The Determinant and Trade Potential of Export of Indonesian Textile Products: a Gravity Model

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This paper objectives is examining the determinant factors that influential to export in Indonesia textile products, especially in two aggregate products, yarns and fibres (SITC 26) and fabrics (SITC 65). Using standard and augmented gravity model, this paper concludes that the geographical distance and size of partner countries' economy which reflects in its GDP, per capita income and population is significantly impact the pattern of textile product export growth. However, the size of reporters' (Indonesia) economy is not significant for the fabrics products export. Moreover, Indonesia tends export to partner countries with similar level of per capita income. Finally, Indonesia needs to diversify its export destination to countries that still experiencing undertraded condition. So that Indonesia textile industry can evade any risks concerning excessive market dependency to any country.

Keywords: Gravity model, Indonesia, Textile, Trade potential

I. Introduction

The study of international trade has increasingly become a growing concern among scholars and researchers throughout the world. Since economic globalization is now an inevitable phenomenon, then more and more research have been done in these issues. The study of international economics constitutes the flow of economic resources (such as commodity, money, human resources, etc) between countries. Even though right now the transactions in international financial market are emerging substantially in volume, amount and complexity, yet the international trade that refers to commodity maybe the oldest and foremost engine that evolves global economy. The trade flow from export and import activities reflects many things within countries/regions that engage in global economy. It shows the need of market expansion, different taste that leads to product heterogeneity, linkage in supply chain and many other things that essential in determining the international trade. Thus, it encourages scholars and researchers to study the factors and variables that specifically and/or generally causes trade between countries. These enduring studies from centuries ago have produced many theories in international trade.

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The Ricardian theory of comparative advantage and Heckscher-Ohlin model of factor endowment marked the classical and neo-classical theories in international trade (Appleyard et al. 2008). Subsequently, in the past few decades, many theories have derived from these predecessors to explain factors in international trade. Among them, there is gravity model that study the impact of economic size and geographical distance to trade flow between bilateral countries or regions. The theory pioneered by Tinbergen (1962) and Pöyhönen (1963)that study the effect of national income and geographical distance to imports of commodity[1]. Originated from Newtonian theory of universal gravity, the model postulates that the force between two objects is determined by their body mass and the distance between them. Thus, in econophysics sense, the trade flow represents the gravitational force, the economic scale and wealth of two countries correspond to body mass of each subject, and the geographical distance is exactly denotation of physical distance. Recently, this model is employed in social science problem solving in order to explain the flows of not only trade but also immigrants and money repatriation, foreign direct investment, etc.

This paper utilizes gravity model to examine the bilateral export flow between Indonesia and selected trading partner countries, specifically in downstream and midstream textile industry (code 26 and 65 Standard International Trade Classification/SITC Revision 3). The objectives of this research is twofold, first, understanding the nature of Indonesian manufactured textile product exports. With regard to gravity model, the results should show the role of independent variables (economic size/wealth, geographical distance and other control variables) to influence the export. The results also supposed to determine the significance and direction of the effect. The second objective is to reveal the trade potential between Indonesia and its selected trading partners regarding the specific commodity. The estimation results from gravity model will be the tool to predict the export value in the same trading partner and the same period of analysis. Then, the comparison between predicted and actual export value yields the projection of trade potential, which refers to undertrade or overtrade circumstances between Indonesia and its trading partner. Ultimately, the purpose of this research paper is to contribute the study of international trade. Furthermore, it should illustrate the clear picture of Indonesian manufactured textile industry, especially in global market view.

II. Indonesian Textile Industry

The Indonesian textile industry consists of three mainstream industries. First, the upstream industry, they produce yarn and fiber (code 26 SITC Rev.3). Next, the midstream industry, they manufacture fabrics (code 65 SITC Rev.3). Lastly, the downstream, garment industry (code 84 SITC Rev.3)(Pratiwi Anwar 2000, p.36). For technical reason, the term of Indonesian textile industry in this paper henceforth is referred to upstream and midstream industry only[2]. Prior to the 1960s, the small scale

[1] Linnemann (1966) augmented the model by including population as the proxy of economic size that reflects market and production scale of bilateral countries (Larue and Mutunga 1993, pp. 63 in Kristjansdottir 2005)

[2] Recently, the Indonesian garment industry is now facing problem of overflowing new and used garment products which smuggled from China and neighboring countries. Therefore, the number accounted in any published

and some government owned textile companies started to contribute Indonesian GDP along with other primary goods industry such as food and beverage. However, the introduction process of textile technology is already happened long before Indonesian independence. Then, in the mid 1970s, the industry has started to produce import substitution goods, in order to fulfill domestic demands. In the 1970s, the textile industry is also among the first industry that shifts its paradigm into import substitution goods producer in Indonesian manufacturing industry. Within this period, several multinational textile companies (especially from Japan) have established their plants, which it may explained the occurrence of reviving textile industry. However, most of these multinationals is in midstream (fabrics) industry, so they begin the paradigm shifting in 1975. On the other hand, the upstream (yarn and fiber) industry started to move to import substitution stage later in 1978 (Pratiwi Anwar 2000, p.40).

The next development stage, export orientation or outward looking, reached in 1983 by fabrics industry. However, the yarn and fiber industry is long lagging behind when it started to shift into export orientation phase in 1997. Several government deregulations coincide with domestic and global market situation have triggered the shifting in textile industry from inward looking to outward looking. Since 1970s, the government has relaxed the investment and trade regulation to induce more domestic and (especially) foreign direct investment in textile industry. The improvement of export administration and import liberalization (that decrease the tariff on imported input materials) have substantially endorsed the firms to export their product. Furthermore, currency devaluation policy in 1978, followed in 1985, has made global market favorable than domestic market. Another conditions that initiate the shifting in textile industry is decreasing in labor cost in 1980s (Indian Council for Research on International Economic Relations (ICRIER) 1995) combined with increased in productivity of textile industry. Lastly, the flourished of foreign direct investment all over the world has increased East Asian multinationals investment in 1980s to 1990s (Osada 1994).

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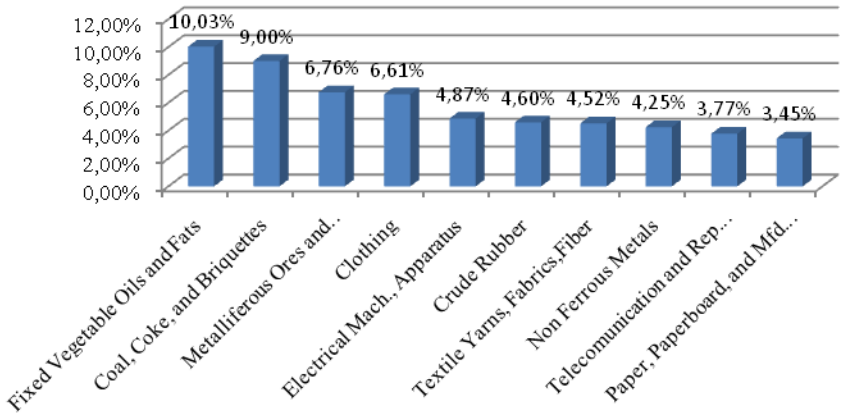
data of garment trade (import, market demand, consumption, etc) may not reflect the real data, since it is difficult to verify trading data from underground/black market.

Figure 1
10 Largest Indonesia Exported Products 2004-2009



Source : Computed from Central Bank of Indonesia database

From the beginning development stage until recently, the textile industry has been contributing Indonesia's economy particularly in total output, labor absorption, foreign direct investment and export. The declining importance of textile industry mainly because rapid growth of other manufacturing industry sectors, such as food and beverage, electronic, chemical, pharmaceutical and automotive. In terms of share to Indonesia's total export, the textile industry is in position number 7 among 10 largest exported products (of 66 divisions/ 2 digits SITC Rev.3) in Indonesia 2004-2009 as shown in the Figure 1 below. These products account for almost 60% of total export, and textile industry share is 4,52% of total export. While the largest exported products is from food and beverage sector (fixed vegetable oils and fats) followed by mineral sector (coal, metalliferous ores and metal).

Furthermore, the role of Indonesian textile industry in international trade is also very important. In 2008, the Indonesian textile industry is of the 15th rank for textile fabrics (SITC 65) export in the world. It contributes 1,50% of total world exports as expressed in the table 1 below.

Table 1
20 Largest Textile World Exporter, 2008

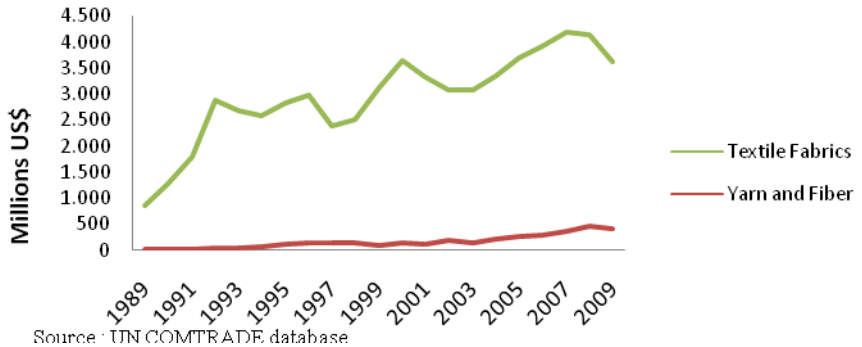
Rank	Country	SITC 65		Country	SITC 26	
		Value (US$)	Share		Value (US$)	Share
1	China	65.366.583.459	26,70%	USA	6.867.422.882	23,04%
2	Italy	16.091.507.199	6,57%	Australia	2.341.243.151	7,86%
3	Germany	15.901.460.000	6,50%	Germany	2.204.633.000	7,40%
4	USA	12.470.256.158	5,09%	China	2.036.930.548	6,83%
5	Hong Kong SAR	12.256.104.656	5,01%	India	2.029.642.171	6,81%
6	India	10.372.330.047	4,24%	Rep. of Korea	1.268.691.843	4,26%
7	Turkey	9.399.326.853	3,84%	Japan	1.209.203.904	4,06%
8	Belgium	8.135.642.051	3,32%	Belgium	934.966.242	3,14%
9	France	7.367.407.581	3,01%	Brazil	870.352.859	2,92%
10	Japan	7.340.457.412	3,00%	United Kingdom	751.817.664	2,52%
11	Pakistan	7.186.246.049	2,94%	Thailand	513.495.647	1,72%
12	Netherlands	4.807.457.396	1,96%	Italy	506.450.296	1,70%
13	United Kingdom	4.445.613.921	1,82%	France	473.491.661	1,59%
14	Spain	4.355.743.982	1,78%	**Indonesia**	**454.636.464**	**1,53%**
15	**Indonesia**	**3.674.528.238**	**1,50%**	New Zealand	432.988.926	1,45%
16	Thailand	3.211.358.519	1,31%	Greece	357.864.777	1,20%
17	Czech Rep.	2.725.500.806	1,11%	Turkey	302.773.346	1,02%
18	Austria	2.248.755.576	0,92%	Netherlands	296.946.994	1,00%
19	Poland	2.173.645.375	0,89%	Czech Rep.	266.196.835	0,89%
20	Mexico	1.993.163.229	0,81%	South Africa	260.784.327	0,87%

Source : Computed from UN COMTRADE database

In addition, the industry also hold the 14th position for yarn and fiber (SITC 26) export in the world, with 1,53% contribution to total world exports. From the table above we also know that Indonesia and Thailand are the largest textile exporter in ASEAN. Accordingly, China, India and Japan are consistently in the largest textile world exporter group with United States and other European Union (EU) member (Germany, Belgium, United Kingdom, France, Italy and Netherlands).

The export trend of Indonesian textile products in the last two decades, 1989-2009, shows steady high growth for textile fabrics product (figure 2). Moreover, the trend is less volatile with slightly seasonal adjustment. Even in the 1997-1998 crises the export value was only dropped about 27% and recover by 16% in the next year. However, the

Figure 2
Indonesian Textile Industry Export Trend 1989-2009



Source : UN COMTRADE database

yarn and fiber export products growth rate told the different story. The growth trend is very flat and the export value is relatively small compare to textile fabrics product. Thus,

this fact is consistent with the hypothesis that the yarn and fiber industry is lagging behind, in term of paradigm shifting from import substitution to export orientation as mentioned before.

Another aspect that demonstrates the real condition of Indonesian textile industry is its export destination. The calculation of Indonesian textile export to its 40 major partner countries data in 2008 evinces that most of Indonesian textile fabrics products is exported to East Asian, West European and ASEAN countries in that order. Additionally, for yarn and fiber product, over 50% of its export destination is to West European, South Asian and East Asian countries respectively (Table 2).

Table 2
Indonesian Textile Industry Export Destination, 2008
(taken from 40 major countries export partner)

Region	Textile Fabrics	Yarn & Fiber	GDP shares	Population shares
East Asia	22,98%	13,70%	18,97%	22,92%
West Europe	19,00%	27,73%	14,17%	2,81%
ASEAN	13,69%	8,75%	2,12%	8,53%
West & Central Asia	9,14%	7,62%	3,46%	4,21%
South America	7,95%	1,83%	3,83%	5,70%
North & Central America	7,68%	12,28%	30,78%	7,33%
South Asia	5,81%	15,98%	3,07%	24,73%
Africa	3,08%	1,86%	2,32%	14,60%
Oceania	1,05%	2,97%	1,92%	0,51%
East Europe	0,80%	0,22%	3,82%	4,35%

Source : computed from UN COMTRADE database

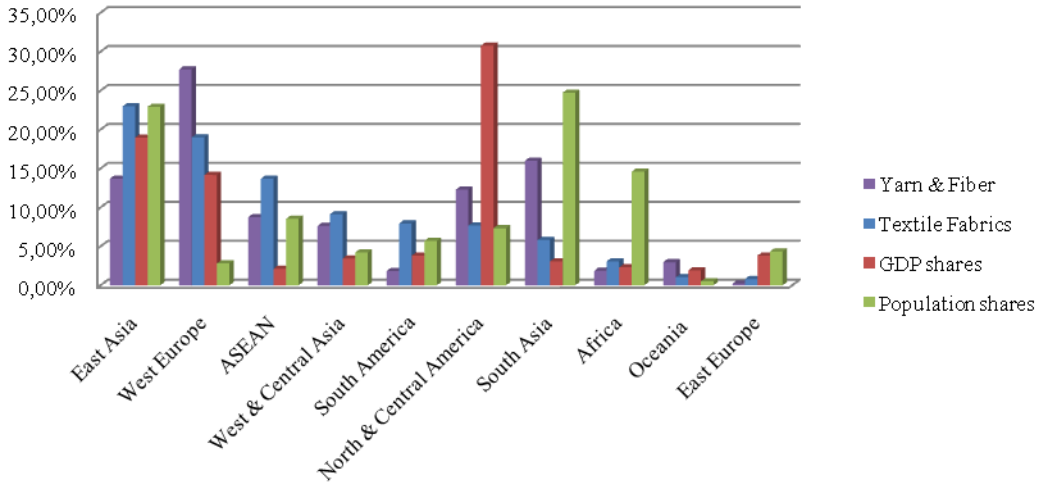
In order to correlate the fact about Indonesian textile product export destination with gravity model, in Table 2 has include the proportion of each region GDP's and population with world's GDP and Population, in the last two columns. Thus, we can compare the proportion of Indonesian major textile export destination with the region's economic size and wealth, which represent by GDP and population.

It should be noted that the proportion of region's GDP and population shown in table above is included all country member of the region. On the other hand, the proportion of Indonesian textile products export destination is not include all the member of the region, only the 40 major Indonesian export partner. Nevertheless, these 40 major trading partners is resemblance of over 90% of Indonesian textile products total export to the world. Thus, it is still reasonable to compare the proportion of Indonesian textile products export destination with its partner's GDP and Population share to the world.

From figure 3, which is the graph depiction of table 2, we can easily visualize that there was inequality between Indonesian textile products export destination compare to its trading partners economic size. The export to East Asian countries represents the most balance proportion of export destination and economic size. The gap between export proportion and economic size is relatively narrow. Conversely, West European countries absorb reasonably high Indonesian textile products, while its population is very small compare to other regions. Another example is in the North and Central America region. The export of textile products from Indonesia to this region is relatively the same size

compare to ASEAN countries, for instance. Yet, this region's GDP is the highest in the world.

Figure 3
Indonesian Textile Industry Export Destination, 2008
(taken from 40 major countries export partner)



Source : computed from UN COMTRADE database

Ultimately, these rough calculations above may indicate undiversified export destination of Indonesian textile products. Therefore, it also a sign of undertrade or overtrade between Indonesia and its trading partner. The case of excessive or overtrade situation may increase the international trading risk for Indonesia. For example, if there is any economic, political or social turbulence in any country which have excessive export products from Indonesia, then Indonesia will suffer if the export decreasing abruptly. Conversely, in any country that experienced undertrade with Indonesia, there are potential market expansions for Indonesia that will minimize the international trading risk.

III. The Gravity Model

The gravity model derived from physics law of the universal gravitational force. This concept then utilized to explain the flow in social science issues such as trade flows, capital flows (FDI & money repatriation), and human (migration) among countries. The original specification of Newton's Law for the gravitational force two objects *i* and *j* is expressed as:

$$GF_{ij} = \frac{M_i \, M_j}{(D_{ij})^2} \qquad (1)$$

In this equation, the gravitational force (GF) is directly proportional to product the masses (M) of the objects and inversely proportional to the square of the distance (D) between them. The early application of this equation in international trade study is in reduced form. The new form omitting the square of the distance, and transform the

equation into (natural) logarithms. In this form, the gravitational force is replaced into trade flow (export and/or import) as the dependent variable. Furthermore, the national income (GDP) represents the body mass and the physical distance still in its original form. Thus, the early gravity model of trade flow is as follows:

$$Ln(TF_{ij}) = LnGDP_i + LnGDP_j - LnD_{ij} \qquad \text{where } i \neq j \qquad (2)$$

The equation above simply explains that the trade flow (TF) between two countries (i & j) is the function of GDP of i and j and the physical distance between them. Moreover, the GDP represent market size and purchasing power of trade partners while the distance is the rough measurement of physical distance between them.

Theoretical Considerations

Despite the empirical success in explaining international trade patterns (Bergstrand 1985) and regional trade block, the early empirical research on gravity model is preceded its theoretical studies. Thus, some critics have addressed for its lack of theoretical justification. Subsequently, several researchers attempted to reconcile international trade theories and gravity model. One of the first attempts to derive gravity model from international trade theory is Anderson (1979). Under complete specialization, no tariff, no transportation costs and homothetic preference assumption, he found that gravity equation can be rearranged from simple/pure and trade-share expenditure system. Additionally, he also exercised the equation with the assumption of many goods, tariff and distance. In his conclusion, he emphasized that the gravity equity equation can be derived from the properties of expenditure system.

Afterward, Jeffrey Bergstrand perhaps the most praised scholar in 1980s that continuously worked in theoretical study of gravity model. Following Linnemann (1966) work, Bergstrand (1985) attempts to develop theoretical foundation for gravity model from partial equilibrium model. Started with constant-elasticity of substitution (CES) function, he evinces that equilibrium of export supply and import demand leads to original gravity equation (before loglinear transformation). Of course, he is done it under certain assumptions: small (relative) market of aggregate trade flow, identical utility and production function, perfect goods substitutability, perfect commodity arbitrage, zero tariffs and zero transport costs. In the successive study, Bergstrand (1989) employs monopolistic competition model of Dixit & Stiglitz (1977) with the assumption of differentiated goods among firms rather than countries. In his later work, Bergstrand (1990) added Linder hypothesis[3] in his model to capture income differentials effect. Additionally, in order to deal with the critics of his assumption, he incorporated GDP deflator as the proxy of price and physical distance and dummy variable for tariffs.

Another most cited theoretical research on gravity model is the study by Alan Deardorff (1998). In his paper, Deardorff derived the gravity equation from the rudiment

[3] Linder hypothesis (Linder 1961) is opposing traditional Heckscher-Ohlin model of factor endowments in international trade. It stated that two countries with similar level of endowments and income would share the same preferences. Therefore they would increase the trade between each other.

international trade theory of Heckscher-Ohlin (HO) model, especially, in two extreme cases: the frictionless trade and the existing of trade impediment. In the first case, he proves that the gravity equation can simply derived from standard HO model, either in homothetic or arbitrary preference assumption. In the latter case, impeded trade, he demonstrates that from standard HO model with transport costs he can obtain original gravity equation, both in Cobb-Douglas and CES preference. Concisely, in his conclusion, Deardorff stated that even a simple gravity equation can be derived from standard theories. Furthermore, he suspects that any international trade model will fall to gravity equation.

Perhaps there are numerous studies that explore theoretical considerations for gravity model. Ranging in assumptions and preferences, these studies has proven that gravity equation can be derived from any theories of international trade. Nevertheless, the reader may wish to refer the studies of Anderson & van Wincoop (2001, 2004); Helpman & Krugman (1987); Shiro Armstrong (2007); Evenett & Keller (2002); Harrigan (2001) for more detailed and recent contributions on theoretical findings of gravity model.

Previous Empirical Works

Ever since pioneered by Tinbergen (1962) and Pöyhönen (1963), there are abundant studies that empirically test the trade flow using gravity model. However, these studies are so plentiful to depict even in a single chapter of a book. Therefore, I only discuss some recent papers that related to this study, in which they differ in certain properties.

As known by its form, the gravity model is useful in assessing bilateral trade between countries. Thus, it means that gravity model is applicable for at least two cases: first, trade between multiple countries with their multiple partners. Usually, the objective of this model is to evaluate a regional trade block/area such as NAFTA, Eurozone, MERCOSUR, CAFTA, etc. For more detailed surveys of this case, the reader may refer to several works afterward. Roberts (2004, 2005) tests the impact of proposed China-ASEAN free trade area. Kharel & Belbase (2010) investigate the trade flow of group of landlocked developing countries (LLDC) to propose integrated trading system between them and improve their engagement in international trade. Hapsari & Mangunsong (2006) study the determinant factors of ASEAN free trade area (AFTA) members' export and explore the impact of trade creation/diversion, factor endowment differences and export structure similarity. Salim & Kabir (2010) assess the success of ASEAN regional integration compare to Europe Union (EU) countries trade integration. Lankhuizen et al. (2009) study the tradeoff between foreign direct investment and export within OECD countries. Fratianni (2007) empirically evaluates gravity model which covering trade in 143 countries, that separated into north (OECD) and south (non OECD) countries. Lastly, Zarsoso & Lehman (2003) examine trade flows between 5 MERCOSUR members plus Chile and 15 EU countries.

The second case is trade between a country with its multiple trading partners. The primary objective of this study is to characterize the determinant factors of gravity

model. However, recently many scholars include more variables to the traditional gravity model to capture other aspects that may influence the trade flows and to assess trade potential between a country and its trading partner. Several researchers have utilized gravity model to evaluate bilateral trade flows of aggregate or specific products in specific country: Australia (Rahman 2009), Cambodia (Kim 2006), China (Gu 2008), wood products of South Africa (Eita & Jordaan 2007), United States (Leitão 2010), and especially frozen tart cherries products of United States (Aguilar 2006), Fiji (Ram & Prasad 2007), Netherlands (Földvári 2006), marine products of Iceland (Kristjansdottir 2005), and India (Prabir De 2009). Please note that these aforementioned papers are perhaps only small part of numerous studies in gravity model using single country reporter perspective.

Recently, the empirical research in international trade using gravity model has become more "augmented" in number of regressors and estimation techniques. The supplementary variables vary in term of:

- Size of economy (in addition of national income): population, per capita GDP, per capita income differentials
- Geographical distance (in addition of physical distance): nautical miles, remoteness, proximity
- Trade restriction: tariff, relative exchange rate
- Dummy variables to control qualitative aspects of the model: common culture (language, colonialize), common regional trade agreement, spatial (common border, landlocked, coastal)
-

Furthermore, the development of econometrics science has support the improvement of regression methods from cross section to panel data analysis, to capture the dynamics of the time invariant in trade data. Nevertheless, the variation in number of regressors and estimation methods that utilized in gravity model is surprisingly not deterred the power of this model to explain bilateral trade between countries.

IV. Methodology and Data

This paper follows the recent empirical research in gravity model, which augmented the traditional model into several additional models. Therefore, in examining the bilateral export of Indonesian textile products, I include additional regressors and employ panel data regression. The first model is standard gravity model:

$$LnEXP_{it} = \beta_0 + \beta_1 LnY^{I}_{t} + \beta_2 LnY_{it} + \beta_3 LnDist_i + u_{it} \quad (3)$$

Moreover, in order to capture the impact of other qualitative aspects, we modified the model (3) by including binary regressors (dummy):

$$LnEXP_{it} = \beta_0 + \beta_1 LnY^{I}_{t} + \beta_2 LnY_{it} + \beta_3 LnDist_i + \beta_4 DASEAN + \beta_5 DAPEC + \beta_6 DBorder + u_{it} \quad (4)$$

Where EXP_{it} denotes export value of Indonesia to its (i) trading partners in period (t) respectively, Y^{I}_{t}, Y_{it}, D_i are the GDP of Indonesia and country i in period t respectively, and D are the geographical distance between Indonesia and country i which is time invariant. The dummy variable would takes the number 1 if country j is a member of ASEAN or APEC and shared common border with Indonesia, and zero if otherwise. Finally, u_{it} is the identically and independently distributed error-terms.

As it was pointed in previous section, national income (expressed in GDP) variables are expected to have positive impact to export. Furthermore, Indonesian GDP and export is likely in endogenous relationship, since in the macroeconomic equation GDP formed partly by net foreign trade. However, in similar case, the estimation results was in just slightly and insignificantly different estimates than a standard regression and therefore, for the sake of simplicity, Y^{I}_{t} is handled as exogenous (Földvári 2006). The effect of geographical distance is negative to export, since it reflects transport costs. Lastly, the influence of dummy variables, common regional trade agreement (RTA) and shared border, is suppose to be positive. It is natural since the purpose of RTA is to encourage trade between members. Furthermore, the same as distance variable, neighboring countries tends to trade more rather than distant countries.

As an alternative specification, I replace national income with population, per capita income and per capita income differential in the model, replacing the population variables:

$$\begin{aligned} LnEXP_{it} = {} & \beta_0 + \beta_1 LnP^{I}_{t} + \beta_2 LnP_{it} + \beta_3 LnYPc^{I}_{t} + \beta_4 LnYPc_{it} + \beta_5 Ln\Delta Ypc^{I}_{it} \\ & B_6 LnDIST_i + \beta_7 DASEAN + \beta_8 DAPEC + \beta_9 DBorder + u_{it} \end{aligned} \qquad (5)$$

Where YPc^{I}_{t},YPc_{it},P^{I}_{t}, and P_{it} are GDP per capita income and population of Indonesia and country i, in time t respectively, and ΔYpc^{I}_{it} is per capita income difference between Indonesia and country i, in time t respectively. From mathematical perspective, this replacement does not make any difference since:

$$LnY = Ln(YPc \times P) = LnYPc + LnP \qquad (6)$$

However, in econometrics view the results might slightly different. The per capita income of Indonesia and its trading partner impact to export is expected to positive, since higher income means larger market to expand (in the view of exporting or importing country). Therefore, higher per capita countries tend to trade each other. Furthermore, as noted earlier, the addition of per capita income differential is to evaluate whether the export pattern following Linder hypothesis. Thus, negative sign of the coefficient means that the model support Linder hypothesis and vice versa. The impact of population (both Indonesia and partner countries) cannot be indicated a priori, since the effect can flow in different direction. Large population means substantial domestic market and higher degree of self sufficiency. Thus, they usually tend to refrain exporting their products. However, large population also encourages higher labor

division, higher economies of scale and finally, opportunity to trade in more differentiated goods.

This paper utilizes panel data regression to estimate these models above. The estimation methods in this study are estimated generalized least square (EGLS) with weighted cross section to control contemporaneous heteroscedasticity in cross section data. Furthermore, these models estimation should run thoroughly in both fabrics products (SITC 65) and yarns and fibers products (SITC 26) data. In order to assess the potential trade, I utilize the results of standard gravity model estimation. Accordingly, the trade success is the comparative measurement between actual trade and potential trade:

$$\text{Trade Success} = \frac{\text{Actual Trade}}{\text{Potential Trade}}$$

If the actual trade is smaller than potential trade, it is a sign of undertrade phenomenon between Indonesia and its trading partner countries. Therefore, it means there are possibilities to export more to these countries. Conversely, if actual trade is larger than potential trade, it is a sign of overtrade. In overtrade case, it does not necessarily mean that Indonesia should reduce the export level to these countries. Yet, it reveal a risk and opportunity loss if Indonesia's export destination is excessively large in any country.

The data collected in this paper are time series data from 2000-2008 and cross section of 26 countries (Indonesia, Australia, Bangladesh, Brazil, Canada, China, Hongkong SAR, Egypt, France, Germany, India, Italia, Japan, Malaysia, Mexico, Netherland, Pakistan, Philippines, South Korea, Russia, Saudi Arabia, Singapore, Spain, Thailand, United Kingdom, and United States of America) which randomly selected from Indonesia's major trading partner countries in each continent. Furthermore, this selected country is comprises almost 70% of Indonesia total export. The following table depicts detailed data explanation of each variable.

Table 3
Variable Explanations

Variable Name	Summary	Source
Export	Total Export value. Reporter : Indonesia, Partner : 25 selected countries	United Nations Commodity Trade Statistics Database (UN COMTRADE) accessed through World Integrated Trade Solution (WITS)
GDP	GDP value at 2005 constant price	United Nations Statistics Division (UN STATS), National Account Main Aggregate Database
Population	De facto population in a country, area or region as of 1 July of the year	UN STATS, National Account Main Aggregate Database
Per capita income	GDP per head calculated as the aggregate of production (GDP) divided by the population size.	UN STATS, National Account Main Aggregate Database
∆per capita income	First difference of per capita income	Computed by author from UN STATS, National Account Main Aggregate Database
Distance	Nautical miles. Since the cargo of exported textile products travels through seas/oceans.	GeoDataSource™ Distance Calculator, http://www.geodatasource.com/distancecalculator.aspx
Dummy Variables	Membership of ASEAN and APEC, Border: shared border with Indonesia	http://www.aseansec.org/, www.apec.org

Finally, Appendix 1 presents the detailed descriptive statistics of the data used in this research paper.

V. Estimation Results

Table 4 and 5 shows the GLS estimation results of the gravity model estimated with Eviews 6.0. As explained in the previous section, this paper estimates two gravity models. First, the estimation of standard gravity model with national income, geographical distance and dummy variables. Second, the estimation of augmented gravity model with population, per capita income and per capita income difference as an additive variable. Each table presents regression results of fabrics (SITC 65) products and yarns and fibres (SITC 26) products. Therefore, in this section I discuss the results of two proposed models within two aggregated products.

Table 4
Standard Gravity Model Estimation Results

REGRESSORS	SITC 65 (Fabrics)			SITC 26 (Yarns and Fibers)		
C	**15.16702**	*3.814980*	(3.975648)***	**-45.81505**	*7.336372*	(-6.244919)***
LnY^I	**0.036355**	*0.140233*	(0.259247)	**2.554787**	*0.243715*	(10.48267)***
LnY	**0.378925**	*0.011600*	(32.66610)***	**0.422063**	*0.063701*	(6.625660)***
LnDist	**-1.002886**	*0.050322*	(-19.92931)***	**-2.184271**	*0.106890*	(-20.43473)***
DASEAN	**-0.159599**	*0.076126*	(-2.096497)**	**-1.972264**	*0.154751*	(-12.74472)***
DAPEC	**-0.247325**	*0.020729*	(-11.93144)***	**0.005506**	*0.144014*	(0.038232)
DBORDER	**-0.245762**	*0.070239*	(-3.498964)***	**-0.598574**	*0.085537*	(-6.997871)***
(Pool) Observations	250			250		
R^2	0.645373			0.589258		

- Coefficient in bold, standard error in italic, t statistics in parentheses
- * significant in 10%, ** significant in 5%, *** significant in 1%

The estimation results of standard gravity model for fabrics products in table 4 shows that GDP of Indonesia is not significant in affecting the value of fabrics products export. The reason is perhaps that Indonesia is in the phase of export orientation, so the size of its national income does not impact the level of export value. As expected, the trading partners' GDP positively influences the export value and the geographical distance has negative impact. However significant, all the dummy variables have negative effect on export value. The result is inconsistent with the expected effect, that neighboring countries and shared members of international organization should create more trade cooperation. This fact does not necessarily mean that become a member of regional/international organization would discourages trade. The possibility is the different role or policy in international trade of textile products within the country member, since they are just cooperation forum so they do not have specific trading agreement. In addition, this maybe occurs as the consequence of declining export trend to some ASEAN and APEC member during this period.

On the other hand, the estimation results of yarns and fibers product present slightly different facts. The GDP of Indonesia still have positive significant impact in multiplying export of yarns and fabrics products. Furthermore, the coefficient is bigger than its trading partner countries' GDP. This means the increase of export level will follow the raising level of Indonesia's national income. Moreover, inline to gravity model

perspective, the supply potential to export yarns and fibers products is depend on the size of Indonesia's economy.

Table 5 presents the estimation results of augmented gravity model on fabrics and yarns and fibers products. From the results, Indonesia's per capita income and population is not influential significantly to increase export value of fabric products. This indicates the export of fabrics products did not depend on the supply side of the economy or domestic demand. Thus, however large per capita income and population of Indonesia, it seems does not impact the level of export value significantly. Nonetheless, the yarns and fibers products export value is depend on the size of Indonesia's GDP but not its population. Therefore, it means that the level of export depend of the dimension of Indonesia's economy, as shown by positive significant of Indonesia's per capita GDP coefficient.

Table 5
Augmented Gravity Model Estimation Results

REGRESSORS	SITC 65			SITC 26		
C	**5.470505**	*53.72684*	(0.101821)	**131.6281**	*120.7119*	(1.090432)***
LnYPc^{I}	**-0.262074**	*0.250603*	(-1.045771)	**1.366983**	*0.655934*	(2.084026)**
LnYPc	**0.700248**	*0.028216*	(24.81712)***	**1.140321**	*0.134547*	(8.475265)***
LnP^{I}	**0.676323**	*2.894319*	(0.233673)	**-6.343299**	*6.524521*	(-0.972224)
LnP	**0.341168**	*0.016884*	(20.20597)***	**0.558350**	*0.072237*	(7.729464)***
LnΔYPc	**-0.221837**	*0.024912*	(-8.904760)***	**-0.696751**	*0.100917*	(-6.904216)***
LnDist	**-1.083439**	*0.049407*	(-21.92865)***	**-2.297343**	*0.151764*	(-15.13762)***
DASEAN	**-0.296147**	*0.075432*	(-3.926031)***	**-2.367285**	*0.333733*	(-7.093347)***
DAPEC	**-0.283229**	*0.021243*	(-13.33270)***	**-0.192828**	*0.155910*	(-1.236794)
DBORDER	**-0.362989**	*0.033008*	(-10.99713)***	**-0.316873**	*0.283917*	(-1.116077)***
(Pool) Observations	250			250		
R^2	0.607212			0.625615		

- Coefficient in bold, standard error in italic, t statistics in parentheses
- * significant in 10%, ** significant in 5%, *** significant in 1%

The positive and significant coefficients of partner countries' per capita income and population are consistent with the gravity model perspective. Therefore, it suggests that the increase in export value is larger in higher income and population partner countries, which reflects its market demand. Furthermore, the negative and significant coefficient of per capita income difference shows that the smaller gap of per capita income level of Indonesia and its trading partner encourages the export of fabrics and yarns and fibers products. In other words, the pattern of export of textile products follows Linder hypothesis, which stated that countries with similar income per capita would trade more. The negative and significant coefficient of geographical distance is also coherent with gravity model standpoint, since it reflects transport costs. Thus, the furthest countries from Indonesia would have lower export value. Lastly, indifferent with estimation results of standard gravity model, the dummy variables (shared border and membership of ASEAN and APEC) coefficient is contradictory with inherent of its purpose to enhance trade.

The summary of predicted trade potential showed in Appendix 2 of this paper. As mentioned in the previous section, the projected export value is generated from the

results of standard gravity model estimation. However, since the dummy variables are inconsistent and some of them are also insignificant, I use the reduced form of the standard gravity model (without dummy variables). So, the estimation to generate the potential trade for fabrics products is:

$$LnEXP_{it} = 7.604907 + 0.255205\ LnY^{I}_{t} + 0.380035 LnY_{it} - 0.813700\ LnDist_{i} + u_{it}$$

While for for yarns and fibers products is:

$$LnEXP_{it} = -35.950145 + 1.808263\ LnY^{I}_{t} + 0.583540\ LnY_{it} - 1.568352\ LnDist_{i} + u_{it}$$

The results in Appendix 2 revealed that several trading partner countries are experiencing undertraded with Indonesia. They are Canada, France, Mexico, Netherland, Saudi Arabia and Singapore, who are undertraded in fabrics, yarns and fibers products. Afterward, Malaysia, Philippines, Russian Federation, South Korea and United Kingdom actual trade is lower than their potential trade in fabrics products. Ultimately, Indonesia needs to export more yarns and fibers products to Australia, China, Germany, India, Pakistan and Thailand.

VI. Concluding Remarks

In explaining the pattern of export value of Indonesia textile products, this paper develops standard and augmented gravity model and perform estimated generalized least square on dataset involving 25 major trading partner countries. Furthermore, this paper calculate potential trade value and compare it to the actual trade data within the period of analysis. The results presented in this paper not only confirm that gravity model is applicable in this case, but also revealed some insightful phenomenon.

In all models and both aggregated products (yarns and fibers and fabrics products), the results exhibit positive and significant impact of trading partner countries economy size, which represent by GDP, per capita income and population. Thus, the size in form of income or population of partner countries does matter in export growth of Indonesia textile products. However, for the fabrics products, the reporter's (Indonesia) GDP and per capita income is not significant affecting export value. While for yarns and fibers products, the coefficient present a contrary effect. It probably means that in case exporting products, the fabrics product is less sensitive to change in domestic demand and supply rather than the yarns and fabrics products.

From the test of Linder hypothesis, it shows that Indonesia tends to trade more with countries that have similar preference, which represent by similar income per capita. The coefficient of geographical distance that corresponds to transport costs confirms the theory of gravity. So that transport costs still a significant barrier in Indonesia's textile products export growth. Unexpectedly, the membership of ASEAN or APEC and the shared border with neighboring countries do not bring positive and significant impact in textile products export growth. Since it does not necessarily imply that joining these organizations would decrease export, the proper policy implication is to explore more

benefit of this cooperation forum, especially related to textile products trading agendas. Lastly, from the trade potential evaluation, Indonesia needs to diversify its textile products export destination to the undertraded countries.

This study is limited in its explanatory variables and models, due simplicity issues to narrowing the discussion from original structure of gravity model and least square estimation. And it is quite common in quantitative studies that employ econometric tools. Therefore, for further development and refinement of this research, one may expect to add more explanatory variables that proven significant from other previous empirical research. Furthermore, any alternatives panel estimation by modifying and enriching the data, cross section data for fixed effect estimation, for example, is wide open.

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Appendix 1
Descriptive Statistics

Summary	Exp 65	Exp 26	DASEAN	DAPEC	DBorder	Dist	DYPc	Y^I	Y
Mean	92321687.62	5499185.	0.160000	0.520000	0.160000	4428.680	16139.30	270032501638.2	1446274596253.
Median	73379739.50	3021188.	0.000000	1.000000	0.000000	4011.200	13864.54	263994153149.2	766711447162.3
Maximum	393064836.0	55046403	1.000000	1.000000	1.000000	9088.700	50597.39	339995203996.1	1324750000000
Minimum	1154725.000	4072.000	0.000000	0.000000	0.000000	482.1400	22.87247	216276749161.0	41752924508.13
Std. Dev.	74256785.08	7593011.	0.367341	0.500602	0.367341	2579.672	14628.76	39347609348.89	2416296038701.
Skewness	1.536108733	2.999865	1.854852	-0.080064	1.854852	0.270360	0.382145	0.353614904934	3.501569641162
Kurtosis	5.441487744	15.41022	4.440476	1.006410	4.440476	1.927746	1.748565	1.903855968067	15.734757364339
Jarque-Bera	160.4102351	1979.274	164.9675	41.66709	164.9675	15.02196	22.39821	17.72610148653	2200.187551432
Probability	0.000000000	0.000000	0.000000	0.000000	0.000000	0.000547	0.000014	0.000141522656	0.000000000000
Observations	250	250	250	250	250	250	250	250	250
Cross sections	25	25	25	25	25	25	25	25	25

Summary	YPc^I	YPc	P^I	P
Mean	1266.389	17215.01	214999244.5	169879097.0
Median	1142.730	15102.52	215049390.0	64900766.50
Maximum	2245.502	52842.89	227345082.0	1314357176.
Minimum	759.5538	317.0729	202512990.0	3932862.000
Std. Dev.	490.7592	14953.93	7962891.323	309661387.3
Skewness	0.750238	0.388051	-0.014284073	2.903560548
Kurtosis	2.279487	1.792269	1.766996140	9.999792286
Jarque-Bera	28.86010	21.46822	15.84494434	861.6640362
Probability	0.000001	0.000022	0.000362505	0.000000000
Observations	250	250	250	250
Cross sections	25	25	25	25

Appendix 2
Summary of Predicted Trade Potential

Country	Yarns and Fibers					Fabrics				
	Mean of Actual Trade	Mean of Potential Trade	Gap	Trade Success	Sign	Mean of Actual Trade	Mean of Potential Trade	Gap	Trade Success	Sign
Australia	7.904.166	3.636.909	4.267.258	2,1733		51.113.453	81.199.986	-30.086.532	0,6295	**U**
Bangladesh	3.249.357	1.381.768	1.867.589	2,3516		72.774.641	39.960.507	32.814.134	1,8212	
Brazil	1.139.645	767.474	372.171	1,4849		126.303.758	36.625.390	89.678.368	3,4485	
Canada	167.113	860.712	-693.599	0,1942	**U**	30.260.373	39.693.310	-9.432.938	0,7624	**U**
China	13.786.207	6.857.528	6.928.680	2,0104		120.111.299	120.391.783	-280.483	0,9977	**U**
Egypt	3.595.387	495.793	3.099.593	7,2518		49.058.484	24.523.410	24.535.074	5,4871	
France	842.236	2.077.760	-1.235.524	0,4054	**U**	22.559.742	66.054.161	-43.494.420	0,7427	**U**
Germany	4.245.205	2.589.023	1.656.182	1,6397		73.298.159	75.784.133	-2.485.974	0,2977	**U**
Hongkong SAR	11.169.002	3.429.184	7.739.819	3,2570		134.563.324	69.967.758	64.595.567	1,0476	
India	9.005.194	4.299.355	4.705.839	2,0945		72.445.613	88.126.855	-15.681.242	0,8221	**U**
Italy	5.760.626	2.017.274	3.743.352	2,8556		108.134.904	64.275.159	43.859.745	1,6824	
Japan	11.007.772	9.276.265	1.731.507	1,1867		321.338.565	152.249.077	169.089.488	2,1106	
Malaysia	4.959.966	14.354.090	-9.394.124	0,3455	**U**	152.877.712	144.072.969	8.804.743	1,0611	
Mexico	451.917	652.253	-200.337	0,6929	**U**	29.423.814	33.623.151	-4.199.337	0,8751	**U**
Netherland	706.328	1.033.717	-327.389	0,6833	**U**	35.781.242	41.895.730	-6.114.488	0,8541	**U**
Pakistan	18.784.661	1.075.064	17.709.596	17,4731		19.227.439	36.872.215	-17.644.776	0,5215	**U**
Philippines	2.820.598	3.097.146	-276.547	0,9107	**U**	71.696.411	63.456.669	8.239.741	1,1298	
Russian Federation	63.091	1.538.400	-1.475.309	0,0410	**U**	3.730.448	51.449.598	-47.719.150	3,8244	
Saudi Arabia	297.965	1.295.594	-997.629	0,2300	**U**	83.981.604	44.238.788	39.742.816	0,0843	**U**
Singapore	2.580.010	20.775.609	-18.195.599	0,1242	**U**	89.237.062	172.636.419	-83.399.356	0,4865	**U**
South Korea	9.023.489	3.955.228	5.068.261	2,2814	**U**	196.761.530	85.125.777	111.635.753	1,0483	
Spain	1.472.802	1.272.920	199.882	1,1570		71.825.608	48.528.816	23.296.792	1,4801	
Thailand	6.294.894	5.520.040	774.854	1,1404		84.761.989	89.476.420	-4.714.431	0,9473	**U**
United Kingdom	1.565.346	2.042.287	-476.941	0,7665	**U**	76.285.885	65.631.355	10.654.530	1,1623	
United States	16.586.644	3.288.754	13.297.890	5,0434		210.489.133	95.854.581	114.634.552	2,1959	