LUND UNIVERSITY
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An Assessment of Factors Determining Intra-Industry Trade Between Ethiopia and Sub-Saharan Africa Countries (2000-2016)

by

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Abstract

This paper examines the intensity of Intra-Industry Trade (IIT) in miscellaneous manufacturing products with digit-two code level. It also aims to identify the determinants of IIT between Ethiopia and the twenty-two Sub-Saharan African countries using random effects estimation for the period 2000-2016. On the basis of the Grubel-Lloyd index, the study finds out that more than half of the SSA trading partners level of IIT is below 0.5 that indicates low intensity of IIT. The econometric result reveals that the extent of Ethiopia's IIT is positively correlated with the market size, while it is negatively correlated with trade openness, distance, common language. and COMESA dummy. The negative sign of trade openness, common language and COMESA dummy are inconsistent with theoretical expectations. The coefficient of COMESA dummy is also unexpectedly insignificant; this can mainly be associated with Ethiopia's unwillingness to be a member of COMESA FTA.

Key words: Ethiopia, SSA, country-specific determinants, IIT, miscellaneous manufacturing products

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Contents

List of Tables

List of Figures

1 Introduction

Ethiopia is the most populous nation in the UN list of Least Developed Countries (LDC) and ranks the second populous country in Africa with an estimated population size of over 105 million in the year 2017 (World Bank, 2018). The countries border Ethiopia include Djibouti, Eritrea, Kenya, Sudan, Somalia, and South Sudan. In 2017, Ethiopia exported goods and services worth 6.2 billion USD and imported 19.1 billion USD incurring a negative trade balance of 13 billion USD (World Bank, 2018). According to the Human Development Report 2017, the country's total export and import contributes 32 per cent of the total GDP. In the last two decades, it has been the fastest growing economy in the world. Several sources have remarked that the country enjoyed an average growth with a range of 7 per cent to 12 per cent annually in the last decade (International Trade Administration, 2018).

It is widely recognized that one country can achieve economic growth and development through the participation in international trade and investment. Most emerging economies have achieved rapid economic growth over time under trade liberalization policies (Oyejide, 2000). Trade openness to the international market has been considered as a pre-requisite to be considered as a member in the multilateral trade such as World Trade Organization (WTO). However, Ethiopia has not yet a member to the World Trade Organization (WTO) for the country does not abolish trade restrictions in most sectors. It's application for membership to the WTO in 2003, has not reached accession stage due to the complex nature of the accession process that requires painstaking decisions on trade policy reforms (Bienen, 2017).

On the other hand, Ethiopia is a member of different preferential trade agreements including the Africa Growth and Opportunity Act (AGOA) with the US and Everything but Arms (EBA) with the European countries. The country has been exporting mainly primary products to these developed countries through the agreements, and they have not brought significant impact on the economy of the country (USAID East Africa Trade and Investment Hub, 2018). With regards to the regional blocks, Ethiopia belongs only to Common Market for Eastern and Southern Africa (COMESA) out of the thirteen regional economic cooperation and integration in Africa but has not yet acceded to this Free Trade Area (FTA) (Martina, 2008). As a result, Ethiopia does not eliminate and reduce customs tariffs and non-tariff barriers.

The inception of Common Market for Eastern and Southern Africa (COMESA) dating back in the Preferential Trade Area (PTA) in the 1960s of the post-independence of most African countries (Ofa et al. 2012). When the United Nations Economic Commission for Africa proposed the idea of regional integration in 1965, the newly independent states in Eastern and Southern Africa established a regional economic integration, PTA. Among other things, the PTA was established with the aim of tapping the large market size, maximize the social and economic cooperation, and for the ultimate formation of economic community. Currently, COMESA has 21 member states with a population size of over 520 million and forming a major market for internal and external trading with USD 238 billion worth of goods. Such regional economic integration schemes as COMESA aim to stimulate production and increase trade among member countries (Ofa et al. 2012).

Generally, both intra-reginal and multilateral trade which are widely practice in the international trade involve the exchange of various commodities between countries. When a country participates in international trade, then the country engages in both intra-industry and inter-industry trade (Mulenga, 2012). Intra-industry trade (IIT) refers to the simultaneous import and export of products that categorized under the same product group, such as the two-way exchange of differentiated textiles or vehicles, while inter-industry trade refers to trading of products that belongs to different product categories, for instance the export of textiles and the import of vehicles. Over the past half century, the world economy increased sharply in global trade volume. Kien and Thao (2016) attributes this growth with the increase trend of intra-industry trade (IIT). Several studies have indicated that intra-industry has become increasingly popular and intensifying over time (Grubel and Lloyd, 1975; Lancaster, 1980; Krugman, 1981; Greenaway & Milner, 1983). Since inter-industry trade accommodate the rising trends in new trade patterns, the IIT has been receiving a lot of consideration through time (Kien and Thao, 2016).

Many investigations on IIT attempt to address three key issues pertaining to measuring the intensity of IIT, the causes of IIT, and actions to be taken towards improving IIT between investigated nations (Kien and Thao, 2016). Furthermore, most of the previous studies on IIT have given focus on developed nations, while relatively few studies have been carried out on developing nations, particularly on SSA countries. The goal of the present study is, therefore, to investigate the patterns and determinants of IIT in the miscellaneous manufacturing products between Ethiopia and twenty-two Sub-Saharan African (SSA) countries. It particularly aims to

determine the intensity of Ethiopia's IIT and to find out the determinants of IIT between Ethiopia and SSA trading partners.

1.1 Research Problem

It is generally believed that intra-industry trade is mostly the characteristics of developed countries (Mulegna, 2012). Several empirical studies on IIT give more emphasis on identifying the determinants and assessing the intensity of the IIT on the industrialized and high-income countries, whereas the number of studies dedicated to developing countries remains modest (Davis, 1995; Kawecka, 2009; Jambor, 2014; Kien and Thao, 2016). Due to low export in differentiated products and low trend in IIT among SSA, only few studies have been conducted on assessing the IIT among SSA countries (Mulenga, 2012; Djoumessi and Bala, 2013; Ludasia, 2015). Similarly, there are no adequate research conducted in IIT particularly on Ethiopia. Therefore, this calls for the present study to conduct and come up with important findings to assess the level of IIT and it would also help to assess the determinants of IIT between Ethiopia and SSA countries. Moreover, this study also hopes to fill in the gap of the existing scanty literature thereby making some contribution to the existing little research stock on Ethiopia's IIT in the miscellaneous manufacturing industry.

1.2 Aim and Scope

This thesis aims to examine the intensity of the intra-industry trade in miscellaneous manufacturing products. In addition, this study also identifies the determinants of IIT between Ethiopia and the twenty-two Sub-Saharan African countries using a panel data. Since there is problem of data availability, the present study considers onlythe twenty-two of all SSA countries. The determinant of IIT can empirically be categorized into two groups: country-specific and industry-specific factors (Greenaway and Milner, 1986; Balassa and Bauwens, 1987; Greenaway et al. 1994; DeRosa and Roningen, 2003). The country specific factors explain IIT through country's macroeconomic variables such as market size, trade orientation, and distance. On the other hand, industry-specific factors related to individual industries' characteristics such as product differentiation, marketing costs, industrial concentration, foreign investment, and tariff dispersion. This study, however, identifies only the determinants of country-specific factors of IIT. The study also explores through such macroeconomic

determinants as market size, trade liberalization, geographical distance, common official language, and regional trade agreements.

1.3 Outline of the Thesis

This thesis is organized in six sections. The first section provides relevant demographic and economic information on Ethiopia and a brief overview of intra-industry trade in comparison with inter-industry trade. This section also offers the research problem, aim and scope of the thesis. The second section offers theoretical basis of this study and presents the critical review of the previous researches in the area. The section explores the methods employed by previous works to measure the intensity and identify the determinants of IIT.

Section three presents secondary data sources and discuss its reliability, representativity and validity of the data. Furthermore, this section critically discusses the data and create awareness for the reader how and why the study frames the sample size and select the time period. The fourth section presents the methodology and the framework employed in the present research. It identifies the model the study uses and explains the dependent, independent, and dummy variables. In addition, it presents the different model and provide justification for why the study has opted the model in examining IIT between Ethiopia and SSA countries. The fifth section presents and discusses Grubel-Lloyd index results, diagnostic test results and the regression analysis. Finally, the sixth section gives concluding remarks and forwarding recommendations for future research.

2 Theory and Previous Studies

2.1 Theoretical Approach

Trade is an economic activity that enhances economic development (Clark and Stanley, 1999; Kien& Thao, 2016). Theories on trade are often classified as classical and neo-classical. These have been used to explain trade patterns between countries for a long time, while through time different trade theories have developed following the emergence of new trade patterns. In what follows, a brief overview of the trade theories that are often used to explain trade patterns and the definition of the theories are presented. Furthermore, the country specific determinants of IIT and the measurement of IIT also discussed briefly.

The earliest trade theory which is known as the theory of comparative advantage was proposed by David Ricardo (1817). Ricardo's theory of comparative advantage is one of the oldest and most distinguished theories in economics. It is also known as the inter-industry trade theory (Clark & Stanley, 1999; Mulegna, 2012; Nderi, 2016). The assumption starts with the concept of absolute advantage. If a country has a better technology in producing a product over other country, then it has an absolute advantage in the production of that product. However, absolute advantage does not explain the realistic patterns of trade because it implies that one country should not import anything from another country if the country has better technology in the production of goods over the other country. In addition, comparative advantage is the key concept in Ricardian model of trade. A comparative advantage is nothing however it is a comparison of the opportunity cost of one product over the other products across countries. The assumptions of the inter-industry trade include constant returns of economies scale, homogenous products, and perfect competition (Clark and Stanley, 1999).

The second traditional trade model proposed by the two Swedish economists, Bertil Heckscher and Eli Ohlin, who considered several factors of production. The so-called Heckscher-Ohlin (H-O) theory assumes that a country export commodities that are produced by the factor that it has in relative abundance and import products that are manufactured by the factor where it has relatively less abundance. The theory bases its claim on comparative advantages of homogeneous goods in a perfect competition context, and it characterizes trade between two countries which have differences in factor endowment (Clark and Stanley, 1999; Al-Mawali, 2005). Furthermore, the traditional H-O trade theory, which is built upon the assumption that

countries export on the basis of their comparative advantage, underscores the condition that such trade are considered to be beneficial to some countries but a disadvantage for others (Clark and Stanley, 1999; Kien and Thao, 2016).

The major difference between Ricardian theory of comparative advantage and H-O theory is that the former assumes technology differences across countries that drive to comparative advantage. On the other hand, the latter assumes that a country gain comparative advantage over the other when the country has differences on factor endowments. The traditional trade theory (both Ricardian and H-O) underscores the differences among countries in terms of technology, climate, factor endowment, etc. It also assumes that countries export the products that use their abundant resources intensively and import products that use their scarce resources intensively (Lindert&Pugel, 1996; Ruffin, 1999).

However, these assumptions on which the traditional theories of trade (inter-industry trade that includes Ricardian comparative advantage and H-O theories) have been found to be insufficient to explain the new trends of trade (intra-industry trade) in similar but differentiated products (Jambor, 2013). This gave rise to the birth of the intra-industry trade in the 1980 and it aims to address issues that couldn't have been addressed by the traditional theory of trade (Clark and Stanley, 1999; Kien and Thao, 2016). The emergence of IIT is associated with the fact that the traditional factor-proposition theory which was proposed by Heckscher- Ohlin (the H-O theory) is not capable of sufficiently explaining the trading of similar economies (Kien and Thao, 2016). Intra-Industry Trade is known with the practice of simultaneous import and export within same industry and it has been a unique feature of international trade for many years (Al-Mawali, 2005).

According to Damoense and Jordan (2007), IIT is defined as the parallel trading of 'a product within a particular industry' which does not necessitate comparative advantage as it bases itself on differentiated products and scale economies. For example, Sweden exports Volvo cars to Germany and imports Mercedes-Benz automobiles from Germany as well, which is difficult to explain with the models of comparative advantage. Intra-industry trade can be rationalised with models featuring increasing returns to scale, technology, and love-of-variety preferences. Moreover, Lancaster (1980) and Krugman (1980) propose that an increase in trade flow in the form of IIT results from product differentiation in the market where there is monopolistic competition and increasing returns of scale. According to Brulhart (1995), the new trade theories including the Krugman Model which proposes consumers' costless differentiability

and love of variety leads to no two firms producing identical goods in terms of consumption characteristics.

In light of the above, it has been suggested that IIT is not expected to exist between developing nations for factors relating to demand and supply (Gray, 1979). As the theory basis itself on features of developed nations, most empirical studies have, thus far, contemplated on developed countries. On the other hand, IIT between North (developed) and South (developing) nations is considered to be explained using the traditional H-O model as there is huge disparity in each country's endowment (Al-Mawali, 2005). Thus, studies have given little attention to IIT involving developing nations.

The notions of horizontal and vertical differentiated IIT are also prominent in the literature. The literature on theory of IIT makes distinction between Horizontal Intra-industry Trade (HIIT) and Vertical Intra-Industry Trade (VIIT) product differentiation (Brander & Krugman, 1983; Kandogan, 2003). The former refers to a two-way trading of homogeneous products with the same quality but with different characteristics (Lancaster, 1980; Krugman, 1981). In other words, the same quality goods with different characteristics associated with style and customer preferences referred to as horizontal differentiation (Kandogan, 2003; Al-Mawali, 2005). While vertical differentiation refers to a two-way trading of 'different varieties of quality products'. It is also defined as goods of the same characteristics with different quality (Kandogan, 2003; Al-Mawali, 2005).

As opposed to the above, for Kandogan (2003) the key factor for horizontal IIT and vertical IIT distinction is the stage of production. In this regard, horizontal IIT refers to similar products at the same production stage which are simultaneously exported and imported due to product differentiation, while vertical IIT refers to simultaneous export and import of goods in the same industry that are at different production stages due to varying factor intensities (Kandogan, 2003). On the other hand, Kien and Thao (2016) states that vertical IIT can be explained using the comparative advantage theory. The vertical differentiated IIT can be further divided into the neo-Hecksher-Ohlin (H-O) models which assume a perfect competitive market. On the other hand, the vertical differentiated IIT models are built upon the assumption of monopolistic competition and increasing returns of scale (Krugman, 1980; Helpman& Krugman, 1985). This implies that the intra-industry trade in differentiated products occurs between partners with similar factors of endowments.

The ultimate goal of the traditional trade theories was providing explanation on trade primarily on the basis of comparative advantages which gave rise to the inter-industry trade, while the majority of the world's trade carried out in the form of intra-industry trade (Clark and Stanley, 1999). The later on the other hand emphasizes that an increase in economic integration leads to increase in IIT. In addition, the new theories consider the notions of increasing returns and imperfect to explain IIT which mainly aims at addressing the gaps resulting from inadequacy of the comparative advantage and the H-O theories in attempting to explain IIT (Gullstrand, 2002). Thus, the new theory aims to explain the intra-industry trade as opposed to inter-industry trade which is the import and export of goods from different industries (Clark and Stanley, 1999).

The scholars who first realized the existence of simultaneous import and export within the same industry by similar economies are Verdoorn (1960) and Balasa (1966). After a decade, Grubel and Lloyd (1975) brought the idea into scholarly work with description of IIT measurement and with explanation and estimates of IIT for all OECD countries (Al-Mawali, 2005). Grubel and Lloyd (1975) laid the foundation for much of the theoretical model of IIT and proposed economies of scale and monopolistic competition are key characteristics of IIT (Al-Mawali, 2005). Most theoretical models developed to describe IIT differ from the traditional H-O model in that they take into account the effects of imperfect competition, economies of scale, and product differentiation in the international trade (Al-Mawali, 2005).

The determinants of IIT can empirically be categorized into two groups: country specific and industry specific factors (Greenaway and Milner, 1986; Balassa and Bauwens, 1987; Greenaway et al. 1994). According to Kien and Thao (2016), country specific determinants examine the relationship between IIT, and common and specific features of country such as per capita income, income difference, average country size differences, distance, common boarders, average trade orientation, participation in economic integration schemes, and common language. While industry specific determinants are linked with each industries' features including product differentiation, marketing costs, variability of profit rates, scale of economy, industrial connection, foreign investment, foreign affiliates, tariff dispersion, and offshore assembly (Kien and Thao, 2016).

On the other hand, the Grubel-Lloyd index and the Threshold- based method are the most commonly used measures of IIT (Ecochard et al. 2005). According to the Grubel-Lloyd index, IIT trade between two countries in product category *i* in a year as total trade, (*Xi* + *Mi*), minus inter-industry trade, (*Xi* - *Mi*): $IITi = (Xi + Mi) - |Xi - Mi|$, where *Xi* and Mi are exports and imports of product *i* nominalized by dividing by the total trade. The GL index fails to differentiate the horizontal and vertical IIT, thus, the threshold method is employed. The threshold method assumes that price differential within certain range will reflect differentiation of products feature (Horizontal IIT) and price differentiation outside the range reflects differences in quality (Vertical IIT).

2.2 Previous Studies

Most empirical studies have been conducted on developed nations since the IIT theory developed mainly on the basis of features from developed countries (Al-Mawali, 2005). There are only few studies on IIT in SSA countries which have investigated the determinants of IIT such as GDP, diversification, proximity and non-tariff barriers (Mulegna 2002; Al-Mawali, 2005; Mutambara and Hess, 2014; Nderi, 2016). Generally, the IIT between Ethiopia and SSA countries is a least studied area. I have been able to find only one published article concerning the intensity and determinants of Ethiopia's IIT i.e. Mutambara and Hesss (2014). In what follows, I briefly overview previous literature on IIT with particularly emphasis on Sub-Saharan African countries and emerging economies.

For Balassa and Bauwens (1987); Fukao, Ishido and Ito (2003); Hurley (2003), FDI plays an important role on IIT, and such determinants as market size, GDP per capita, distance, economies of scales, and product differentiations are also important determinants of IIT. Jambor (2013) examines the country-specific determinants of Horizontal and Vertical intra-industry agri-food trade between New Member States (NMS) and the EU-27. He argues that factor endowments are inversely related to agri-food horizontal IIT, while directly related to vertical IIT between new EU member states and the 27 EU states. His result shows that economic size is positively and significantly related to both Horizontal and Vertical IIT, while distance and IIT are found to be negatively related in both cases. These findings are consistent with the research work of Ekanayake and Ledgerwood (2008) on the analysis of the U.S. IIT with Caribbean countries. Their result further found out that the level of per capita income,

trade intensity, product differentiation, industry size, and product quality differences are positively correlated with IIT. On the other hand, Ferto (2007) in his work on the Hungarian intra-industry agri-food trade patterns with the EU-15, the result shows that differences in per capita income, average GDP, distance are negatively associated with HIIT, while VIIT is positively related with income differences and distance.

Kien and Thao (2016) explores the determinants of IIT in the Vietnamese manufacturing sector and found out that IIT is positively influenced by GDP and GDP per capita, while it is negatively related with distance and trade imbalance. Besides, the Free Trade Area (FTA) dummy is not statistically significant that implies an ambiguous effect of the participation in regional economic integration schemes on the share of horizontal, vertical and total IIT. It might also indicate that Vietnam's and its major trading partners tariff reduction are not significant enough to have explicit effects on the quantity of IIT. They also identify that economies of scale enhances the share of IIT; and the share of trading parties increases as closer the two economies are. Similarly, the finding of Thorpe and Zhaoyang (2005) also indicate that economies of scale are positively related to IIT.

Contrary with Kien and Thao results, Thrope and Zhaoyang (2005) finds out that trade imbalance affects positively IIT in East Asian economies. On the other hand, Thorpe and Zhaoyang (2005) argue that the two-way trade in all measures of IIT is positively related to country specific variables (e.g. market size, exchange rate depreciation, income, and level of development), but it is negatively related to geographic proximity of trading partners. Another study by Umemoto (2005), investigates the IIT trade between Japan and Korea for the automotive parts. The result reveals that the smaller differences in GDP and transportation costs are the main factors that influence the IIT between Korea and Japan. The Korea-Japan Free Trade Area (FTA) also plays a prominent role in stimulating IIT in automobile parts.

Zhang et al. (2005) analyses IIT between China and fifty trading partners and found out that IIT has increased significantly from 31.2 per cent in 1992 to 39.4 per cent in 2001. They attribute the high intensity of IIT mainly with the implementation of trade liberalization policies after 1991. For instance, China reduced the average import tariffs from 43.2 per cent at the beginning of the 1990s to 15.3 per cent in 2001. Consistent with Zhang et al. (2005), Vidya and Prabheesh (2019) also found out that the intensity of IIT has become more stronger between India and Indonesia when India reduced trade barriers and open its market to the international market. Similarly, a study by Hellvin (1996) on IIT between China and OECD

countries, the study found out per capita income and market size are positively correlated, while trade barriers were found to be negatively correlated and statistically significant. More importantly, trade liberalization has tremendous role in the vertical two-way trading between ASEAN-5 countries and China (Chin et al. 2015). Depending on whether the IIT is vertical or horizontal, the influences of these determinants on IIT differ.

Unlike the developed countries and Asian countries, SSA countries experience is generally low in intra-industry trade and export diversification (Ofa et al. 2012). The intra-African trade remained under 12 per cent in the last decade which is also low compared to other regions. Nderi (2016) on his analysis of IIT between Kenya and SSA countries, he finds out that the intensity of IIT is very low. According to his regression result, the market size of Kenya, both Kenya's and its trading partners per capita GDP are found to be positively correlated with IIT. Mulegna (2002) investigates the country-level and industry-level determinants between Zambia and the Southern African Development Community (SADC), the result reveals that factors such as per capita income, transportation cost, and colonial ties are important factors depicting Zambia's IIT and its trading partners in the SADC region (Mulegna, 2002).

Accordingly, GDP, distance, and dummies for common border and language positively determine the IIT between Zambia and its SADC trading partners, but it decreases due to disparity in per capita income. The positive sign for distance is not in conformity with the earlier expectation that long distance lowers the intensity of IIT and it is also in contrast to Balassa (1986) argues that IIT will tend to be stronger when trading countries are geographically close to each other. Mulegna (2012) give explanation the fact that Zambia's extent of IIT with South Africa is higher despite the longer distance as compared to other countries which are geographically closer to Zambia. Besides, Djoumessi and Bala (2013) present an evaluation of the cross-border effect on the level of IIT for selected thirty-eight African countries. The econometric result reveals that the African countries trade more domestically instead of trading with other African countries. The study also indicates that the common coloniser and common official languages significantly and positively affect bilateral trade within the capital goods sector.

A study by Damoense and Jordaan (2007) focus on the analysis of the extent of IIT between South Africa and its main trading partners in the automobile industry. The study reveals that market size and differences in per capita income significantly influence the share of IIT on the South African automotive industry. On the other hand, another study by Al-Mawali (2005)

examines the intensity of IIT and identifies country-specific determinants of horizontal and vertical intra-industry trade for the South African economy for the period 1994-2004. Based on his econometric analysis he finds out that both horizontal and vertical IIT are positively related to market size and standard of living, and negatively related to geographical distance.

To my knowledge, there are no previous studies done on Ethiopia-SSA IIT, except for an article by Mutambara and Hess (2014) that focuses on Ethiopia's trade with the North versus the South. It examines IIT by using Grubel-Lloyd IIT indices for high technology manufactured products. The study reveals that Ethiopia's trade with Asia and the Middle East is stronger than compared with northern countries. This is mainly attributed to geographical nearness of Asia and the Middle East; and factors such non-tariff barriers as phytosanitary regulations, packaging, and quality standards make Ethiopia's export products less competitive in the northern countries. On the other hand, the study concludes that the country's intra-industry trade in high technology products tends to be with countries in the north (e.g. Italy). According to Mutambara and Hess (2014), Ethiopia can build stronger manufacturing sector by fostering trade ties with developed countries via the transfer of knowledge, skill and state of the arts technologies.

3 Data

This section begins by providing insight on the data sources for all dependent and explanatory variables and their utility for this research. Then, it briefly describes how the study constructs the dataset that has been used throughout the paper. Finally, it provides key insights to the quality of the data and briefly explains its limitation.

3.1 Source Material

The study uses both descriptive and econometric methods to achieve the objectives. This research uses secondary data and collects the data from credible international organizations database. Regarding the econometric model, the research includes several country-specific factors as independent and dummy variables in order to explain the extent of IIT between Ethiopia and SSA trading partners: market size, trade openness, geographical distance, regional trade agreements (COMESA), and common language. All the data are annual statistics from the year 2000-2016.

The dependent variable (Intra-industry Trade) that is Ethiopia's simultaneous import and export to SSA trading partners for the miscellaneous manufacturing products are collected from United Nations Commodity Trade (UN Comtrade). Data on GDP is collected from World Development Indicators (WDI) of the World Bank. The bilateral distance between Addis Ababa (capital of Ethiopia) and the capital city of trading partners, and dummy variables including common language are obtained from Institute for Research on the International Economy (CEPII) database. On the other hand, the regional trade agreement that is the list of Common Market for Eastern and Southern Africa (COMESA) list of member states is collected from COMESA official website.

3.2 Data Description

To obtain data for calculating IIT to use as dependent variable, this study utilizes UN Comtrade database. In order to compute IIT, first I collect simultaneous import and export of miscellaneous manufacturing products (section 8) classified according to Standard International Trade Classification (SITC) Rev.3 with digit-two code data. According to UN Comtrade data classification, miscellaneous manufacturing products and manufacturing products are categorized under section eight and section six respectively. Unlike manufacturing

products (section 6), miscellaneous manufacturing products (section 8) relatively require both unsophisticated technology and low skill labor. The miscellaneous manufacturing products (section 8) digit-two product categories which are classified by the United Nations (UN) are defined and listed in table 4.1 below.

Table 3.1 Categories of miscellaneous manufacturing products digit-two product code

Digit-two Product code	**Product List/Label**
81	Prefabricated buildings, sanitary, heating and lighting fixtures
82	Furniture and parts thereof
83	Travel goods, handbags, etc.
84	Articles of apparel & clothing accessories
85	Footwear
87	Professional and Scientific and scientific instruments
88	Photographic apparatus, optical goods, watches and clocks

Source: UN Comtrade

Several studies that analyse the pattern of IIT on developed countries and emerging economies (including Asian countries) execute their analysis particularly on manufacturing products (section 6). However, based on the economic level of most SSA countries, they are not able to manufacture products that require advanced technologies and skilled labor. Hence the countries import the products from Asia, the U.S. and Europe. On the other hand, most SSA countries simultaneous import and export data are almost nil for the manufacturing products (section 6) in the UN Comtrade database which indicates that Ethiopia is not trading with other SSA countries. As a result, in considering SSA countries market size, the level of technology, and infrastructure, the study only focuses on miscellaneous manufacturing products.

Initially, the study aims to analyse the patterns of IIT between Ethiopia and forty-nine SSA countries. However, more than half of SSA trading partners do not have sufficient import and export data. Therefore, this study bases on twenty-two SSA trading partners with Ethiopia (see the countries list under Appendix A). Besides, from the twenty-two sample SSA trading partners, some of the countries export and import values are zero. In order to reduce countries that have zero value on both export and import data, I collect data from the UN Comtrade by considering the trading partner countries as a reporter country (i.e. mirror imaging). These

helps to get reliable result both on the computation of the intensity of IIT and regression analsysis. On the other hand, the study considers the time period from the year 2000 to 2016 that is largest panel form of 374 observations (17 years by 22 trading partners with Ethiopia). The dependent variable (IIT) total observations are 310 and the remaining 64 observations considered as a missing value (refer the descriptive statistics under Appendix B).

In order to collect the miscellaneous manufacturing simultaneous export and import data, the study uses Standard International Trade Classification (SITC), Rev.3 from the UN Comtrade database. This basic classification groups all commodities into headings appropriate for economic analysis. The United Nations recommended all countries to use SITC for their international trade data, and thus encourages international comparability of trade statistics. Initially, most countries report trade statistics based on the Harmonized Commodity Description and Coding Systems (HS), and then the UN Comtrade system converted in to SITC. Currently, the SITC classification revision reaches on the fourth edition, and it was accepted by the United Nations Statistical Commission in 2006. However, this study uses SITC Rev. 3, because SITC Rev. 4 trade statistics data for some countries has started from 2007.

Furthermore, the study basis its data collection on digit-two code for both simultaneous export and import miscellaneous manufacturing products. There are four digit codes included in the UN Comtrade. It generally assumes that if one is closer to the maximum digit code (i.e. digit-four), then the products become disaggregate and vies-versa. The reason behind the selection of digit-two code for this study is because the number of countries on digit-four is far much fewer than those in digit three. The same pattern is obtained one compares digit-three to digit-two. Regards to the coverage of the research period, all the data encompasses annual statistics from the year 2000-2016. The choice of these period is due to the fact that it captures recent development of IIT in SSA countries. In addition, Jerven (2013) in his book entitled “poor numbers: How we are misled by African Development Statistics and What to do about it” recommends for researchers to use recent data in order to reduce the risk of data unreliability.

On the other hand, Gross Domestic Product (GDP) data for both reporting country (Ethiopia) and the SSA trading partners are collected from WDI and considered as explanatory variables in the econometric model. Some authors use average GDP (summation of reporter and trading partners GDP divided by two) for the econometrics analysis (Kien and Thao, 2016; Nderi, 2016). However, this study follows studies such as Bezawit, 2016; Birhan, 2015; and Zelalem, 2014 who collect and use the reporter and the trading partners GDP data separately to regress

the econometric model instead of taking the average values. The rationale in considering the reporter country and trading partner countries separately is that the explanatory power of the model becomes too low, and some of the variables sign will be against the theoretical assumption of the gravity model.

The other important explanatory variable included in this study is geographical distance. Institute for Research on the International Economy (CEPII) database reveals several geographical variables, in particular bilateral distances. As a result, between Addis Ababa (capital city of Ethiopia) and each of the twenty-two trading partners capital city bilateral distance (in kilometres) are collected in order to regress the econometrics model. Similar to the geographical distance, common official language data are also gathered from CEPII database. In the database, the data are organised as the measure of Common Official Language (COL) is a binary one, i.e. either 0 or 1. If the reporting country (Ethiopia) and the trading country has common official language, then it assigns 1, and 0 otherwise. Besides, in order to get the overall data structure of the study and descriptive statistics of the data refer Appendix B.

3.3 Data Limitation

In the beginning of this section, it was mentioned as one of the strengths of the data that the data are collected from credible international organizations database such as World Bank and United Nation. However, it does not mean that the data are free from biasedness and provide one hundred per cent assurance on the quality of the data. It is mandatory to remember that these data are supplied from the national statistical offices Jerven (2013). In other words, the availability of the data in the international organization database depends on the reporting national statistical authorities. Jerven (2013) states that most African governments produce inaccurate and false economic statistics that should not be reliable. Due to this, the researchers do not rely on most of the African national statistics authorities' economic statistics and reports. As a result, simultaneous export and import data and both reporter and trading partner GDP data might not be reliable due to the fact that the data are recorded on the national statistical authorities' database.

4 Methods

To achieve the objectives of the study, both descriptive and empirical analysis are undertaken. The descriptive analysis shows the trend of export and import of manufacturing products that fall in the same product category between Ethiopia and SSA countries. For the empirical analysis, the study uses the Grubel-Lloyd index to measure the existence and the intensity of IIT between Ethiopia and SSA trading partners. Furthermore, this study uses panel data by pooling cross-sectional and time series data from twenty-two SSA trading partners over the period 2000-2016, resulting in a panel set of 310 observations. The countries represent the major trading partners of Ethiopia and the selection of the time period is on the basis of the availability of data. In order to analyse the panel data, this study uses the gravity model of international trade to identify the determinants of IIT between Ethiopia and SSA.

4.1 Measurementof Intra-Industry Trade

The Grubel-Lloyd index (1975) is the most widely used method in measuring the intensity of IIT. The GL index calculates the share of IIT as the part of balanced trade that represents the overlap between export and import of total trade between countries j and k for a given industry i. The GL index computes the intensity of IIT between Ethiopia and the rest of SSA countries as trade partners. The index is calculated by using the following formula:

$$\mathrm{IIT}_{ijk} = \left[1 - \frac{|X_{ijk} - M_{ijk}|}{(X_{ijk} + M_{ijk})}\right]$$

Where: IIT_{ijk} is the intra-industry trade index i between Ethiopia (j) and SSA countries (k)

X_{ijk} are Ethiopia's exports (j) of industry i to SSA countries (k)

M_{ijk} are Ethiopia's imports (j) of industry i from SSA countries (k)

The IIT index takes value from 0 to 1

If $X_{ijk} = M_{ijk}$, then $IIT_{ijk} = 1$, this indicates all trade in industry i is Intra-industry Trade

If $X_{ijk} = 0$ or $M_{ijk} = 0$, then $IIT_{ijk} = 0$, this indicates all trade in industry i is Inter-industry Trade

4.2 Gravity Model

To analyse the country-specific determinants of intra-industry trade between Ethiopia and SSA, the study uses the gravity model of international trade. This study employs the gravity model because it is widely used model to identify the determinants of Intra-industry Trade. The gravity model was derived from the gravity law of Physics that was postulated by Issac Newton, which states that two physical bodies will experience gravitational pull that is proportionate to the distance between them. Accordingly, the gravity model of international trade proposes that the volume of trade between two countries is determined by the product of their GDP divided by the distance between them (Armstrong, 2007). The gravity model of trade used to estimate bilateral trade flows on the basis of economic size and distance between two countries (Tinbergen, 1962). Therefore, the following formula explained the mathematical traditional gravity model:

$T_{ijt} = \beta_0(GDP_i\ \beta_1 * GDP_j\beta_2 / DIS_{ij}\beta_3)$ ..... (1)

Where: $T_{ij}$the dependent variable that stand for trade flow between country i and j;

β_0 is the intercept for the gravity model

GDP_i and GDP_j stands for GDP/economic sisze for country i and j;

DIS_{ij} stands for Distance between country i and country j

To facilitate the econometric analysis, several authors have transformed the above equation (1) into a linear form by using logs and written as follows:

$ln\ (T_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) - \beta_3 ln(Dis_{ij}) + \varepsilon_{ij}$ …… (2)

Where: β_0, β_1, β_2 and β_3 stand for coefficients that can be estimated

ε_{ij} stands for the error term and this captures the shocks

4.2.1 Augmented Gravity Model

The gravity equation is augmented to include some additional explanatory variables that are expected to influence the determinants of Ethiopia's IIT. The study also incorporates dummy variables which were not included in the traditional gravity model. Several studies have used augmented gravity models to identify country-level determinants of IIT in bilateral trade between countries and regions (Mulegna, 2012; Kien& Thao, 2016; Nderi 2016). Then, the explanatory variables changed to logarithm form of the gravity model of trade similar with a typical specification that has been employed in several previous empirical studies of international trade, including Filippini & Molini, 2003; Rose, 2004; Nderi, 2016. The study uses the following basic model and augmented gravity model to identify country-level determinants of IIT between Ethiopia and SSA trading partners.

The augmented gravity model:

$$lnIIT_{ijt}=\beta_0+\beta_1 lnGDP_{it}+\beta_2 lnGDP_{jt}+\beta_3 lnOPEN+\beta_4 lnDIST_{ij}+\beta_5 DRTA_{ijt}+\beta_6 DCL_{ij}+\varepsilon_{ij} \ldots. (3)$$

Where:

$\beta_0 - \beta_6$: coefficients to be estimated;

ln is the natural logarithm;

i is a country i.e. Ethiopia; j: SSA trading partner countries and t: is the year from 2000 to 2016;

*ln*IITis the log of Intra-industry Trade between country i and country j;

*ln*GDPi and lnGDPj is the log of GDP for country i and country j;

*ln*OPEN denote the log of an index for trade openness;

*ln*DIST*ij* is the log of the distance between country i and country j;

DCL_{ij} is a common official language dummy that takes value 1 if country i and j speak common official language and 0 otherwise;

DRTA*ij* is a regional trade agreement (COMESA) dummy that takes value 1 when a there is a regional trade agreement between country i and country j and 0 otherwise; and

ε_{ij}:is the error term

4.2.2 Description of Variables and Expected Signs of Coefficients

4.2.2.1. Dependent Variable

Intra-Industry Trade (IIT): the annual trade flow of simultaneous export and import between country i (Ethiopia) and country j (SSA trading partners) are used as dependent variables of the model.

4.2.2.2. Independent Variables

Economic size (GDP_{it}, GDP_{jt}): the Gross Domestic Products measure the size of the country's economy and economic performance. It is also defined as the market value of all final goods and services within a country in a specific period. It is assumed that the greater the economic size, the higher the IIT. In any other economic activity, trade increase the size of the economy (Filippini, 2003; Zelalem, 2014; Birhan, 2015). The expected sign for β_1 and β_2 are positive.

Trade Openness (OPEN): it measures the degree of trade between Ethiopia and SSA trading partners. It assumes that the higher the trade openness between the trading partners, the greater the IIT (Mulegna, 2012; Nderi, 2016). In other words, if the two countries trade more, then there is high probability of IIT level to increase. Therefore, the expected sign for β_3 is positive.

Distance ($DIST_{ij}$): the geographical distance between capital cities of trading partners is taken as a proxy for transportation cost, delivery time, transaction costs, and market access barriers (Ram and Prasad, 2007). Countries that are far from the trading partner areas are expected to trade less as compared to those located closer to their trading partners (Damoense&Jordaan, 2007). Therefore, β_4 expected to have a negative sign.

Common Language (CL_{ij}): countries which speak common official language would have a positive impact on trade flows (Baltagai, 2005; Zelalem, 2014; Birhan, 2015). As a result, common border and common language can take the value of 1 if Ethiopia and the trading partner country has common border and common official language and 0 otherwise. Hence, β_6 andβ_7 are expected to turn positive.

Regional Trade Agreement (COMESA RTAij): if countries have regional trade agreements then their bilateral volume of trade increases (Zelalem, 2014; Birhan, 2015; Kien& Thao, 2016). The gravity model encompasses RTA dummy because to capture changes in the bilateral trade due to trade creating trade preference agreements. The Regional Trade Agreement

dummy take the value of 1 if the trading partner country is a member of COMESA, and 0 otherwise. The expected sign for β_5 is positive.

4.3 Estimation Procedure Using Panel Data

The model is estimated using a panel data framework in stata. The use of panel data methodology in this study can be justified based on its advantages on more variability and allow to explore more issues than cross-sectional or time series-data (Kennedy, 2008, p.282). In addition, panel data provide more informative data, less collinearity among the variables, and more degrees of freedom (Baltagi, 2001). Panel data are also called longitudinal data or cross-sectional time-series data. These longitudinal data have "observations on the same units in several different time periods" (Kennedy, 2008, p.281). The cross-sectional dimension indicated by subscript i and the time series dimension indicated by subscript t as indicated in below equation.

$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$, i= 1, 2, 3,..., N and t = 1, 2, 3… , T …………………………………… (4)

Where: Y_{it}has a dimension of (N × 1) with N denoting the number of cross-sectional parts. The subscript i denoted as individuals, households or countries, the subscript t is time and α is a scalar. β is a parameter vector and X_{it}represents the i^{th} observation on K explanatory variables and it is a (1 × K) vector. ε represents the error term.

Prior to the regression analysis and analysing the panel data, it is mandatory to select either fixed or random effect model. As a result, Hausman test has been conducted to decide either to use fixed effect or random effect model. The regression result regarding the hausman test and other diagnostic test including homoscedasticity, multicollinearity, and autocorrelation test results briefly discuss in the next section.

5 Empirical Analysis

This section presents the descriptive analysis, the Grubel-Lloyd index results and the econometrics analysis. The descriptive analysis briefly shows Ethiopia's external trade orientation and export and import of Ethiopia to destinations region. This section also discusses the results of the IIT through Grubel-Lloyd index between Ethiopia and the SSA trading partners in order to examine the existence and the level of IIT. Regards to the econometric analysis, the study uses the gravity model of international trade to identify the determinants of IIT between Ethiopia and SSA trading partners.

5.1 External Trade of Ethiopia

Empirical research has found out that there is a positive relationship between GDP growth rate and trade openness. On the other hand, Rodrik (1992) states that trade openness might also be a potential cause for macroeconomic instability by enhancing inflation, depreciating exchange rate and leading to trade deficit. As can be seen from Figure 5.1, the trend of GDP has increased since 2007 except a slight decline for the year 2010 and 2011. However, when we see the trend for the total trade (openness), it has a fluctuated trend for the last ten years. The share of Ethiopia's total trade (import + export) over GDP is 36 per cent and 28 per cent for the year 2007 and 2016 respectively. Based on this, it is possible to deduce that the country is more engaged in domestic trade instead of participating in the international trade.

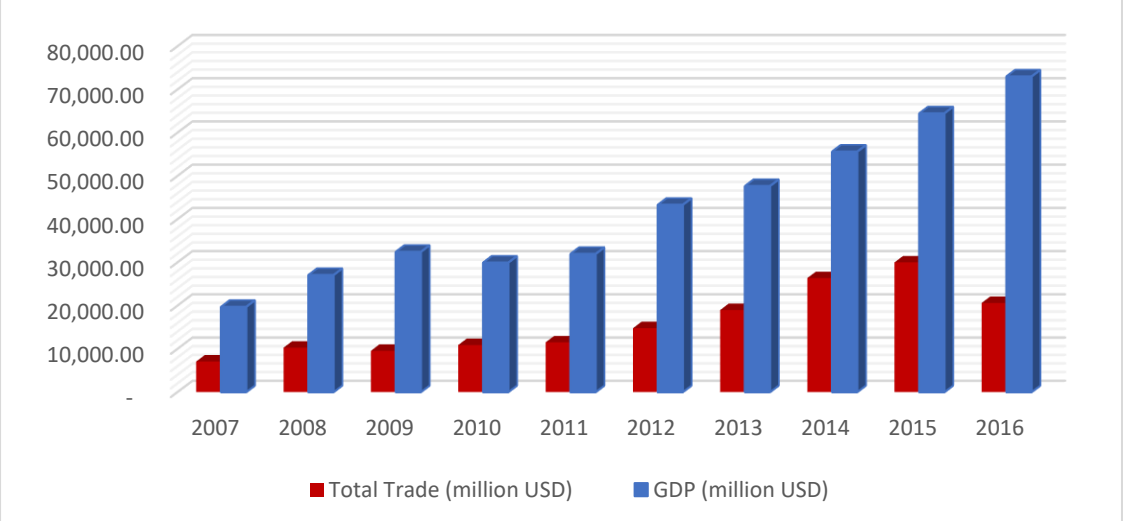

Figure 5.1 Ethiopia's Total Trade and GDP (UN Comtrade and own computation)

5.1.1 Import and Export Destination of Ethiopia by Region

Table 5.1 shows Ethiopia's import and export of miscellaneous manufacturing products to different regions between 2005-2016. During the period 2005-2008, Ethiopia exported mainly to the US and it was 42 per cent of the total export, however it declined to 22 per cent for the period 2013-2016. With regards to the country's import East and South Asia secured 50 per cent of Ethiopia's total importduring the period 2013-2016, only a reduction of 10 per cent from period 2005-2008.

The trend of the export and import between Ethiopia and SSA countries shows that the export has been increasing throughout the decade, while the import has been stable. However, the export is still low when we compared with European countries. With regards to the import, Ethiopia has been importing miscellaneous manufacturing products mainly from East and South Asia and European countries, and the country's import from SSA countries has been low. Between the year 2013 to 2016 the SSA region supplied 2 per cent of Ethiopia's imports, and absorbed about 23 per cent of its exports. During the previous decade, SSA region has experienced increased volume of export, but uniform trend in imports. This implies that low level of IIT between Ethiopia and SSA countries particularly on miscellaneous manufacturing products, SITC Revision 3.

Table 5.1 Ethiopia's Export and Import of Miscellaneous Manufacturing Products

Region	**Export (%)**			**Import (%)**		
	2005-2008	2009-2012	2013-2016	2005-2008	2009-2012	2013-2016
SSA	7	14	23	2	2	2
East & South Asia	2	3	5	60	66	50
EU	38	55	42	18	15	14
MiddleEast&N.Africa	10	10	4	12	7	3
USA	42	14	22	4	5	3
Others	1	4	4	5	5	28

Source: UN Comtrade and own computation

5.1.2 Ethiopia's Top Export and Import Destination in SSA

Table 5.2 shows the trends in Ethiopia's trade with its top trading partners in SSA in the period 2006-2016. Ethiopia's trade with SSA continues to increase substantially as can be seen in Table 5.2. The total value of Ethiopia's export increased from USD 183 thousand to USD 2.6

million in 2006 and 2011 respectively. The export even increased further to USD 7.1 million in 2016. The share of Ethiopia's export to SSA as a proportion of total exports of the rest of the world (ROW) rose from 5 per cent in 2006 to 19 per cent in 2016. Ethiopia's export destination in SSA has been dominated by Kenya, Djibouti, and South Africa of which Kenya takes the largest of 70 per cent and 7.5 per cent, and 4.5 per cent share of Djibouti and South Africa respectively in 2016.

Regards with the import, the total value of Ethiopia's import from SSA trading partners rose for USD 7.4 million in 2006 to USD 10.7 million in 2011, and then further rose to USD 18.1 million in 2016. However, the import share to SSA as a proportion of total imports of the rest of the world (ROW), it has declined from 2 per cent to 1per cent in 2006 to 2016 respectively. Most of Ethiopia's imports from SSA came from Kenya and South Africa of which Kenya is the largest, representing 61 per cent in 2016.

Table 5.2 Ethiopia's Top Import and Export Destination of Miscellaneous Manufacturing Products

Ethiopia's Top Export Destination	**2006**	**2011**	**2016**	**Ethiopia's Top Import Countries**	**2006**	**2011**	**2016**
Kenya	22.80	25.05	70.02	Kenya	34.16	56.31	60.77
South Africa	27.30	21.46	4.51	South Africa	20.82	31.73	14.14
Congo	10.74	4.10	1.63	Djibouti	17.63	0.00	0.00
Rwanda	7.55	6.75	0.28	Swaziland	3.03	3.51	4.56
Djibouti	2.93	4.01	7.49	Rwanda	0.03	0.43	10.17
Zambia	9.04	4.90	0.24	Nigeria	0.59	0.26	3.87
Malawi	6.17	0.37	3.66	Tanzania	0.19	2.28	0.18
Zimbabwe	0.81	5.54	1.13	Zimbabwe	2.16	0.07	0.15
Senegal	3.10	2.49	1.13	Cameroon	0.97	0.58	0.70
Uganda	0.55	2.12	1.85	Mozambique	2.03	0.01	0.10
Total SSA (in 1000 USD)	**183**	**2,598**	**7,075**	Total SSA (in 1000 USD)	**7,445**	**10,665**	**18,109**
ROW (in 1000 USD)	**3,931**	**50,336**	**37,655**	ROW (in 1000 USD)	**367,470**	**607,722**	**1,786,370**
Total Trade (%)	**5**	**5**	**19**	Total Trade (%)	**2**	**2**	**1**

Source: UN Comtrade and own computation

5.2 Grubel-Lloyd Index Results

5.2.1 Miscellaneous Manufacturing Products

The intensity of IIT between Ethiopia and SSA trading partners for the miscellaneous manufacturing products result are shown on Table 5.3 (for details refer Appendix C). As can be seen from Table 5.3, the intensity of the IIT is much stronger with countries like Djibouti, Zambia, Ghana, Botswana, and Uganda during the period 2000-2004. The average IIT between Ethiopia and Djibouti, Zambia, Botswana and Uganda are 0.42, 0.30, 0.29, 0.24, and 0.23 respectively. The Grubel-Lloyd IIT index explain that when the value of IIT closer to one, the country involves more in IIT with the trading partners. On the other hand, if the IIT value closer to zero, the country engages mainly in inter-industry trade. Based on Grubel-Lloyd index, all the listed SSA trading partner IIT value is below 0.5 which indicates that the trade between Ethiopia and trading partners is mostly inter-industry trade instead of IIT during the period 2000-2004.

The IIT value of Ethiopia and Djibouti dramatically has decreased not only for the period 2005-2009 but also had continued to decline till 2016 andhas taken the value of zero implying their trade has changed to inter-industry instead of intra-industry. During the period 2005-2009, Rwanda, Zambia, Congo, Ghana, and Zimbabwe become the main trading partner of Ethiopia with the IIT level of 0.49, 0.46, 0.39, 0.38 and 0.37 respectively. The level of IIT shows an increasing trend during the period 2005-2009 as compared with the previous period. However, the IIT value still not yet closer to one that indicates main trading partner of Ethiopia mainly participate in inter-industry trade.

Unlike the previous periods, the IIT value becomes greater than 0.5 for the period 2010-2014. The intensity of IIT is much stronger with countries like Uganda, Mozambique, Zimbabwe, South Africa, and Botswana. Based on the Grubel-Lloyd index, the IIT value between Ethiopia and Uganda is 0.68 implying that there is IIT between the two countries. Furthermore, most SSA trading partners also show an increasing trend on their IIT value except for Djibouti and Rwanda. In the year 2015-2016, the IIT value is increased if we compare with the previous periods. The intensity of IIT becomes stronger mainly with Tanzania with a value of 0.79. Moreover, countries including Uganda, Ghana, Coted'Iviore, and Kenya become main trading partner of Ethiopia and has stronger IIT level of 0.67, 0.64, 0.62, and 0.57 respectively.

The result also shows that out of the twenty-two SSA trading partners, almost half of the countries belong to the same regional trade agreement (COMESA). However, the intensity of IIT is weak and a few Ethiopia's trading partners experience the value of IIT greater than 0.5. This indicates most of the trade that has been made between Ethiopia and SSA trading partners for miscellaneous manufacturing products has been in form of inter-industry trade rather than IIT. The small value of IIT also indicates that there is lack of deeper integration between Ethiopia and COMESA member countries. Previous studies have also found out that higher IIT led to deeper integration (Kien& Thao, 2016; Nderi, 2016).

Table 5.3 Grubel-Lloyd Index for Miscellaneous Manufactured Products

Trading Partners	**IIT for aggregate Miscellaneous Manufacturing Products**			
	2000-2004	**2005-2009**	**2010-2014**	**2015-2016**
Botswana	0.2400	0.3427	0.4858	0.3904
Coted'Iviore	0.1916	0.3361	0.4260	0.6162
Cameroon	0.0114	0.2122	0.4412	0.2508
Congo	0.0005	0.3806	0.3124	0.2267
Djibouti	0.4165	0.0764	0.0000	0.0000
Ghana	0.2858	0.3785	0.4739	0.6413
Kenya	0.0311	0.0802	0.3957	0.5688
Mali	0.1803	0.1727	0.3513	0.1590
Mozambique	0.0925	0.3641	0.5114	0.4947
Mauritius	0.0472	0.0919	0.4100	0.1217
Malawi	0.2838	0.2385	0.3505	0.1736
Namibia	0.2564	0.3076	0.4792	0.0605
Nigeria	0.1708	0.1837	0.4314	0.1356
Rwanda	0.1192	0.4883	0.1749	0.0340
Senegal	0.0285	0.3352	0.4648	0.5745
Swaziland	0.0004	0.0284	0.2371	0.0036
Togo	0.0799	0.0403	0.3491	0.4526
Tanzania	0.1898	0.3569	0.3789	0.7880
Uganda	0.2307	0.3491	0.6828	0.6709
South Africa	0.0071	0.1812	0.4871	0.2282
Zambia	0.2995	0.4569	0.4073	0.2882
Zimbabwe	0.0480	0.3766	0.5029	0.3885

Source: UN Comtrade and own computation

5.2.2 Textile and Footwear Products

According to the Standard International Trade Classification (SITC), miscellaneous manufacturing products (section 8) incorporates articles of apparel and clothing accessories, and footwear as one of the product lists under the category. In addition, there are five different product categories listed under miscellaneous manufacturing products (they are listed in section three under data description sub-heading). As can be seen from figure 5.2 and 5.3, the value of Ethiopia's export and import value of textile, clothing and footwear is much higher than the other products. Therefore, the following analysis gives emphasis on the textile and footwear products to compute with the level of IIT using G-L index.

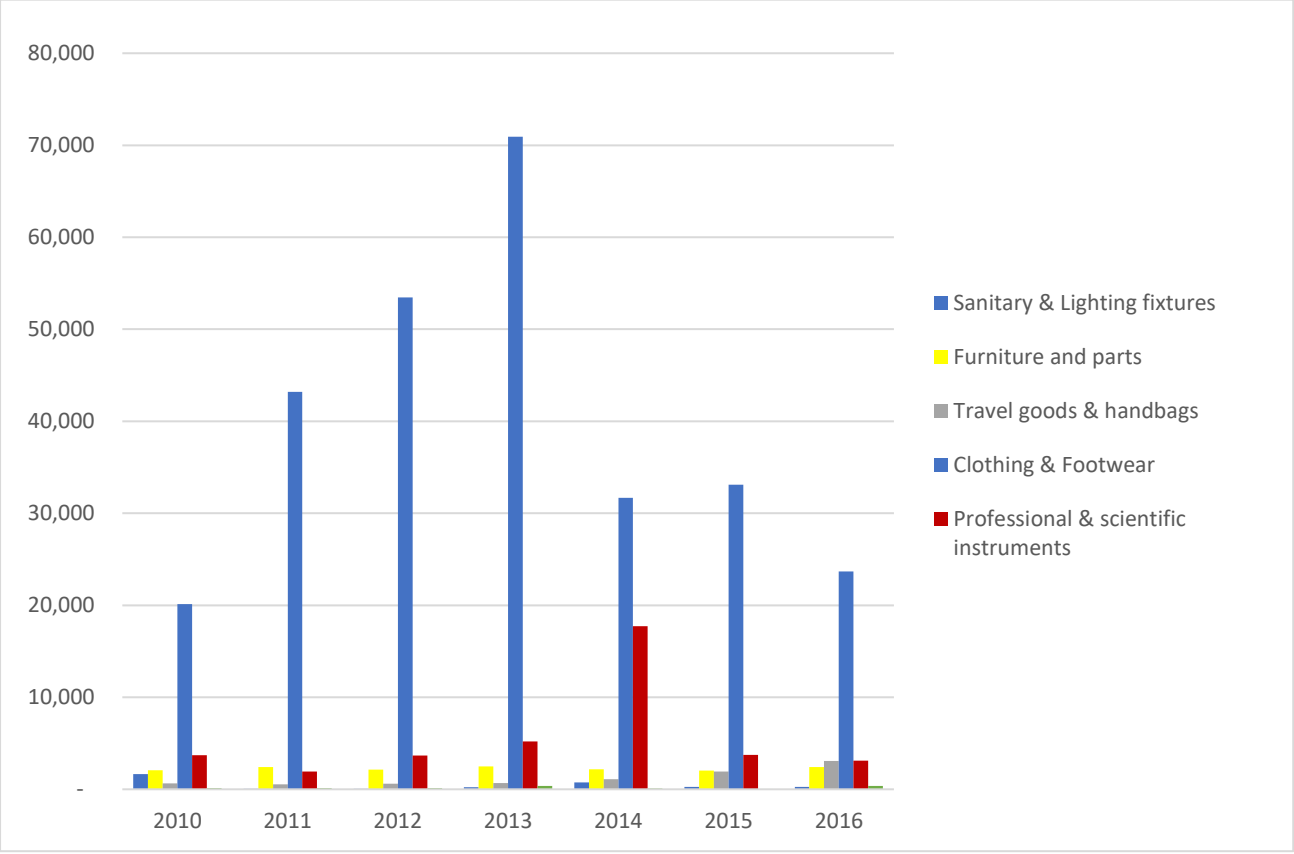

Figure 5.2 Export of Miscellaneous Manufacturing Products to the World, in USD '000 (UN Comtrade and own computation)

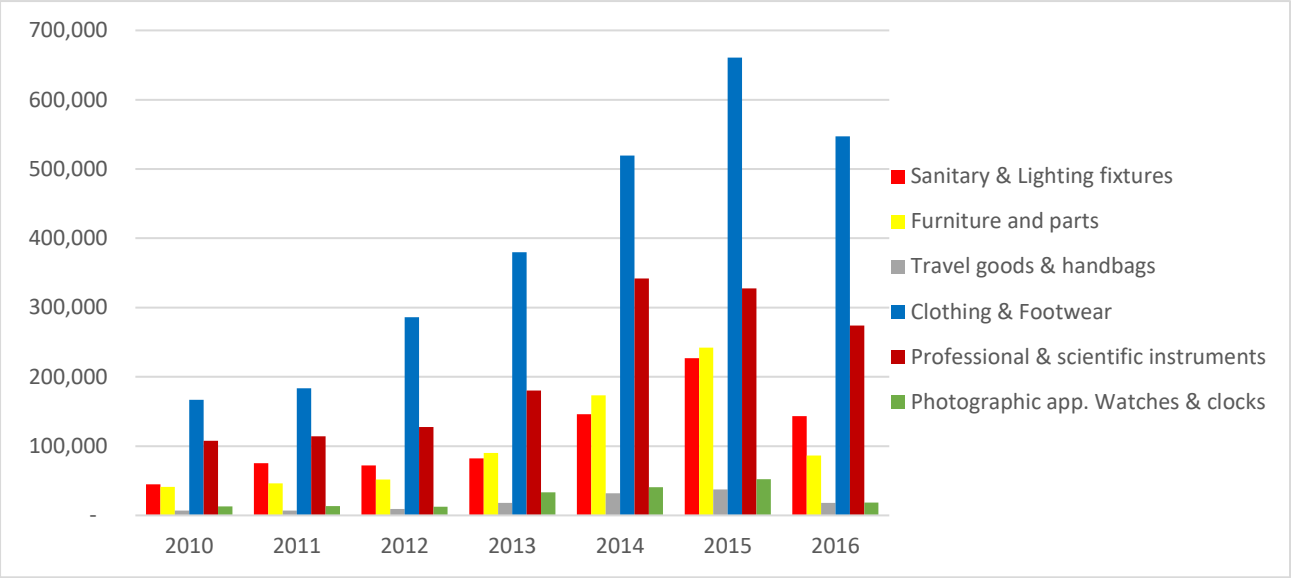

Figure 5.3 Import of Miscellaneous Manufacturing Products from the World, in USD '000 (UN Comtrade and own computation)

As depicted in table 5.4 below (for details refer Appendix D), the intensity of IIT particularly on the clothing and footwear products are weak and more than half of the countries' IIT value has been closer to zero for the period 2000-2004. The intensity of IIT relatively stronger with Nigeria, Djibouti, Ghana, and Malawi with the IIT value of 0.39, 0.29, 0.27, and 0.25 respectively. However, the intensity of the IIT with the main trading partners is weak and less than 0.5. In 2005-2009, the trend of the IIT value has shown an increment if we compare with the previous period. During this period, the main trading partners were Rwanda, Tanzania, Coted'Ivoire with the IIT level of 0.42, 0.42, and 0.41 respectively though the intensity is weak and possible to infer that the countries are engaged in inter-industry.

In the year 2010-2014, most trading partners have been engaged in intra-industry trade with Ethiopia compared with the previous period. During this period, Uganda has become the main trading partner and the intensity of IIT has become more stronger compared with other SSA countries with the value of 0.62. In addition, countries like Kenya and Ghana have stronger IIT intensity next to Uganda. The countries which are strong IIT partners of Ethiopia have relatively similar GDP levels and geographically closer to that of the reporter country except Ghana. During the period 2015-2016, the intensity of IIT shows increment in comparison with the previous periods. The intensity of IIT has been stronger mainly with Uganda, Zimbabwe, and Senegal with a value of 0.76, 0.74, and 0.73 respectively. Generally, results show that

during the earlier period, the trading partners (i.e. Ghana and Nigeria) IIT with Ethiopia have relatively big GDP, and they are not neighbours to Ethiopia. These countries do not even belong the same regional trade agreement (COMESA). However, in recent periods, the IIT trend shows that Ethiopia engages with countries that have relatively similar GDPand belong to the same regional block. For instance, as we look at the intensity of IIT of the top five main trading partners (i.e. Uganda, Senegal, Zimbabwe, Congo, and Tanzania) all of these countries are geographically closer to Ethiopia except Senegal and are members of COMESA, with the exception of Senegal and Tanzania.

Table 5.4 Grubel-Lloyd Index for Textile and Footwear Products

Trading Partners	**IIT for Textile and Footwear Products**			
	2000-2004	**2005-2009**	**2010-2014**	**2015-2016**
Botswana	0.0000	0.1862	0.5118	0.4483
Coted'Iviore	0.0000	0.4179	0.3397	0.4036
Cameroon	0.0000	0.0819	0.4367	0.2620
Congo	0.0005	0.2382	0.2790	0.6995
Djibouti	0.2901	0.0880	0.0000	0.0000
Ghana	0.2720	0.3552	0.5551	0.5202
Kenya	0.0139	0.3912	0.5902	0.1372
Mali	0.0000	0.2221	0.2426	0.1937
Mozambique	0.0000	0.1680	0.3653	0.5069
Mauritius	0.0000	0.0628	0.3905	0.2210
Malawi	0.2545	0.0155	0.2237	0.6003
Namibia	0.0000	0.3373	0.5538	0.4089
Nigeria	0.3852	0.0861	0.3998	0.5844
Rwanda	0.0204	0.4213	0.2915	0.3823
Senegal	0.0000	0.2585	0.5450	0.7384
Swaziland	0.0005	0.3124	0.4577	0.3684
Togo	0.0727	0.0428	0.2394	0.4523
Tanzania	0.0624	0.4203	0.4392	0.6468
Uganda	0.0224	0.3689	0.6223	0.7634
South Africa	0.0050	0.1416	0.3445	0.3924
Zambia	0.0433	0.3587	0.3042	0.2791
Zimbabwe	0.1128	0.3287	0.2623	0.7398

Source: UN Comtrade and own computation

5.3 Regression Analysis

This section analyses the econometrics results using the gravity model in order to identify the determinants of Intra-Industry Trade between Ethiopia and the twenty-two SSA trading partners. In order to regress the panel data, this study uses a static panel data model over its dynamic counterpart. This is because the former includes pooled, fixed and random effect methods, while the latter consists of lagged dependent variable as an explanatory variable. As a result, the dynamic panel data model complicates the estimation, executes biased and inconsistent results since the lagged dependent variable might be correlated with the error component (Asteriou, 2006). Due to the fact that this study regresses the panel data through a static panel model as it uses either fixed or random effect model. Prior to the analysis of the regression result, first Hausman test has been conducted to decide whether to use fixed or random effect model. Moreover, the diagnostic test results executed, and the regression results are also performed.

5.3.1 Hausman Test

Prior to the Hausman test result, this section briefly explains major differences between fixed effect and random effect model. The fixed effect model assumes a parameter estimate of a dummy variable as a part of the intercept. It examines individual differences in intercepts and assumes the same slopes and constant variance across individual, group and entity (Park, 2011). Moreover, fixed effect is an appropriate model for analysis if the variables vary over time (Torres-Reyna, 2007). It controls for all time invariant differences between individuals and cannot estimate the effect of time invariant variables.

On the other hand, the random effect model assumes individual effects or heterogeneity are not correlated with regressors. It examines constant intercepts and slopes across individual and the difference among individuals or time periods basis on individual specific errors not on the intercepts (Park, 2011). Furthermore, the random effect model assumes that the variation across the individuals or institutions to be random and uncorrelated with both the dependent and independent variable (Baltagi, 2005). Unlike fixed effect model, random effect model takes into account time invariant variables like distance, common regional trade agreement, common border, and common language.

In order to know either fixed effect or random effect is more appropriate in the panel data, it is important to examine the Hausman specification test. The Hausman test compares fixed and random effect models under the null hypothesis that individual effects are uncorrelated with any regressor in the model. Several researchers (Baltagi, 2005; Tores-Reyna, 2007; Borenstein, 2009; Zelalem, 2014) used a Hausman test to decide either to use fixed effect or random effect model. Similarly, this study also considers a hausman test in order to decide either to use fixed effect or random effect model in order to run the regression.

Therefore, after running both FE and RE model then the decision lies on the results of the null hypothesis. If the null hypothesis of no correlation is rejected, it is possible to conclude that the individual effects εi are significantly correlated with any one of the regressors hence, a fixed effect model is favoured over the random counterpart. On the other hand, if the null hypothesis is accepted there is no systematic difference in the coefficients, and thus the random effect model is preferred over fixed effect model (Park, 2011). The random effect model is also selected over its fixed effect when the null hypothesis that the individual effects are uncorrelated with the other regressors is not rejected. The Hausman specification test conducted and the result shows that we cannot reject the null hypothesis of (prob>Chi2=0.9067) is not less than 0.05 (see Appendix E). This indicates that there is no misspecification for the random effect model at all level of significance in the panel data.

In addition to the Hausman test, this study also examines the regression result for pooled OLS, fixed and random effect in order to decide which one is appropriate for the model. Accordingly, the study run pooled OLS, fixed effect and random effect model at a time. As we can see from the regression result (Table 5.5), the fixed effect estimation method does not take time invariant variables such as distance, common language and regional trade agreement dummies into account. Therefore, it has been dropped and absorbed by the intercept. In addition, the sample errors become bigger in FE than the pooled OLS, and RE model which has an indication of the sample mean that is less than the accurate reflection of the actual population mean. Hence, in addition to the Hausman test, the regression result also confirms that FE does not fit for the model.

On the other hand, it is also mandatory to decide either to use pooled OLS or RE model. Thus, it is possible to decide after executing the Breusch Pagan test. If the null hypothesis of constant variance is not rejected in the test, then the pooled OLS regression is favoured. However, the Breusch Pagan Lagrange multiplier test result (see Appendix F) indicates to reject the null

hypothesis. This study, therefore, uses the random effects model as opposed to pooled OLS and the fixed effects estimation methods.

Table 5.5 Regression result for Pooled OLS, FE and RE

Coefficients	Pooled	Fixed effects	Random Effects
ln gdpit	0.559***	0.583**	0.569***
	(0.136)	(0.267)	(0.140)
ln gdppjt	0.328***	0.339	0.327***
	(0.101)	(0.383)	(0.116)
ln open	-0.408***	-0.399***	-0.406***
	(0.0567)	(0.0791)	(0.0611)
ln dist	-0.844***	dropped	-0.859***
	(0.213)		(0.250)
dcl	-0.533**	dropped	-0.539*
	(0.238)		(0.278)
drta	-0.129	dropped	-0.146
	(0.252)		(0.299)
Constant	-20.90***	-28.83***	-20.98***
	(3.258)	(4.524)	(3.417)
Observations	310	310	310
R-squared	0.254	0.198	0.254
Number of _Country	22	22	22

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3.2 Homoscedasticity Test

Homoscedasticity assumption explains that the conditional variance of the error terms should be constant. In other words, the error term has the same variance given any value of the explanatory variable (Wooldrdge, 2012). It also assumes that the variance of the error term is constant or homoscedastic regardless of the values taken by the regressors. However, a violation of this assumption implies that the error term is heteroscedastic and has undesirable consequences.

Therefore, to check whether there is a problem of heteroscedasticity in the model or not, this study conducts the Breusch-Pagan Lagrange multiplier test (Bresuch and Pagan, 1980).The result suggests that there is heteroskedasticity in the model because P value is less than 0.05 (Prob>chi2=0.0001) hence, the study reject the null hypothesis of the constant variance (see Appendix F). On the other hand, in order to overcome heteroskedasticity problem from the model, the study run a robustness test (see Appendix G).

5.3.3 Multicollinearity Test

The classical linear regression model assumption states that there is no perfect multicollinearity. Accordingly, there should not be exact or near exact linear association among some or all independent variables of a regression model (Gujarati, 2005, p.346). Multicollinearity is a question of degree not types. The meaningful distinction is whether multicollinearity existed in the model or not; however, this depends on its various degrees (Gujarati, 2005, p.363). Gujarati (2005, p.348) discusses about the existence of perfect multicollinearity in the model leads the regression coefficients of the X variable to be indeterminate and the standard error becomes infinite. On the other hand, if there is no perfect multicollinearity, then the regression coefficient however determinate and holds large standard errors. This implies that the coefficients cannot be estimated with great precision or accuracy.

Accordingly, this study conducts both simple correlation matrix and variance inflation factor (vif) to check whether there is multicollinearity exist between the independent variables. The correlation matrix assumes that the explanatory variables in the model have strong correlation with each other if the coefficients are greater than 0.8. However, according to the correlation matrix, the result shows that the coefficients are less than 0.8, which indicates that the model does not have multicollinearity problem (see Appendix H1). In addition to the correlation matrix, the study also conducts variance inflation factor (vif) to check the existence of multicollinearity in the model. Accordingly, the result shows that all the vif coefficients are less than 5 that implies that the collinearity might not be a problem in the model (see Appendix H2).

5.3.4 Autocorrelation Test

It assumes that the error terms for different time periods are not correlated. The test for the problem of serial correlation uses Wooldridge test for autocorrelation in panel-data models. According to Baltagi (2005) and Tores-Reyna(2007), the autocorrelation problem can only exist if the study uses macro panel datasets that consider the period which is longer than twenty years. Therefore, it might not be a problem in micro panel and it is not mandatory to consider autocorrelation test for this research because the time periods are less than 20 years.

5.4 Determinants of IIT between Ethiopia and SSA Trading Partners

To interpret the regression results and to discuss the determinants of the IIT, it is mandatory to analyse the statistical significance of the coefficients of each explanatory variable included in the model in explaining the dependent variable. Accordingly, the regression analysis starts by examining only the effect of both the economic size of the reporter and trading partners without including any control variables (model 1). Afterwards, it extends the model by adding four control variables on step by step basis and in this way, it constructs the basic specification of this study (model 5). The reason behind the control of the variables is to see whether the explanatory and the dummy variables significantly changes when the model augment the number of the independent variables.

Accordingly, first, both Ethiopia's and SSA trading partners GDP is regressed, the SSA trading partners GDP is not significant in (model 1) though both have the expected positive sign. Afterwards, when the trade openness variable augmented in (model 2), the SSA trading partners GDP become significance at 0.1 level and the explanatory power of the model significantly increases (R2= 20.76). However, there is unexpected negative sign executed for trade openness on IIT for the whole model. This unexpected sign might be attributed to the low engagement of Ethiopia's IIT with its trading SSA countries.

The geographical distance variable included in (model 3) become significance at 0.01 level and negatively correlated to IIT which is consistent with the theory. This implies that the trading partners that are far from the reporting country experienced low IIT. On the other hand, common language dummy is included in (model 4). Even if the coefficient is significance at 0.05 level, though it is negatively correlated with IIT which is inconsistent with the expected sign. Finally, the last regression (model 5) reveals that economic size (both reporter and trading partners' GDP), trade openness, distance, and common language are significant factors in explaining IIT between Ethiopia and its trading partners in the SSA. However, the regional trade agreement dummy is not statistically significant with a negative sign.

Table 5.6 Random effect model results for the determinants of IIT

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5
ln gdpit	0.783***	0.627***	0.600***	0.548***	0.569***
	(0.145)	(0.136)	(0.134)	(0.133)	(0.140)
lngdppjt	0.0197	0.182*	0.274***	0.355***	0.327***
	(0.119)	(0.0986)	(0.101)	(0.0976)	(0.116)
ln open		-0.332***	-0.402***	-0.412***	-0.406***
		(0.0580)	(0.0621)	(0.0593)	(0.0611)
ln dist			-0.666***	-0.810***	-0.859***
			(0.238)	(0.224)	(0.250)
dcl				-0.586**	-0.539*
				(0.252)	(0.278)
drta					-0.146
					(0.299)
Constant	-21.13***	-25.37***	-22.43***	-21.62***	-20.98***
	(3.118)	(3.056)	(3.187)	(3.112)	(3.417)
Observations	310	310	310	310	310
R-squared overall	10.56	20.76	23.66	25.33	25.39
Number of _Country	22	22	22	22	22

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The following analysis is based on (model 5) that is the main model for this study that incorporates all the explanatory and dummy variables to explain the Intra-Industry Trade. Both the coefficient of the economic size variables has a positive sign as expected and the variables are significance at 0.01 level. This means that a 10 per cent increase in the GDP of Ethiopia has led to a 5.6 per cent increase on IIT with SSA trading partners. Similarly, an increase in the GDP of the SSA trading partners of Ethiopia by 10 per cent has led to a 3.3 per cent increase on IIT. The prediction result confirms that participating in larger markets leads Ethiopia to experience economies of scale, which enhance IIT between the SSA trading partners. This result is consistent with findings such as Stone and Lee, 1995; Clark and Stanley, 1999; Ekanayake, 2001; Kien and Thao, 2016; Nderi, 2016.

The trade liberalization coefficient in contrast with the theory, it negatively correlated with the IIT throughout the model. This finding is inconsistent with Clark and Stanley, 1999; Nderi, 2016. The unexpected sign of trade openness can be attributed to the fact that Ethiopia external orientation seems to be more restrictive. In other words, the country's participation both in import and export trade with SSA trading partners is meagre and the country might have higher

domestic trade relative to foreign trade. This finding is consistent with Djoumessi & Bala (2013) and their result concludes that African countries trade more domestically instead of trading with each other.

The geographical distance between the capital city of Ethiopia and SSA trading partners coefficient is significant at 0.01 level and has a negative sign suggesting the transportation cost is a key barrier to IIT. As distance in kilometres increases by 10 per cent, IIT between Ethiopia and SSA partners reduces by 86 per cent. Similarly, Stone and Lee, 1995; Kien& Thao, 2016; Nderi, 2016 found out consistent with this result. The Grubel-Lloyd index also substantiate this finding and the result indicates that the intensity of IIT becomes stronger mainly with geographically closer country such as Kenya, Tanzania and Uganda.

The existence of common language between the trading partners enhances IIT because it contributes to freer information (Balassa and Bauwens, 1987; Stone & Lee, 1995). The result shows that the coefficient becomes negative 0.54 and significant at 0.01 level. This implies that having the same official language between Ethiopia and SSA trading partners decrease IIT by 5.4 per cent. It suggests that the trading partners with English as official language have low IIT with Ethiopia compared with non-English official language countries. In other words, common official language between Ethiopia and SSA trading partners does not have a significant role in facilitating IIT. This finding is inconsistent with Ekanayake, 2001 and Mulenga, 2012.

Regards to the COMESA dummy, the coefficient is correlated negatively with IITimplying that Ethiopia's participation in IIT with COMESA member countries is low. Similarly, the Grubel-Lloyd index result also indicates that the intensity of IIT between Ethiopia and most COMESA member countries is weak, and most member countries' IIT value is less than 0.5. The low intensity of IIT signals that there is no strong integration between Ethiopia and COMESA member countries. Furthermore, the COMESA dummy becomes insignificant in the estimated model. Consistent with this finding, Kien and Thao (2016) also finds out that the Free Trade Area (FTA) dummy is not statistically significant, and they attribute the result with the reduction of tariff that has been made by both Vietnam and the trading partners are not significant enough to have explicit effect on the quantity of IIT. Similarly, Ethiopia has not yet reduced both customs tariffs and non-tariff barriers to the intra-regional trade,yet not a member of COMESA FTA. Moreover, it can also be associated with the tariff reduction by COMESA member states which is not significant enough to have explicit effect on the quantity of IIT. The result considers this as one of the potential reasons because currently, out of the twenty-

one COMESA member states only fifteen has joined the FTA and reduced both the customs tariffs and non-tariff barriers. On the other hand, both Ethiopia and the remaining six COMESA member states does not eliminate and reduce customs tariffs and non-tariff barriers. Therefore, this has a negative effect on the intensity of IIT between Ethiopia and COMESA member countries.

6 Conclusion

This study aims to examines the intensity of Intra-Industry Trade (IIT) in miscellaneous manufacturing products. It also aims to identify the determinants of IIT between Ethiopia and the twenty-two Sub-Saharan African countries for the period 2000-2016. To examine the existence and the intensity of IIT, the study uses Grubel-Lloyd index. On the other hand, the gravity model of international trade is used to determine the country specific IIT between Ethiopia and SSA trading partners.

The trend of Ethiopia's miscellaneous manufacturing products export to SSA countries dramatically increased from 7 per cent in 2005 to 23 per cent in 2016. However, it is still too low when the country's export to SSA is compared with the country's export to the European countries. The finding shows that 42 per cent of the total Ethiopia's export share belongs to European countries during the period 2013-2016. On the other hand, the trend of Ethiopia's import from SSA countries stagnated at 2 per cent of the total Ethiopia's import share since 2005. Ethiopia has been importing half of the total share of miscellaneous manufacturing products from Asia. This implies that there is low level of IIT between Ethiopia and SSA countries particularly on miscellaneous manufacturing products.

The Grubel-Lloyd result shows that in the beginning of the previous decade the intensity of IIT between Ethiopia and SSA countries is weak and the level of IIT is less than 0.5. However, after 2010, the value of IIT is greater than 0.5. During the period 2015-2016, the intensity of IIT becomes stronger mainly with Tanzania with a value of 0.79. Furthermore, countries like Uganda, Ghana, Coted'Ivoire, and Kenya also become main trading partner of Ethiopia with stronger IIT level of 0.67, 0.64, 0.62 and 0.57 respectively. In general, the GL index result reveals that fourteen SSA trading partners level of IIT between Ethiopia becomes below 0.5 during the year 2015-2016.

In addition, the study computes the intensity of IIT particularly on textile and footwear products. These products have been selected to compute their GL index since Ethiopia's export and import value is higher than the other products listed under the miscellaneous manufacturing products category. Similar with miscellaneous manufacturing products, the GL index result shows that the intensity of IIT is weak and less than 0.5 for the period 2000-2010. In addition, during the year 2015-2016, the intensity of IIT becomes stronger and reach a level of 0.76, 0.74 and 0.73 with countries like Uganda, Zimbabwe, and Senegal respectively.

In order to identify the country specific determinants of IIT, the study uses random effect model. To decide whether to use fixed or random effect model, the study conducts a Hausman test. Therefore, the test result recommended that random effect is more appropriate and fit with the model. According to the main model (model 5) of this study, the regression result found out that both the coefficient of the economic size variables has a positive sign as expected and the variables are significance at 0.01 level. The predicted coefficient indicated that a 10 per cent increase in the GDP of Ethiopia has led to a 5.6 per cent increase on IIT with SSA trading partners. Based on this, it is possible to infer that participating in large markets leads Ethiopia to experience economies of scale that enhance IIT between the SSA trading partners.

The trade liberalization coefficient becomes negative in contrast with the theoretical expectation. The unexpected sign of trade openness can be attributed to the fact that Ethiopia external orientation seems to be more restrictive and the country might also have higher domestic trade relative to foreign trade. On the other hand, consistent with the Grubel-Lloyd index result, the econometrics result also found out that the intensity of IIT becomes strongermainly with countries that are geographically closer to Ethiopia. These countries include Kenya, Tanzania and Uganda. Furthermore, the econometrics result reveals that common official language negatively correlated with IIT which is against the theoretically expected sign. However, it is possible to conclude that common official language does not have a significant role in facilitating IIT between Ethiopia and SSA trading partners.

Besides, inconsistent with the expected sign, COMESA dummy is negatively correlated with IIT. This implies that Ethiopia's participation in IIT with COMESA member countries is low. The GL index also substantiates this result and found out that there is weak intensity of IIT between Ethiopia and COMESA member states. This is because Ethiopia has not yet joined COMESA FTA. In addition, it can also be associated with the fact that tariff reduction by COMESA member states might not also be significant enough to have explicit effect on the quantity of IIT.

In general, the major finding of the gravity model and GL index show that Ethiopia has low and weak intensity of IIT respectively with COMESA member countries. The result has far reaching implications to the policy makers in Ethiopia to join COMESA FTA and to liberalize its market to SSA trading partners. This requires the country to review its custom tariffs and non-tariff barriers. This would enhance the IIT not only between Ethiopia and COMESA member countries but also with the rest of SSA trading partners. Consequently, this would

foster the country's economic development, and it would promote regional integration and multilateral trade regimes.

Finally, it is possible to deduce that previous research on the assessment of IIT between Ethiopia and SSA countries is a least studied area. As a result, this research strongly recommends for future research to work on different sectors in addition to miscellaneous manufacturing sector and consider industry specific factors such as product differentiation, marketing cost, industrial concentration and foreign investment.

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Appendix A: SSA Countries list included in the study

Sr. No.	Countries
1	Botswana
2	Coted'Iviore
3	Cameroon
4	Congo
5	Djibouti
6	Ghana
7	Kenya
8	Mali
9	Mozambique
10	Mauritius
11	Malawi
12	Namibia
13	Nigeria
14	Rwanda
15	Senegal
16	Swaziland
17	Togo
18	Tanzania
19	Uganda
20	South Africa
21	Zambia
22	Zimbabwe

Appendix B: Summary Statistics of Variables

Variable		Mean	Std. Dev.	Min	Max	Observations
lniit	overall	-1.940495	1.775249	-8.657361	-.0033686	N = 310
	between		.6981273	-4.105398	-.966018	n = 22
	within		1.641608	-8.8931	1.696392	T-bar = 14.0909
lngdpit	overall	23.82453	.7633904	22.78388	25.01374	N = 374
	between		0	23.82453	23.82453	n = 22
	within		.7633904	22.78388	25.01374	T = 17
lngdppjt	overall	23.19999	1.34847	20.12766	27.06627	N = 374
	between		1.272912	20.66842	26.27797	n = 22
	within		.5172712	21.78038	24.32186	T = 17
lnopen	overall	-12.74432	2.005886	-19.52988	-6.690002	N = 366
	between		1.596668	-14.57574	-8.498143	n = 22
	within		1.242989	-18.01903	-5.951813	T-bar = 16.6364
lndist	overall	7.982909	.5712165	6.312252	8.723918	N = 374
	between		.5838766	6.312252	8.723918	n = 22
	within		0	7.982909	7.982909	T = 17
dcl	overall	.6818182	.4663944	0	1	N = 374
	between		.4767313	0	1	n = 22
	within		0	.6818182	.6818182	T = 17
drta	overall	.4545455	.4985966	0	1	N = 374
	between		.5096472	0	1	n = 22
	within		0	.4545455	.4545455	T = 17

Appendix C: IIT for miscellaneous manufactured products under digit 2 level

SSA trading partners	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
Botswana	0.0526	0.5959	0.0000	0.0405	0.5110	0.0054	0.0305	0.0907	0.7917	0.7953	0.3381	0.4990	0.0000	0.8321	0.7598	0.0195	0.7612	0.3602
Coted'Iviore	0.0048	0.0000	0.7195	0.0000	0.2337	0.5899	0.6954	0.0000	0.0000	0.3952	0.0649	0.6650	0.0000	0.4727	0.9275	0.2798	0.9526	0.3530
Cameroon	0.0000	-	-	0.0343	0.0230	0.0285	0.0371	0.4022	0.0115	0.5818	0.4974	0.6114	0.2638	0.8184	0.0151	0.2443	0.2574	0.2251
Congo	0.0000	-	-	0.0026	0.0000	0.0066	0.4651	0.0106	0.5076	0.9131	0.0000	0.2511	0.5316	0.5370	0.2425	0.2122	0.2413	0.2307
Djibouti	0.2091	0.0136	0.0978	0.8536	0.9086	0.3677	0.0082	0.0000	0.0000	0.0062	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1450
Ghana	0.4308	0.0603	0.0767	0.0323	0.8290	0.2560	0.0105	0.2513	0.4127	0.9619	0.6040	0.4079	0.6168	0.5696	0.1709	0.8337	0.4489	0.4102
Kenya	0.0600	0.0862	0.0015	0.0035	0.0041	0.0037	0.0324	0.0568	0.2662	0.0420	0.1071	0.1956	0.2343	0.7353	0.7063	0.5166	0.6209	0.2160
Mali	0.0000	0.0622	0.0307	0.0000	0.8084	0.0277	0.0000	0.1832	0.3810	0.2713	0.2471	0.7802	0.0340	0.6360	0.0594	0.0000	0.3180	0.2258
Mozambique	0.4626	-	-	0.0000	0.0000	0.0000	0.0000	0.0358	0.8778	0.9066	0.8962	0.0930	0.4018	0.2517	0.9141	0.4190	0.5704	0.3429
Mauritius	0.1608	0.0000	0.0000	0.0689	0.0061	0.0022	0.0197	0.2803	0.1426	0.0149	0.5818	0.6459	0.4899	0.2032	0.1291	0.0840	0.1593	0.1758
Malawi	0.3620	0.6107	0.0767	0.2021	0.1675	0.0000	0.0390	0.0502	0.1377	0.9657	0.4511	0.4642	0.1758	0.5379	0.1233	0.1782	0.1690	0.2771
Namibia	0.0000	0.6458	0.6365	0.0000	0.0000	0.0000	0.0144	0.0000	0.7033	0.8203	0.2937	0.7537	0.3167	0.4329	0.5990	0.0002	0.1208	0.3140
Nigeria	0.0649	0.0744	0.6824	0.0101	0.0221	0.0000	0.0000	0.5480	0.0237	0.3468	0.4035	0.8775	0.7505	0.0804	0.0454	0.0169	0.2543	0.2471
Rwanda	0.0000	0.2788	0.0000	0.0303	0.2871	0.8253	0.2587	0.0000	0.4558	0.9014	0.0010	0.4161	0.0743	0.1612	0.2219	0.0468	0.0212	0.2341
Senegal	0.0000	-	0.0000	0.0000	0.1425	0.0416	0.1358	0.5124	0.1799	0.8065	0.0979	0.5114	0.0477	0.6797	0.9874	0.4259	0.7232	0.3113
Swaziland	0.0000	0.0004	0.0017	0.0000	0.0000	0.0000	0.0027	0.0972	0.0067	0.0356	0.2421	0.0082	0.1789	0.6259	0.1303	0.0008	0.0063	0.0786
Togo	0.1552	0.0000	0.1481	0.0000	0.0962	0.0000	0.0000	0.0090	0.1802	0.0121	0.1221	0.8842	0.0599	-	0.6792	0.0000	0.9053	0.1913
Tanzania	0.0454	0.6235	0.1461	0.0013	0.1330	0.0379	0.0089	0.7308	0.2745	0.7326	0.4509	0.1895	0.1321	0.5823	0.5399	0.7208	0.8552	0.3650
Uganda	0.0185	0.5601	0.2378	0.1395	0.1977	0.2548	0.0398	0.4419	0.2643	0.7447	0.9618	0.6444	0.7368	0.4606	0.6105	0.6563	0.6854	0.4503
South Africa	0.0012	0.0116	0.0043	0.0152	0.0034	0.0049	0.0626	0.2979	0.3432	0.1974	0.2050	0.2829	0.1844	0.8272	0.9362	0.2346	0.2217	0.2255
Zambia	0.1693	0.0000	0.7492	0.5383	0.0405	0.6727	0.2944	0.2205	0.1000	0.9966	0.2274	0.3137	0.3299	0.6717	0.4941	0.0701	0.5064	0.3762
Zimbabwe	0.0000	0.0257	0.2137	0.0000	0.0004	0.4021	0.0183	0.2628	0.2927	0.9071	0.7278	0.1047	0.7015	0.9801	0.0005	0.2739	0.5032	0.3185

Appendix D: IIT for textile and footwear products under digit 2 level

SSA Trading Partners	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
Botswana	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1002	0.0000	0.0000	0.8307	0.2552	0.3312	0.2276	0.8478	0.8973	0.0000	0.8966	0.2580
Coted'Iviore	-	-	-	0.0000	-	0.8259	0.9599	0.0000	0.0000	0.3036	0.0000	0.7504	0.0000	0.1042	0.8440	0.0000	0.8072	0.2703
Cameroon	0.0000	-	-	0.0000	0.0000	0.0000	0.0318	0.3023	0.0103	0.0651	0.1991	0.6425	0.2471	0.8290	0.2657	0.2262	0.2978	0.1833
Congo	0.0000	-	-	0.0026	0.0000	-	0.0000	0.0096	0.5263	0.6552	0.0000	0.4390	0.7025	0.2533	0.0000	0.7107	0.6883	0.2346
Djibouti	0.2560	0.0286	0.2694	0.8967	0.4965	0.4397	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1404
Ghana	0.8963	0.0829	0.0782	0.3029	0.8352	0.0770	0.1245	0.1730	0.4122	0.9893	0.4719	0.3085	0.7050	0.6329	0.6573	0.2651	0.7753	0.4581
Kenya	0.0666	0.0019	0.0000	0.0007	0.0222	0.0004	0.2560	0.3737	0.8890	0.4368	0.8032	0.3441	0.8630	0.2244	0.7164	0.0603	0.2141	0.3102
Mali	-	0.0000	0.0000	0.0000	0.0000	0.0277	-	0.4834	0.3518	0.2475	0.1733	0.0630	0.0014	0.9756	0.0000	0.0000	0.3874	0.1595
Mozambique	0.0000	-	-	0.0000	0.0000	0.0000	0.0000	0.0381	0.0000	0.8019	0.8716	0.0951	0.5413	0.3183	0.0000	0.6466	0.3673	0.2165
Mauritius	-	-	0.0000	0.0000	-	-	0.0000	-	0.2232	0.0906	0.5814	0.0000	0.5210	0.8501	0.0000	0.4420	0.0000	0.1593
Malawi	0.8889	0.0000	0.3627	0.0211	0.0000	0.0000	0.0153	0.0622	-	0.0000	0.3937	0.5341	0.0000	0.1905	0.0000	0.4255	0.7751	0.2158
Namibia	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	-	0.6896	0.9968	0.3587	0.9319	0.2262	0.4068	0.8455	0.7100	0.1078	0.3102
Nigeria	0.0000	0.0587	0.9345	0.9329	0.0234	0.0000	0.0000	0.0673	0.0003	0.3628	0.1672	0.7893	0.1559	0.3479	0.5387	0.7892	0.3796	0.3263
Rwanda	0.0000	0.0000	0.0000	0.1022	0.0000	0.8624	0.4853	0.0000	0.2539	0.5050	0.0000	0.9511	0.0695	0.1520	0.2848	0.0000	0.7645	0.2606
Senegal	0.0000	-	0.0000	0.0000	0.0000	0.0546	0.0000	0.5233	0.0000	0.7145	0.0453	0.4151	0.7493	0.5479	0.9671	0.6722	0.8046	0.3232
Swaziland	0.0000	0.0000	0.0023	0.0000	0.0000	0.0000	0.2995	0.6216	0.0841	0.5569	0.1429	0.3552	0.7081	0.4443	0.6379	0.3007	0.4361	0.2700
Togo	0.3633	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0993	0.0000	0.1146	0.4821	0.0000	0.0000	-	0.7151	-	0.9047	0.1576
Tanzania	0.0673	0.1330	0.0749	0.0369	0.3390	0.0680	0.8115	0.7295	0.1979	0.2944	0.0167	0.4596	0.7307	0.3624	0.6267	0.7658	0.5278	0.3672
Uganda	0.0581	0.0074	0.0131	0.0332	0.7823	0.6243	0.0610	0.4097	0.5663	0.1831	0.0697	0.9656	0.8519	0.4378	0.7866	0.6648	0.8619	0.4339
South Africa	0.0002	0.0108	0.0012	0.0128	0.0619	0.0032	0.0086	0.2338	0.2628	0.1994	0.3688	0.8094	0.1749	0.2000	0.1691	0.4815	0.3033	0.1942
Zambia	0.0000	0.0000	0.0000	0.2166	0.0576	0.6337	0.0000	0.2376	0.0000	0.9222	0.1821	0.3090	0.4623	0.5677	0.0000	0.0710	0.4873	0.2439
Zimbabwe	-	0.2631	0.3008	0.0000	0.0003	0.5545	0.0001	0.2454	0.0222	0.8215	0.8264	0.2878	0.1824	0.0111	0.0036	0.6574	0.8222	0.2940

Appendix E: Hausman Test

```
. hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |    fixed       random       Difference          S.E.
-------------+------------------------------------------------------------
      lngdpit |   .5694261    .5477521       .021674       .0437028
    lngdppjt |   .3265294    .3552446      -.0287152       .0629899
      lnopen |  -.4058764   -.4117058       .0058293       .0146724
      lndist |  -.8587662    -.810444      -.0483222       .1098496
         dcl |  -.5386583   -.5860739       .0474156       .1170214
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        1.55
                Prob>chi2 =      0.9067
```

Appendix F: Homoscedasticity Test

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lniit

         chi2(1)      =    15.43
         Prob > chi2  =   0.0001
```

Appendix G: Robustness

```
. reg lniit lngdpit lngdppjt lnopen lndist drta dcb, rob

Linear regression                               Number of obs     =        310
                                                F(6, 303)         =      14.66
                                                Prob > F          =     0.0000
                                                R-squared         =     0.2467
                                                Root MSE          =      1.556
```

lniit	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lngdpit	.6102057	.1485598	4.11	0.000	.3178662	.9025451
lngdppjt	.2545771	.1061681	2.40	0.017	.045657	.4634971
lnopen	-.4374663	.0812352	-5.39	0.000	-.5973229	-.2776097
lndist	-.5967264	.255608	-2.33	0.020	-1.099718	-.0937347
drta	-.2852698	.2685453	-1.06	0.289	-.8137197	.2431802
dcb	.7106379	.5371467	1.32	0.187	-.3463723	1.767648
_cons	-23.15015	3.976294	-5.82	0.000	-30.9748	-15.3255

Appendix H: Multicollinearity test

Appendix H1: Correlation Matrix

```
. correlate lniit lngdpit lngdppjt lnopen lndist dcl
(obs=310)
```

	lniit	lngdpit	lngdppjt	lnopen	lndist	dcl
lniit	1.0000					
lngdpit	0.3252	1.0000				
lngdppjt	0.1121	0.3468	1.0000			
lnopen	-0.3221	-0.0825	0.3215	1.0000		
lndist	0.0339	0.1390	0.2073	-0.3469	1.0000	
dcl	-0.0985	-0.0284	0.2699	0.1748	-0.2347	1.0000

Appendix H2: Variable Inflation Factor (VIF)

```
. vif
```

Variable	VIF	1/VIF
lngdppjt	1.70	0.587379
lnopen	1.46	0.683024
lndist	1.44	0.695218
dcl	1.22	0.822423
lngdpit	1.22	0.822643
Mean VIF	1.41	