DETERMINANTS OF ETHIOPIA'S EXPORT PERFORMANCE: A GRAVITY MODEL ANALYSIS

YISHAK TEKALIGNE TAYE

Munich, June 2009
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ABSTRACT

The purpose of this paper is to identify and empirically analyze determinants of export performance of Ethiopia. It begins 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, it moves on to an econometric analysis of the determinants of export performance. A gravity model is employed with panel data using 30 Ethiopia’s trading partners for the period 1995–2007. The model is estimated with the Generalized Two Stages Least Squares (G2SLS) method. Endogeneity of FDI and GDP to exports, heteroskedasticity and serial correlation for AR (1) are controlled.

The results suggest that supply side conditions are a major factor for Ethiopia’s export performance. The results show that good institutional quality and internal transport infrastructure appear to be major determinants, whereas the real exchange rate and FDI have no statistically significant effect on Ethiopia’s export performance. Furthermore, the growth of domestic national income affects Ethiopian exports positively.

Foreign market access conditions also play a significant role. The results indicate 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’ national income, and distance, which is a proxy for transport costs, affects Ethiopian exports negatively.

Keywords:
Ethiopia; export; supply side factors; external market access conditions; gravity model.

* The author expresses his gratitude to Dr. Alemayehu Geda for all his assistance, guidance, suggestions, and direction, which aided in the completion of this paper. He has also benefited from the discussions with and comments received from Dr. Derk Bienen. Mr. Ataafu G/Meskel has provided assistance in structuring the data in panel data form.
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ACRONYMS

AGOA  African Growth and Opportunity Act
CES  Constant Elasticity of Substitution
EBA  Everything But Arms
EPRDF  Ethiopian People’s Revolutionary Democratic Front
ETB  Ethiopian Birr
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
GLS  Generalized Least Squares
IMF  International Monetary Fund
IV  Instrumental Variable
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 Organization
USD  United States Dollar
VIF  Variable Inflation Factor
WTO  World Trade Organization
1 INTRODUCTION

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

Like other African countries, Ethiopia has faced these problems for a long time. For instance, in 1983 the Provisional Government of Socialist Ethiopia noted that the basic constraints for Ethiopian exports include the low volume of exportable products, the limited degree of diversification of exports, which 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. (cf. Abay and Zewdu 1999). Moreover, after the downfall of the Derg regime, the Transitional Government of Ethiopia stated that “it is essential to increase and diversify exports” (1991: 33, as cited in Abay and Zewdu 1999).

In response to 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 markets. When compared to the pre-1991 period, the trade policy regime has become more liberal (Alemayehu, 1999).

Owing to this policy shift some improvements in export performance have been registered. Trade statistics show that export earnings have increased during the post reform period. According to the Ministry of Trade and Industry (MOTI), the real value of export earnings increased from ETB 5 billion during the first six year period of the Derg regime (1973-1978) to ETB 39.7 billion in the last six years of the EPRDF regime (2000/1-2006/7).

Regarding the composition of exports, until the 1990s the Ethiopian export sector could be characterised as a ‘three-commodity sector’ consisting of coffee, hides and skins, and oilseeds and pulses. Between 1966 and 1996, on average 59% of the country’s export earnings came solely from coffee (Abay and Zewdu, 1999). According to MOTI data, although coffee is still the dominant export item, since 2001/02 its contribution to total export earnings has declined to 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) has increased remarkably and reached 63.7%. 
However, Ethiopia’s share in total world exports is still very low, amounting to 0.01% in 2006 (WTO, 2007). In this regard, Alemayehu (1999) and Abay and Zewdu (1999) argue that Ethiopia’s external trade has major problems both on the supply side – its dependency on few primary products, characterised by large fluctuations in volume; and a very high degree of concentration of exports on few commodities – and on the demand side – a low income elasticity for the type of commodities that Ethiopia exports, declining prices for its exports, and limited destinations for Ethiopian exports. Both supply and demand side problems are typical African problems: For example, more than 50% of African countries’s export earnings are derived from only three principal commodities such as coffee, tropical beverages and cocoa (Alemayehu, 2006). On the other hand, international organisations have often recognised that Africa's exports still face market access problems 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 identifies the major supply capacity and foreign market access factors and examines how much these factors affect the country’s export performance. An econometric gravity model of bilateral trade flows is applied to analyse the determinants of Ethiopia's export performance.

The rest of the paper is structured as follows. Chapter 2 reviews the relevant theoretical and empirical literature regarding the subject. In chapter 3, the model specification and estimation results are presented. Chapter 4 concludes the paper.

2 LITERATURE REVIEW

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

2.1 Export supply capacity

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: domestic transport infrastructure, macroeconomic environment/real exchange rate, foreign direct investment and institutional quality (UNCTAD, 2005). I briefly discuss each of these factors below.

One of the major factors affecting export supply capacity is the domestic transport infrastructure. It is likely to play an important role especially at the early stages of export sector development (UNCTAD, 2005). Most African countries are characterised by poor transport infrastructure, which is a major impediment to trade, competitiveness and sustainable development (UNCTAD, 2005; Mbekeani, 2007; Bacchetta, 2007), and isolates countries, inhibiting their participation in global production networks (Limão and Venables, 2000). Due to poor internal transport infrastructure African transport costs are high making their exports expensive and uncompetitive (Radelet and Sachs, 1998; Matthee, Grater and Krugell, 2007), and reducing foreign earnings from exports (UNCTAD, 2003; Matthee, Grater and Krugell, 2007). The analysis of African trade flows shows that their relative volume is low due to poor infrastructure (Limão and Venables, 2001). Therefore, improvements in transportation services and infrastructure can lead to improvements in export performance (Fugazza, 2004; Clarke, 2005; Francois and Manchin, 2006; Edwards and Odendaal, 2008).

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

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

A stable real exchange rate is conducive to export expansion (Mouna and Reza, 2001). The real exchange rate is often rendered uncompetitive in low income countries by poor economic management and turbulence in financial markets (Biggs, 2007). Ensuring that the real exchange rate adjusts to more realistic levels is a means of enhancing the economy’s incentives for exporting and can lead to an increase in the production of export products (De Rosa and Green, 1991; Oyejide, 2007). While an overvalued currency can undermine export competitiveness through a direct loss of price competitiveness for exporting firms undervaluation of the currency can bolster export competitiveness (Biggs, 2007), enhance the incentives for export activities (Oyejide, 2007) and lead to diversification of exports (Sorsa, 1999; Mouna and Reza, 2001).
Empirically, it has been proven that the real exchange rate has a significant effect on a country’s export performance (Sekkat and Vaoudakis, 1999; Mouna and Reza, 2001). While appreciation of the real exchange rate affects exports negatively (Sharma, 2000; Love and Turner, 2001; Edwards and Alves, 2005; Morrissey and Mold, 2007), depreciation affects exports positively (Asmerom, 1999; Achy and Sekkat, 2001; Mouna and Reza, 2001; Edwards and Alves, 2005). On the other hand, some studies indicate that the effect of exchange rate variability on exports is ambiguous (Hooper and Kohlhagen, 1978; Klaassen, 1999; Du and Zhu, 2001; Kihangire, Potts and Cameron, 2005).

The effect of the 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 competition face exports of a particular country on the world market. In general, industrial products have a higher price elasticity than primary products, which causes industrial exports to respond perfectly to changes in the exchange rate (Roshan, 2007). Conversely, the low response to price changes of demand for primary products, which are the main exports of LDCs, implies that LDC exports respond imperfectly to changes in the real exchange rates, i.e. the effect of exchange rate changes on LDCs exports is ambiguous.

Foreign direct investment (FDI) is another important factor affecting the export supply capacity of a country. There is consensus among development economists that FDI inflows are likely to play an important role in explaining growth of recipient countries (De Mello, 1997, 1999; Buckley et al., 2002; Akinlo, 2004; Seetanah and Khadaroo, 2007). By increasing capital stock, FDI can contribute to a more efficient use of existing resources and absorb unemployed resources and thus increase a country’s output and productivity (De Gregorio, 1992; Seetanah and Khadaroo, 2007). However, the World Bank (1993) notes that the role of FDI in export promotion depends crucially on the motive for such investment: If the motive behind FDI is to capture the domestic market (tariff-jumping type of investment), it may not contribute to export growth. On the other hand, if the motive is to tap export markets by taking advantage of a 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 studies of the role of FDI in export performance also report mixed findings. Some studies found a negative relationship between FDI and export (Horst, 1972; Jeon, 1992; Ancharaz, 2003; Gu, Awokuse and Yuan, 2008). In contrast, others indicate that FDI have a positive effect on the export performance of host countries (Fugazza, 2004; UNCTAD, 2005; Morrissey and Mold, 2007; Gu, Awokuse and Yuan, 2008). Finally, Lall and Mohammad (1983) and Sharma (2000) do not see any statistically significant impact of FDI on exports.

The fourth and last major factor that affects export supply capacity is institutional quality. The quality of institutions and policies are decisive in determining whether countries can benefit from globalisation (UNCTAD, 2008). Levchenko (2004) suggests that differences in institutional
quality can themselves be a source of comparative advantage (cf. Francois and Manchin 2006).
Weak and missing institutions have been shown to limit the ability of firms to take advantage of
new trading opportunities in low-income countries (Roland 2000; Stiglitz and Charlton 2006;
Biggs, 2007). It has also been shown that institutional quality is highly correlated with trade
(Dollar and Kraay, 2002; Francois and Manchin, 2006). In this regard, Francois and Manchin
(2006) show that export performance and the propensity to take part in the trading system at all,
depend on institutional quality. Anderson and Marcouiller (2002) also find that a deterioration of
the quality of a country’s institutions should result in a reduction of its exports (cf. Francois and
Manchin 2006). However, evidence from successful exporting countries indicates that good
institutions have large elements of indeterminacy and characteristics specific to individual
countries (Biggs, 2007).

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 and Sekkat,
2006). The quality of institutions affects the investment climate, which in turn affects the supply
capacity of the economy (World Bank, 2004a; Munemo, Bandyopadhyay and Basistha, 2007).
Méon and Sekkat (2006) have shown in their empirical analysis that a deterioration of the quality
of institutions results in lower investment which in turn lowers trade. Moreover, bad institutions
reduce aggregate productivity (Hall and Jones, 1999; Olson, Sarna and Svamy, 2000; Méon and
Sekkat, 2006). In relation to this, Méon and Sekkat (2006) argue that countries whose institutions
result in low productivity will likely have difficulties in exporting and trading abroad.

2.2 Market access conditions

The other major factor that determines export performance of a country is related to the external
market access conditions for its exports (Fugazza, 2004; UNCTAD, 2005). The literature has
shown that foreign market access and supply capacity conditions are equally important for the
development of a country’s external sector (Redding and Venables, 2003; Fugazza, 2004). In the
case of foreign market access, two dimensions can be considered. The one is explained through
interventions by trading partners, and the second one is related to the measures implemented by
the exporting country to provide its exportables with a price advantage (McCarthy, 2008).

Trading partners influence the 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
liberalisation of world trade, first under the auspices of the General Agreement on Tariffs and
Trade (GATT) and now under the auspices of the World Trade Organization (WTO)1 (Thirlwall,
2000). Due to these and other trade negotiations, access to international markets has improved
(Thirlwall, 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).

1 The WTO replaced the GATT in 1995. The bulk of the WTO’s work comes from the 1986-1994 negotiations
and earlier negotiations under the GATT (WTO, 2003).
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 tackling high tariff peaks and escalation facing items of export interest to developing countries’ agricultural and non-agricultural exports. In industrial countries, border protection in manufacturing is generally low but remains high for labor-intensive products of interest to developing countries (IMF and World Bank, 2001). As indicated by the IMF and the World Bank (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 inhibit the diversification of exports toward higher value-added products.

In recent years, non-tariff barriers (NTBs) have 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 set by importing countries. These barriers have had serious implications for developing countries in terms of high compliance costs and potential or actual trade losses (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 for 1999-2001, has shown that NTBs affect LDC exports more than other developing country exports. For example, NTBs like environment related trade barriers affect 41% of merchandise exports of LDCs but only 21% of other developing country exports. In this regard, Mold (2005) estimated the potential loss of Africa’s trade through the imposition of higher quality standards and phyto-sanitary controls and indicated that the potential loss for LDCs could run into millions of dollars. In relation to this, Kirchbach and Mimouni (2003) also note that LDCs are the most exposed to NTBs and show that while 40% of LDC exports are subject to NTBs, the figure for developing and transition economies is only 14%.

Developed countries have designed and offered preferential access schemes (such as EBA and AGOA) for poor developing countries in order to ensure better access to their markets without asking for a reciprocal treatment in exchange (Kirchbach and Mimouni, 2003), with the objective of raising beneficiaries’ 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.

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2 Tariff peaks refer to tariffs above 15% and tariff escalation refers to tariffs that increase with the level of processing (IMF and World Bank, 2001; UNCTAD, 2005).
3 NTBs include technical regulations and standards, sanitary and phyto-sanitary measures, environmental conditions and anti-competitive market structures and practices (UNIDO, 2002; UNCTAD, 2005).
4 The European Union’s ‘Everything But Arms’ (EBA) policy is a development initiative designed to offer LDCs 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).
5 The African Growth and Opportunity Act (AGOA), which was signed into United States law in May 2000. It offers preferential access for Sub-Saharan Africa's products into US markets. In return, beneficiary countries must commit to improve their economic policy environment, participate more actively in the globalisation process, promote political and economic stability, and foster human and workers' rights in Africa (Mattoo, Roy and Subramanian, 2002; Nouve and Staatz, 2003).
escalation (IMF and World Bank, 2001), and strict rules of origin\(^5\) (Paul, 2003; Mold, 2005). Due to these conditions, preference schemes for poorer countries have not proven to be very effective in increasing market access for targeted countries (IMF and World Bank, 2001). In this regard, Paul (2003) has shown that the direct impact of EBA on LDC exports has not so far been significant. Mattoo, Roy and Subramanian (2002) found that the benefits of AGOA for Africa would be about five times greater if exporting countries were not subject to the restrictive rules of origin imposed by the United States (cf. Mold 2005).

Apart from trade barriers, foreign market access is also determined by international transportation costs (UNCTAD, 2005), which constitute an important element for countries to supply their exports at a competitive price in the world market. High international transport costs can price a country out of export markets (Mbekeani, 2007) and are a key determinant of a country’s ability to participate fully in the world economy and especially to increase exports (Limão and Venables, 2001; Edwards and Odendaal, 2008). Today, transport costs represent a significant barrier to African exports (Amjadi and Yeats, 1995; Biggs, 2007; Matthee, Grater and Krugell, 2007; Edwards and Odendaal, 2008) and account for a large component of the final cost of the export product (Biggs, 2007; Mbekeani, 2007). Analysis of low-income countries indicates that transport costs are amongst the most important trade barriers (Porto, 2005; Matthee, Grater and Krugell, 2007).

For countries located far from their export markets, the effect of transport costs on trade is especially severe. Distance is an important factor in international trade relations. As distance increases, trade volumes decrease (Venables, 2001; 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; Matthee, Grater and Krugell, 2007).

Apart from a country’s distance to main markets, its geography (whether it is landlocked or coastal) also affects international transport costs (Matthee, Grater and Krugell, 2007). Landlocked countries tend to have poor access to ports which correlates negatively with transport costs (Redding and Venables, 2003). Therefore, landlocked countries’ transport costs are higher, and they have lower international trade volumes than coastal countries (Radelet and Sachs, 1998; Limão and Venables, 2001; Matthee, Grater and Krugell, 2007). 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; Matthee, Grater and Krugell, 2007).

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\(^5\) 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.
3 MODEL SPECIFICATION, DATA AND EMPIRICAL RESULTS

3.1 Model Specification

3.1.1 Gravity Model of International Trade

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

The gravity model originates from Newtonian physics. Newton’s law of gravity 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 Newton’s 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: 81). 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 and 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 because of its theoretical foundation but because of the opportunity it offers to project bilateral trade relations (Egger, 2002).

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

Although gravity models have been criticised for their lack of theoretical underpinnings, empirically they seem to perform particularly well and are therefore well suited for policy analysis (Matyas and Harris, 1998). However, according to Matyas and Harris (1998), major drawbacks of earlier studies lie in the nature of the data used and explicit (or implicit) model restrictions: 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. In order to account for heterogeneity across countries in trade flows, recently gravity models have been generalised and adopted to a panel data setting, where several time series of cross-section data sets were pooled (Matyas and 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 and Helpman (1985) tried to identify the relationship between the bilateral trade flows and the product of two countries’ GDPs by utilizing the Differentiated Products Model, Deardorff (1995) has shown that the gravity model can be derived from several variants of the Heckscher-Ohlin Model.

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

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

In the following section, it will be shown how the CES monopolistic competition model is useful in deriving a gravity model in order to analyse the export performance of a country.

### 3.1.2 Theoretical Framework for Modeling Export Performance

Redding and Venables (2003) and Fugazza (2004) developed a theoretical framework using one of the international trade models, i.e. a trade model based on product differentiation derived from a CES demand structure, for estimating the gravity model in order to analyse a country’s export performance. In this paper, I follow their approach to develop a theoretical framework for modeling Ethiopia’s export performance.

Following Redding and Venables (2003) and Fugazza (2004), 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:

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

(1)
where \( U_j \) denotes the utility function of country \( j \); \( \sigma \) is the elasticity of substitution between any pair of products; \( n_i \) refers to the set of varieties produced in country \( i \); and \( x_{ij} \) 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:

\[
X_{ij} = p_{ij}^{-\sigma} E_j G_j^{(\sigma-1)}
\]  

(2)

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

It is assumed that the producer price \( p_i \) 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 producer prices. This cost includes: the cost of getting the product to and from the border in countries \( i \) and \( j \) (\( t_i \) and \( t_j \) respectively) and the cost of getting the product across the border \( (T_{ij}) \). While intra-country cost \( (t_i \) and \( t_j \)) would reflect internal geography and infrastructure, inter-country cost \( (T_{ij}) \) would reflect external geography and policy barriers. Thus price \( p_{ij} = p_i t_i T_{ij} t_j \) 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, takes the form

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

(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

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

(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 conditions of country \( j \) : it depends on the 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

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

(5)
Therefore, from equation number 4, bilateral trade flows can be expressed as the product of exporter supply capacity, importer market conditions, and the term \( T_{ij}^{1-\sigma} \) which measure bilateral trade costs between them. Hence,

\[
n_p \sum x_{ij} = S_i \sum (T_{ij})^{1-\sigma} M_j
\]  

(6)

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

\[
x_i = n_p \sum x_{ij} = S_i \sum (T_{ij})^{1-\sigma} M_j
\]  

(7)

where the term \( \sum (T_{ij})^{1-\sigma} M_j \) refers to country \( i \)'s foreign market access \( \text{FMA}_i \). Therefore this equation implies that the product of supply capacity and foreign market access gives the total value of a country’s exports.

### 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 Ethiopia's export performance 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:

\[
X_{ij} = f(SC_i, \text{FMA}_{ij})
\]  

(8)

where \( X_{ij} \) is the total value of exports from Ethiopia (country \( i \)) to its trading partner (country \( j \)), \( SC_i \) is Ethiopia's supply capacity, and \( \text{FMA}_{ij} \) are the market access conditions for Ethiopian exports of Ethiopia's trading partner \( j \).

In section two, I surveyed the most important determinants of a country's export performance as identified in the literature. In this section, these determinants are integrated into the model.

For any given point in time, the foreign market access variable can be written as a function:

\[
\text{FMA}_{ij} = g[\text{GDP}_j, \sum (T_{ij})^{1-\sigma}]
\]

where \( (T_{ij})^{1-\sigma} = f(DIST_{ij}, FTP_j)^{1-\sigma} \)

FMA contains the importing country \( j \)'s characteristics such as economic size (GDP), factors affecting costs related to trade flows, i.e. international transport costs as proxied by distance (DIST), and foreign trade policy (FTP) barriers (tariff and NTBs).
In the standard specification 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, I use the formula developed by Karagöz and Saray (2008) to calculate weighted distance. The formula is given by:

\[
\text{WDIST}_{ijt} = \frac{(\text{DIST}_{ij} \times \text{GDP}_i)}{\sum \text{GDP}_i}
\]

where \(\text{WDIST}_{ijt}\) is the weighted distance between country \(i\) (Ethiopia) and \(j\) (Ethiopia’s trading partner) in year \(t\); \(\text{DIST}_{ij}\) is the geographical distance between countries \(i\) and \(j\); \(\text{GDP}_i\) is GDP of country \(i\) in year \(t\); and \(\sum \text{GDP}_i\) is overall sum of the GDPs of country \(i\) (the sum covers the period from 1995 to 2007 in this study).

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

\[
\text{SC}_i = h (\text{GDP}_i, \text{FDI}_i, \text{INF}_i, \text{RER}_i, \text{IQ}_i)
\]

where GDP is 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, allowing for changes over time, the model to analyse Ethiopia’s export performance is as follows

\[
\ln X_{ijt} = \alpha + \beta_1 \ln \text{GDP}_i + \beta_2 \ln \text{FDI}_i + \beta_3 \ln \text{INF}_i + \beta_4 \ln \text{RER}_i + \beta_5 \ln \text{IQ}_i + \\
\beta_6 \ln \text{GDP}_j + (1 - \sigma) [\beta_7 \ln \text{FTP}_j + \beta_8 \ln \text{WDIST}_{ij}] + U_{ijt}
\]  

(9)

where

- \(X_{ijt}\) is the value of Ethiopian exports to her trading partner \(j\) (in USD million) at time \(t\);
- \(\text{RER}_{ijt}\) is the average real exchange rate between Ethiopia and her trading partner \(j\) at time \(t\);
- \(\text{GDP}_i\) is the value of Ethiopia's GDP at current market prices (in USD million) at time \(t\);
- \(\text{GDP}_j\) is the value of GDP of country \(j\) at current market prices (in USD million) at time \(t\);
- \(\text{FDI}_i\) represents FDI stock in Ethiopia (in USD million) at time \(t\);
- \(\text{INF}_i\) represents the quality of Ethiopia's internal transport infrastructure (captured by the percentage of paved roads out of the total roads) at time \(t\);
- \(\text{IQ}_i\) represents the institutional quality index of Ethiopia at time \(t\);
- \(\text{FTP}_j\) represents the foreign trade policy index of country \(j\) at time \(t\);
- \(\text{WDIST}_{ij}\) represents the weighted distance between Ethiopia and her trading partner \(j\) at time \(t\); and
- \(U_{ijt}\) represents the stochastic term - a log-normally distributed error with \(E(\ln U_{ij}) = 0\).
3.2 Data and Definition of Variables

In order to deduce sound conclusions from the empirical study, it is important to choose an appropriate time period and to include as many countries as possible into the sample. The study covers the period from 1995 to 2007 for a total of 30 trading partners of Ethiopia. The countries are chosen based on their importance for Ethiopia as a trading partner and the data availability for the different variables.

1. Export (X)

The annual values (in USD million) of Ethiopian exports to each of the 30 trading partners are mainly collected from IMF DOTS 2008 CD-ROM.

2. Real Exchange Rate (RER)

Data on the nominal real exchange rate and price indices are collected from the International Financial Statistics Year Book 2008. In order to calculate the average real exchange rate, I apply the IMF definition of the real exchange rate: real exchange rate as price of domestic currency against foreign currency:

\[
RER = \frac{E \cdot P^*}{P}
\]

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

Depreciation of the real 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.\(^6\)

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.

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\(^6\) The permanent link for the WDI site is: [http://go.worldbank.org/IW6ZUUHUZ0](http://go.worldbank.org/IW6ZUUHUZ0).
4. Domestic and Foreign Income (GDP)

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

Since exports are the difference between domestic supply and domestic demand, they should be affected by the growth in domestic income. When the economy 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 of the importing country the greater the demand for imports and thus for Ethiopia’s exports. Hence, the coefficients of Ethiopia’s trading partner GDP are expected to have positive signs.

5. Distance (WDIST)

Data on the distance between Ethiopia and her trade partners 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 distance data and GDP as measured according to item 4 above I calculate the weighted distance between Ethiopia and its trading partners for each year in the observation period.

6. Foreign Trade Policy (FTP)

Trade policy is a measure of the degree of tariff and non-tariff barriers that trading partners apply. Trade policy in this study is proxied by a trade policy index, which is taken from the Index of Economic Freedom created by the Heritage Foundation. 7

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)

Data on FDI stock is taken from UNCTAD World Investment Report 2008. 8

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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.

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's Worldwide Governance Indicators (WGI) project (Kaufmann et al. 2009) 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. I take the aggregate value of the four components as a proxy for Ethiopia’s institutional quality.\(^9\) 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, it has to be explored whether the variables specified in the model are normally distributed random variables. A graphical (histogram and box plot) and numerical inspection (Skewness-Kurtosis test) has been performed for testing normality. The results indicate that, for most of the variables in the 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, I take the log transformed variables. The graphical and numerical inspection of the log transformed variables confirms that they exhibit an almost normal distribution (see details in figures Appendix A1 and A2; Table A1 to Table A4). Following Galmacci and Pannone (1990), I performed a Variable Inflation Factor (VIF) Analysis to check for multicollinearity. The analysis indicates that all the variables have a VIF value of less than 10, meaning there is no a problem of multicollinearity in the data (see Table A5).

A diagnostic analysis has been conducted to examine which estimation technique fits the model and the data well (see detail in Table A6). In order to examine the presence of individual and/or time effects in the data, a random effects test is performed. The Lagrange Multiplier test, developed by Breusch and Pagan (1979), indicates the presence of individual and time effects in the data. The Hausman specification test (Hausman, 1978) 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. The 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 it should be tested. The testing reports a modified Bhargava et al. Durbin-Watson value of 1.29, which is clearly less than 2. This indicates the presence of serial correlation.

The issue of endogeneity is also examined and tested with the Hausman test. With endogeneity being detected and not corrected, the parameters estimated from ordinary random effects model are biased and inconsistent. Therefore to circumvent this problem, lagged values of these endogenous variables are considered and an 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, the model is estimated with a Generalized Two Stage Least Squares (G2SLS) estimation.

The estimation results indicate that the model has an 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% (Table 1).

### Table 1: G2SLS Random-Effects IV Regression Result. Dependent Variable: Log of Ethiopia’s Export to its Trading Partners

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log of GDP of Ethiopia</td>
<td>1.295024*</td>
<td>3.06</td>
<td>0.002</td>
</tr>
<tr>
<td>Log of GDP of trading partner</td>
<td>0.9342211*</td>
<td>6.69</td>
<td>0.000</td>
</tr>
<tr>
<td>Log of FDI of Ethiopia</td>
<td>-0.3159379</td>
<td>-1.52</td>
<td>0.129</td>
</tr>
<tr>
<td>Log of IQ of Ethiopia</td>
<td>1.365431***</td>
<td>2.43</td>
<td>0.015</td>
</tr>
<tr>
<td>Log of INF of Ethiopia</td>
<td>1.067096*</td>
<td>2.13</td>
<td>0.034</td>
</tr>
<tr>
<td>Log of RER between Ethiopia and its trading partners</td>
<td>0.0232066</td>
<td>0.49</td>
<td>0.626</td>
</tr>
<tr>
<td>Log of WDIST between Ethiopia and its trading partners</td>
<td>-0.8812179**</td>
<td>-2.16</td>
<td>0.031</td>
</tr>
<tr>
<td>Log of trading partner FTP</td>
<td>0.6607988***</td>
<td>1.75</td>
<td>0.080</td>
</tr>
<tr>
<td>Constant</td>
<td>-9.192575</td>
<td>-9.192575</td>
<td></td>
</tr>
</tbody>
</table>

R$^2$ within = 0.1394  
R$^2$ between = 0.7519  
R$^2$ overall = 0.5664  
Wald chi$^2$ (8) = 135.77  
Prob > chi$^2$ = 0.0000

*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. The log of the institutional quality (IQ) variable is entered with a positive sign at 5% significance level. The positive coefficient of the variable indicates that Ethiopia’s export depends on its institutional quality. 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 results also indicate that internal transport
infrastructure (INF), measured by the log of percentage of paved roads out of the total roads, is significant at 5%. FDI and real exchange rate are statistically insignificant, and the sign of the FDI variable is negative which is against the hypothesis. The results also suggest that the log of domestic income (GDP) is statistically significant at 1% and has a positive sign. According to the estimated results a 1% increase in GDP, other things equal, would bring about a 1.29% increase in exports.

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%. The distance variable (WDIST), 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 exports 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 shows that a 1% improvement in their trade 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%.

4 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 very low, at 0.01% in 2006 (WTO, 2007).

This study has attempted to identify the factors that contribute for the poor export performance of Ethiopia. I followed the empirical approach of Redding and Venables (2003) and Fugazza (2004) which helps to decompose export performance of individual countries into supply capacity and foreign market access conditions. An econometric gravity model of bilateral trade flows between Ethiopia and its trading partners has been specified and tested using annual data for Ethiopia and 30 of its main trading partners for the years 1995-2007.

The empirical results suggest that supply side conditions are a major factor to determine Ethiopia's export performance. Besides domestic national income, the major supply side factors such as internal transport infrastructure and institutional quality are found to be statistically significant and affect Ethiopian exports positively; where as FDI and real exchange rate are found to be statistically insignificant.
According to the estimated results foreign market access conditions also play a significant role in Ethiopia’s export performance. The results suggest that national income of 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 determinants. 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. Often, it is noted that a depreciation of a country’s real exchange rate will cause a gain in competitiveness of that country. The results of this study indicate that a depreciation of the real exchange rate would not affect the international competitiveness of Ethiopian exports. How, then, can Ethiopia enhance its competitiveness in the global market?

   It is evident from the experience of the East Asian countries that they were able to maintain their export competitiveness by diversifying from products for which world demand was growing only slowly (Mytelka, 1999; Melesse, 2002). In other words, these countries attained competitiveness through their effort to industrialise their economy. Since the world demand for primary products is not very dynamic, Ethiopia may not be competitive through exporting primary products according to its existing comparative advantage. 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 of 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 Diagnostic Trade Integration Study (DTIS, World Bank, 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, and have been influenced by the incentive structure that has a bias against exports. The DTIS also indicates that most agriculture and manufacturing projects are oriented towards the local market. These may be the reasons for the insignificant impact of FDI on Ethiopia's export performance. As FDI can help the diversification of the current export structure to the technological content of exports the following policy measures are necessary: major changes in the policy environment should be considered in order to attract export-oriented FDI projects; the incentive structure should be reformed further and the domestic business climate be improved, including government provision of public goods; and existing FDI projects should be enabled 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. This will require both an improvement in supply conditions and a pursuit of better access to international markets.

This analysis has been carried out at an aggregate level. The dependent variable (total exports to each trading partner) groups together exports of primary, mineral and manufactured products. In future research, it may be useful to conduct the analysis at a more disaggregated, 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. HISTOGRAMS AND BOX PLOTS 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. HISTOGRAMS AND BOX PLOTS 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
### APPENDIX B. TABLES

#### Table A1: Summary Statistics of the Level Variables

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GDP of Ethiopia*</td>
<td>9896.308</td>
<td>3503.557</td>
<td>1.717266</td>
<td>4.731039</td>
</tr>
<tr>
<td>2</td>
<td>GDP of trading partner *</td>
<td>956776.9</td>
<td>2005752</td>
<td>4.003875</td>
<td>20.55327</td>
</tr>
<tr>
<td>3</td>
<td>FDI of Ethiopia*</td>
<td>1578.612</td>
<td>1144.714</td>
<td>0.4608574</td>
<td>1.852876</td>
</tr>
<tr>
<td>4</td>
<td>INF of Ethiopia**</td>
<td>13.93769</td>
<td>1.921432</td>
<td>1.354037</td>
<td>4.489121</td>
</tr>
<tr>
<td>5</td>
<td>IQ of Ethiopia***</td>
<td>21.38462</td>
<td>5.9211445</td>
<td>-0.5347958</td>
<td>2.74631</td>
</tr>
<tr>
<td>6</td>
<td>RER between Ethiopia and its trading partners</td>
<td>3.496149</td>
<td>4.270112</td>
<td>1.030532</td>
<td>2.915353</td>
</tr>
<tr>
<td>7</td>
<td>Distance between Ethiopia and its trading partners (Km)</td>
<td>489.5091</td>
<td>294.1017</td>
<td>1.38541</td>
<td>5.989204</td>
</tr>
<tr>
<td>8</td>
<td>Foreign trade policy***</td>
<td>71.85385</td>
<td>15.27127</td>
<td>-1.957016</td>
<td>6.634525</td>
</tr>
</tbody>
</table>

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

#### Table A2: Summary Statistics for the Log-transformed Variables

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

#### Table A3: Skewness-Kurtosis Test for Normality (Variables in Levels)

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>Adj $\chi^2$ (2)</th>
<th>Prob &gt; $\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GDP of Ethiopia</td>
<td>0.000</td>
<td>0.000</td>
<td>.</td>
<td>0.0000</td>
</tr>
<tr>
<td>2</td>
<td>GDP of trading partner</td>
<td>0.000</td>
<td>0.000</td>
<td>.</td>
<td>0.0000</td>
</tr>
<tr>
<td>3</td>
<td>FDI of Ethiopia</td>
<td>0.000</td>
<td>0.000</td>
<td>.</td>
<td>0.0000</td>
</tr>
<tr>
<td>4</td>
<td>INF of Ethiopia</td>
<td>0.000</td>
<td>0.000</td>
<td>68.87</td>
<td>0.0000</td>
</tr>
<tr>
<td>5</td>
<td>IQ of Ethiopia</td>
<td>0.000</td>
<td>0.310</td>
<td>15.62</td>
<td>0.0000</td>
</tr>
<tr>
<td>6</td>
<td>RER between Ethiopia and its trading partners</td>
<td>0.000</td>
<td>0.852</td>
<td>40.06</td>
<td>0.0000</td>
</tr>
<tr>
<td>7</td>
<td>Distance between Ethiopia and its trading partners (Km)</td>
<td>0.000</td>
<td>0.000</td>
<td>.</td>
<td>0.0000</td>
</tr>
<tr>
<td>8</td>
<td>Foreign trade policy</td>
<td>0.000</td>
<td>0.000</td>
<td>.</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
### Table A4: Skewness-Kurtosis Test for Normality (Log-transformed Variables)

<table>
<thead>
<tr>
<th>Item</th>
<th>Variable</th>
<th>Pr(Skewness)</th>
<th>Pr(Kurtosis)</th>
<th>Adj $\chi^2(2)$</th>
<th>Prob $&gt; \chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Log of GDP of Ethiopia</td>
<td>0.000</td>
<td>0.024</td>
<td>64.64</td>
<td>0.0000</td>
</tr>
<tr>
<td>2</td>
<td>Log of GDP of trading partner</td>
<td>0.002</td>
<td>0.429</td>
<td>9.97</td>
<td>0.0068</td>
</tr>
<tr>
<td>3</td>
<td>Log of FDI of Ethiopia</td>
<td>0.000</td>
<td>0.000</td>
<td>31.81</td>
<td>0.0000</td>
</tr>
<tr>
<td>4</td>
<td>Log of INF of Ethiopia</td>
<td>0.000</td>
<td>0.023</td>
<td>44.64</td>
<td>0.0000</td>
</tr>
<tr>
<td>5</td>
<td>Log of IQ of Ethiopia</td>
<td>0.000</td>
<td>0.339</td>
<td>45.02</td>
<td>0.0000</td>
</tr>
<tr>
<td>6</td>
<td>Log of RER between Ethiopia and its trading partners</td>
<td>0.000</td>
<td>0.000</td>
<td>56.56</td>
<td>0.0000</td>
</tr>
<tr>
<td>7</td>
<td>Log of Distance between Ethiopia and its trading partners (km)</td>
<td>0.000</td>
<td>0.272</td>
<td>17.26</td>
<td>0.0002</td>
</tr>
<tr>
<td>8</td>
<td>Log of Foreign trade policy</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### Table A5: Multicollinearity Test (Variable Inflation Factor for the Variables)

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

Mean VIF = 3.71

### Table A6: Summary of Diagnostic Tests

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