent variables, and the direction of each explanatory variables. Meanwhile, the magnitude of Pseudo R-Square is not a matter of concern.

Based on the results above, Pseudo R-Square of Probit method provides 0.1428 which means that export propensity can be described 14.28% by independent variables, while the other 85.72% can be explained by other variables which are not included in the model. Like Probit test, Likelihood Ratio in Logit test also displays that the P-value is 0.000 (less than 0.005). It means that all independent variables can be used to estimate the dependent variable. While, Pseudo R-Square of Logit model brings out a result that dependent variable is successfully described 14.41% by explanatory variables.

In choosing between those model, goodness of fit test has also to be determined first as a reference to reinforce the reasons for selecting the most appropriate one. Table 5.3 below provides the results of goodness of fit of both Probit and Logit test. Sensitivity value implies the accuracy of the model in explaining the success events that is stated as correct success events of all observation in the model (error type I). While, specificity value indicates the accuracy of the model in explaining the failed events that is stated as correct failed events of all observation in the model (error type II).

In general, by looking at value of Pseudo R-Square and goodness of fit results, Logit test is selected as the appropriate test in explaining the variation of explanatory variables in terms of firm-level characteristics due to it shows a higher percentage than Probit results. Hence, we can interpret that the model is successfully measured as much as 83.31% of actual condition.

Table 5.3 Goodness of Fit of Firm-level Characteristics Model

Classification	Logit Test	Probit Test
Sensitivity	30.18%	29.88%
Specificity	97.59%	97.68%
Positive predictive value	77.09%	77.56%
Negative predictive value	83.87%	83.82%

False + rate for true ~D	2.41%	2.32%
False - rate for true D	69.82%	70.12%
False + rate for classified +	22.91%	22.44%
False - rate for classified -	16.13%	16.18%

Correctly classified	83.31%	83.31%

Source: Author computation using STATA 13.0 (2015)

5.1.1.1 Analysis of the Coefficients

5.2.1.1.1 Analysis of Odds Ratio

The ratio of two possibilities, which are the possibility to export or the possibility to not exports, is defined by the odds ratio. In this results, the odds ratio of all explanatory variables shows positive value (see Table 5.4), meaning that the rising of all independent variables will increase likelihood of a firm to exports[3].

Regarding to the results of Table 5.4, the odds ratio of a firm with FO in deciding to export in 2012 is 1.03 times higher than a firm with no FO. Further, the odds ratio of productivity shows that the odds ratio of a firm with high productivity to exports is 1 times higher than a firm with lower productivity.

[3] The author will not explain capital stock variable due to no significant effect was shown both on marginal effects and odds ratio results.

Table 5.4 Odds Ratio of Firm-Level Characteristics Model

Logistic Regression			
Variable	**Odds Ratio**	**Z**	**P - Value**
fo	1.03204 (0.001)	46.59	0.000
Capital Stock	1.000 (5.23e-12)	0.52	0.604
Productivity	1.000 (4.05e-11)	9.06	0.000
_cons	0.182 (0.019)	-86.17	0.000

Source: Author computation using STATA 13.0 (2015)

5.2.1.1.2 Analysis of Marginal Effects

5.2.1.1.2.1 Foreign Ownership

The Probit test displays the result that FO has a positive significant marginal effects. It indicates that the probability of a firm with FO is 0.02 percentage point more likely than a firm with no FO. While, the result of Logit test has also positive significant marginal effects. It shows that the probability of a firm with FO is 0.03 percentage point more likely than a firm with no FO. The magnitude of FO can also defined that the higher the FO of a firm, then the higher possibility of a firm to export which is in line with the null hypothesis of this research. These results are in accordance with the previous findings by Rasiah (2005) who showed that that the firms in Indonesia which are foreign-owned have a higher capacity to export compared with the local one, especially in auto parts, garments & electronics; and Aitken, et.al. (1997) who found that FO leads to the increasing of export propensity of manufacturing firms in Mexican.

5.2.1.1.2.2 Productivity

Likewise FO, Probit test gives the result that productivity has positive significant marginal effects. It is described that the likelihood of a firm with higher productivity is 1.23e-10 percentage point more likely to export than a firm with lower productivity. Meanwhile, Logit test also provides positive significant marginal effects on export propensity. The probability of a firm with higher productivity is 3.67e-10 percentage point more likely to export than a firm with less productivity. It indicates that this variable is in line with the null hypothesis of the research.

5.2.2 Geographic Characteristics

In this following model, author will analyze both of geographic characteristics to investigate whether these elements have an important effect on the likelihood to export. Further, the analysis of this model also compares between two specification test which are Probit and Logit. This regression results is presented on the Table 5.5.

The results on Table 5.5 displays that Likelihood Ratio of probit and logit test, which is shown by P-value, is less than 0.005. This has an interpretation that the null hypothesis which stated that independent variables can not explain the dependent variable, is rejected. It can also means export propensity can be estimated by the model which focused on geography characteristics.

Table 5.5 describes that value of Pseudo R^2 of Probit method is 0.6775 which means that export propensity can be described 67.75% by independent variables, while the other 32.25% can be explained by other variables which are not included in the model. While, Pseudo R^2 of Logit model brings out a result that dependent variable is successfully explained 68.4% by explanatory variables, while the rest of it (31.6%) can be described by other variables that are not included in the model. Comparing those two results, Logit is more preferable to be chosen as the appropriate model.

Table 5.5 Regression Result of Geographic Characteristics Model

Variable	Probit Marginal Effects	Logit Marginal Effects
surf_n	0.00000428*** (0.000000864)	0.00000992*** (0.00000168)
loc	3.226*** (0.0327)	6.003*** (0.0735)
exspil_n	1.884*** (0.184)	4.394*** (0.407)
educ	-0.00000665*** (0.000000775)	-0.0000131*** (0.00000171)
pop	2.11e-09 (1.25e-09)	4.25e-09 (3.06e-09)
roden	0.584*** (0.0817)	1.352*** (0.168)
elec	-0.000884** (0.000323)	-0.00179* (0.000730)
hme	0.00162 (0.00185)	0.00186 (0.00423)
_cons	-2.586*** (0.110)	-5.213*** (0.244)
Number of Obs.	23559	
Prob > Chi2 (P-value)	= 0.0000	= 0.0000
Pseudo R2	0.6775	0.6840
Standard errors in parentheses ="* p<0.05	** p<0.01	*** p<0.001"

Source: Author computation using STATA 13.0 (2015)

However, we also have to look at the results of goodness of fit test as a consideration in choosing appropriate model. Table 5.6 provides some information about goodness of fit test for this model. By looking at value of

sensitivity, specificity and correctly classified, Logit is selected as the appropriate test in explaining the variation of explanatory variables in terms of geography characteristics. It means that the model is successfully measured as much as 96.14% of actual condition.

Table 5.6 Goodness of Fit of Geographic Characteristics Model

Classification	Logit Test	Probit Test
Sensitivity	86.99%	88.95%
Specificity	98.45%	97.16%
Positive predictive value	93.40%	88.78%
Negative predictive value	96.77%	97.21%

False + rate for true ~D	1.55%	2.84%
False - rate for true D	13.01%	11.05%
False + rate for classified +	6.60%	11.22%
False - rate for classified -	3.23%	2.79%

Correctly classified	96.14%	95.50%

Source: Author computation using STATA 13.0 (2015)

5.2.2.1 Analysis of the Coefficients

5.2.2.1.1 Analysis of Odds Ratio

The odds ratio of this second model shows positive value for all of explanatory variables (see Table 5.7). It can be interpreted that any increase of all explanatory variable will also increase likelihood to export of a firm[4]. Based on the results, the odds ratio of a region with wider surface area in influencing a firm to export is 1.000 times than a smaller region. While, odds ratio of a firm, located inside industrial area, to export is 404.60 times than a firm located outside industrial area. Then, value of odds ratio of a region with higher percentage of exported firms to export is 80.967 times than a region with lower percentage of export spillovers.

Further, odds ratio of non-skilled labor in affecting export propensity is 0.999 times than skilled labor. Meantime, value of odds ratio of a region, which has longer total length, to export is 3.864 times than a region which have shorter of total length. Last, odds ratio for a region with higher number of installed capacity of electricity in deciding to export is 0.998 times than a region with less installed capacity of electricity.

[4] The author doesn't include an odds ratio and marginal effects analysis of population and HME due to insignificant effects of these variables to export propensity.

Table 5.7 Odds Ratio of Geographic Characteristics Model

Logistic Regression			
Variable	**Odds Ratio**	**Z**	**P - Value**
Surf_n	1.000 (0.000)	5.89	0.000
loc	404.6084 (0.074)	81.65	0.000
exspil_n	80.967 (0.000)	10.79	0.000
educ	0.999 (0.000)	-7.65	0.000
pop	1.000 (3.06e-9)	1.39	0.165
roden	3.864 (0.168)	8.07	0.000
elec	0.998 (0.000)	-2.45	0.014
hme	1.002 (0.004)	0.44	0.660
_cons	0.005 (0.244)	-21.32	0.000

Source: Author computation using STATA 13.0 (2015)

5.2.2.1.2 Analysis of Marginal Effects

5.2.2.1.2.1 Surface Area

From Table 5.5, we can see that this variable has a positive significant in influencing export propensity. Probability of a firm in a region with wider surface area to export is 0.000004 percentage point higher than smaller surface area (Probit test). While in Logit test, probability of a firm in a region with wider surface area to exports is 0.000009 percentage point higher than smaller surface area in 2012. This result is also in accordance with the study by Nicolini (2003) who found that that this variable gave the significant value to the exports in European Regions.

5.2.2.1.2.2 Location

Table 5.5 displays that probability of a firm located inside industrial area in deciding exports in Probit test is 3.226 percentage point higher than a firm located outside industrial area. While, from Logit test, probability of a firm located inside industrial area in doing exports is 6.003 percentage point higher than a firm located outside industrial area. This results is in accordance with null hypothesis of this research which stated that a firm which is located inside the industrial area would be more likely to export compared with the company which is located outside the industrial zone.

5.2.2.1.2.3 Export Spillovers

From Probit test output, we can see that marginal effects of this variable is 1.884. It means that the probability of a firm to export in a region with higher percentage of export spillovers is 1.884 times higher than a region with lower percentage of export spillovers. While, Logit test shows that probability of a firm to export in a region with higher percentage of export spillovers is 4.394 times higher than a region with lower percentage of export spillovers. This result also has similar output with the study by Farole, et.al. (2013) who found that this factor is significant to influence export propensity since it indicates the advantage of *agglomeration effects* in Indonesia during 1990 - 2005.

5.2.2.1.2.4 Education

Table 5.5 shows Probit output for this variable is equal to -0.000007. It means that the probability of a firm to export in a region with higher number of skilled labor is 0.000007 times lower than a region with lower number of skilled labor. Meantime, Logit test output shows that the probability of a firm to export in a region with higher number of skilled labor is 0.00001 times less than a region with lower number of skilled labor.

This finding is in line with the research by Ghemawat (2007). He argued this variable is related with the input costs due to the decision of a firm hire labor. In order to minimize the costs for labor, they would be hire less skilled labor than semi-skilled labor for their production process. Hence, a firm in a region with higher skilled labor will less likely to exports since it creates the higher labor costs.

5.2.2.1.2.5 Road Density

It is described in Table 5.5 that marginal effects of this variable in Probit test is equal to 0.584. It means that export propensity of a firm, located in a region with higher availability of total length of road, is 0.584 times higher than a region with lower availability of total length of road. Meanwhile, Logit test shows that export propensity of a firm, located in a region with higher availability of total length of road, is 1.352 times higher than a region with lower availability of total length of road. In addition, this result also has a similar output with the study by Farole, et.al. (2013). They found that road density gives significant impact to export propensity of manufacturing firms in Indonesia during 1990 – 2005.

5.2.2.1.2.6 Electricity

Marginal effects of this variable on Probit test is equal to -0.0009. The sign of this variable in not in line with the hypothesis of this research since it provides negative significant effects to export propensity. It is can be interpreted that a higher number of installed capacity by PT.PLN will leads to the likelihood of a firm to export 0.0009 times less than a region with lower number of installed capacity by PT.PLN (from Probit result). While, Logit test results that that a higher number of installed capacity by PT.PLN will leads to the likelihood of a firm to export – 0.0018 times less than a region with lower number of installed capacity by PT.PLN. This finding is supported by the study of Farole, et.al. (2013) who found that this variable produces negative significant effects to export propensity in Indonesia during 1990 -2005.

5.2.3 First-Nature Geographic Characteristics

In the following model, the author will only analyze FNG to investigate whether this element is really matters in giving an effect on likelihood to exports in this model. Further, the results and analysis of this model also compares between two specification test which are Probit and Logit. This regression results is presented on the following table (see Table 5.8).

Table 5.8 Regression Results of FNG Model

Variable	Probit Marginal Effects	Logit Marginal Effects
surf_n	-0.00000202*** (0.000000410)	-0.00000365*** (0.000000743)
_cons	-0.761*** (0.0177)	-1.242*** (0.0314)
Number of Obs.	23563	
Prob > Chi2 (P-value)	= 0.0000	= 0.0000
Pseudo R2	0.0010	0.0011
Standard errors in parentheses ="* p<0.05	** p<0.01	*** p<0.001"

Source: Author computation using STATA 13.0 (2015)

Table 5.8 displays that the Likelihood Ratio of Probit and Logit test, which is shown by P-value, is less than 0.005. This has an interpretation that the null hypothesis, which stated that independent variables can not explain the dependent variable, is rejected. It can also means export propensity can be estimated by the model which focused on FNG only.

In addition, it is also described that value of Pseudo R^2 of Probit method is 0.0010 which means that export propensity can be described 0.10% by surface area of a region, while the other 99.9% can be explained by other variables which are not included in the model. While, Pseudo R^2 of Logit model brings out a result that dependent variable is successfully explained 0.11% by explanatory variables, while the rest of it (99.89%) can be described

by other variables that are not included in the model. Comparing those two results, Logit is more preferable to be chosen as the appropriate model based on result analysis on Pseudo R^2 even though the percentage gap of both approach is almost similar.

Likewise the previous sub-section (see 5.2.2), in choosing an appropriate test, we also have to look at the results of goodness of fit test as a consideration. Table 5.9 provides some information about goodness of fit test for this model. By looking at value of sensitivity, specificity and correctly classified, both Probit and Logit test produce the same results. Thus, the author considers value of Pseudo R^2 (see Table 5.8) in choosing appropriate test due to the same output of Goodness of Fit. Hence, Logit is selected as the appropriate test in explaining the variation of explanatory variables in terms of FNG.

Table 5.9 Goodness of Fit of FNG Model

Classification	Logit Test	Probit Test
Sensitivity	0.00%	0.00%
Specificity	100.00%	100.00%
Positive predictive value	.%	.%
Negative predictive value	79.83%	79.83%

False + rate for true ~D	0.00%	0.00%
False - rate for true D	100.00%	100.00%
False + rate for classified +	.%	.%
False - rate for classified -	20.17%	20.17%

Correctly classified	79.83%	79.83%

Source: Author computation using STATA 13.0 (2015)

5.2.3.1 Analysis of the Coefficient

5.2.3.1.1 Analysis of Odds Ratio

The odds ratio of this third model shows positive value for surface area as representative of FNG (see Table 5.10). It can be interpreted that any increase of surface area of a region will also increase likelihood to export of a firm. Based on the results, odds ratio of a region with wider surface area in influencing a firm to exports is 0.999 times than a smaller region.

Table 5.10 Odds Ratio of FNG Model

Logistic Regression			
Variable	**Odds Ratio**	**Z**	**P - Value**
surf_n	0.999 (0.000)	- 4.91	0.000
_cons	0.289 (0.031)	-39.53	0.000

Source: Author computation using STATA 13.0 (2015)

5.2.3.1.2 Analysis of Marginal Effects

The result of the Probit test displays a negative significant value of surface area in affecting export propensity of manufacturing firms. Based on Probit test result, the probability of a firm located in a region with larger surface area is 0.000002 percentage point less than of a firm located in a region with smaller surface area. While, the probability of a firm located in a region with larger surface area is 0.000003 percentage point less than of a firm located in a region with smaller surface area.

This finding is in line with the study by Nicolini (2003) who found that surface area produces negative significant effect on the trade flows in European Regions. She implied that the wider surface are of a region encourage the larger transportation costs which has to be paid by a firm in delivering their goods. Another study by Matthee and Krugell (2008) found that surface area also has negative significant effect to regional manufacturing firms in doing exports in South Africa countries.

5.2.4 Second-Nature Geographic Characteristics

The following model is the last model of this research to find out the impact of SNG to export propensity of manufacturing export in Indonesia. The regressions result of Probit and Logit test is presented below (see Table 5.11).

Table 5.11 Regression Results of SNG Model

Variable	Probit Marginal Effects	logit Marginal Effects
loc	3.219***	5.988***
	(0.0326)	(0.0734)
exspil_n	1.620***	3.810***
	(0.176)	(0.392)
educ	-0.00000457***	-0.00000863***
	(0.000000651)	(0.00000154)
pop	1.43e-09	3.05e-09
	(1.22e-09)	(2.96e-09)
roden	0.402***	0.963***
	(0.0730)	(0.154)
elec	-0.0000594	0.0000870
	(0.000273)	(0.000647)
hme	-0.00212	-0.00677
	(0.00168)	(0.00394)
_cons	-2.263***	-4.481***
	(0.0876)	(0.205)
Number of Obs.	23560	
Prob > Chi2 (P-value)	= 0.0000	= 0.0000
Pseudo R2	0.6766	0.6829
Standard errors in parentheses		
="* p<0.05	** p<0.01	*** p<0.001"

Source: Author computation using STATA 13.0 (2015)

Table 5.11 displays that the Likelihood Ratio of Probit and Logit test, which is shown by P-value, is less than 0.005. This has an interpretation that the null hypothesis which stated that independent variables can not explain the dependent variable, is refuted. It can also means export propensity can be estimated by the model which focused on SNG only.

In addition, it is also described that value of Pseudo R^2 of Probit method is 0.6766 which means that export propensity can be described 67.66% by surface area of a region, while the other 32.33% can be explained by other variables which are not included in the model. While, Pseudo R-Square of Logit model points out a result that dependent variable is successfully explained 68.29% by explanatory variables, while the rest of it (31.71%) can be described by other variables that are not included in the model. Comparing those two results, Logit is more preferable to be chosen as the appropriate model based on result analysis on Pseudo R-square even though the percentage gap of both approach is almost similar.

As in the previous sub-section (see 5.2.2 and 5.2.3), the author also does the goodness of fit test as a consideration in choosing an appropriate test. Table 5.12 provides some information about goodness of fit test for this model. By considering Pseudo R-Square and goodness of fit result, Logit is selected as the appropriate test in explaining the variation of explanatory variables in terms of SNG.

Table 5.12 Goodness of Fit of SNG Model

Classification	Logit Test	Probit Test
Sensitivity	86.99%	88.95%
Specificity	98.45%	97.16%
Positive predictive value	93.40%	88.78%
Negative predictive value	96.77%	97.21%

False + rate for true ~D	1.55%	2.84%
False - rate for true D	13.01%	11.05%
False + rate for classified +	6.60%	11.22%
False - rate for classified -	3.23%	2.79%

Correctly classified	96.14%	95.51%

Source: Author computation using STATA 13.0 (2015)

5.2.4.1 Analysis of the Coefficients

5.2.4.1.1 Analysis of Odds Ratio

The odds ratio of the last model shows positive value for all of explanatory variables (see Table 5.13). It means that any increase of all explanatory variable

will also increase likelihood to export of a firm[5]. Based on the results, the odds ratio of a firm located inside industrial area to export is 404.60 times than a firm in outside industrial area. From there, the value of odds ratio of a region with higher percentage of exported firms to export is 45.136 times than a region with lower percentage of export spillovers. Moreover, the odds ratio of non-skilled labor in affecting export propensity is 0.999 times than skilled labor. Lastly, the value of odds ratio of a firm, located in region which has more availability of total length of road, to export is 2.620 times than a region with shorter of total length.

Table 5.13 Odds Ratio of SNG Model

Logistic Regression			
Variable	**Odds Ratio**	**Z**	**P - Value**
loc	404.6084 (0.074)	81.65	0.000
exspil_n	45.136 (0.392)	9.72	0.000
educ	0.999 (0.000)	-5.59	0.000
pop	1.000 (2.96e-9)	1.03	0.302
roden	2.620 (0.154)	6.26	0.000
elec	1.000 (0.0006)	0.13	0.893
hme	0.993 (0.004)	-1.72	0.086
_cons	0.113 (0.205)	-21.87	0.000

Source: Author computation using STATA 13.0 (2015)

5.2.4.1.2 Analysis of Marginal Effects

5.2.4.1.2.1 Location

Table 5.11 displays that probability of a firm located inside industrial area in deciding exports in Probit test is 3.219 percentage point higher than a firm located outside industrial area. While, from Logit test, probability of a firm located inside industrial area in doing exports is 5.988 percentage point higher than a firm located outside an industrial area.

5.2.4.1.2.2 Export Spillovers

Marginal effects of this variable is equal to 1.884 which means that the probability of a firm to exports in a region with higher percentage of export spillovers is 1.620 times higher than a region with lower percentage of export spillovers. While, Logit test shows that probability of a firm to export in a region with higher percentage of export spillovers is 3.810 times higher than a region with lower percentage of export spillovers.

[5] The author doesn't include an odds ratio and marginal effects analysis of population, electricity and HME due to insignificant effects of these variables to export propensity.

5.2.4.1.2.3 Education

Probit output on Table 5.11 for this variable is equal to -0.000005. It means that the probability of a firm to export in a region with higher number of skilled labor is 0.000005 times lower than a region with lower number of skilled labor. Meantime, Logit test output shows that the probability of a firm to exports in a region with higher number of skilled labor is 0.00009 times less than a region with lower number of skilled labor.

5.2.4.1.2.4 Road Density

From Table 5.11, we can see that Probit test produces the result that export propensity of a firm, located in a region with higher availability of total length of road, is 0.402 times higher than a region with lower availability of total length of road. Meanwhile Logit test shows that export propensity of a firm, located in a region with higher availability of total length of road, is 0.963 times higher than a region with lower availability of total length of road**.**

Chapter 6
Conclusion

6.1 Concluding Remarks

Much research has already been conducted to investigate the determinants exports of manufacturing firms in Indonesia, while there are relatively few researches that have concerned on geographic characteristics of where the firms are located. In addition, there is still very little literature that is concerned about propensity of manufacturing firms to exports by combining firm's characteristics and geographic characteristics. Therefore, the author undertakes this research to analyze the determinants o exports of manufacturing firms in Indonesia in 2012 by focus more on geographic characteristics. The analysis of this study is conducted to determine the answer which elements that have more significant influence to export propensity, firm level or geographic characteristics or both of them. Second, as this research is more focused on geographic characteristics, the author sought to find the answer as to whether geographic characteristics really matter to influence the likelihood of a firm to export, FNG or SNG or both of them.

Moreover, this use statistical techniques by using STATA 13.0 including marginal effects test, goodness of fit and odds ratio have been employed to analyze the propensity of manufacturing firms to exports. Some explanatory variables from firm characteristics is put into the model namely FO, total capital stock and productivity. While, explanatory variables from geographic characteristics, namely surface area (as representative of FNG); location, exports spillovers, population, education, electricity, road density and HME (as representative of SNG), have been set to examine whether they are really matters in influencing exports propensity.

Furthermore, the author examines those variables by using Probit and Logit test. In addition, this study also develops four types of restricted model in order to resolve the research questions. The first two models (model 3 and 4) are formed by considering firm level characteristics and geographic characteristics separately, while the following models (model 5 and 6) are developed by putting FNG and SNG separately. By considering value of Pseudo R-Square and Goodness of Fit results, the second model, which contains of geographic characteristics, has more important role in influencing exports propensity in Indonesia during 2012 rather than first model that puts firm level characteristics.

Specific model (model 5 and 6), which are formed to find out what kind of geographic characteristics that is really matters in affecting export propensity, shows that SNG is more applicable and has more significant effects in affecting export propensity of manufacturing firms in Indonesia during 2012.

6.2 Policy Recommendations

Some rational analysis based on some previous studies were given to explain the magnitude of each variables. It is expected that the reader of this paper will be get the clearly elucidation about this study. Based on these findings, some policy recommendations could be submitted to the government and private sectors to improve the manufacturing exports in Indonesia.

First, focused on human capital stock, it needs to be concerned since manufacturing firms tend to hire semi-skilled labor rather than skilled labor for their production process. It can be seen from the direction of sign of this variable is conversely with export propensity. Problem of high cost of education implemented by government should be resolved since it cause a serious problem on exports performance in Indonesia. By giving more subsidy for education, it is expected would decrease cost of schooling for people. As consequence, there is wider opportunity for an individual to entrance the school. By hiring skilled labor, it is expected that manufacturing firms in Indonesia would be more capital intensive rather than labor intensive in the future. Hence, flow of capital stock in Indonesia in FDI form and also technology change can be optimally managed.

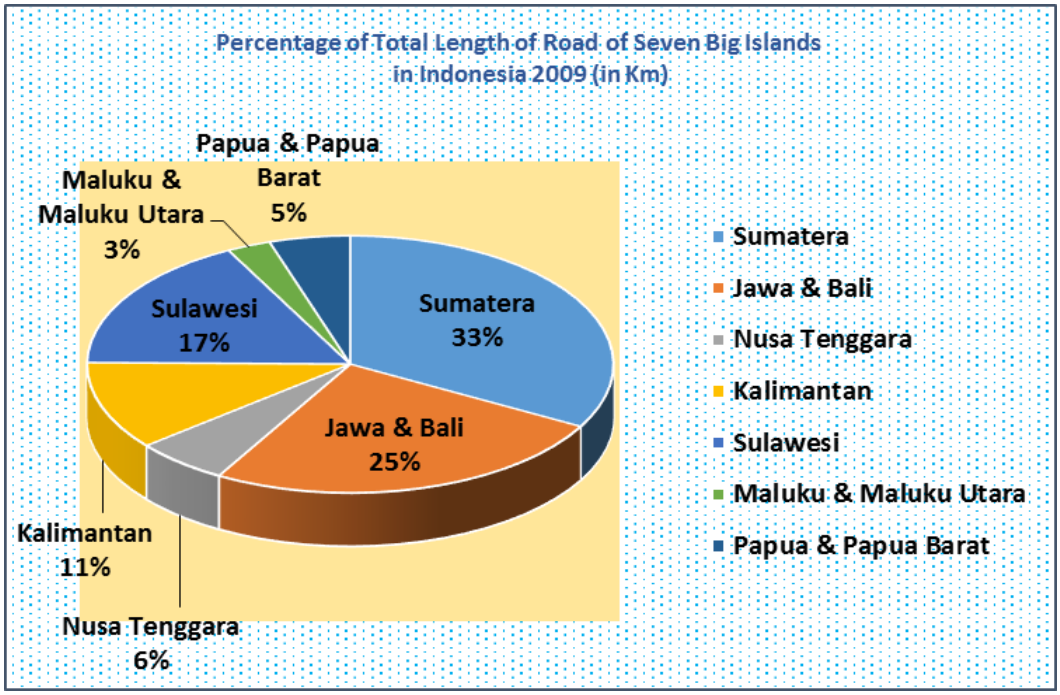
The following recommendation is related with improvement of some areas in a region with natural resource abundance to be formed as industrial area, especially in some remoteness islands in Indonesia such as Nusa Tenggara, Kalimantan (Borneo), Maluku, and Papua. The purpose of this suggestion is expected to attract more investors, both of domestic and foreign, to invest their capital to those regions. This action needs more local government intervention and private sectors to hand in hand in improving some location which are not fully developed. Further, it is expected that transfer of knowledge and technology and transportation costs reduction will be occur evenly among those areas.

Next policy recommendation is related with improvement of road in regional level. In advanced, the improvement of road as physical infrastructure is not only focused on develop a new road but also concerning on damage road restoration. Local government should more active in attracting private sectors to invest on infrastructure improvement, hence it would make better off for delivery system. In addition, central government has to give more attention in providing road facilities on western regions of Indonesia in order to improve better access and decline transportation costs. Interlinked road between Sulawesi and Kalimantan (Borneo) is also become an urgent needs to be developed.

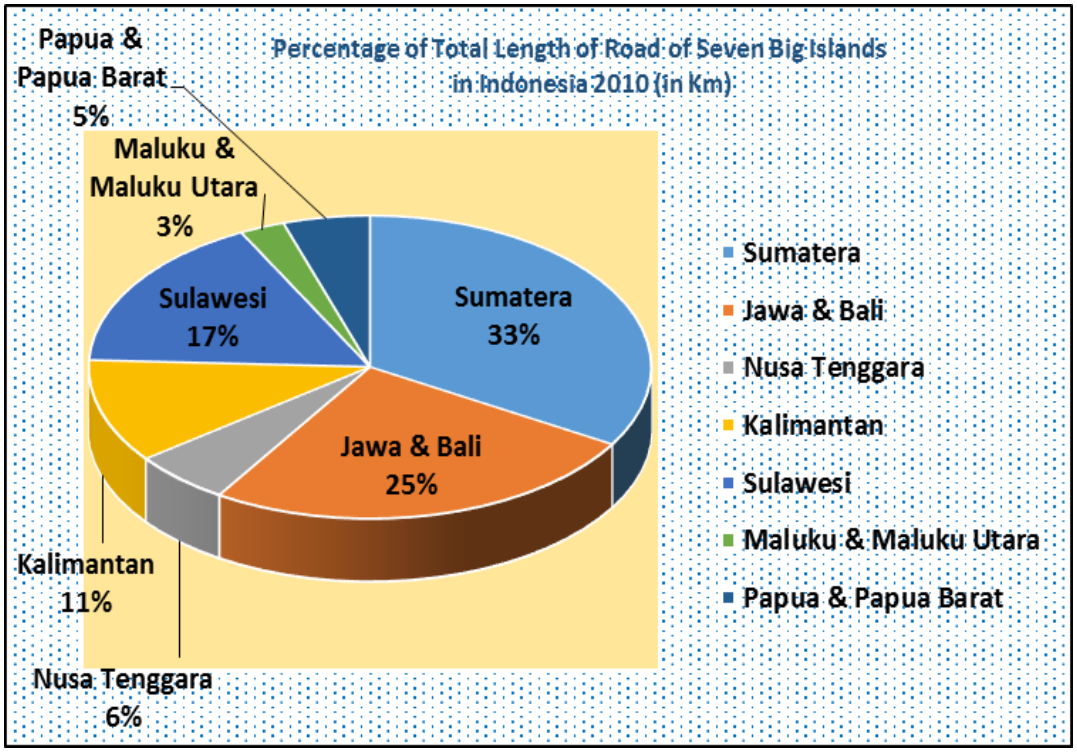
Last policy recommendation for physical infrastructure is related with the role of central government to overcome a problem in access to electricity. Determination of policy should be more focused on development and utilization of renewable energy as main source of electricity, so that the price of electricity with renewable energy will become cheaper compared with non-renewable energy. In addition, government should be emphasized on equalization of electrical installation for remoteness areas, especially on western area of Indonesia, in order to eliminate the big gap of electricity costs and access in Indonesia.

Appendices

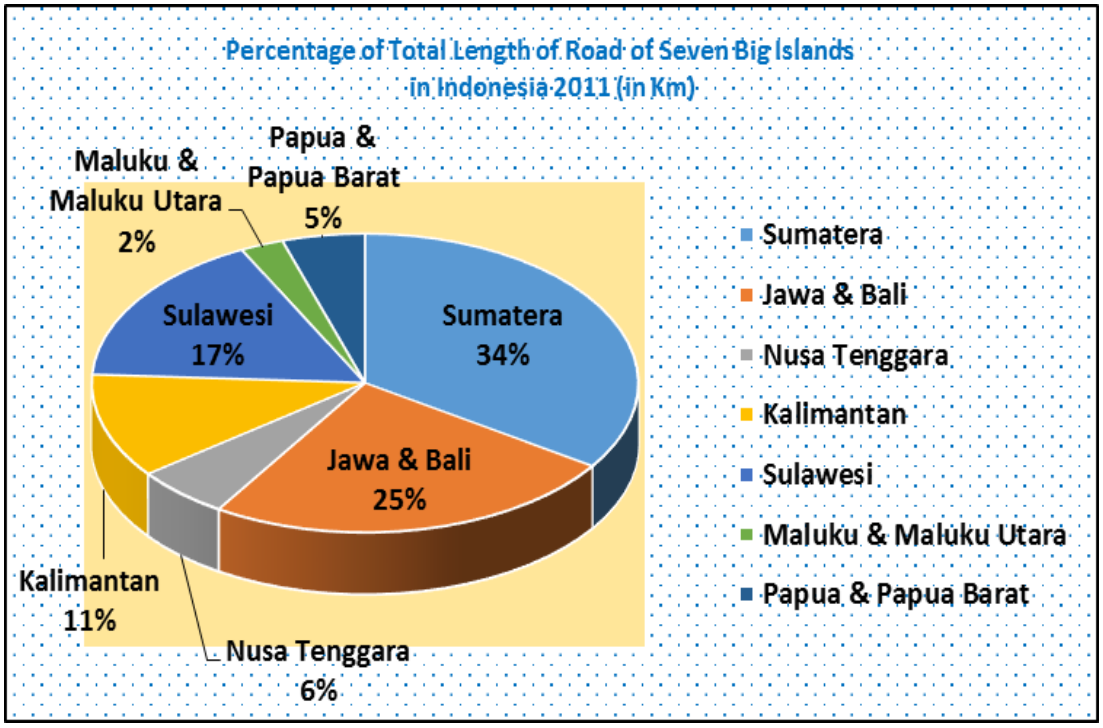
Appendix 1a Percentage of Total Length of Road of Seven Big Islands in Indonesia 2009 (in Km)



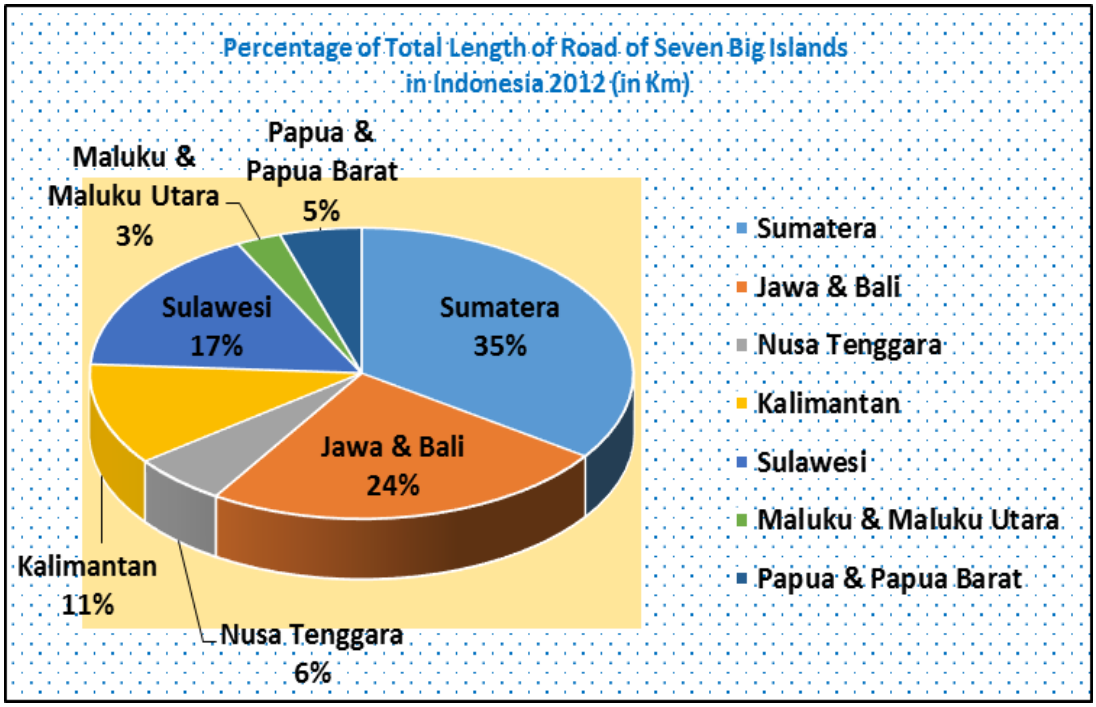
Appendix 1b Percentage of Total Length of Road of Seven Big Islands in Indonesia 2011 (in Km)



Appendix 1c Percentage of Total Length of Road of Seven Big Islands in Indonesia 2011 (in Km)



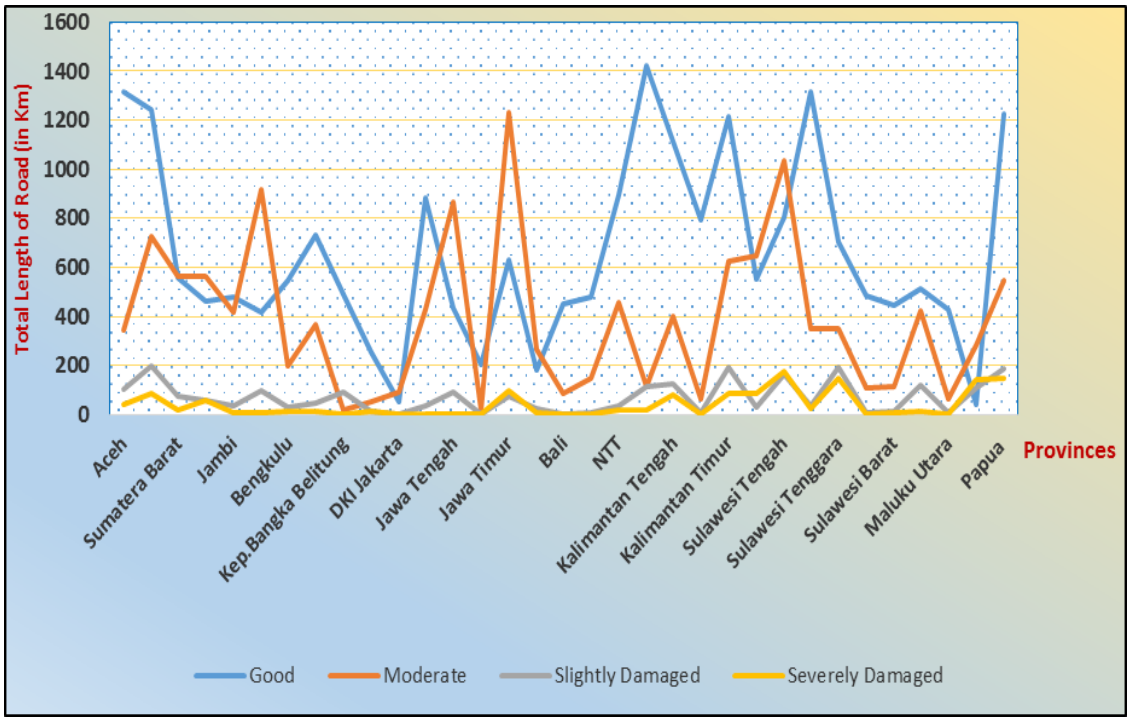
Appendix 1d Percentage of Total Length of Road of Seven Big Islands in Indonesia 2012 (in Km)



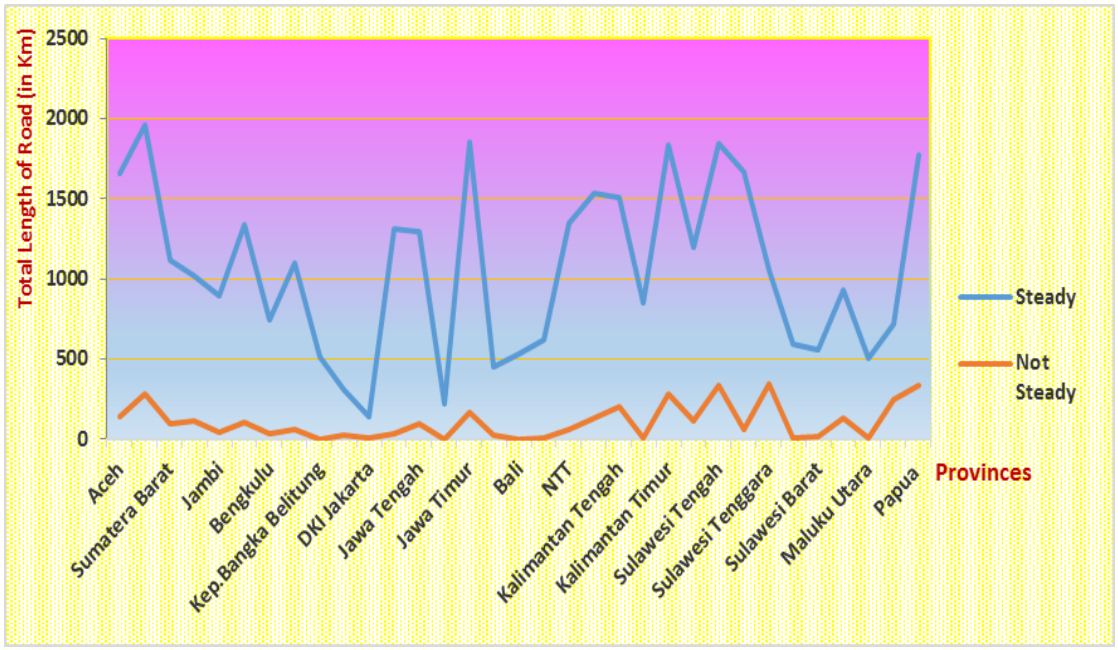
Appendix 2 List of Provinces in Indonesia and Its Category of Seven Big Islands

No.	Province	Category of Seven Big Islands
1	Aceh	Sumatera
2	Sumatera Utara	Sumatera
3	Sumatera Barat	Sumatera
4	Riau	Sumatera
5	Jambi	Sumatera
6	Sumatera Selatan	Sumatera
7	Bengkulu	Sumatera
8	Lampung	Sumatera
9	Kep.Bangka Belitung	Sumatera
10	Kep.Riau	Sumatera
11	DKI Jakarta	Jawa
12	Jawa Barat	Jawa
13	Jawa Tengah	Jawa
14	DI. Yogyakarta	Jawa
15	Jawa Timur	Jawa
16	Banten	Jawa
17	Bali	Bali
18	NTB	Nusa Tenggara
19	NTT	Nusa Tenggara
20	Kalimantan Barat	Kalimantan
21	Kalimantan Tengah	Kalimantan
22	Kalimantan Selatan	Kalimantan
23	Kalimantan Timur	Kalimantan
24	Sulawesi Utara	Sulawesi
25	Sulawesi Tengah	Sulawesi
26	Sulawesi Selatan	Sulawesi
27	Sulawesi Tenggara	Sulawesi
28	Gorontalo	Sulawesi
29	Sulawesi Barat	Sulawesi
30	Maluku	Maluku
31	Maluku Utara	Maluku Utara
32	Papua Barat	Papua
33	Papua	Papua Barat

Appendix 3c **Figure of Road Condition in Indonesia by Province in Indonesia 2012 (in Km)**



Appendix 3d **Figure of Road Stability in Indonesia by Province in Indonesia 2012 (in Km)**



Appendix 4 Number of New Entrants by Type of School and Province Academic Year 2011/2012 and 2012/2013 (in Person)

Academic Year	2011/2012	2012/2013
Aceh	258717	213346
Sumatera Utara	822176	776102
Sumatera Barat	288958	269611
Riau	258936	281575
Jambi	152370	135103
Sumatera Selatan	389489	342796
Bengkulu	95825	96549
Lampung	358890	346316
Kep.Bangka Belitung	58487	57102
Kep.Riau	71524	75165
DKI Jakarta	707401	665619
Jawa Barat	1948359	1944109
Jawa Tengah	1441060	1289026
DI Yogaykarta	192628	198285
Jawa Timur	1509263	1352432
Banten	437535	452790
Bali	195533	206921
NTB	212702	209587
NTT	279110	305733
Kalimantan Barat	236736	198555
Kalimantan Tengah	113411	87245
Kalimantan Selatan	142480	136200
Kalimantan Timur	195451	175688
Sulawesi Utara	137217	135520
Sulawesi Tengah	131712	138762
Sulawesi Selatan	466032	467294
Sulawesi Tenggara	144721	129737
Sulawesi Barat	62317	56665
Gorontalo	66483	66348
Maluku	111626	107373
Maluku Utara	73872	64501
Papua Barat	49292	45845
Papua	126549	123854

Appendix 5a Marginal Effects of Probit Test for Firm-Level Characteristics

```
Conditional marginal effects                      Number of obs   =      21896
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : fo cap prod
at           : fo              =    7.875311 (mean)
               cap             =    1.18e+08 (mean)
               prod            =    1.19e+08 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fo	.0052961	.0001135	46.65	0.000	.0050736	.0055185
cap	5.48e-13	8.80e-13	0.62	0.533	-1.18e-12	2.27e-12
prod	3.43e-11	3.43e-12	10.01	0.000	2.76e-11	4.10e-11

Appendix 5b Marginal Effects of Logit Test for Firm-Level Characteristics

```
Conditional marginal effects                      Number of obs   =      21896
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : fo cap prod
at           : fo              =    7.875311 (mean)
               cap             =    1.18e+08 (mean)
               prod            =    1.19e+08 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fo	.0049704	.0001176	42.28	0.000	.00474	.0052008
cap	4.27e-13	8.24e-13	0.52	0.604	-1.19e-12	2.04e-12
prod	5.78e-11	6.43e-12	8.99	0.000	4.52e-11	7.04e-11

Appendix 5c Probit Test for Firm-Level Characteristics

```
Iteration 0:   log likelihood = -11307.476
Iteration 1:   log likelihood =  -9693.694
Iteration 2:   log likelihood =  -9692.763
Iteration 3:   log likelihood = -9692.7295
Iteration 4:   log likelihood = -9692.7292

Probit regression                                 Number of obs   =      21896
                                                  LR chi2(1)      =    3229.49
                                                  Prob > chi2     =     0.0000
Log likelihood = -9692.7292                       Pseudo R2       =     0.1428
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fo	.0190442	.0003795	50.19	0.000	.0183005	.019788
cap	1.97e-12	3.16e-12	0.62	0.533	-4.23e-12	8.17e-12
prod	1.23e-10	1.23e-11	10.03	0.000	9.92e-11	1.47e-10
_cons	-1.014483	.0107923	-94.00	0.000	-1.035635	-.9933301

Appendix 5d Logit Test for Firm-Level Characteristics

```
Iteration 0:   log likelihood = -11307.476
Iteration 1:   log likelihood = -9757.1757
Iteration 2:   log likelihood = -9687.0167
Iteration 3:   log likelihood = -9678.5934
Iteration 4:   log likelihood = -9678.5681
Iteration 5:   log likelihood = -9678.5681

Logistic regression                               Number of obs   =      21896
                                                  LR chi2(1)      =    3257.82
                                                  Prob > chi2     =     0.0000
Log likelihood = -9678.5681                       Pseudo R2       =     0.1441
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fo	.031537	.0006769	46.59	0.000	.0302103	.0328637
cap	2.71e-12	5.23e-12	0.52	0.604	-7.53e-12	1.30e-11
prod	3.67e-10	4.05e-11	9.06	0.000	2.87e-10	4.46e-10
_cons	-1.703746	.0197718	-86.17	0.000	-1.742499	-1.664994

Appendix 5e Goodness of Fit Test of Probit Test for Firm-Level Characteristics

Classified	True D	True ~D	Total
+	1386	401	1787
-	3253	16856	20109
Total	4639	17257	21896

Classified + if predicted Pr(D) >= .5
True D defined as exp != 0

Sensitivity	Pr(+| D)	29.88%
Specificity	Pr(-|~D)	97.68%
Positive predictive value	Pr(D| +)	77.56%
Negative predictive value	Pr(~D| -)	83.82%
False + rate for true ~D	Pr(+|~D)	2.32%
False - rate for true D	Pr(-| D)	70.12%
False + rate for classified +	Pr(~D| +)	22.44%
False - rate for classified -	Pr(D| -)	16.18%
Correctly classified		83.31%

Appendix 5f Goodness of Fit Test of Logit Test for Firm-Level Characteristics

Classified	True D	True ~D	Total
+	1400	416	1816
-	3239	16841	20080
Total	4639	17257	21896

Classified + if predicted Pr(D) >= .5
True D defined as exp != 0

Sensitivity	Pr(+| D)	30.18%
Specificity	Pr(-|~D)	97.59%
Positive predictive value	Pr(D| +)	77.09%
Negative predictive value	Pr(~D| -)	83.87%
False + rate for true ~D	Pr(+|~D)	2.41%
False - rate for true D	Pr(-| D)	69.82%
False + rate for classified +	Pr(~D| +)	22.91%
False - rate for classified -	Pr(D| -)	16.13%
Correctly classified		83.31%

Appendix 5g Odds Ratio for Firm-Level Characteristics

Logistic regression — Number of obs = 21896
LR chi2(1) = 3257.82
Prob > chi2 = 0.0000
Log likelihood = -9678.5681 — Pseudo R2 = 0.1441

exp	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
fo	1.03204	.0006986	46.59	0.000	1.030671	1.03341
cap	1	5.23e-12	0.52	0.604	1	1
prod	1	4.05e-11	9.06	0.000	1	1
_cons	.1820004	.0035985	-86.17	0.000	.1750824	.1891917

Appendix 6a Marginal Effects of Probit Test for Geographic Characteristics

Conditional marginal effects — Number of obs = 23559
Model VCE : OIM

Expression : Pr(exp), predict()
dy/dx w.r.t. : surf_n loc exspil_n educ pop roden elec hme
at : surf_n = 37357.27 (mean)
loc = .2020459 (mean)
exspil_n = .1679758 (mean)
educ = 60898.11 (mean)
pop = 2.59e+07 (mean)
roden = 1.355553 (mean)
elec = 554.535 (mean)
hme = 116.0919 (mean)

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	7.16e-07	1.45e-07	4.95	0.000	4.32e-07	9.99e-07
loc	.5394972	.0112466	47.97	0.000	.5174543	.5615401
exspil_n	.3150852	.0307966	10.23	0.000	.2547251	.3754454
educ	-1.11e-06	1.28e-07	-8.70	0.000	-1.36e-06	-8.61e-07
pop	3.52e-10	2.08e-10	1.69	0.091	-5.57e-11	7.60e-10
roden	.0976668	.0136689	7.15	0.000	.0708763	.1244573
elec	-.0001479	.000054	-2.74	0.006	-.0002537	-.0000421
hme	.0002707	.0003097	0.87	0.382	-.0003363	.0008777

Appendix 6b Marginal Effects of Logit Test for Geographic Characteristics

```
Conditional marginal effects                      Number of obs   =      23559
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : surf_n loc exspil_n educ pop roden elec hme
at           : surf_n          =    37357.27 (mean)
               loc             =    .2020459 (mean)
               exspil_n        =    .1679758 (mean)
               educ            =    60898.11 (mean)
               pop             =    2.59e+07 (mean)
               roden           =    1.355553 (mean)
               elec            =     554.535 (mean)
               hme             =    116.0919 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	6.82e-07	1.16e-07	5.91	0.000	4.56e-07	9.09e-07
loc	.4130535	.0121022	34.13	0.000	.3893337	.4367733
exspil_n	.3023483	.027892	10.84	0.000	.2476811	.3570156
educ	-9.01e-07	1.17e-07	-7.69	0.000	-1.13e-06	-6.72e-07
pop	2.93e-10	2.11e-10	1.39	0.165	-1.20e-10	7.06e-10
roden	.0930171	.0114437	8.13	0.000	.0705878	.1154463
elec	-.000123	.0000502	-2.45	0.014	-.0002214	-.0000246
hme	.000128	.0002912	0.44	0.660	-.0004428	.0006988

Appendix 6c Probit Test for Geographic Characteristics

```
Iteration 0:   log likelihood =  -11843.12
Iteration 1:   log likelihood = -3923.4548
Iteration 2:   log likelihood = -3819.8528
Iteration 3:   log likelihood = -3819.2681
Iteration 4:   log likelihood =  -3819.268

Probit regression                                 Number of obs   =      23559
                                                  LR chi2(8)      =   16047.70
                                                  Prob > chi2     =     0.0000
Log likelihood =  -3819.268                       Pseudo R2       =     0.6775
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	4.28e-06	8.64e-07	4.95	0.000	2.59e-06	5.97e-06
loc	3.226146	.0327471	98.52	0.000	3.161963	3.290329
exspil_n	1.884182	.1842643	10.23	0.000	1.523031	2.245333
educ	-6.65e-06	7.75e-07	-8.58	0.000	-8.17e-06	-5.13e-06
pop	2.11e-09	1.25e-09	1.69	0.091	-3.35e-10	4.55e-09
roden	.5840389	.0817033	7.15	0.000	.4239035	.7441744
elec	-.0008843	.0003231	-2.74	0.006	-.0015175	-.0002511
hme	.0016188	.0018526	0.87	0.382	-.0020123	.0052498
_cons	-2.585907	.1103009	-23.44	0.000	-2.802092	-2.369721

Appendix 6d Logit Test for Geographic Characteristics

```
Iteration 0:   log likelihood =  -11843.12
Iteration 1:   log likelihood = -4480.7689
Iteration 2:   log likelihood = -3849.3035
Iteration 3:   log likelihood = -3743.5696
Iteration 4:   log likelihood = -3742.4772
Iteration 5:   log likelihood = -3742.4764
Iteration 6:   log likelihood = -3742.4764

Logistic regression                               Number of obs   =      23559
                                                  LR chi2(8)      =   16201.29
                                                  Prob > chi2     =     0.0000
Log likelihood = -3742.4764                       Pseudo R2       =     0.6840
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	9.92e-06	1.68e-06	5.89	0.000	6.62e-06	.0000132
loc	6.00292	.0735188	81.65	0.000	5.858825	6.147014
exspil_n	4.394038	.407193	10.79	0.000	3.595954	5.192122
educ	-.0000131	1.71e-06	-7.65	0.000	-.0000165	-9.74e-06
pop	4.25e-09	3.06e-09	1.39	0.165	-1.75e-09	1.03e-08
roden	1.35182	.1675392	8.07	0.000	1.02345	1.680191
elec	-.0017873	.0007303	-2.45	0.014	-.0032186	-.000356
hme	.0018601	.0042331	0.44	0.660	-.0064366	.0101568
_cons	-5.213322	.2444768	-21.32	0.000	-5.692487	-4.734156

Appendix 6e Goodness of Fit Test of Probit Test for Geographic Characteristics

	True		
Classified	D	~D	Total
+	4226	534	4760
-	525	18274	18799
Total	4751	18808	23559

```
Classified + if predicted Pr(D) >= .5
True D defined as exp != 0
```

Sensitivity	Pr(+| D)	88.95%
Specificity	Pr(-|~D)	97.16%
Positive predictive value	Pr(D| +)	88.78%
Negative predictive value	Pr(~D| -)	97.21%
False + rate for true ~D	Pr(+|~D)	2.84%
False - rate for true D	Pr(-| D)	11.05%
False + rate for classified +	Pr(~D| +)	11.22%
False - rate for classified -	Pr(D| -)	2.79%
Correctly classified		95.50%

Appendix 6f Goodness of Fit Test of Logit Test for Geographic Characteristics

Classified	True D	True ~D	Total
+	4133	292	4425
-	618	18516	19134
Total	4751	18808	23559

Classified + if predicted Pr(D) >= .5
True D defined as exp != 0

Sensitivity	Pr(+| D)	86.99%
Specificity	Pr(-|~D)	98.45%
Positive predictive value	Pr(D| +)	93.40%
Negative predictive value	Pr(~D| -)	96.77%
False + rate for true ~D	Pr(+|~D)	1.55%
False - rate for true D	Pr(-| D)	13.01%
False + rate for classified +	Pr(~D| +)	6.60%
False - rate for classified -	Pr(D| -)	3.23%
Correctly classified		96.14%

Appendix 6g Odds Ratio for Geographic Characteristics

Logistic regression — Number of obs = 23559
LR chi2(8) = 16201.29
Prob > chi2 = 0.0000
Log likelihood = -3742.4764 — Pseudo R2 = 0.6840

exp	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	1.00001	1.68e-06	5.89	0.000	1.000007	1.000013
loc	404.6084	29.74634	81.65	0.000	350.3125	467.3199
educ	.9999869	1.71e-06	-7.65	0.000	.9999835	.9999903
pop	1	3.06e-09	1.39	0.165	1	1
roden	3.864454	.6474475	8.07	0.000	2.782777	5.366582
elec	.9982143	.000729	-2.45	0.014	.9967866	.9996441
hme	1.001862	.0042409	0.44	0.660	.9935841	1.010209
exspil_n	80.96672	32.96908	10.79	0.000	36.45047	179.8498
_cons	.0054436	.0013308	-21.32	0.000	.0033712	.0087899

Appendix 7a Marginal Effects of Probit Test for FNG

```
Conditional marginal effects                    Number of obs   =      23563
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : surf_n
at           : surf_n          =    37355.28 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	-5.67e-07	1.15e-07	-4.92	0.000	-7.92e-07	-3.41e-07

Appendix 7b Marginal Effects of Logit Test for FNG

```
Conditional marginal effects                    Number of obs   =      23563
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : surf_n
at           : surf_n          =    37355.28 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	-5.86e-07	1.19e-07	-4.91	0.000	-8.20e-07	-3.52e-07

Appendix 7c Probit Test for FNG

```
Iteration 0:   log likelihood = -11845.397
Iteration 1:   log likelihood = -11833.069
Iteration 2:   log likelihood = -11833.057
Iteration 3:   log likelihood = -11833.057

Probit regression                               Number of obs   =      23563
                                                LR chi2(1)      =      24.68
                                                Prob > chi2     =     0.0000
Log likelihood = -11833.057                     Pseudo R2       =     0.0010
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	-2.02e-06	4.10e-07	-4.92	0.000	-2.82e-06	-1.21e-06
_cons	-.7613037	.0176686	-43.09	0.000	-.7959334	-.7266739

Appendix 7d Logit Test for FNG

```
Iteration 0:   log likelihood = -11845.397
Iteration 1:   log likelihood = -11832.834
Iteration 2:   log likelihood = -11832.795
Iteration 3:   log likelihood = -11832.795

Logistic regression                             Number of obs   =      23563
                                                LR chi2(1)      =      25.20
                                                Prob > chi2     =     0.0000
Log likelihood = -11832.795                     Pseudo R2       =     0.0011
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	-3.65e-06	7.43e-07	-4.91	0.000	-5.10e-06	-2.19e-06
_cons	-1.241834	.0314165	-39.53	0.000	-1.303409	-1.180259

Appendix 7e Goodness of Fit Test of Probit Test for FNG

	True		
Classified	D	~D	Total
+	0	0	0
-	4752	18811	23563
Total	4752	18811	23563

```
Classified + if predicted Pr(D) >= .5
True D defined as exp != 0
```

Sensitivity	Pr(+| D)	0.00%
Specificity	Pr(-|~D)	100.00%
Positive predictive value	Pr(D| +)	.%
Negative predictive value	Pr(~D| -)	79.83%
False + rate for true ~D	Pr(+|~D)	0.00%
False - rate for true D	Pr(-| D)	100.00%
False + rate for classified +	Pr(~D| +)	.%
False - rate for classified -	Pr(D| -)	20.17%
Correctly classified		79.83%

Appendix 7f Goodness of Fit Test of Logit Test for FNG

Classified	True D	True ~D	Total
+	0	0	0
-	4752	18811	23563
Total	4752	18811	23563

Classified + if predicted Pr(D) >= .5
True D defined as exp != 0

Sensitivity	Pr(+| D)	0.00%
Specificity	Pr(-|~D)	100.00%
Positive predictive value	Pr(D| +)	.%
Negative predictive value	Pr(~D| -)	79.83%
False + rate for true ~D	Pr(+|~D)	0.00%
False - rate for true D	Pr(-| D)	100.00%
False + rate for classified +	Pr(~D| +)	.%
False - rate for classified -	Pr(D| -)	20.17%
Correctly classified		79.83%

Appendix 7g Odds Ratio for FNG

Logistic regression — Number of obs = 23563
LR chi2(1) = 25.20
Prob > chi2 = 0.0000
Log likelihood = -11832.795 — Pseudo R2 = 0.0011

exp	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
surf_n	.9999964	7.43e-07	-4.91	0.000	.9999949	.9999978
_cons	.288854	.0090748	-39.53	0.000	.2716043	.3071992

Appendix 8a Marginal Effects of Probit Test for SNG

Conditional marginal effects — Number of obs = 23560
Model VCE : OIM

Expression : Pr(exp), predict()
dy/dx w.r.t. : loc exspil_n educ pop roden elec hme
at : loc = .2020798 (mean)
exspil_n = .1679722 (mean)
educ = 60895.6 (mean)
pop = 2.59e+07 (mean)
roden = 1.355512 (mean)
elec = 554.5198 (mean)
hme = 116.0871 (mean)

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loc	.5402718	.0112131	48.18	0.000	.5182947	.562249
exspil_n	.2718884	.0294559	9.23	0.000	.2141559	.329621
educ	-7.67e-07	1.08e-07	-7.12	0.000	-9.78e-07	-5.56e-07
pop	2.39e-10	2.05e-10	1.17	0.243	-1.62e-10	6.41e-10
roden	.0674996	.0122555	5.51	0.000	.0434792	.09152
elec	-9.97e-06	.0000459	-0.22	0.828	-.0000999	.00008
hme	-.0003563	.0002817	-1.26	0.206	-.0009085	.0001958

Appendix 8b Marginal Effects of Logit Test for SNG

```
Conditional marginal effects                      Number of obs   =      23560
Model VCE    : OIM

Expression   : Pr(exp), predict()
dy/dx w.r.t. : loc exspil_n educ pop roden elec hme
at           : loc             =    .2020798 (mean)
               exspil_n        =    .1679722 (mean)
               educ            =     60895.6 (mean)
               pop             =    2.59e+07 (mean)
               roden           =    1.355512 (mean)
               elec            =    554.5198 (mean)
               hme             =    116.0871 (mean)
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loc	.4165776	.01209	34.46	0.000	.3928817	.4402735
exspil_n	.2650174	.0271713	9.75	0.000	.2117627	.3182722
educ	-6.00e-07	1.07e-07	-5.61	0.000	-8.10e-07	-3.91e-07
pop	2.12e-10	2.06e-10	1.03	0.301	-1.90e-10	6.15e-10
roden	.0670058	.0106396	6.30	0.000	.0461526	.087859
elec	6.06e-06	.000045	0.13	0.893	-.0000822	.0000943
hme	-.0004709	.0002742	-1.72	0.086	-.0010082	.0000664

Appendix 8c Probit Test for SNG

```
Iteration 0:   log likelihood = -11844.721
Iteration 1:   log likelihood = -3933.2675
Iteration 2:   log likelihood =  -3831.368
Iteration 3:   log likelihood = -3830.7812
Iteration 4:   log likelihood = -3830.7812

Probit regression                                 Number of obs   =      23560
                                                  LR chi2(7)      =   16027.88
                                                  Prob > chi2     =     0.0000
Log likelihood = -3830.7812                       Pseudo R2       =     0.6766
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loc	3.218531	.0326309	98.63	0.000	3.154575	3.282486
exspil_n	1.619705	.1755377	9.23	0.000	1.275658	1.963753
educ	-4.57e-06	6.51e-07	-7.02	0.000	-5.85e-06	-3.29e-06
pop	1.43e-09	1.22e-09	1.17	0.243	-9.69e-10	3.82e-09
roden	.4021115	.0730175	5.51	0.000	.2589998	.5452232
elec	-.0000594	.0002734	-0.22	0.828	-.0005953	.0004765
hme	-.0021228	.0016773	-1.27	0.206	-.0054101	.0011646
_cons	-2.262602	.0875991	-25.83	0.000	-2.434293	-2.090911

Appendix 8d Logit Test for SNG

```
Iteration 0:   log likelihood = -11844.721
Iteration 1:   log likelihood = -4487.0372
Iteration 2:   log likelihood = -3860.6165
Iteration 3:   log likelihood = -3756.7993
Iteration 4:   log likelihood = -3755.7482
Iteration 5:   log likelihood = -3755.7474
Iteration 6:   log likelihood = -3755.7474

Logistic regression                               Number of obs   =      23560
                                                  LR chi2(7)      =   16177.95
                                                  Prob > chi2     =     0.0000
Log likelihood = -3755.7474                       Pseudo R2       =     0.6829
```

exp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loc	5.988373	.0733839	81.60	0.000	5.844544	6.132203
exspil_n	3.809671	.3917554	9.72	0.000	3.041844	4.577497
educ	-8.63e-06	1.54e-06	-5.59	0.000	-.0000116	-5.60e-06
pop	3.05e-09	2.96e-09	1.03	0.302	-2.74e-09	8.85e-09
roden	.9632193	.1538525	6.26	0.000	.6616738	1.264765
elec	.000087	.0006473	0.13	0.893	-.0011816	.0013557
hme	-.0067692	.0039394	-1.72	0.086	-.0144904	.0009519
_cons	-4.48105	.2049324	-21.87	0.000	-4.88271	-4.07939

Appendix 8e Goodness of Fit Test of Probit Test for SNG

	True		
Classified	D	~D	Total
+	4227	534	4761
-	525	18274	18799
Total	4752	18808	23560

```
Classified + if predicted Pr(D) >= .5
True D defined as exp != 0
```

Sensitivity	Pr(+| D)	88.95%
Specificity	Pr(-|~D)	97.16%
Positive predictive value	Pr(D| +)	88.78%
Negative predictive value	Pr(~D| -)	97.21%
False + rate for true ~D	Pr(+|~D)	2.84%
False - rate for true D	Pr(-| D)	11.05%
False + rate for classified +	Pr(~D| +)	11.22%
False - rate for classified -	Pr(D| -)	2.79%
Correctly classified		95.51%

Appendix 8f Goodness of Fit Test of Logit Test for SNG

Classified	True D	True ~D	Total
+	4134	292	4426
-	618	18516	19134
Total	4752	18808	23560

Classified + if predicted Pr(D) >= .5
True D defined as exp != 0

Sensitivity	Pr(+| D)	86.99%
Specificity	Pr(-|~D)	98.45%
Positive predictive value	Pr(D| +)	93.40%
Negative predictive value	Pr(~D| -)	96.77%
False + rate for true ~D	Pr(+|~D)	1.55%
False - rate for true D	Pr(-| D)	13.01%
False + rate for classified +	Pr(~D| +)	6.60%
False - rate for classified -	Pr(D| -)	3.23%
Correctly classified		96.14%

Appendix 8g Odds Ratio for SNG

Logistic regression — Number of obs = 23560
LR chi2(7) = 16177.95
Prob > chi2 = 0.0000
Log likelihood = -3755.7474 — Pseudo R2 = 0.6829

exp	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
loc	398.7654	29.26295	81.60	0.000	345.3449	460.4495
educ	.9999914	1.54e-06	-5.59	0.000	.9999884	.9999944
pop	1	2.96e-09	1.03	0.302	1	1
roden	2.620118	.4031118	6.26	0.000	1.938034	3.542259
elec	1.000087	.0006474	0.13	0.893	.9988191	1.001357
hme	.9932536	.0039129	-1.72	0.086	.9856141	1.000952
exspil_n	45.13557	17.6821	9.72	0.000	20.94383	97.27062
_cons	.0113215	.0023201	-21.87	0.000	.0075765	.0169178

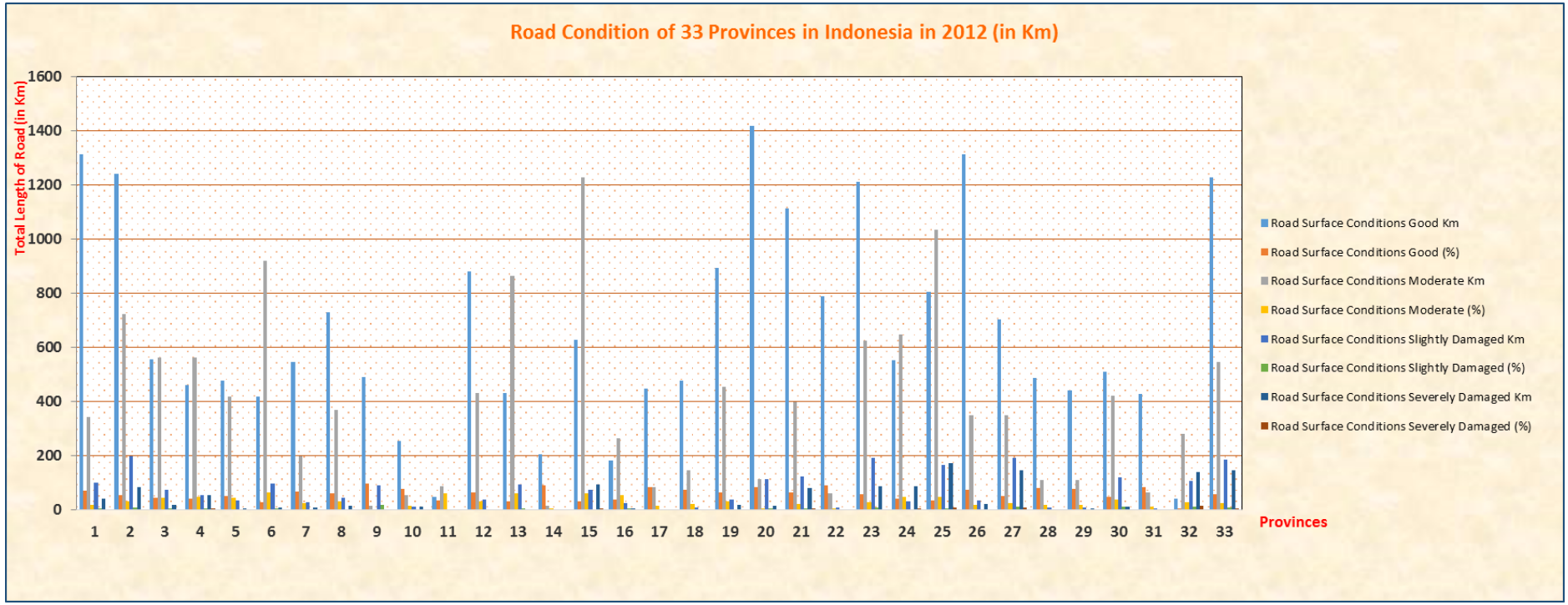
Appendix 3a Overview of Road Condition in Indonesia by Province in Indonesia 2012

No.	Province	Total Length (Km)	Road Condition in Indonesia by Province in 2012											
			Road Surface Conditions								Road Stability			
			Good		Moderate		Slightly Damaged		Severely Damaged		Steady		Not Steady	
			Km	(%)	Km	(%)	Km	(%)	Km	(%)	Km	(%)	Km	(%)
1	Aceh	1803.35	1315.3	72.94	345	19.13	102	5.68	40.7	2.25	1660.3	92.07	143.1	7.93
2	Sumatera Utara	2249.64	1240.4	55.14	723.6	32.16	200	8.89	85.8	3.81	1963.9	87.30	285.7	12.70
3	Sumatera Barat	1212.89	557.94	46.00	561.9	46.33	73.4	6.05	19.6	1.62	1119.8	92.33	93.05	7.67
4	Riau	1134.47	460.21	40.57	562.5	49.58	56.1	4.94	55.7	4.91	1022.7	90.15	111.8	9.85
5	Jambi	936.48	476.94	50.93	417.9	44.63	34.3	3.67	7.28	0.78	894.87	95.56	41.41	4.42
6	Sumatera Selatan	1444.26	419.77	29.06	919.3	63.65	96.5	6.68	8.64	0.60	1339.1	92.72	105.2	7.28
7	Bengkulu	783.87	545.73	69.62	200.1	25.53	27.5	3.51	10.5	1.34	745.82	95.15	38.05	4.85
8	Lampung	1159.57	729.46	62.91	368.8	31.81	47	4.05	14.3	1.23	1098.3	94.72	61.28	5.28
9	Kep.Bangka Belitung	509.59	492.16	96.58	17.02	3.34	89.9	17.65	2.53	0.50	509.18	99.92	0.41	0.08
10	Kep.Riau	334	256.42	76.77	53.64	16.06	12.5	3.73	11.5	3.43	310.06	92.83	23.94	7.17
11	DKI Jakarta	142.65	49.51	34.71	89.34	62.63	3.8	2.66	0	0.00	138.85	97.34	3.8	2.66
12	Jawa Barat	1351.13	881.97	65.28	430.6	31.87	37.6	2.78	0.9	0.07	1312.6	97.15	38.52	2.85
13	Jawa Tengah	1390.57	432	31.07	865.5	62.24	93	6.69	0.1	0.01	1297.5	93.30	93.1	6.70
14	DI. Yogyakarta	223.16	204.82	91.78	16.24	7.28	2.1	0.94	0	0.00	221.06	99.06	2.1	0.94
15	Jawa Timur	2027.01	628.97	31.03	1229	60.64	73.8	3.64	95.1	4.69	1858.1	91.67	168.9	8.33
16	Banten	476.49	183.23	38.45	264	55.41	24.8	5.20	4.47	0.94	447.26	93.87	29.24	6.14

Appendix 3a (Contd.)

No.	Province	Total Length (Km)	Road Condition in Indonesia by Province in 2012											
			Road Surface Conditions								Road Stability			
			Good		Moderate		Slightly Damaged		Severely Damaged		Steady		Not Steady	
			Km	(%)	Km	(%)	Km	(%)	Km	(%)	Km	(%)	Km	(%)
17	Bali	535.23	448.77	83.85	85.65	16.00	0.8	0.15	0	0.00	534.43	99.85	0.8	0.15
18	NTB	632.17	478.26	75.65	145.8	23.06	7.88	1.25	0.25	0.04	624.04	98.71	8.13	1.29
19	NTT	1406.68	895.29	63.65	454.9	32.34	37.3	2.65	19.1	1.36	1350.2	95.99	56.45	4.01
20	Kalimantan Barat	1664.55	1420.1	85.31	113.7	6.83	115	6.90	15.9	0.95	1533.8	92.15	130.7	7.85
21	Kalimantan Tengah	1714.83	1112.8	64.89	398.9	23.26	123	7.17	80.2	4.68	1511.7	88.15	203.2	11.85
22	Kalimantan Selatan	866.09	790.99	91.33	63.23	7.30	8.95	1.03	2.91	0.34	854.22	98.63	11.87	1.37
23	Kalimantan Timur	2118.17	1214.1	57.32	624.2	29.47	193	9.10	87.2	4.12	1838.3	86.79	279.9	13.21
24	Sulawesi Utara	1319.23	553	41.92	647.8	49.10	31.6	2.39	86.9	6.59	1200.8	91.02	118.5	8.98
25	Sulawesi Tengah	2181.95	805.69	36.93	1036	47.48	166	7.60	175	8.00	1841.6	84.40	340.3	15.60
26	Sulawesi Selatan	1722.86	1314	76.27	351.7	20.41	35.3	2.05	21.9	1.27	1665.6	96.68	57.24	3.32
27	Sulawesi Tenggara	1397.05	704.69	50.44	350.7	25.10	194	13.86	148	10.60	1055.4	75.54	341.7	24.46
28	Gorontalo	606.7	487.23	80.31	110.6	18.22	8.8	1.45	0.1	0.02	597.79	98.53	8.9	1.47
29	Sulawesi Barat	571.98	443.61	77.56	111.9	19.55	10.8	1.88	5.74	1.00	555.46	97.11	16.52	2.89
30	Maluku	1066.65	509.89	47.80	420.9	39.46	122	11.44	13.8	1.29	930.8	87.26	135.9	12.74
31	Maluku Utara	511.89	429.73	83.95	64.88	12.67	5.27	1.03	2	0.39	504.62	98.58	7.27	1.42
32	Papua Barat	963.24	43.45	4.51	282.7	29.35	106	11.03	141	14.63	716.12	74.34	247.1	25.66
33	Papua	2111.44	1228.2	58.17	548.2	25.97	188	8.88	147	6.98	1776.4	84.13	335	15.87

Appendix 3b Figure of Road Condition in Indonesia by Province in 2012



References

Aitken, B., Hanson, G. H., & Harrison, A. E. (1997). Spillovers, Foreign Investment, and Export Behavior. *Journal of International Economics* 43(1–2) pp.103–132.

Annual Total Trade Tables (ATT) (2000-2013). 8th edition. *International Trade Statistics Database.* (http://unstats.un.org/unsd/trade/data/tables.asp#annual) [Accessed on Wednesday, 21th July, 2015, 00.30 a.m.]

Berry, A., Rodriguez, E., & Sandee, H. (2002). Firm and Group Dynamics in The Small and Medium Enterprise Sector in Indonesia. *Small Business Economics* 18(1–3) pp.141–161.

Central Bureau of Statistics of Indonesia. (2012). (Accessed on Wednesday, 21th July, 2015).

Central Bureau of Statistics of Indonesia. (2012). *Statistical Yearbook of Indonesia,* 2012. Jakarta.

Central Bureau of Statistics of Indonesia. (2013). *Statistical Yearbook of Indonesia,* 2013. Jakarta.

Central Bureau of Statistics of Indonesia. (2014). *Statistical Yearbook of Indonesia,* 2014. Jakarta.

Chang, H.H. and Van Mrrewijk, C. (2013). Firm heterogeneity and Development: Evidence from Latin American countries. *The Journal of International Trade & Economic Development***,** Taylor & Francis Journals, vol. 22(1), pp.11-52, February.

Clerides, S. K., Lach, S., & Tybout, J. R. (1998). Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco. *Quarterly Journal of Economics* 113(3) pp.903–947.

Damodar, N. Gujarati (2003). Basic Econometrics. Fourth Edition. McGraw-Hill, New York.

Davis, D.R. and Weinstein, D.E. (1999). Economic Geography and Regional Production Structure: An Empirical Investigation. *European Economic Review* 42 pp.379-407.

Farole, et.al. (2013). Geography and the Determinants of Firm Exports in Indonesia. *World Development* Vol. 44 pp. 225-240.

Ghemawat, P. (2007). Redefining Global Strategy. Boston, Massachusetts: *Harvard Business School Press.*

GIZ, BAPPENAS. (2012). Development of the Indonesian NAMAs framework.

Gomes, F. Cardoso (1997). Manajemen Sumber Daya Manusia. Yogyakarta: Andi Offset.

Gonzalez, R.V. and Pueyo F. (2009). First-Nature vs. Second-Nature Causes: Industry Location and Growth in The Presence of an Open-Access Renewable Resource. *Munich Personal RePEc Archive (MPRA) Paper* No. 18586

Greene, William H. (2000). Econometric Analysis. Fifth Edition. Upper-Saddle River, New Jersey: Prentice Hall.

Henderson, Vernon. (1997). Externalities and Industrial Development. *Journal of Urban Economics* 42, pp.449-470.

Ministry of Educational and Culture of Indonesia (2013). Indonesia Educational Statistics on Brief 2012/2013. *Center for Educational Data and Statistics 2013*.

Krugman, P.R. (1980). Scale Economics, Product Differentiation and The Pattern of Trade. *American Economic Review* 70 (5): 950–59.

Krugman, P.R. (1991). Geography and Trade. Massachusetts Institute of Technology, Cambridge.

Krugell, W. and Matthee, M. (2009). Measuring the Export Capability of South African Regions. *Development Southern Africa* Vol. 26 No.3, September.

Kuncoro, M. (2002). Analisis Spasial dan Regional Studi Aglomerasi & Kluster Industri Indonesia. Cetakan Pertama, Penerbit UPP AMP YKPN, Yogyakarta.

Kusumaningrum, R. (2006). Perancangan Model Pendukung Keputusan Untuk Penentuan Lokasi Industri Berdasarkan Proses Hierarki Analitik. *Jurnal Matematika* Vol. 9 No.1, April 2006: 139 – 143.

Matthee, M. and Naude, W. (2008). The Determinants of Regional Manufactured Exports from a Developing Country. *International Regional Science Review*, Vol. 31. No. 4 pp.343-358.

Ministry of Industry (2011). *Industri Dalam Angka 2011*. Jakarta.

Ministry of Public Works (2012). *Transportation Statistics of Indonesia 2012*. Jakarta

Naude, W. (2009). Geography, Transport and Africa's Proximity Gap. *Journal of Transport Geography* 17 pp.1–9.

Nicolini, R. (2003). On the Determinants of Regional Trade Flows. *International Regional Science Review* 26(4) pp. 447-65.

O'Sullivan, A. (1996). Urban Economics Irwin, Third Edition.

Ramstetter, E. D. (1999). Trade Propensities and Foreign Ownership Share in Indonesian Manufacturing. *Bulletin of Indonesian Economic Studies* 35(2) pp.43–66.

Rasiah, R. (2005). Foreign Ownership, Technological Intensity and Export Incidence: A study of Auto Parts, Electronics and Garment Firms in Indonesia. *International Journal of Technology and Globalization*, 1(3–4), 361–380.

RUKN (2015) published by Ministry of Energy and Mineral Resources. (https://www.djk.esdm.go.id/pdf/Draft%20RUKN/Draft%20RUKN%202015%20-%202034.pdf) [Accessed on Wednesday, 21th July, 2015, 00.30 a.m.]

Sjöholm, F. 2003). Which Indonesian Firms Export? The Importance of Foreign Networks. *Papers in Regional Science*, 82 pp.333–350.

Smith, A. 1776/1976. An Inquiry into the Nature and Causes of the Wealth of Nations. *Glasgow Edition (R.H. Campbell, A.S. Skinner, Eds.*). Oxford: Clarendon Press.

The Economic and Social Research Institute (2006). Who Exports? A Firm-Level Study of the Characteristics of Exporters and the Determinants of Export Performance for Northern Ireland and the Republic of Ireland. *Working paper.*

The Global Competitiveness Report 2013-2014. (http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf) [Accessed on Wednesday, 21th July, 2015, 01.45 a.m.]

Wagner, J. (2007). Exports and Productivity: A Survey of the Evidence from firm- level Data. *The World Economy* 30(1) pp. 60-82.

Wooldridge, J.M. (2012). Introductory Econometrics: A Modern Approach. Cengage Learning.

World Bank's Reports (2005). Electricity for All: Options for Increasing Access in Indonesia. (http://siteresources.worldbank.org/INTEAPASTAE/Resources/Electricity_for_All-Increasing_Access_in_Indonesia.pdf) [Accessed on Wednesday, 12th August 2015, 18.35 p.m.]

Worosuprodjo, S. (2007). Mengelola Potensi Geografis Indonesia untuk Pembangunan Wilayah Berkelanjutan dalam *Pidato Pengukuhan Jabatan Guru Besar pada Fakultas Geografi UGM, Yogyakarta.*