ADDIS ABABA UNIVERSITY
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DETERMINANTS OF EXPORT PERFORMANCE OF ETHIOPIA: A GRAVITY MODEL ANALYSIS

By

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Determinants of Export Performance of Ethiopia: A Gravity Model Analysis

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Approved by: **Signature**

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ACRONYMS

AGOA	African Growth and Opportunity Act
CES	Constant Elasticity Substitution
EBA	Everything But Arms
FDI	Foreign Direct Investment
FMA	Foreign Market Access
G2SLS	Generalized Two Stages Least Square
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
IMF	International Monetary Fund
LDC	Least Developed Country
MOTI	Ministry of Trade and Industry
NTB	Non Tariff Barrier
OLS	Ordinary Least Squares
UNCTAD	United Nations Conference for Trade and Development
UNIDO	United Nations Industrial Development Organizations
WB	World Bank
WTO	World Trade Organization

ABSTRACT

The purpose of this paper is to identify and empirically analyze determinants of export performance of Ethiopia. We began with a novel decomposition of the growth in countries' exports into the contribution from internal supply-side and external market access conditions. Building on the results of this decomposition, we moved on to an econometric analysis of the determinants of export performance. We employed a gravity model with a panel data using 30 Ethiopia's trading partners for the period 1995–2007. Our model has been estimated with Generalized Two Stages Least squares (G2SLS) estimation. Endogeneity of FDI and GDP to export, heterosckedasticity, and serial correlation for AR (1) are controlled. The estimated result suggests that internal supply side conditions are one of the major factors for export performance of Ethiopia .The result shows that good institutional quality and internal transport infrastructure appear to be major determinants; where as real exchange rate and FDI have no statistically significant effect on export performance of Ethiopia. Furthermore, the growth of domestic national income affects Ethiopian exports positively. According to the estimated result, foreign market access conditions also play a significant role. The result indicates that import barriers imposed by Ethiopia's trading partners do play an important role in determining the volume of Ethiopian exports. Moreover, export performance is positively related to Ethiopia's trading partners' income and distance, which is a proxy for transport costs, affects Ethiopian exports negatively.

Key words and phrases: *Ethiopia; Export; supply side factors; external market access condition; Gravity model*

I. INTRODUCTION

Over the past two decades, developing countries have progressively increased their share of global trade from just under one-quarter to about one-third. Asia and particularly China account for most of the change and this has been facilitated by diversification of exports. While developing Asia's share of total world exports increased from 11.7% in 1985 to 21.5% in 2005, Africa's share decreased from 4.3% to 2.9% of total exports over the same period (Bacchetta, 2007). Deep rooted structural problems, weak policy frameworks and institutions, and protection at home and abroad (IMF and WB, 2001), and the structure of African exports, which is characterized by dependence on primary commodities, (Alemayehu, 2006; UNCTAD, 2008; Biggs, 2007) are considered as the reasons for Africa's poor export performance.

Like other African countries, Ethiopia has also faced these problems for a long time. For instance, the Provisional Government of Socialist Ethiopia (1983), as cited in Abay and Zewdu (1999), noted that the basic constraints in the Ethiopian exports include the smallness of the volume of exportable products, the limited degree of diversification in the composition of exports, the fact that exports are made up mainly of unprocessed primary products, frequent economic crisis…which substantially reduce the demand for and prices of primary products, artificial trade barriers by trading partners etc. Moreover, after the downfall of the Derg regime, the Transitional Government of Ethiopia (1991),

as cited in Abay and Zewdu (1999), also says, "it is essential to increase and diversify exports ....." (1991:33).

Considering the problem, Ethiopia has taken different measures such as export financing incentive schemes, export trade duty incentive scheme and duty free importation scheme to those wholly engaged in supplying their products to foreign market. When it is compared to the pre-1991 period, the policy regime has shifted toward more liberalized one (Alemayehu, 1999).

Owing to this policy shift, some improvements in export performance have been registered during the post reform period. The export statistics shows that export earning is increasing from time to time. According to MOTI (2007), the real value of export earning during the first six years period of the Derg regime (1973-1978) was 5 billion birr. It reached 39.7 billion birr in the last six years of the EPRDF regime (2000/1-20006/7), which is seven fold higher than the amount during the Derg regime's 5 billion birr.

Regarding the composition of exports, during the 1990s the Ethiopian export sector could be said 'a three-commodity sector' in the sense that its foreign trade heavily depended on exports of a few primary products, i.e. coffee, hides and skins, and oilseeds and pulses. Specifically, between 1966 and 1996, on the average 59% of the country's export earnings came solely from coffee (Abay and Zewdu, 1999). Although coffee is still the dominant export item, since 2001/02, the contribution of coffee to the total export earnings has declined and reached 36.3% in 2007. On the other hand, the share of non-

coffee agricultural exports and major manufacturing export commodities (leather and leather products; textile; and agro processing products) have been rising remarkably and reached 63.7% (MOTI, 2007).

However, Ethiopia's share in the world total exports is still at its lowest stage, which was 0.01% in 2006 (WTO, 2007). This implies that supply capacity and/or foreign market access conditions can still be considered as a factor for the country's lowest export performance. In this regard, Alemayehu (1999) and, Abay and Zewdu (1999) argue that Ethiopia's external trade has major problems on the supply side (dependent on few primary products; characterized by huge fluctuation in volume; and a very high degree of concentration of exports on few commodities) and on the demand side (low income elasticity for the type of commodities that Ethiopia exports; declining prices for its exports; and limited destination for Ethiopian exports). Moreover, many African countries including Ethiopia have no diversified export structure, more than 50% of their export earnings being derived from only three principal commodities such as coffee, tropical beverages and cocoa (Alemayehu, 2006). They are also still facing a problem in selling their exports in the international markets (UNIDO, 2002; UNCTAD, 2008).

Identifying and examining the factors that significantly affect Ethiopia's export performance should facilitate the design of policies to improve the performance and ultimately overall economic growth. The objective of this paper is thus to look at the factors behind poor export performance of Ethiopia. The paper will identify the major

supply capacity and foreign market access factors and examine how much these factors affect the country's export performance. We build an econometric gravity model of bilateral trade flows to analyze the determinants.

The rest of the paper is structured as follows. Section two reviews relevant theoretical and empirical literatures regarding the subject. In section three, model specification and estimation results are presented. The last section concludes the paper.

II. LITERATURE REVIEW

The specific factors influencing export performance of a country varies from one country to another. Many scholars have categorized determinants of a country's export performance into two major parts: internal supply and external market conditions (Love and Turner, 2001; Fugazza, 2004; UNCTAD, 2005; UNCTAD, 2006; Stephen and Venables, 2003; Bacchetta, 2007).

Supply conditions are fundamental in defining the export potential of an economy and, for a given level of access to international markets, countries with better supply conditions are expected to export more (Fugazza, 2004). The agenda for assessing export supply constraints needs to consider both constraints to traditional export supply as well as constraints to shifting resources into new export activities (Biggs, 2007). Key determinants of supply side conditions are classified into four major components such as domestic transport infrastructure, macroeconomic environment/real exchange rate, foreign direct investment and institutional quality (UNCTAD, 2005). I have briefly discussed each of these factors below.

One of the major factors that affect export supply relates to domestic transport infrastructure. Internal transport infrastructures are likely to play an important role at the early stage of export sector development (UNCTAD, 2005). Most African countries are characterized by poor transport infrastructure, which is a major impediment to trade, competitiveness and sustainable development (UNCTAD, 2005; Mbekeani, 2007;

Bacchetta, 2007) and isolate countries, inhibiting their participation in global production networks (Limao & Venables, 2000). Due to poor internal transport infrastructure African transport costs are high, which make their exports expensive and uncompetitive (Radelet and Sachs, 1998 as cited in Matthee, Grater and Krugell, 2007), and reduce foreign earnings from exports (UNCTAD, 2003 as cited in Matthee, Grater and Krugell, 2007). Analysis of African trade flows shows that their relative trade volume is low due to poor infrastructure (Limao and Venables, 2001).Therefore, improvements in transportation services and infrastructure can lead to improvements in export performance (Francois, Kepler & Manchin, 2006, as cited in Edwards and Odendaal, 2008; Fugazza, 2004; Clarke, 2005).

It has been shown that infrastructure affects trade via altering transport costs (Edwards & Odendaal, 2008; Limão and Venables, 2001). In this context, Edwards & Odendaal (2008) argue that infrastructure directly affects transport costs by determining the type of transport used (for example, the size of the road determines the maximum size of the truck) and delivery time for the goods. Bougheas, Demetriades, and Morgenroth (1999) as cited in Edwards and Odendaal (2008) have analyzed the effects of infrastructure on trade through its influence on transport costs and find a positive relationship between the level of infrastructure and the volume of trade. Fugazza (2004) also find that internal transport infrastructure has a significant and positive impact in raising export.

The second major factor that affects export supply is real exchange rate. Real exchange rate can be an important element in determining export growth, diversification and international competitiveness of goods produced in a country (UNCTAD, 2005) and is a key variable that requires close government supervision in any program to expand and diversify exports (Biggs, 2007) since its management can influence export performance over a large number of different product groups (Mouna & Reza, 2001).

A more stable and balanced real exchange rate is conducive to export expansion (Mouna & Reza, 2001). The level of real exchange rates is often rendered uncompetitive in low income countries by poor economic management and turbulence in financial markets (Biggs, 2007). Ensuring the exchange rate adjusts to more realistic levels is a means of enhancing the economy's incentives for exporting and could lead to increase in the production of export products (De Rosa and Green, 1991 as cited in Oyejidi, 2007). While overvalued currency can undermine export competitiveness through a direct loss of price competitiveness for exporting firms (Biggs, 2007), undervaluation of the currency can bolster export competitiveness (Biggs, 2007), should enhance the incentives for export activities (Oyejide, 2007) and could lead to diversification of exports (Sorsa, 1999 as cited in Mouna and Reza, 2001).

Empirically, it has been proved that real exchange rates have a significant effect on a country's export performance (Sekkat and Vaoudakis, 1999 as cited in Mouna and Reza, 2001). While appreciation of real exchange rates affects exports negatively (Edwards &

Alves, 2005; Sharma, 2000; Love & Turner, 2001; Morrissey & Mold, 2006), depreciation of real exchange rates affects exports positively (Asmerom, 1999; Achy and Sekkat, 2001 as cited in Mouna and Reza, 2001; Edwrds and Alves, 2005). On the other hand, some studies indicate that the effect of exchange rate variability on exports is ambiguous that is positive or negative (Du & Xu, 2001; Klaassen, 1999 and Hooper & Kohlhagen, 1978 as cited in Cameron, Kihangire and Potts).

The effect of exchange rate on exports depends on the price elasticity of export supply because the real exchange rate should incorporate the price effect on exports. Thus, the higher the price elasticity, the more competitive is world market for exports of the particular country (Roshan, 2007). Industrial products have higher price elasticity but primary products have lower elasticity, this makes industrial exports respond perfectly to the changes in exchange rate (Roshan, 2007). As indicated in the previous section, most LDCs' exports are primary products. Thus the less responsive of primary products to price changes implies that LDCs exports respond imperfectly to the changes in exchange rate i.e. the effect of exchange rate on exports of LDCs is ambiguous.

Foreign direct investment (FDI) is also another important element that affects export supply of a country. There is a consensus among development economists that foreign direct investment (FDI) inflows is likely to play a decisive role in explaining growth of recipient countries (De Mello, 1997, 1999; Buckley et al., 2002; Akinlo, 2004 as cited in Seetanah and Khadaroo, 2006). By increasing capital stock, FDI can increase country's

output and productivity through a more efficient use of existing resources and by absorbing unemployed resources (De Gregorio, 1992 as cited in Seetanah & Khadaroo, 2007). World Bank (1993) as cited in Sharma (2000) notes that the role of FDI in export promotion depends crucially on the motive for such investment. According to World Bank (1993) as cited in Sharma (2000), if the motive behind FDI is to capture domestic market (tariff-jumping type investment), it may not contribute to export growth. On the other hand, if the motive is to tap export markets by taking advantage of the country's comparative advantage, then FDI may contribute to export growth. Thus, whether FDI contributes to export growth or not depends on the nature of the policy regime (Sharma, 2000).

Like the theoretical views, the existing empirical evidences on the role of FDI in export performance are also mixed. Some studies found the negative relationship between FDI and export (Horst, 1972 and Jeon, 1992 as cited in Weishi, Awokuse and Yuan, 2008; Ancharaz, 2003). In contrast, other studies indicate that FDI have a positive effect on export performance of host countries (Weishi, Awokuse and Yuan, 2008; Fugazza, 2004; UNCTAD, 2005; Morrissey & Mold, 2007). On the other hand, Lall and Mohammad (1983), as cited in Weishi, Awokuse and Yuan (2008) and Sharma (2000) do not see any statistically significant impact of FDI on exports.

The fourth and the last major factor that affects export supply relates to institutional quality. The quality of institutions and policies are decisive in determining whether countries can benefit from globalization (UNCTAD, 2008). Levchenko (2004) as cited in

Francois & Manchin (2006) suggests that differences in institutional quality can themselves be a source of comparative advantage. Weak and missing institutions have been shown to limit the ability of firms to take advantage of new trading opportunities in low- income countries (Stiglitz and Charlton 2006, and Roland 2000 as cited in Biggs, 2007). Evidence from successful exporting countries indicates that good institutions have large elements of indeterminacy and characteristics specific to individual countries (Biggs, 2007). It has been proved that institutional quality is highly correlated with trade (Dollar & Kraay, 2002 as cited in Francois and Manchin, 2006). In this regard, Francois & Manchin (2006) shows that export performance and, the propensity to take part in the trading system at all, depend on institutional quality. Anderson and Marcouiller (2002) as cited in Francois and Manchin (2006) also find that a deterioration of the quality of a country's institutions should result in a reduction of its exports.

In addition to the direct effect, institutions may also indirectly affect trade through their impact on other variables that determine trade flows like investment and productivity (Méon & Sekkat, 2006). The quality of institutions affects the investment climate, which in turn affects the supply response of the economy (World Bank, 2005 as cited in Munemo, Subhayu and Basistha, 2007). Méon & Sekkat (2006), in their empirical analysis, have shown that a deterioration of the quality of institutions results in lower investment which in turn lowers trade. Moreover, bad institutions reduce aggregate productivity (Hall & Jones, 1999 and Olsen et al., 2000 as cited in Méon & Sekkat,

2006). In relation to this, Méon & Sekkat (2006) argues that countries whose institutions result in low productivity will likely have difficulties in exporting and trading abroad. The other major component that determines export performance of a country is related to external market access conditions (Fugazza, 2004; UNCTAD, 2005). It has been proved that foreign market access and supply capacity conditions are equally important for the development of external sector of the country (Fugazza, 2004; Stephen and Venables, 2003). In the case of foreign market access, two dimensions can be considered. While the first dimension is explained through intervention by trading partners, the second dimension is related to the measures implemented by the exporting country to provide its exportable with a price advantage (Mc Carthy, 2008).

Trading partners influence export performance of a country through their trade policies (Tariff and Non tariff measures). In the world economy since 1950 there has been a massive liberalization of world trade, first under the auspices of GATT[1] and now under the auspices of the WTO[2] (Anthony, 2000). Due to these and other trade negotiations, access to international markets has improved (Anthony, 2000; Fugazza, 2004; Clarke, 2005; Biggs, 2007). However, it is likely that there is still much to gain from further improvements in market access conditions (Fugazza, 2004). Meaningful market access requires a further lowering of all kinds of barriers to trade (Mold, 2005; UNCTAD, 2005). In this context, UNCTAD (2005) notes that the most important actions should be

[1] GATT (General Agreement on Tariffs and Trade) was established in 1947 (Anthony, 2000). Since 1948, GATT had provided the rules for the multilateral trading system. (WTO Publication, 2003)
[2] WTO (World Trade Organization) replaced the GATT and begun life on January 1995. The bulk of the WTO's work comes from the 1986-1994 negotiations and earlier negotiations under the GATT. (WTO Publication, 2003)

tackling high tariff peaks and escalation[3] facing items of export interest to developing countries' agricultural and non-agricultural exports. In industrial countries, border protection in manufacturing is generally low, but it remains high on labor-intensive products of interest to developing countries (IMF and WB, 2001). As indicated by IMF and WB (2001), tariff peaks and escalation in sensitive products (textiles and clothing, agriculture, food products, wood products, and pulp and paper) disproportionately affect the products exported by developing countries and which inhibit the diversification of exports toward higher value-added products.

In recent years, NTBs[4] have also become increasingly important (UNIDO, 2002; UNCTAD, 2005). As noted by UNIDO (2002), products have to comply with a myriad of technical standards, health and safety requirements and regulations etc. set by importing countries. These barriers have caused serious implications for developing countries in terms of high compliance costs and potential or actual trade loses as increasing number of their exports are being subject to them (UNCTAD, 2005). Moreover, such barriers to market access undermine incentives in low income countries to move into higher productivity, non traditional export areas (Biggs, 2007).UNCTAD (2007), based on a data 1999-2001, has proved that NTBs affects LDCs exports more than other developing countries exports and find that NTBs like environment related

[3] Tariff peak refers to tariffs above 15% and tariff escalation refers to tariffs that increase with the level of processing. (UNCTAD, 2005; IMF and WB, 2001)

[4] NTBs (Non Tariff Barriers) those relates to technical regulations and standards, sanitary and phyto sanitary measures, environmental conditions and anti-competitive market structures and practices. (UNIDO, 2002; UNCTAD, 2005)

trade barriers affect 41% of merchandize exports of LDCs but only 21% of other developing countries. In this regard, Mold (2005) estimated the potential loss of Africa's trade through the imposition of higher quality standards and phyto sanitary controls in the export market and indicates that the potential loss can run into millions of dollars. In relation to this, Kirchbach and Mimouni (2003) also notes that LDCs are the most exposed to NTBs and in their estimation they show that while 40% of LDCs exports are subject to NTBs , the figure for developing and transition economies is only 14%.

Developed countries have designed and offered a preferential access schemes (EBA and AGOA)[5] for poor developing countries in order to ensure a better access to their market with out asking in exchange a reciprocal treatment (Kirchbach and Mimouni, 2003), and integrate them into the world trading system and there by raising their export earnings (Paul, 2003). Even though, to some extent, the restrictive effects of tariff and non tariff measures are mitigated by these preferential access schemes for poorer countries, these schemes are still affected by the existence of tariff peaks and tariff escalation (IMF and WB, 2001) and strict rules of origin[6] (Mold, 2005; Paul, 2003). Due to these barriers, these schemes for poorer countries have not proven very effective in increasing market

[5] The European Union's 'Everything But Arms' (EBA) policy is a development initiative designed to offer least developed countries tariff- and quota-free access to the Union's market for all exports, with the exception of armaments. EBA was introduced in March 2001. (Gibb, 2006)
The African Growth and Opportunity Act (AGOA), which was signed into United States (US) law in May 2000, offers preferential access to Sub-Saharan Africa's (SSA) products in US markets. In return, beneficiary countries must commit to improve their economic policy environment, participate more actively in the globalization process, promote political and economic stability, and foster human and workers' rights in Africa (Mattoo, Roy and Subramanian, 2002, as cited in Nouve and Staatz, 2003)

[6] Rules of origin oblige beneficiary countries to prove that a high percentage of the value-added has been created within national territory, thereby restricting sourcing from third countries. (Mold, 2005; Paul, 2003)

access for these countries (IMF and WB, 2001). In this regard, Paul (2003) has analyzed the impacts of EBA on LDCs exports and shows that the direct impact of EBA has no so far significant. On the other hand, Mattoo et.al. (2002) as cited in Mold (2005) estimated the benefits of AGOA for Africa and finds that the benefits would be about five times greater if exporting countries were not subject to the restrictive rules of origin imposed by the United States.

Apart from these trade barriers, foreign market access is also determined by international transportation costs (UNCTAD, 2006), which is the most important element for countries to supply their exports at a competitive price in the world market. In this regard, Mbekeani (2007) argues that trade performance and competitiveness are affected by international transport costs (costs of moving goods between countries), and by the way in which these costs affect imports as well as exports. High transport costs for moving goods from points of production to final destinations can price a country out of export markets (Mbekeani, 2007) and are key determinants of a country's ability to participate fully in the world economy and especially to grow exports (Limão and Venables, 2001; Edwards and Odendaal, 2008). Today transport cost represent a significant barrier to African exports (Amadji and Yeats, 1995; Biggs, 2007; Matthee, Grater and Krugell, 2007; Edwards and Odendaal, 2008) and represent a large component of the final cost of the export product (Mbekeani, 2007; Biggs, 2007). Analysis on low-income countries indicates that transport costs are amongst the most important of trade barriers (Porto, 2005 as cited in Matthee, Grater and Krugell, 2007). According to empirical studies, the

general consensus is that international transport costs negatively affect a country's trade volumes (Matthee, Grater and Krugell, 2007).

For countries located far from markets, the effect of transport costs on trade is more severe. Distance is an important part of international trade relations. As distance increases, trade volumes decrease (Venables, 2001 as cited in Matthee, Grater and Krugell, 2007). Limão and Venables (2002) demonstrate that exports and imports of both final and intermediate goods bear transport costs that increase with distance. Remoteness from economic activity increases transport costs and accounts for the poor export performance of many developing countries situated far from the major markets (Venables, 2005 as cited in Matthee, Grater and Krugell, 2007).

Apart from a country's external geography, its internal geography (whether it is landlocked or coastal) also affects transport costs (Matthee, Grater and Krugell, 2007). Landlocked countries tend to have poor internal geography (access to ports), which correlates negatively with transport costs (Redding & Venables, 2003). Therefore, landlocked country's transport costs are higher and they have lower trade volumes than coastal countries (Radelet & Sachs, 1998 as cited in Matthee, Grater and Krugell, 2007; Limão & Venables, 2001). Moreover, exporters situated in landlocked countries incur extra costs since products have to switch between more modes of transport than is the case for coastal countries (Martínez-Zarzoso,Gracía-Menéndez and Suárez-Burguet, 2003 as cited in Matthee, Grater and Krugell, 2007).

III. Model Specification, Data and Empirical results

3.1. Model Specification

3.1.1. Gravity Model of International Trade

Decomposition of export performance into foreign market access and internal supply capacity requires use of bilateral trade information in a gravity model. Gravity model offers an explanation of countries' trade flows in terms of exporter and importer country characteristics and 'between country' information, particularly distance (Stephen and Venables, 2003).

The gravity model originates from the Newtonian physics notion. Newton's gravity law in mechanics states that two bodies attract each other proportionally to the product of each body's mass divided by the square of the distance between their respective centers of gravity (Rahman , 2006). The gravity model for trade is analogous to this law. The analogy is as follows: "the trade flow between two countries is proportional to the product of each country's 'economic mass', generally measured by GDP, each to the power of quantities to be determined, divided by the distance between the countries' respective 'economic centers of gravity', generally their capitals, raised to the power of another quantity to be determined" (Christie 2002:1 as cited in Rahman, 2006). Hence, the gravity model is formed on the central idea that income and distance between countries are positive and negative determinants of bilateral trade, respectively (Alemayehu & Atnafu, 2008).

In international trade, the gravity model was first introduced by Tinbergen (1962) and Pöyhönen (1963) mainly to account for the patterns of bilateral trade flows among the European countries (Sohn,2001). Since then, the gravity model has been used and increasingly improved in empirical studies of international trade flows. In the last decade, the application of gravity models enjoyed a big revival not so much by its more rigorous theoretical foundation but by the opportunity to project bilateral trade relations (Egger, 2002).

Some authors argue that though gravity model fits the data well, it has no theoretical foundation (see Rose 2004; Eichengreen et al 2004; and Frankel and Wei, 1995 as cited in Atnafu, 2007). According to Rose (2004) as cited in Atnafu (2007), the gravity model is a successful model in two senses: first, the estimated effect of distance and output (the traditional gravity effects) are sensible economically and statistically significant, and reasonably consistent across studies; second, the gravity model explains most of the variations in international trade.

Although gravity models have been criticized for their luck of theoretical underpinnings, empirically they seem to perform particularly well, and are therefore well suited for policy analysis (Matyas & Harris, 1998). According to these authors, a major drawback of all studies prior to Matyas (1997, 1998) and Matyas et al. (1997) lies in the nature of the data used, and the explicit (or implicit) model restrictions implied it: inference was drawn either upon a cross-section of country data in one time period, or upon single time series of data in a country by country approach, which imposed severe explicit (or

implicit) restrictions on the specification of the model. In order to account for heterogeneity across countries in trade flows, recently gravity models have been generalized and adopted to a panel data setting, where several time-series of cross-section data sets were pooled (Matyas & Harris, 1998).

Due to the successive works of various economists the gravity model has gradually developed into a systematic economic model with a strong economic foundation (Sohn, 2001). Works by Krugman and Helpman (1985), Bergstrand (1989), Deardorff (1995) and Evenett and Keller (1998) greatly contributed to the establishment of a theoretical foundation for the gravity model by showing that the gravity equation can be derived from a number of different international trade models (Sohn, 2001). As indicated by Sohn (2001), while Anderson (1979) and Krugman & Helpman (1985) tried to identify the relationship between the bilateral trade flows and the product of two countres' GDPs by utilizing the Differentiated Products Model, Deardorff (1995) has shown that the gravity model can be derived from several variants of the H-O Model.

Oguledo and MacPhee (1994), as cited in Atnafu (2007), have derived the gravity equation from a linear expenditure system. They note, as cited in Atnafu (2007), "this new approach is another attempt to answer recent criticism that the theoretical foundation of the gravity model is weak.

Feenstra (2002), on his part, note that Constant Elasticity Substitution (CES) monopolistic competition model is an especially convenient way to derive the gravity equation, especially when we allow for transport costs and other trade barriers. According to this author, Anderson (1979) was the first to derive the gravity equation while taking into account these price differences across countries.

In the following section, we will see how the Constant Elasticity Substitution monopolistic competition model is useful in deriving a gravity model in order to analyze export performance of a country.

3.1.2. Theoretical Framework for Modeling Export Performance

Stephen and Venables (2003), and Fugazza (2004) developed a theoretical framework using one of the international trade model, that is a trade model based on product differentiation derived from a constant elasticity of substitution (CES) demand structure for estimating the gravity model in order to analyze export performance of a countries'. Thus, we follow the approach of Stephen and Venables (2003), and Fugazza (2004) to develop a relevant theoretical framework for modeling export performance of Ethiopia. Following Stephen & Venables (2003), and Fugazza (2004), we consider the range of products produced in each country **i** and the demand for differentiated products by country **j** is modeled by the constant elasticity utility function of the form:

$$U_j = [\sum n_i x_{ij}^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \quad , \sigma > 1 \qquad (1)$$

where **Uj** denotes utility function of country **j**; **σ** is the elasticity of substitution between any pair of products; $\mathbf{n_i}$ refers to the set of varieties produced in country **i**; $\mathbf{x_{ij}}$ is the consumption in country **j** of a single product variety from this set.

In this framework, the demand in country **j** for each variety is given by the form:

$$\mathbf{X_{ij} = p_{ij}^{-\sigma} E_j G_j^{(\sigma-1)}} \qquad (2)$$

where $\mathbf{G_j = [\sum^R_i n_i p_{ij}^{1-\sigma}]^{1/1-\sigma}}$, refers to the price index defined over the prices of individual verities ($\mathbf{p_{ij}}$) produced in **i** and sold in **j** ; $\mathbf{E_j}$ is country's **j** total expenditure on differentiated products; $\mathbf{E_j\ G_j^{(\sigma-1)}}$ is a scale factor that indicates the position of the demand curve in market **j**; and **σ** refers to the own price elasticity of demand and identical across varieties.

It is assumed that the producer price $\mathbf{p_i}$ is the same for all varieties produced in country **i**. Transport frictions, which reflect the cost of getting a good from country **i** to country j, are set proportional to producers price. This cost includes: the cost of getting the product to and from the boarder in countries **i** and **j** ($\mathbf{t_i}$ **and** $\mathbf{t_j}$ respectively) and the cost of getting the product across the boarder ($\mathbf{T_{ij}}$). While intra-country cost ($\mathbf{t_i}$ **and** $\mathbf{t_j}$) would reflect internal geography and infrastructure, inter-country cost ($\mathbf{T_{ij}}$) would reflect external geography and policy barriers. Thus price $\mathbf{p_{ij} = p_i t_i T_{ij} t_j}$, which refers to the cost of delivery of a product from country **i** to market **j**.

The value of total exports of country **i** to country **j**, therefore, take the form

$$n_i p_i x_{ij} = n_i p_i^{1-\sigma} (t_i T_{ij} t_j)^{1-\sigma} E_j G_j^{\sigma-1} \quad (3)$$

This equation of bilateral trade flows provides a theoretical support for estimation of a gravity trade model. This equation can be re-written as

$$n_i p_i x_{ij} = [n_i (p_i t_i)^{1-\sigma}](T_{ij})^{1-\sigma}[E_j (G_j/t_j)^{\sigma-1}] \quad (4)$$

The right hand side of this equation contains both importer and exporter country characteristics. The term $n_i(p_i t_i)^{1-\sigma}$ reflects supply capacity of the exporting country. It is the product of the number of varieties and their price competitiveness. The last term $E_j(G_j/t_j)^{\sigma-1}$ refers to market capacity of country j: it depends on total expenditure in country j, on internal transport costs t_j, and on the number of competing varieties and their price expressed in the price index.

Denoting market capacity and supply capacity by M_j and S_i respectively, so

$$M_j = E_j (G_j/t_j)^{\sigma-1}, \qquad S_i = n_i (p_i t_i)^{1-\sigma} \quad (5)$$

Therefore, from equation number 4, bilateral trade flows can be expressed as the product of exporter supply capacity, importer market capacity, and the term $T_{ij}^{1-\sigma}$ which measure bilateral trade costs between them. Hence,

$$n_i p_i \sum x_{ij} = S_i \sum (T_{ij})^{1-\sigma} M_j \quad (6)$$

Considering each country's overall export performance, the total value of exports at the country level can be expressed as

$$x_i = n_i p_i \sum x_{ij} = S_i \sum (T_{ij})^{1-\sigma} M_j \quad (7)$$

where the term $\sum(T_{ij})^{1-\sigma} M_j$ refers to country **i** foreign market access $\mathbf{FMA_i}$. Therefore this equation implies that the product of supply capacity and foreign market access gives the total value of exports of a country.

3.1.3. Empirical Model for The Study

Based on the above theoretical concepts, it is possible to distinguish between foreign market access and supply capacity determinants of export performance of Ethiopia using the bilateral trade information between Ethiopia and its trading partners. Thus, the value of total exports of Ethiopia to all destinations is given by:

$$\mathbf{X_{ij}=f(SC_i,FMA_{ij})} \qquad (8)$$

where $\mathbf{X_{ij}}$ = the value of total exports from country i (Ethiopia) to country j (its trading partner)

$\mathbf{SC_i}$ = Supply Capacity of Ethiopia

$\mathbf{FMA_{ij}}$ = Market access condition of Ethiopia's trading partner

In section two, we surveyed the most important determinant of export performance of a country as identified in the literature. In this section, we empirically take into account those determinants.

Therefore, the foreign market access variable can be written as a function:

$$\mathbf{FMA_{ij} = g[GDP_j, \sum(T_{ij})^{1-\sigma}]}$$

where $\mathbf{(T_{ij})^{1-\sigma} = f\,(Dist_{ij}, Trade\ Policy)^{1-\sigma}}$

FMA contains the impacts of the importing country's j characteristics such as economic size of the country (GDP), and factors affecting costs related to trade flows i.e. transport costs, and policy barriers (tariff and NTBs).

On the other hand, supply capacity can be written as a function:

$$\mathbf{SC_i = h\ (GDP_i, FDI_i, INF_i, RER_i, IQi)}$$

where GDP explain the economic potential of the exporting country, while FDI, internal transport infrastructure (INF), real exchange rate (RER), and institutional quality (IQ) affect the exporting country's ability to adjust to the changing global demand patterns.

Hence, the model we estimate to analyze export performance of Ethiopia is as follows

$$\mathbf{lnXijt = \alpha + \beta_1 lnGDP_{it} + \beta_2 lnFDI_{it} + \beta_3 lnINF_{it} + \beta_4 lnIQ_{it} + \beta_5 lnRER_{ijt} + \beta_6 lnGDP_{jt} + (1-\sigma)[\beta_7 lnFTP_{jt} + \beta_8 lnDIST_{ijt}] + U_{ijt}} \quad (9)$$

where $\mathbf{X_{ijt}}$ represents the value of Ethiopian exports to her trading partner j (in million US dollars) at time t.

$\mathbf{RER_{ijt}}$ represents the average real exchange rate between Ethiopia and her trading partner country j at time t.

$\mathbf{GDP_{it}}$ represents the value of gross domestic product of Ethiopia at current market prices (in million US dollars) at time t.

$\mathbf{GDP_{jt}}$ represents the value of gross domestic product of country j at current market prices (in million US dollars) at time t.

$\mathbf{FDI_{it}}$ represents FDI stock of Ethiopia (in million US dollars) at time t.

$\mathbf{INF_{it}}$ represents internal transport infrastructure of Ethiopia (captured by % age of paved roads out of the total roads) at time t.

IQ_{it} represents institutional quality index of Ethiopia at time t.

FTP_{jt} represents foreign trade policy index of country j at time t.

$DIST_{ijt}$ represents the weighted distance between Ethiopia and her trading partner j at time t.

U_{ijt} represents stochastic term a log-normally distributed error with E (lnU_{ij}) =0

3.2 Data and Definition of Variables

In order to deduce sound conclusions from the empirical study, choosing appropriate period of time and as many countries as possible into the sample is desirable. The study covers the period between 1995 and 2007 for a total of 30 Ethiopia's trading partners. The countries are chosen on the basis of the importance of trading partnership with Ethiopia and on the availability of data on the different variables.

1. Export (X)

Annual data on Export value (in million US dollars) of Ethiopia to its each 30 trading partners are mainly collected from IMF DOTS 2008 CD-ROM.

2. Real Exchange Rate (RER)

Real exchange rate is a useful general indicator of a country's international price competitiveness. International price competitiveness is regarded as a key determinant of a country's international trade in goods and services. If competitiveness improves, exports increase. The data on nominal real exchange rate and price indices are collected from International Financial Statistics Year Book 2008. In order to calculate the average real

exchange rate, we apply the IMF definition of real exchange rate: real exchange rate as price of domestic currency against foreign currency:

$$\mathbf{RER = E.\ P^*/\ P}$$

where , ***E*** is the bilateral nominal exchange rate , P* is consumer price index of the foreign country and P is domestic consumer price index (Ethiopia in this case).

Hence, the fall of domestic currency in terms of foreign currency results devaluation of home currency and if the price of domestic currency against the foreign currency rises, the home currency will appreciate. Generally it is believed that while devaluation of the home currency will decrease export price, appreciation of the home currency will raise export price. Therefore, the real depreciation of the exchange rate enhances the competitiveness of the domestic goods vis-à-vis foreign goods. On the other hand, an appreciation in real exchange rate will decrease competitiveness of home goods in international markets.

3. Internal Transport Infrastructure (INF)

Internal transport infrastructure is captured by the percentage of paved roads out of the total roads. Data on percentage of paved roads is taken from the World Development Indicators database. The permanent link for the WDI site is:

http://go.worldbank.org/IW6ZUUHUZ0

A higher rating indicates a better infrastructure. Better infrastructure should lead to higher trade and therefore more exports from Ethiopia. Thus, the coefficient of internal transport infrastructure is expected to be positive.

4. Domestic and Foreign Income

Since exports are the difference between domestic supply and domestic demand, they should be affected by the growth in domestic income. When the country grows, both domestic demand and domestic supply are shifted, and therefore the expected overall effect of domestic income on exports is ambiguous.

The import demand of the foreign countries is determined by their income. The higher the income (or GDP) of the importing country, the greater the demand for imports and thus Ethiopia's exports. Hence, the coefficients of Ethiopia's trading partner *GDP* are expected to have positive signs.

Data on GDP of Ethiopia and its trading partners (in million US dollars) are collected from World Economic Outlook Data Base.

5. Distance

In the standard specifications of the gravity equation, geographical distance is used as proxy of transport costs or remoteness implying that the coefficient of this variable is expected to have a negative sign. Due to its time invariant nature, definition of the distance is problematic. Although it is not a problem in cross sectional analysis, the variable causes a problem when time dimension is entered in the analysis (i.e. panel-data). In order to overcome this problem and to make distance a varying variable over time, we use the formula developed by Karagoz and Saray (2008) to calculate weighted distance. The formula is given by:

$$\mathbf{WDIST = (Distance_{ij} \times GDP_{it}) / \Sigma GDP_i}$$

where , $wdist_{ij}$ is the weighted distance between country i (Ethiopia in this case) and j

(Ethiopia's trading partners in this case); $dist_{ij}$ is the geographical distance between countries i and j; GDP_{it} is GDP of country i at year t; and ΣGDP_i is overall sum of the GDPs of country i (the sum covers the period from 1995 to 2007 in this study).

Data on the distance between Ethiopia and her trade partner countries are collected based on the distance between Addis Ababa and capital at Ethiopia's trading partners. These data are available from: www.indo.com/distance

Based on the data available from the above sites, we calculate the weighted distance between Ethiopia and its trading partner.

6. Foreign Trade Policy (FTP)

Trade policy is a measure of the absence of tariff and non-tariff barriers that encourage the free flow of foreign commerce. Trade policy in this study is proxied by trade policy index, which is collected from Index of over all Economic Freedom created by Heritage Foundation. The data is available at:

http://www.herirage.org/research/features/index/downloads/academicuserGuide.pdf

The index ranges from 0 to 100. A country with zero tariffs and non-tariff barriers will have a trade freedom score of 100 i.e. 100 signifies an environment that is most conducive to trade. Given that more freedom encourages trade, the sign of the index variable is expected to be positive.

7. Foreign Direct Investment (FDI)

FDI could represent a measure of production development in the export sector. It can be expected to contribute to the enhancing of a country's competitiveness on international markets by increasing the technological content of exports. FDI is included in this study

as stock since FDI stock measures its productive capacity. As it is believed that transformation of the composition of exports increases with FDI, the sign of this variable is expected to be positive.

Data on FDI stock is taken from UNCTAD World Investment Report 2008 – online at: http://stats.unctad.org/FDI/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=n

8. Institutional Quality (IQ)

The institutional environment encompasses macroeconomic stability and openness to trade, as well as the enabling environment for markets consisting notably of the legal and judiciary system, the financial system, taxation, labour relations, investment procedures and customs administration (UNCTAD, 2008). The World Bank estimates the institutional quality of a particular country in terms of rule of law, government effectiveness, regulatory quality and control of corruption. The rank (out of 100) is given for each component. So, we take the aggregate value of the four components as a proxy for Ethiopia's institutional quality. A higher aggregate value is associated with better institutional quality. Hence, the sign of this variable is expected to be positive.

3.3 Model Estimation and Interpretation of Results

Before setting up our estimation models, we have to explore whether the variables specified in our model are drawn from a normally distributed random variables. It is performed graphical (histogram and box plot) and numerical inspection (Skewness-Kurtosis test, SK) for testing normality and these indicates that, for most of the variables

in our sample, the null hypothesis of a normally distributed random variable is rejected. In order to make the variable as close as to a normally distributed one, we take the log transformed variables. The graphical and numerical inspection of the log transformed variables confirms that they exhibit near normal distribution than the variables in levels (see details in figures Appendix A1 and A2; tables 1,2,3 and 4). Following Galmacci and Pannone (1990), it is performed Variable Inflation Factor (VIF) Analysis to check for multicollinearity. The analysis indicates that all the variables have a VIF value less than 10, meaning there is no a problem of multicollinearity in our data (see table 5).

We have conducted diagnostic analysis to examine which estimation technique fits the model and the data well (see detail in table 6). In order to examine the presence of individual and/or time effects in our data, it is performed random effects test. The Lagrange Multiplier (LM) test, developed by Breusch and Pagan (Green, 2003 as cited in Park, 2008), indicates the presence of individual and time effects in our data. Hausman specification test is performed to discriminate between fixed and random effects model. The test result indicates that the random effect is strongly preferable to the fixed effects model.

One common problem encountered in panel data studies is a problem of heteroskedasticity, whose presence renders OLS estimators inefficient. Following Breusch and Pagan (1979) as cited in Atnafu (2007), Breusch and Pagan test for heteroskedasticity is applied, and the null hypothesis of homoskedastic disturbances is

rejected at 1 percent significance. Since the presence of serial correlation biases the standard errors and causes the results to be less efficient, we should be concerned about testing for it. The testing reports a modified Bhargava et. al Durbin-Watson value of 1.29, which is very less than 2.This indicates the presence of serial correlation.

The issue of endogeneity is also examined and tested with Hausman test. With endogeneity being detected and not corrected at its presence, the parameters estimated from ordinary random effects model are biased and inconsistent. The test shows that GDP and FDI are endogenous. Therefore to circumvent this problem, lagged values of these endogenous variables are considered and Instrumental Variable (IV) or Two Stage Least Square (2SLS) estimation is used to take into account these endogeneity issues in estimating the empirical models. Since Generalized Least Squares (GLS) estimation is efficient in the presence of heteroskedasticity and serial correlation, our model is estimated with Generalized Two Stage Least Squares (G2SLS) estimation.

The estimation result indicates that our model has overall R^2 of 0.57. Overall, the variables in our model are jointly significant. This is evidenced by the Wald statistic of 135.77 with a p-value of zero at 1%. (See the details in the following table)

TABLE 3.1: <u>G2SLS RANDOM-EFFECTS IV REGRESSION RESULT</u>

DEPENDENT VARIABLE: LOG OF ETHIOPIA'S EXPORT TO ITS TRADING PARTNERS

Independent Variable	*Coefficient*	*t-ratio*	*p-value*
Log of GDP of Ethiopia	*1.295024**	*3.06*	*0.002*
Log of GDP of trading partner	*0.9342211**	*6.69*	*0.000*
Log of FDI of Ethiopia	*-0.3159379*	*-1.52*	*0.129*
Log of IQ of Ethiopia	*1.365431***	*2.43*	*0.015*
Log of INF of Ethiopia	*1.067096**	*2.13*	*0.034*
Log of RER between Ethiopia and its trading partners	*0.0232066*	*0.49*	*0.626*
Log of Distance between Ethiopia and its trading partners	*-0.8812179***	*-2.16*	*0.031*
Log of Foreign trade policy	*0.6607988****	*1.75*	*0.080*
Constant	*-9.192575*		
R^2 within = 0.1394	*Wald chi^2 (8) = 135.77*		
between = 0.7519	*Prob > chi^2 = 0.0000*		
overall = 0.5664			
Number of observations = 360			

**significance at 1%, **significance at 5%, ***significance at 10%*

Regarding the major supply side variables, all the variables except real exchange rate and FDI are found to be statistically significant. As the result indicates, the log of the institutional quality variable is entered with a positive sign at 5% significance level. The positive coefficient of the variable indicates that Ethiopia's export depends on institutional quality of the country. From the estimated results, holding other things unchanged, it is evident that a 1% improvement in the institutional quality leads to a 1.37% increase of exports to its trading partners. The estimated result also indicates that internal transport infrastructure, measured by the log of % age of paved roads out of the total roads, is significant at 5%. FDI and real exchange rate are statistically insignificant though the sign of the FDI variable is negative which is against our hypothesis. The result also suggests that log of domestic income (GDP) is statistically significant at 1% and has a positive sign. From the estimated results, it can be projected that with a 1% increase in GDP, other things equal, there would be a 1.29% increase in export supply.

All the variables that determine foreign market access conditions are found to be statistically significant with the expected signs. Log of GDP of the trading partners, which determines their import demand, is statistically significant at 1%. A 1% GDP increase of the trading partners would increase their demand for Ethiopian exports by 0.93%. A distance variable, which is a proxy for transport costs, is entered with a negative sign at a 5% significant level. The negative coefficient of this variable indicates that the distance between Ethiopia and its trading partners affects Ethiopian export

negatively. A 1% difference in distance will reduce Ethiopian exports by 0.88%. The estimated result also indicates that trade policy of Ethiopia's trading partners has a significant effect on Ethiopia's exports. The log of this variable is entered with a positive sign as expected at a 10% level of significance. The estimated result evident that a 1% improvement in the conduciveness of their policies (i.e. a 1% increase in their openness) would increase other things equal, Ethiopian exports to these countries by as much as 0.66%.

IV. Conclusion and Policy Implications

Since 1992 Ethiopia has taken different measures for the development of the external sector. Due to these measures, some improvements in export performance have been registered during the post reform period. However, Ethiopia's share in the world total exports is still at a very lowest stage, which was 0.01% in 2006 (WTO, 2007). This study, thus, attempted to identify the factors that contribute for the poor export performance of Ethiopia. We followed the empirical approach of Redding and Venables (2003) and Fugazza (2004), which helps us to decompose export performance of individual countries into supply capacity and foreign market access conditions. Based on these approaches, we have specified an econometric gravity model of bilateral trade flows between Ethiopia and its trading partners. Using annual data of Ethiopia and its 30 trading partners for the years 1995-2007, we investigated these issues.

The empirical result suggests that supply side conditions are one of the major factors that determines export performance of Ethiopia. Besides domestic income, the major supply side factors such as internal transport infrastructure and institutional quality are found to be statistically significant and affects Ethiopian exports positively; where as FDI and real exchange rate are found to be statistically insignificant.

According to the estimated result, foreign market access condition also plays a significant role in export performance of Ethiopia. The result suggests that income of the trading partners, which determines their market capacity or import demand, trade openness of the

trading partners and distance, which is a proxy for transport costs, are the major determinant factors. While trading partners income and trade openness affect Ethiopian exports positively, distance between Ethiopia and its trading partners affects Ethiopian exports negatively.

These findings carry various policy implications.

1. In many literatures it is noted that depreciation of the real exchange rate of a particularly country shows the gain in competitiveness of that country. In this study, it is found that depreciation of real exchange rate is statistically insignificant, meaning it does not increase the competitiveness of Ethiopian exports in the world market. So, how can Ethiopia enhance its competitiveness in the global market?

   It is evident from the experience of East Asia that they were able to maintain their export competitiveness by diversifying away from specializations that involved products for which world demand was growing only slowly (Mytelka, 1999 as cited in Melesse, 2002). In other words, these countries attained competitiveness through their effort to industrialize their economy. Since the world demand for primary products is declining, Ethiopia may not be competitive through exporting primary products according to its existing comparative advantage. So, in order to guarantee a sustainable and long term competitive position in the global market, it is required to create a conducive environment (for instance, regulations for industrialization through sound industrial policy) and generate new capacities in order to diversify the current export structure.

2. The experience in a number of countries suggests that FDI strongly contributes to the transformation of the composition of exports. The policy environment in a given country is paramount for this strong relationship. In this study, the estimated result indicates that FDI has no impact on Ethiopian export performance.

As the WB diagnostic study (2004) indicates, export-oriented FDI projects in Ethiopia have been few and far between. Moreover, foreign investments in Ethiopia have been driven more by market seeking motives than exporting, as compared to local investors and has been influenced by the incentive structure that has a bias against exports. The study also indicates that most agriculture and manufacturing projects are oriented towards the local market and they supply a considerable % age of their products to the local market rather than exporting to the world market. These may be the reasons for the insignificant impact of FDI on export performance of Ethiopia. As FDI can help the diversification of the current export structure to the technological content of exports, it is required to consider major changes in the policy environment in order to attract new export-oriented FDI projects; further reforming the incentive structure and improves the domestic business climate, including government provision of public goods, to enable the existing FDI projects to supply their production to the world market.

3. As the findings suggest, it is necessary for policy makers to take care about all aspects for the development of the export sector. Meaning it should be necessary

to give an emphasis for the improvement in the supply conditions as well as for better access for international markets.

This analysis has been carried out at an aggregate level. Our dependent variable (total export to each trading partner) groups together exports of primary, mineral and manufactured products. In future research work, it may be useful to conduct the analysis at sectoral level. This could enable policy makers to identify which sectors face supply capacity and foreign market access conditions most severely.

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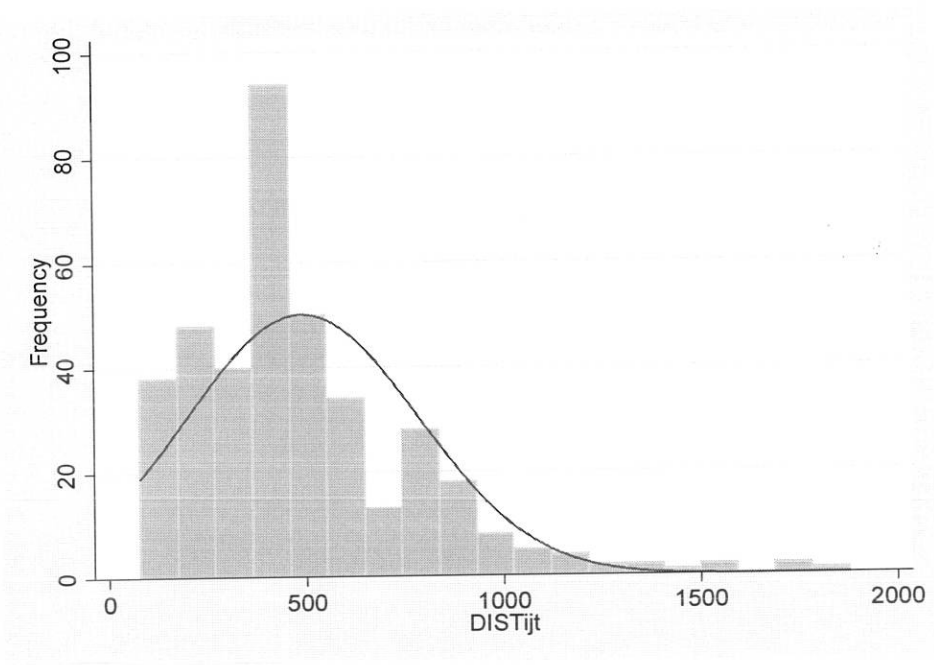
APPENDIX A1. HISTOGRAM AND BOX PLOT OF VARIABLES IN LEVELS



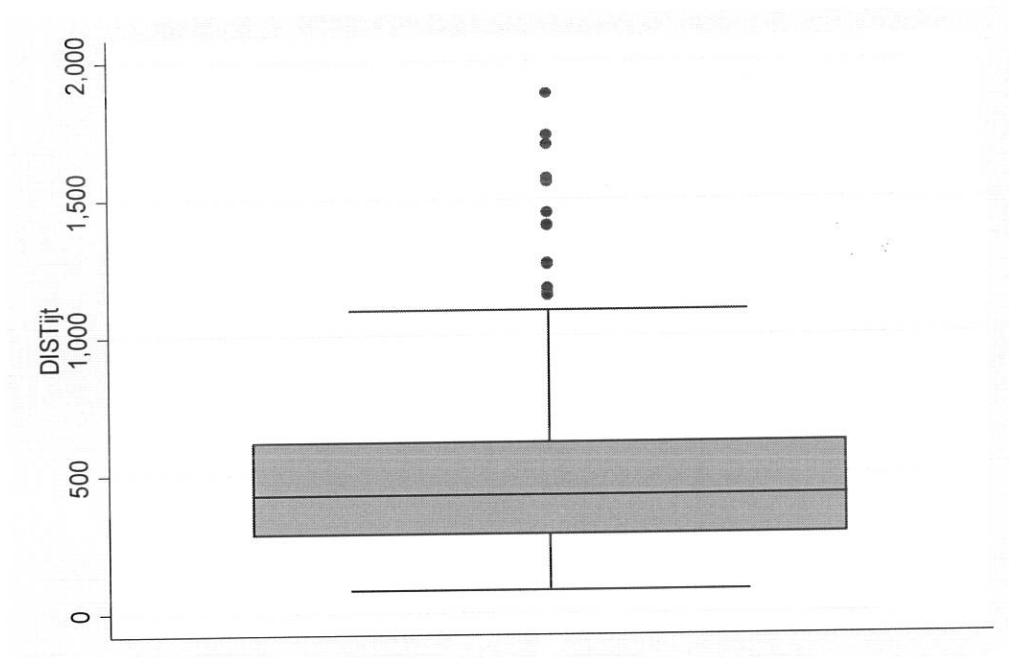
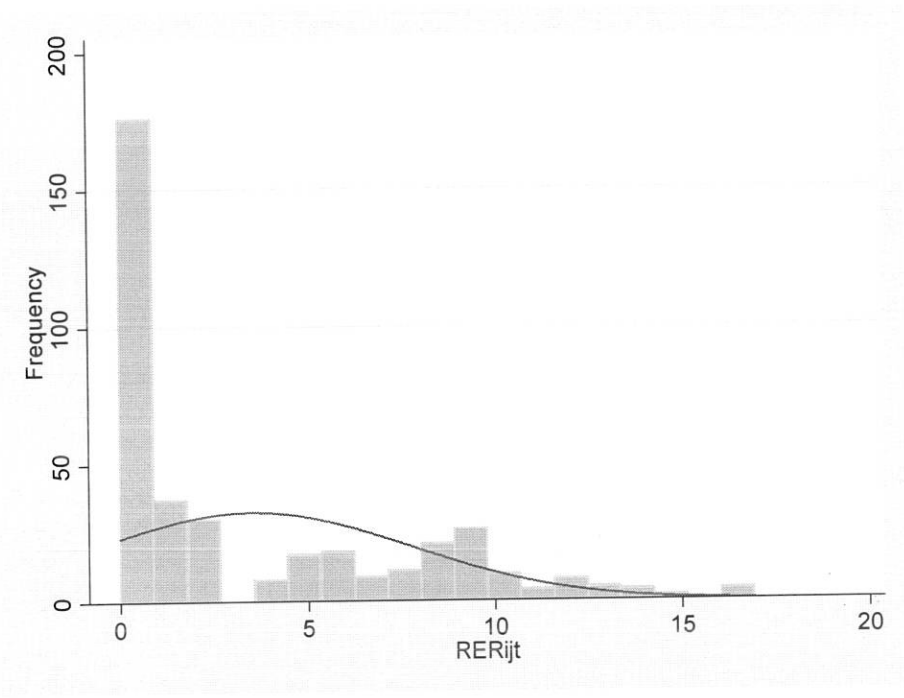


Figure 1: Histogram and Box Plot of Weighted distance between Ethiopia and its trading Partners



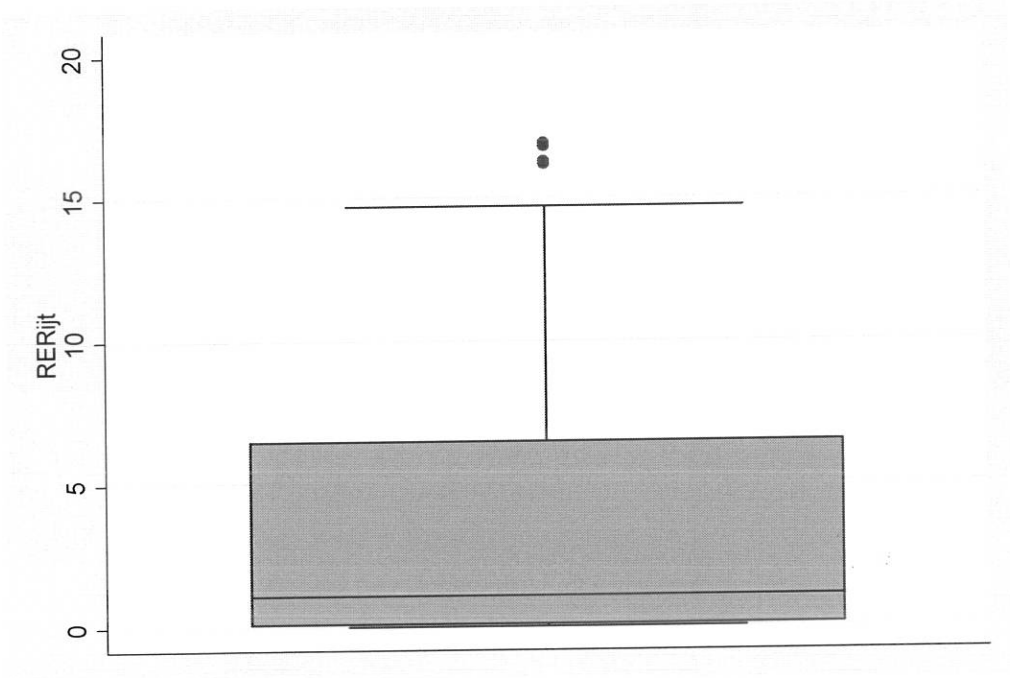
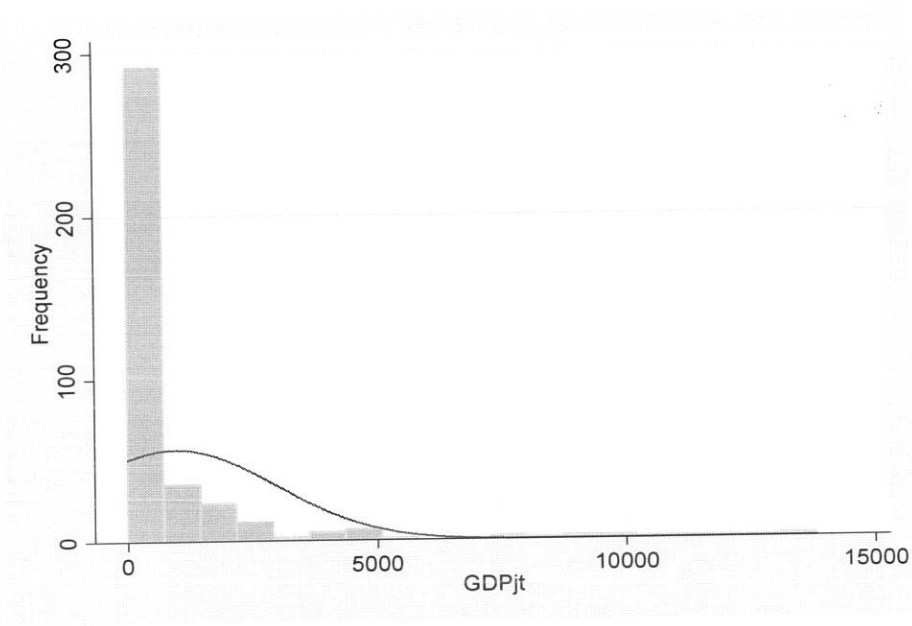


Figure 2: Histogram and Box Plot of Real exchange rate



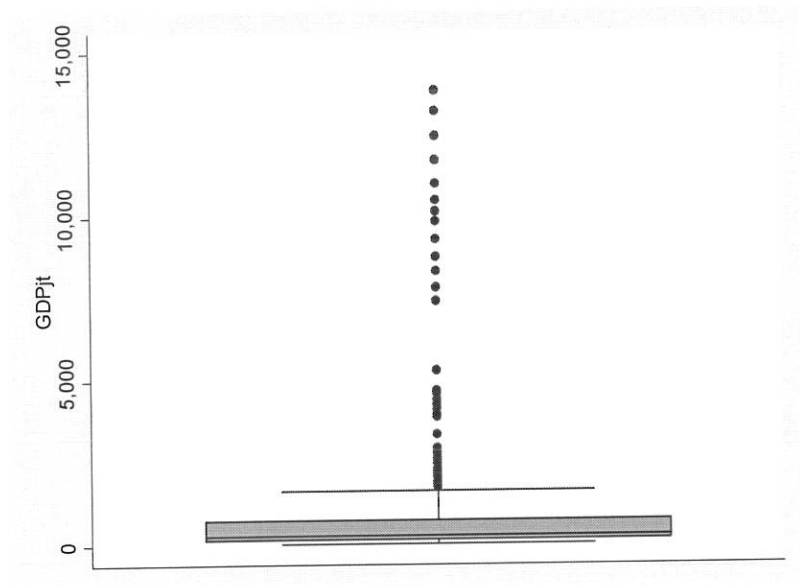


Figure 3: Histogram and Box Plot of GDP of Trading Partners

APPENDIX A2. HISTOGRAM AND BOX PLOT OF LOG-TRANSFORMED VARIABLES

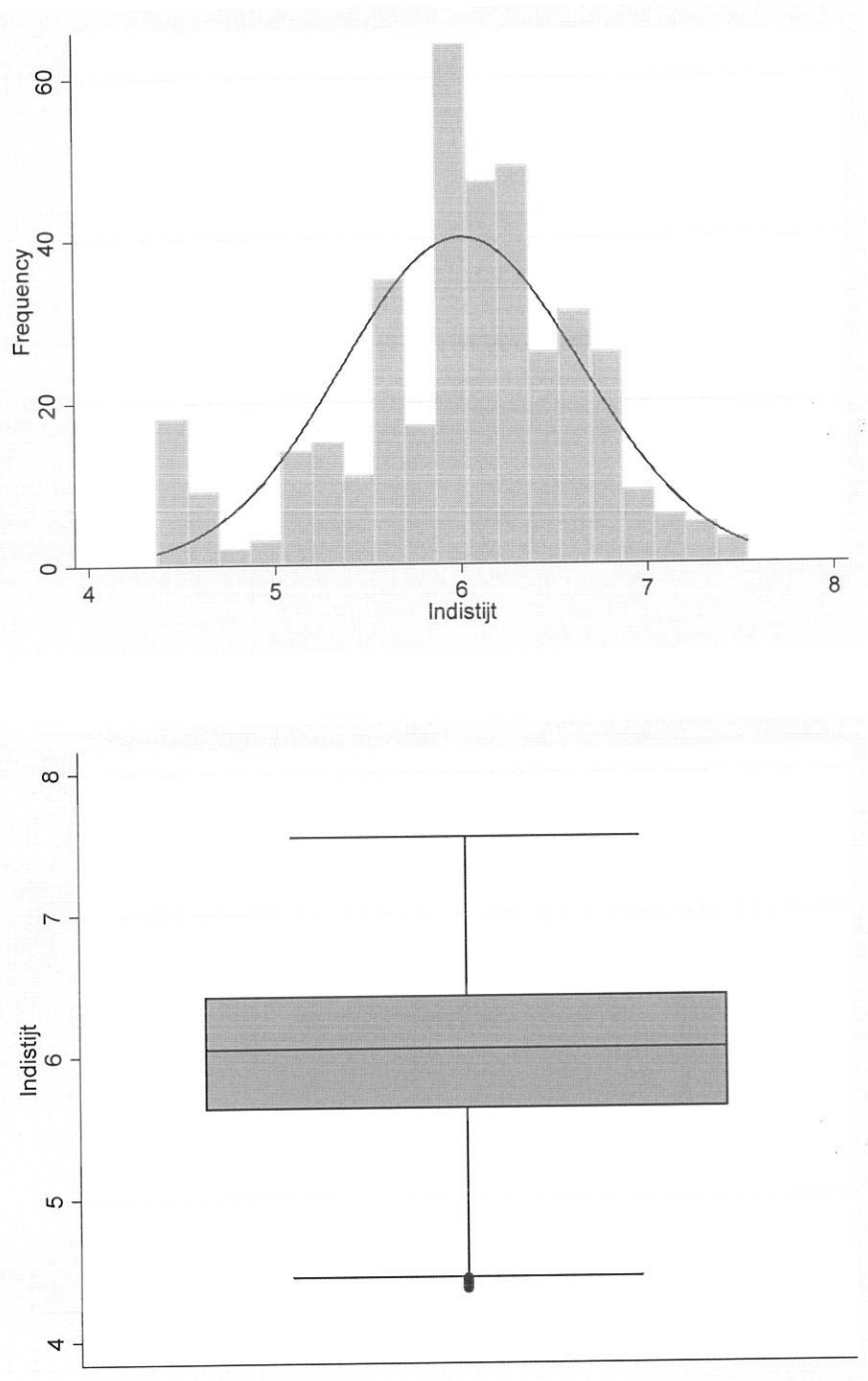


Figure 4: Histogram and Box Plot of log of Weighted distance between Ethiopia and its trading partners

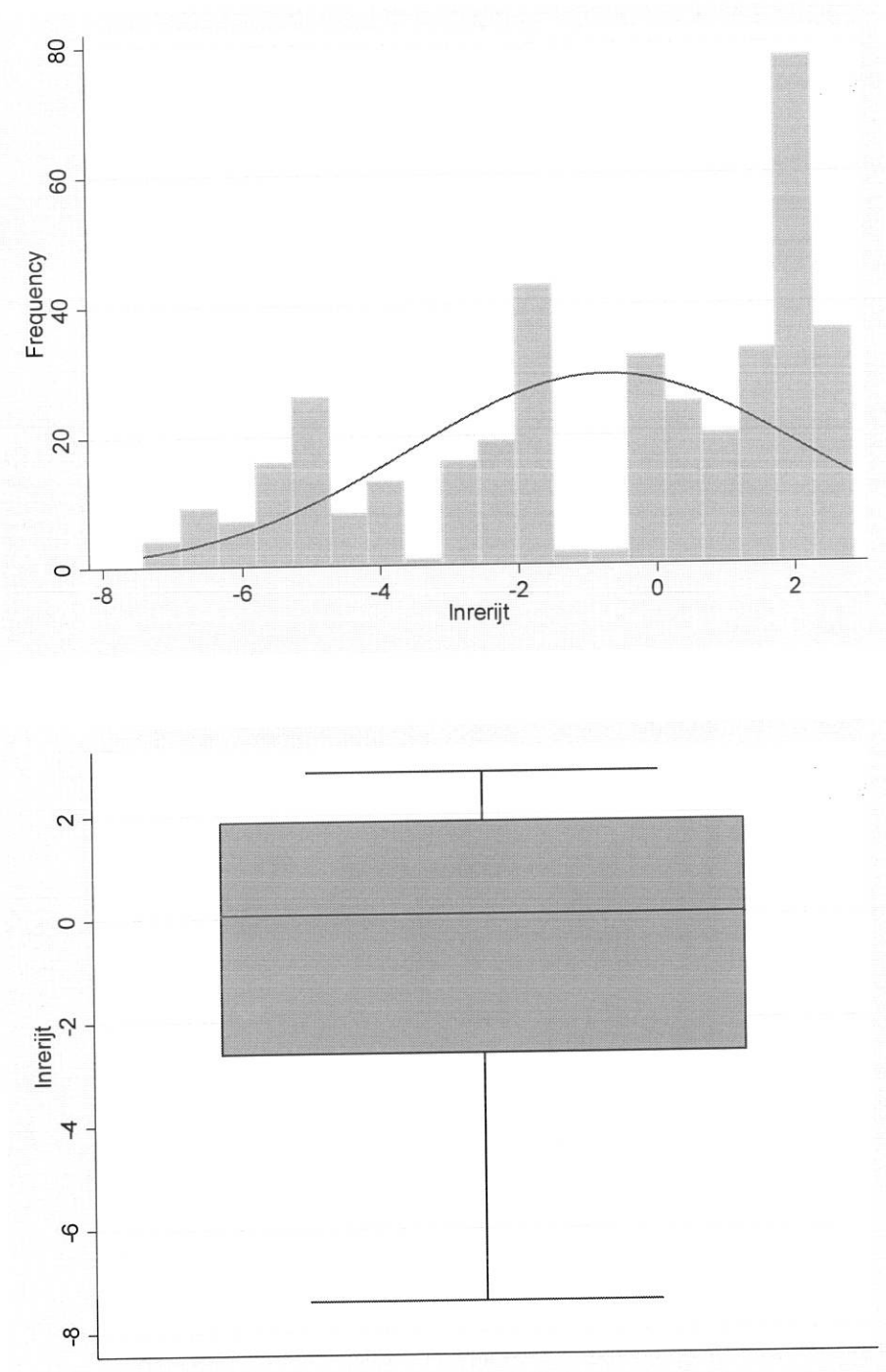


Figure 5: Histogram and Box Plot of log of Real exchange rate

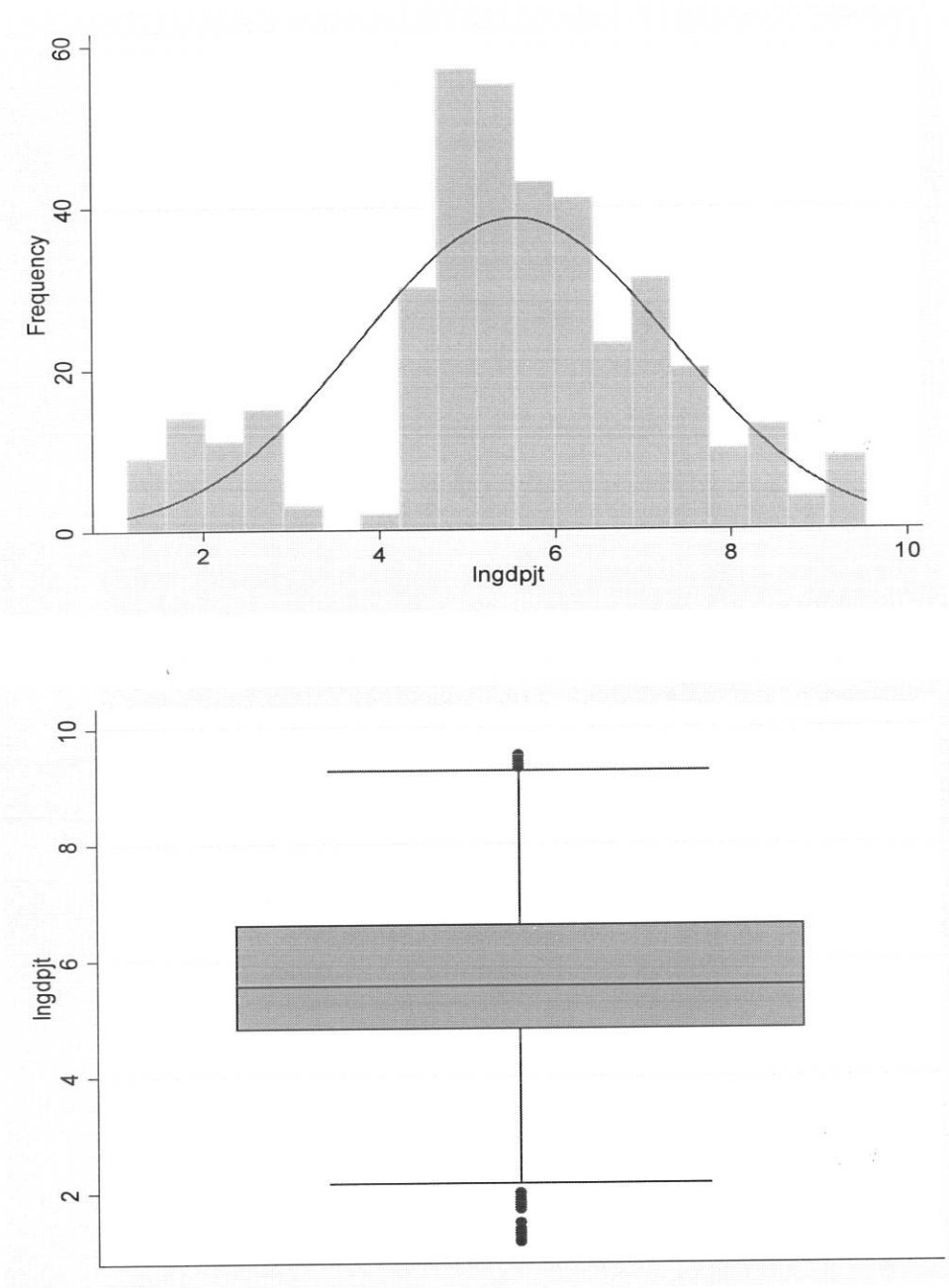


Figure 6: Histogram and Box Plot of log of GDP of Trading Partners

TABLE 1: SUMMARY STATISTICS OF THE LEVEL VARIABLES

Item	*Variable*	*Mean*	*Standard Deviation*	*Skewness*	*Kurtosis*
1	*GDP of Ethiopia**	*9896.308*	*3503.557*	*1.717266*	*4.731039*
2	*GDP of trading partner **	*956776.9*	*2005752*	*4.003875*	*20.55327*
3	*FDI of Ethiopia**	*1578.612*	*1144.714*	*0.4608574*	*1.852876*
4	*INF of Ethiopia***	*13.93769*	*1.921432*	*1.354037*	*4.489121*
5	*IQ of Ethiopia****	*21.38462*	*5.921144 5*	*- 0.5347958*	*2.74631*
6	*RER between Ethiopia and its trading partners*	*3.496149*	*4.270112*	*1.030532*	*2.915353*
7	*Distance between Ethiopia and its trading partners (Km)*	*489.5091*	*294.1017*	*1.38541*	*5.989204*
8	*Foreign trade policy****	*71.85385*	*15.27127*	*-1.957016*	*6.634525*

- *units in millions, **units in % age, ***Score out of 100*

TABLE 2: SUMMARY STATISTICS FOR THE LOG-TRANSFORMED VARIABLE

Item	*Variable*	*Mean*	*Standard Deviation*	*Skewness*	*Kurtosis*
1	*log of GDP of Ethiopia*	*9.151763*	*0.2912171*	*1.41202*	*3.648893*
2	*log of GDP of trading partner*	*13.77134*	*1.783571*	*-0.4049538*	*3.159375*
3	*log of FDI of Ethiopia*	*6.989776*	*0.9808887*	*-0.6339894*	*2.323422*
4	*log of INF of Ethiopia*	*2.625976*	*0.1285789*	*1.045529*	*3.655191*
5	*log of IQ of Ethiopia*	*3.014852*	*0.3295532*	*-1.109349*	*3.206643*
6	*log of RER between Ethiopia and its trading partners*	*-0.7062853*	*2.863351*	*-0.6105816*	*2.079292*
7	*log of Distance between Ethiopia and its trading partners (Km)*	*6.007805*	*0.6460431*	*-0.5684732*	*3.2482*
8	*log of Foreign trade policy*	*4.237622*	*0.3135755*	*-2.988119*	*12.69774*

TABLE 3: SKEWNESS-KURTOSIS TEST FOR NORMALITY (VARIABLES IN LEVELS)

Item	*Variable*	*Pr(Skewness)*	*Pr(Kurtosis)*	*Adj* $\chi^2(2)$	*Prob>* χ^2
1	*GDP of Ethiopia*	*0.000*	*0.000*	.	*0.0000*
2	*GDP of trading partner*	*0.000*	*0.000*	.	*0.0000*
3	*FDI of Ethiopia*	*0.000*	*0.000*	.	*0.0000*
4	*INF of Ethiopia*	*0.000*	*0.000*	*68.87*	*0.0000*
5	*IQ of Ethiopia*	*0.000*	*0.310*	*15.62*	*0.0000*
6	*RER between Ethiopia and its trading partners*	*0.000*	*0.852*	*40.06*	*0.0000*
7	*Distance between Ethiopia and its trading partners (Km)*	*0.000*	*0.000*	.	*0.0000*
8	*Foreign trade policy*	*0.000*	*0.000*	.	*0.0000*

TABLE 4: SKEWNESS-KURTOSIS TEST FOR NORMALITY (LOG-TRANSFORMED VARIABLES)

Item	*Variable*	*Pr(Skewness)*	*Pr(Kurtosis)*	*Adj* $\chi^2(2)$	*Prob>* χ^2
1	*Log of GDP of Ethiopia*	*0.000*	*0.024*	*64.64*	*0.0000*
2	*Log of GDP of trading partner*	*0.002*	*0.429*	*9.97*	*0.0068*
3	*Log of FDI of Ethiopia*	*0.000*	*0.000*	*31.81*	*0.0000*
4	*Log of INF of Ethiopia*	*0.000*	*0.023*	*44.64*	*0.0000*
5	*Log of IQ of Ethiopia*	*0.000*	*0.339*	*45.02*	*0.0000*
6	*Log of RER between Ethiopia and its trading partners*	*0.000*	*0.000*	*56.56*	*0.0000*
7	*Log of Distance between Ethiopia and its trading partners (Km)*	*0.000*	*0.272*	*17.26*	*0.0002*
8	*Log of Foreign trade policy*	*0.000*	*0.000*	.	*0.0000*

TABLE 5: MULTICOLLINEARITY TEST (VARIABLE INFLATION FATOR FOR THE VARIABLES)

Item	*Variable*	*VIF*	*1/VIF*
1	*Log of GDP of Ethiopia*	*2.10*	*0.476410*
2	*Log of GDP of trading partner*	*2.69*	*0.371788*
3	*Log of FDI of Ethiopia*	*9.56*	*0.104610*
4	*Log of INF of Ethiopia*	*1.29*	*0.775580*
5	*Log of IQ of Ethiopia*	*8.45*	*0.118309*
6	*Log of RER between Ethiopia and its trading partners*	*1.41*	*0.708692*
7	*Log of Distance between Ethiopia and its trading partners (Km)*	*2.92*	*0.342557*
8	*Log of Foreign trade policy*	*1.27*	*0.787015*

Mean VIF = 3.71

TABLE 6: SUMMARY OF DIAGNOSTIC TESTS

No.	*Type of Test*	*Observed Statistic*	*P-Value*
1	*Lagrange multiplier test for Presence of random effect*	*232.01*	*0.0000*
2	*Hausman Specification for Fixed and Random effects*	*13.40*	*0.1988*
3	*Breush-Pagan Test For Heteroskedasticity*	*35.79*	*0.0000*
4	*Test for Serial Correlation AR (1)*	*1.29*	*0.0000*
5	*Hausman Endogeniety Test For Joint Exogeniety of GDP and FDI*	*5.58*	*0.0182*

Declaration

This project is my original work, has not been presented for a degree in any other university and that all sources of materials used for this project have been duly acknowledged.

Name: **Yishak Tekaligne Taye**

Signature: _____

Date: June 24, 2009

Confirmed by:

Alemayehu Geda (Prof.)

_____

Signature