

# Ethiopian Coffee Trade Pattern: an Augmented Gravity Modeling Approach

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## Abstract

This study assessed the coffee trade pattern of Ethiopia for a period of 16 years from 1997-2011 for 36 importing countries, which implies that the data were panel. The data became panel type by having a one year gap and result to have 8 years. In the study, policies undertaken by the different regimes in relation to export policies were assessed. There was consideration of the importing capacity of the countries and successiveness of their importing condition for considering the countries as a sample. We used gravity model to identify the degree to which how the power of importer and exporter nations affect the coffee trade of Ethiopia. We explored different tests in order to select the appropriate model to regress the gravity model. As of those tests, the research had adopted the random effect regression system to regress the gravity model. The model result revealed that the model is strong enough to explain the variation in the dependent variable. The result also exhibited that the demand side variables of the coffee export of Ethiopia are significant in affecting the export value. Given this, the foreign GDP of the trade partners affect the export value of Ethiopian coffee in the positive direction and in a significant manner. This implies that each increment in GDP of the coffee trade partners of Ethiopia result into creation of additional demand for Ethiopian coffee. However, the domestic factors are not significant in affecting the supply level of the coffee export of the country.

**Keywords:-** Coffee export, Gravity model, Panel data, Demand and Supply side factors

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## 1. Introduction

### 1.1. Background of the Study

Following the traditional trade argument, trade is viewed as an "engine" of growth playing a supportive role in the economic growth of nations especially the least developed countries (LDCs) and other developing ones. The economic growth of the present day developed nations, that were once developing, is largely attributed to international trade (Salvatore, 1990). Hence, international trade has got special attention in the policy formulation of many LDCs, viewing it as a vehicle to transform the economy of those countries. International trade has also played a crucial role in the historical development of the third world nations. In the second half of the 20<sup>th</sup> century tremendous economic performance of the Asian tigers (South Korea, Taiwan, Hong Kong and Singapore) has largely attributed to the performance of the external sector where the export sector was given a greater emphasis. Strong political commitment towards export promotion and application of appropriate policies together with efficient institutional set up helped these countries to attain a higher growth rate of exports and hence of the overall economy (Debele, 2002).

Over the past two decades, developing countries have progressively increased their share of global trade from just below one-quarter to about one-third. Increased participation in world trade has been facilitated by the diversification of their exports. The share of manufactures in total merchandise exports of developing countries has increased from 35.1% in 1985 to 65.8% in 2004 while the share of developing countries in world exports of manufactures increased from 14.5% in 1985 to 30.3% in 2005. Developing countries have also diversified their export markets. The share of developing country markets in total developing country exports had increased from 27.8% in 1990 to 39.4 in 2004. One of the main considerations in assessing the export performance of a country may relate to its importance in the overall GDP. If the share is high, it can be said that the country is largely engaged in export trade and is benefited a lot from it. If it is low, this may mean that the country is less involved in the export or it does not generate sufficient revenue from what it exports (Kebede, 2011).

Ethiopia has a long history of participation in international trade through having different policies at the different regimes. Ethiopia's export sector is dominated by export of few primary commodities which include agricultural products mainly coffee, oilseeds, pulses, live animals, chat, flower, and hide and skins. The export performance has reached remarkable level in the recent few years that is it reached a never-before-seen level of \$2 billion in

the year 2010. This growth is an impressive one that was 38% increase from the \$1.5 billion in exports registered in the previous year (2009) (Kiros, 2012).

Merchandise exports of the country have been growing at an average rate of 7% during 1981-2008 while manufactured product export was growing at an average rate of 4%. Real merchandise exports were 1.16 billion US\$ in 2008, while manufactured ones were 92.3 million US\$, which was 8% of merchandise exports. The merchandise export revenue was highly dependent on non manufactured exports, where the average share of manufacturing exports during 1981-2008 was around 14.4% (Sisay, 2010).

Ethiopia has a trade relationship with many nations in the world especially with nations from Europe, Africa and South East Asian. In an anticipation to drive some gains from the international trade most countries, particularly the developing ones, have introduced economic reforms and joined bilateral and regional trade agreements. The major export markets of the country (destinations) are nations in Europe followed by Asian and African nations respectively (Khalafalla and Omer, 2012).

Table 4. Trade share of the different part (Values are in percent) of the world

Continent	2005/06	2006/07	2007/08	2008/09	2009/10
Europe	36.87	40.81	41.11	40.05	35.03
Asia	38.37	33.45	35.07	37.13	31.59
Africa	17.10	15.46	14.13	16.59	22.98
America	5.44	5.78	7.83	4.98	4.45
Oceania	0.36	0.36	0.45	0.44	0.42
Unspecified	1.85	4.14	1.41	0.81	4.93
<b>Grand Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Source; World Development Indicators (WDI) of World Bank, 2013.

As the table above showed that majority of the exports of Ethiopia are to countries in Europe, where the share of those markets exhibited reduction in recent times. Having this, the share of Asian nations takes the second largest proportion in importing items from Ethiopia. Given this, Ethiopia is making good trade relationship with African countries in recent times, in which the share showed drastic increment from 16.59% in 2008/09 to 22.98% in 2009/10.

The work of Abay and Zewdu (1999) as cited in Yisak (2009) indicated that Ethiopian export is highly concentrated on few raw products in both the previous and present regimes. Given the high concentration of Ethiopian export on few agricultural products, the country also has huge reliance on few trade partners. Ethiopia exported 43.74% of its coffee to six giant nations (Germany, China, Netherland, Saudi Arabia, Switzerland and USA), which implies that the country has high concentration only on few nations. Germany is the dominant importer of Ethiopian coffee, in which the import level is consistent over the years considered.

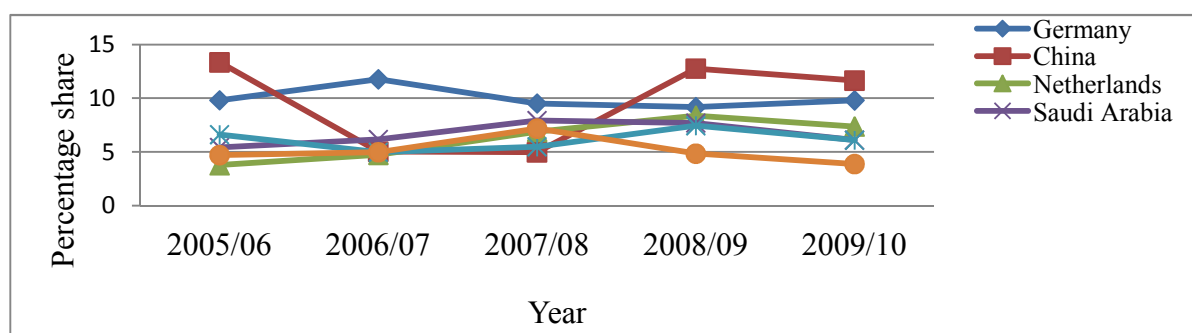


Figure 2. Share of coffee export for the six largest trade partners

Source: Own calculation based on data of WDI, 2013

The share of China exhibited an oscillatory trend in which it was the largest in 2005/06 and 2008/09, and it was the least during 2007/08 (figure 1). Having this, Ethiopian coffee trade share shows an increasing trend with the going of time.

Having all the above this research had tried to assess the pattern and determinants of Ethiopian coffee trade by considering main importer nations from developed and developing nations. It had tried to see how distance and economic level of Ethiopia and importers' affect the coffee trade.

## 1.2. Objective of the Study

The general objective of the study was to assess how economic size of importers and the domestic economy affect the trade pattern of Ethiopian coffee, which is the main exportable crop of the country. This means the research attempted to see how supply and demand side variables affect export of Ethiopian coffee.

The specific objectives of the study are:-

- ✘ To assess the trend of Ethiopian coffee export in recent times,
- ✘ To examine the effect of geographic distance and economic power of importing nations on coffee export of Ethiopia
- ✘ To examine the role of exchange rate in affecting the export of coffee.

## 2. Empirical Review

### 2.1. Coffee Export and Economic Performance

Latin American countries like Colombia, Mexico and Brazil are the largest coffee producers in the world. In Asia, Indonesia and India are also major exporters, and the world market share of Thailand has been increasing dramatically since the mid-1980s. However, with the exception of Colombia, coffee plays a minor role in the export structure of semi-industrialized countries, in which their economy is highly dependent on export of industrial products. On the other hand, apart from oil-producing countries, coffee is Africa's most relevant export product for nations like Ethiopia and Uganda. Millions of farmers, as well as several countries' fiscal budget, depend largely on coffee exports. Four African countries obtained more than 50% of their export earnings from coffee in the period 1987-1989, and nine others more than 10%. Since the collapse of the International Coffee Agreement (July 1989), coffee prices have plummeted dramatically, causing an estimated \$10billions loss to world producers between 1989 and early 1993. For Uganda alone, this loss was \$200 million which was approximately one-third of its export revenue. International coffee prices have been experiencing a strong recovery since 1994, and this is possibly the single main factor underlying the good economic performance of several SSA countries in the last two or three years (Branchi *et al.*,1999). This circumstance could be strongly supported if we observe the condition of Ethiopia mostly in the recent times (see figure 4).

### 2.2. Ethiopian Export Performance

Export revenue of the country is highly dependent on agricultural products produced by smallholders. As of this the gain may be good or it may fall down depending on the productivity of the sector and price of the products. Export performance of the country exhibited an oscillatory movement in the previous years of operation, in which there was drastic reduction in the revenue from export of food items in 2007 (see figure 2). There was no smooth trend like movement in export of both food and manufactured products in the previous two decades. As the graph shows that there was a very huge gap between the two export sources of the nation, in which the gap showed a constant trend. This condition revealed that the country is not on the way to divert from exporting agricultural products to manufactured ones. The graph also depicts that there was good performance in export of the manufactured products at the time of reduction in the export of food, the case of 2001, 2003 and 2007.

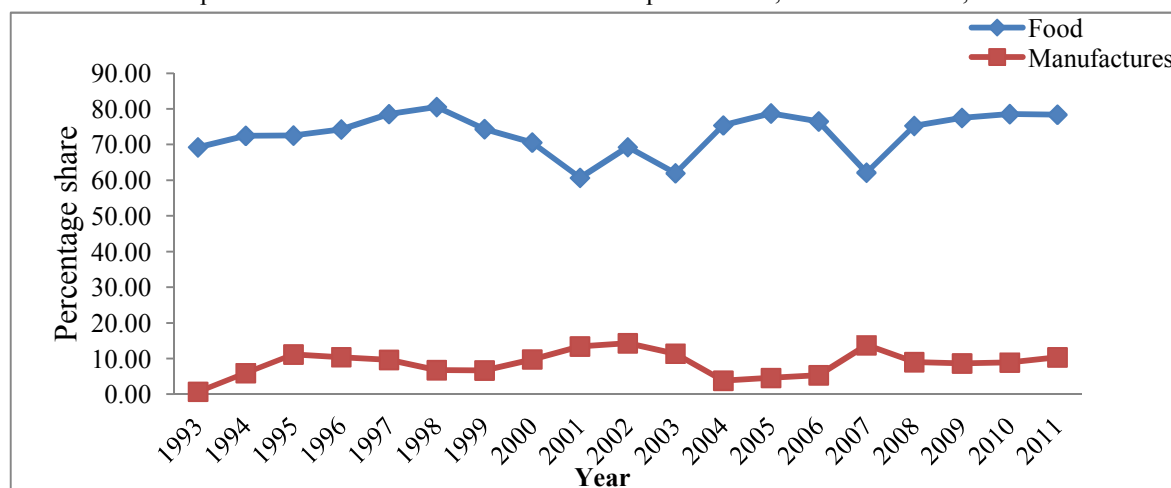


Figure 3. Share of food and manufactured products from the total merchandise export

Source: Own calculation from WDI data, 2013.

As one can see from the following figure the GDP of the country show a continuous growth especially in the current regime. The growth showed sharp increment especially for the previous decade starting from 2000.

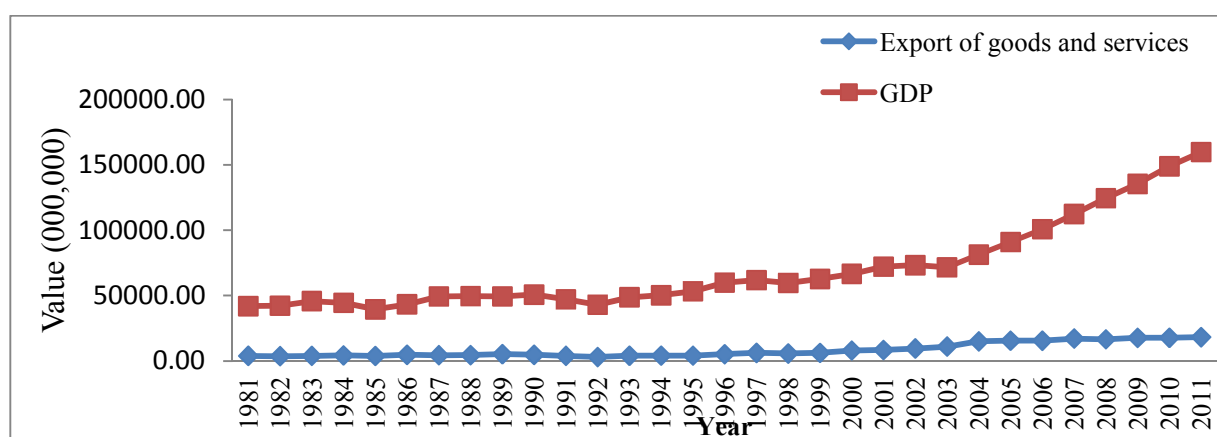


Figure 4. Interaction of export and total gross domestic product

Source: Own conversion from WDI data, 2013.

Though there was level difference between the export and GDP level, but the same condition happened when we consider the growth rate. As the growth in the GDP became jagged the gap between the two was being wider and wider chiefly in the recent times.

### 2.3. Trade Strategies of Ethiopia in Different Regimes

Commodity structure of the Ethiopian export sub-sector is a mirror reflection of the country's overall economic structure at large. Prior to 1974 (the imperial era), there had been a modest growth in the total value of export earnings. The average annual growth rate of real value of exports was 8.2%. During this period, the receipt from the export of pulses and oilseeds has been growing at an average annual rate of 13.1%. Coffee, which is the largest export commodity, has been at an average annual rate of 2.7%. During the Derg regime (1974/75 – 1990/91), the growth rate of real exports was lower from the rate recorded in the previous regime. The growth rate of total value of export earning registered more than 42% decline from the growth rate recorded for the imperial regime. This can be largely attributed to the poor performance in the export of pulses and oilseeds. The proceeds from the export of the commodity, which was growing at an average annual rate of 13.1% during the imperial regime, declined to 2.4% at the time of Derge. During this regime, export revenue from chat has demonstrated an average annual growth of 69.8% compared to 0.8% during the imperial era.

The policy adopted in the pre-1991/92 period (both in the Imperial and Military government of Ethiopia) was characterized by strongly inward-oriented development strategy, which used a prolonged over valuation of the Birr, high tariff rates, extensive foreign exchange control and other non tariff barriers as well as heavy taxation on exports. These policies were likely to have a detrimental impact on export by influencing directly or indirectly the profitability and competitiveness of exports (Debel, 2002).

The percentage share of coffee was 42.6 and 61.6% for the imperial and Derge government respectively. Among the major export products coffee accounts for the lion's share of primary exports and of total merchandise exports as well. From 1970/71-2000/01 coffee alone accounted for 54.4% of the total export proceeds. The share of coffee from the total export reached the smallest (about 25%) in 1974/75 due to political instability while it had the largest share was 80.7% in 1977/78 due to the then government's development campaign efforts. However, Ethiopia's share of the world coffee market has been stable at less than 2% during the last two decades and coffee exports have declined since 1997/98 along with the decline in the world prices (World Bank, 2001). In addition to the fluctuation in the international price of coffee, which acts as a demand side constraint, there are supply side factors (government policies and Institutional problems) that inhibit the performance of the commodity's export (Debel, 2002).

Even though both previous government of Ethiopia were commonly pursuing import substitution strategy and export sector was secondary for them in their economic development plans, it doesn't mean that they didn't make any effort to promote and diversify the country's exports. They made effort to promote exports, diversify the entire export commodities and incorporate the issue in their development plans. The first five year development plan (1957/58-1962/63) gave priority to import-substitution industrial promotion and infrastructural facilities while it gave minor attention for promoting export. Regarding exports, the plan stated the need for increasing exports by making full use of the potential of agriculture and the increasing imports should be financed as much as possible by increasing exports. Though this was the case, expanded deficit in merchandise trade balance was observed at the end of the planning period.

To correct this imbalance the second and third-five year plans were set in place with adequate attention paid for export development through diversification. It stipulated an important role played by new export products of

industrial origins and mining products. In this process, exports were expected to attain a larger degree of in which semi-manufactured and manufactured industrial goods would play an increasing role. Such a move would facilitate the expansion of the country's export through strengthening its world market acceptance and competitiveness and greatly contribute to the improvement of the already affected terms of trade and balance of payment status of the nation. In the second –five year plan the share of agricultural exports was set to exhibit a decrease from 93.6% in 1962/63 of the total export to 72.3% in 1967/68 while the share of manufactured products was planned to increase from 5.2 to 24.2 % during the same year. Given this, in the third-five year development plan (1969/70-1973/74) agricultural product exports were expected to decrease to 75% in 1973/74 from that of 86% in 1967/68. Through the addition of new agricultural products in the export basket, the share of coffee was envisaged to fall from 55 to 40% at the end of the planning period. During the plan period, export was envisaged to double with reduced cost of production and improved quality. In addition, the plan stipulated a three-fold increase in non-agricultural exports such as textiles, wood products, building materials, non-metallic products and chemical industry products. To implement the plan, the then existing system of duty draw back on direct raw materials and other components of export product was revised. Moreover, both fiscal and monetary incentives were offered for both domestic and foreign investors engaged in export-goods production (ibid). The military government who came to power in 1974/75 under took a ten-year perspective plan of 1985/86 - 1994/95. The main objective of the plan was to orient the country's export structure towards manufactured products from the already existing primary exports of agricultural product, to expand substantially the country's foreign exchange earnings through exporting diversified industrial, mining and agricultural products and to diversify export markets and reduce over dependence on traditional ones. The government took part in international trade fairs and encouraged the export of manufactured products and strengthened chambers of commerce and other institutions which are directly engaged in promoting export trade. The ten-year perspective plan stipulated the share of agriculture 85/86 to 53.2% in 1994/95, while the share of other exports from 26.5 to 46.8% in the plan period. The export sector was given a preferential interest rate of 6% on bank loans against 8% for importing activities. However, the subsidy introduced was not sufficient in terms of coverage and amount to neutralize the anti-export bias incentive structure. In 1991 the transitional government of Ethiopia (TGE) together with the IMF and the World Bank has undertaken liberalization and structural adjustment program to address the internal and external imbalances of the economy. In particular trade policy reform was undertaken which aimed at promoting exports through diversifying the country's commodity exports.

### **3. Methodology**

#### **3.1. Data Sources**

The research used secondary data, which were compiled from central statistics agency (CSA), NBE, WB, IMF and others, in which they had collected for their own purpose. It mainly relied on panel data from 1997 - 2011 of world development indicator (WDI) of World Bank, for 37 countries including Ethiopia (see appendix 2 table 2). The panel was by having one year gapping for the years considered, and resulted into getting eight years data for 36 nations that import more than one percent of Ethiopian coffee for each and individual share. This consideration would result into having 288 observations in total. The year considered were enough as compared with the number of years taken into account by other studies. Aggrawal (2001) in his study of the impact of multinational enterprises on India's export performance used panel data from 1996 - 2000 over 916 firms classified into 30 industries. Balogun (2007) used a panel data set from 1990:1 to 2004:4 for 5 members of West African Monetary Zone. Having these, a more comprehensive study by Fugazza (2004) used data for 84 countries from 1980–1999. The dependent variable of this research was value of Ethiopian coffee export at current US\$.

#### **3.2. Method of Data Analysis**

There may be usage of descriptive or econometric type of analysis depending on the data and objectives of the study. Since the objective of the study is to identify the extent to which the distance and other aspects of the trade partners of Ethiopia are affecting the export of coffee, in which there would be usage of econometric approach. Here the main interest of the work was to assess both the demand and supply side variables in affecting the coffee export of the country. A work done by Samia (1989) on import demand relations for Ethiopian coffee for the five major importing countries in the quota market adopted Seemingly Unrelated Regression (SUR) model on the basis of data for 1974-1983. The main emphasis of this work was only on importers side and it does not take into account the demand and supply side simultaneously.

Initially the gravity equation was thought of merely as a representation of an empirically stable relationship between the size of economies, their distance and the amount of their trade. Prominent models of international trade at that time included the Ricardian model, which relies on differences in technology across countries to explain trade patterns, and the Heckscher-Ohlin (HO) model that relies on differences in factor endowments among countries as the basis for trade. It was assumed then that standard Ricardian and HO models were

incapable of providing a foundation for the gravity model. The gravity model was first applied to international trade in the early 1960s. Tinbergen (1962) and Pöyhönen (1963) were the pioneers in generating the notion of analyzing trade flows analogous to Newton's law of gravity. The masses of countries are measured by GDP and the distance between countries is used as a proxy for transport costs. Accordingly, the basic gravity model states that trade flows between two countries are positively affected by the product of the two countries' GDP and negatively influenced by the distance between them (Deardorff, 1995).

The basic form of the gravity equation is as follows:-

$$T_{ij} = \frac{GDP_j^\beta GDP_i^\alpha}{D_{ij}^\theta} \quad (1)$$

Where:  $T_{ij}$  indicates bilateral trade between country  $i$  and  $j$ ;  $GDP_i$  and  $GDP_j$  indicates the economic size of country  $i$  and  $j$ , measured by GDP; and  $D_{ij}$  indicates the bilateral distance between the two countries. The parameters  $\alpha$ ,  $\beta$ , and  $\theta$  are often estimated in a log-linear reformulation of the model. This equation explains bilateral trade using economic size and distance: the larger the two trading partners, the larger the trade flows; the larger the distance between the two countries, the smaller bilateral trade. Usually the model explains 70–80% of the variance in bilateral trade flows (Peter and Steven, 2009). The first important consideration in the improvement of the gravity model is the addition of relevant variables which may explain trade across countries or regions. Explanatory variables like population size, GDP per capita and real exchange rate have been used to the gravity models by different researchers at different time (Frankel *et al*, 1995; Matyas *et al*, 2000; and Elliott and Ikemoto, 2004). In addition, some dummy variables have been incorporated to capture geographical, cultural, institutional and related factors that may influence bilateral trade flows (Aitken, 1973 and Endoh, 1999). However, in order to account for heterogeneity across countries in trade flows, recently gravity models have been modified to a panel data setting, in which case several time series of cross-section data sets would be considered (Harris and Matyas, 1998). Given all these the above equation can be reformulated after having natural logarithmic application:-

$$\ln T_{ij} = \alpha \ln GDP_i + \beta \ln GDP_j - \theta \ln D_{ij} \quad (2)$$

Having the above basic formulation of the gravity model the mathematical equation used in this paper would be formulated as:-

$$\ln COFX_{et} = \alpha + \beta_1 \ln GDP_{et} + \beta_2 \ln GDP_{ft} + \beta_3 \ln DS_{et} + \beta_4 \ln POP_{et} + \beta_5 \ln POP_{ft} + \beta_6 \ln FDI_{et} + \beta_7 EXG_{et} + \mu_i \quad (3)$$

In practice, the gravity equation relates the natural logarithm of the monetary value of export of coffee between Ethiopia and the trade partners. The log of their respective GDPs and other variables try to measure barriers and incentives to trade between them. This specification allows in addition an easy interpretation of the estimated parameters in which the parameters of an equation estimated in logarithms are representative of elasticity.

### 3.3. Definition of Variables

**Coffee export (fobcoff):** it is the dependent variable that is considered as the value of the coffee exported to those countries. It was measured in terms of the current US\$ at the FOB shipping point for each of the sampled years and for each of the nations import from Ethiopia.

**Gross Domestic Product (GDP<sub>et</sub> and GDP<sub>ft</sub>):** it is one of the independent variables that are considered as the main actor in the basic gravity model as well as the model for this work. It may be the GDP of the Ethiopia or its trade partner. GDP of Ethiopia (GDP<sub>et</sub>) is source of power for increasing the export of coffee. Given this, the foreign GDP (GDP<sub>ft</sub>) also would result into increment in the export of coffee by being source of demand. Both of the two GDPs are source of enlarging the export of coffee from Ethiopia, implying that two of the variables are expected to have positive contribution for the expansion of the export.

**Population (POP<sub>et</sub> and POP<sub>ft</sub>):** this variable also has two parts in which its effect on the coffee export is negative in which high population of Ethiopia would reduce coffee export due to huge domestic consumption. High population in importing countries, on the contrary, would induce more coffee export from Ethiopia through stimulating foreign demand of the product. Thus, population increment in importing countries would have positive effect where as the increment of the domestic population could have negative effect on Ethiopian coffee export.

**Exchange Rate of Ethiopian Birr (EGR).** This variable represents the exchange rate of Ethiopian birr per unit of US Dollar for each of the sampled years. Since the main target of devaluation of domestic currency is to initiate the export of the nation, the further the devaluation of domestic currency, the higher coffee export would be implying that there is positive relationship between coffee export and devaluation.

**Distance (DS):** It is the distance between the two nations, which means the geographic distance between Ethiopia and the trade partner nations. This variable is directly related to the cost of transporting the exportable item, coffee. Here the research assumed that the main input of transport, oil, has almost the same rate of increment in its price for the whole nations. Thus, having long distance between Ethiopia and its trading partner would directly result into high cost of transportation and then there will be reduction in the demand of foreigners

to Ethiopian coffee, which implies this variable is expected to have negative effect on the export of coffee.

**Foreign Direct Investment (FDI):** It is one way of increasing the economic capacity of a nation, which implies that successive attraction of foreign direct investment would result into enlargement of the exporting capacity.

#### 4. Result and Discussion

##### 4.1. Trend of Coffee Export of Ethiopia

Many research works and reports of the government showed that coffee takes the lion's share in generating foreign exchange revenue for the country for many decades and even in the present time. In recent years the export revenue from this crop shows successive increment due to increasing in the price of the item.

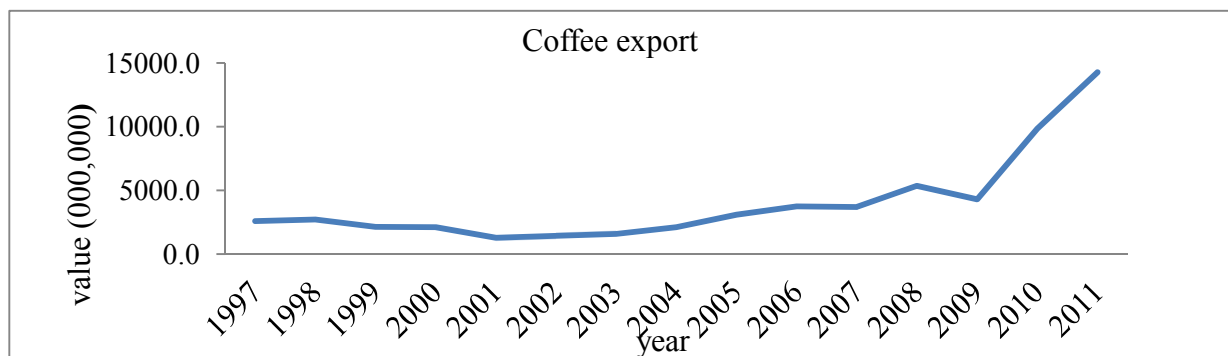


Figure 5. Trend of coffee export of Ethiopia

Source; Own conversion based on WDI, 2013

The above graph shows that there was drastic increment in coffee export of the country starting from 2009 as compared to the previous year performance. This circumstance is highly related with the world price increase especially for agricultural products' price. Though there was alarming increment in the export revenue of coffee induced by its price increment but there was reduction in the volume of production (see figure 5). Given this, there was smooth like movement in the production of the crop before 2006 starting from 2001, which directly result into oscillation in the exported volume of coffee. The variability of the export volume of coffee was so frequent starting from 2005, which was related with the climatic condition and other circumstance related to the smallholders, who are the main source of the crop, with in the country.

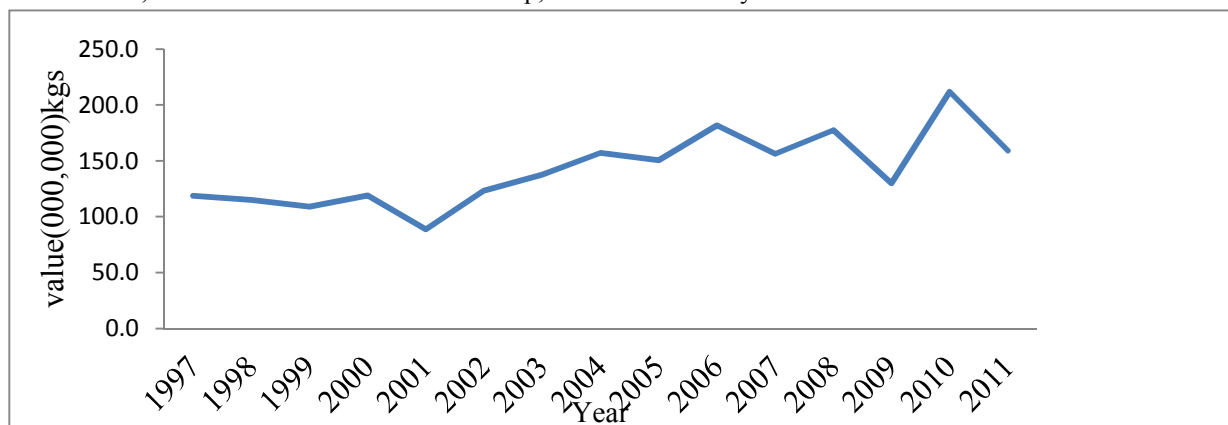


Figure 6. Volume of coffee export of Ethiopia for the sampled years

Source; Own conversion based on WDI, 2013

##### 4.2. Model Tests

We did model specification test to come up with a model which best fits with our objectives since there are more than one candidate models which can analyze the available data. Eventually, gravity model was found to be an appropriate model after conducting the following tests.

###### 4.2.1. Choosing between fixed and random effect model

The two models are mainly adopted for analyzing panel data. They are highly related and one may apply them in an alternative way. Given this, depending on the data type and the interest of the researcher there may be adoption of the one for analyzing a given data. If the interest of the researcher is only on time invariant variables, then he/she may apply the fixed effect model. According to Baier and Bergstrand, an alternative yet simpler way

of treating multilateral resistance is the use of a fixed effect model. Indeed, since Anderson and Van Wincoop, most relevant studies have employed fixed effects techniques for developing gravity models. According to Egger, selection between fixed and random effects models depends on the interests of the analysis, the sample country, the data properties and the underlying theoretical model used. Random effect models are needed to capture cross country and time effects, but note that this model should be considered if they are adequately consistent and there is an interest in estimating time invariant effects (Konstantinos, *et al.*, 2010).

All the above imply that panel data may be analyzed by having either of the two models of analysis. Having this, here this research has the interest of observing the effect of country and time specific variables. To decide between fixed or random effects you can run a Hausman test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. It basically tests whether the unique errors ( $u_i$ ) are uncorrelated with the regressors, the null hypothesis is they are not. The test result revealed that the error terms are uncorrelated with country specific circumstances, which indicates that the chi-square value (0.9742) is insignificant to accept the null hypothesis. This all implies that the appropriate model is the random effect one (see table 2).

Table 5. Hausman test of selection model

Variables	Coefficients			
	Fixed (b)	Random (B)	Difference (b-B)	S.E. (sqrt(diag(V b-V B)))
Lfgdp	0.9417473	1.241728	-0.2999806	0.3922347
Lddgdp	0.2737354	0.1994862	0.0742493	0.1075035
Lpopulation	0.4349462	-0.5429581	0.9779043	1.021157
Letpopula	-2.674336	-2.944583	0.2702467	0.789052
Lfdi	-0.022346	-0.0240154	0.0016694	-
exgr	0.0870923	0.0901345	-0.0030422	-
Prob>chi2 = <b>0.9742</b>				

Source; Model result, 2013

#### 4.2.2. Test of selecting between random effect and OLS model

In some occasions there may be application of the Ordinary Least Squares (OLS) for estimating the coefficients of a gravity model in which its specification is in log-linear form. While OLS is still implemented for analyzing and evaluating policies, researchers have indicated methodological and modeling flaws in the development of gravity models using OLS. The Lagrange Multiplier (LM) test helps to decide between a random effects and a simple OLS regression. The null hypothesis in the LM test is that variance across countries is zero, which means no significant difference across units or no panel effect.

Table 6. Breusch and Pagan Lagrangian multiplier test for random effects

Variables	Variance	Sd= sqrt(var)
LFOBCOFF	5.3219	2.306924
E	1.461318	1.20885
U	1.289693	1.135646
Prob > chibar2 = <b>0.0000</b>		

Source; model result, 2013

The test value (**chi-square 0.000**) showed that the test statistics is significant enough to reject the null hypothesis, which means there is difference across countries or there is panel effect. Thus, the preferred model is random effect but not the simple OLS regression.

#### 4.3. Model Result

After having all the above tests, the research had adopted the random effect model for regressing and has the following result. The difference across units was assumed that of uncorrelated as of the corr ( $u_i, x_i$ ) value where it is zero. Since the probability value of the chi-square value is less than that of 0.05 or it is significant at one percent level of significance, then the model is significant or the variation in the dependent variable is fully explained by the variables considered as an explanatory. It also showed that the coefficients in the model are different from zero. Since each coefficient in time series and cross sectional data represents the average effect of X over Y when X changes across time and between countries by one unit. On average 46.90% of the variance is due to differences across panels, in which the 'rho' is known as the intra class correlation.

The model result showed that four of the total variables (eight) are significant at different level of significance. Given their being significant in affecting the dependent variable many of them, including the insignificant ones, are having the expected sign. The main independent variables of the basic gravity model as well as this model, the foreign GDP and the distance between Ethiopia and importer nations are significant and as to the expected sign. Given this, the coefficient of these two variables is elastic type, which implies that a one percent change in one of these two variables would automatically lead to a more than one percent change in the dependent variable,



coffee export of Ethiopia. As to the model result (table 4) a one percent increment in the GDP of Ethiopian coffee trade partners, would directly result into a 1.242% increment in coffee export value of Ethiopia. Similarly, a one percent decrease in distance between the two nations will induce a 1.23% increment on coffee export from Ethiopia. This implies that the net effect of change in one of the two variables has an elastic type of response.

The variable that is considered as one indicator of the foreign demand, which is the population level of the foreign trade partners, results into having unexpected sign, though it is significant at ten percent level of significance. The research has expected that there may be substitution of importable items like coffee of Ethiopia, as the population of the importer countries becomes larger and larger.

Many scholars had argued that devaluation of the domestic currency in terms of the foreign one has a target of increasing the export of the domestic nation. Exactly the same condition happens in this research, in which the successive devaluation of the domestic currency, birr, in terms of US\$ has a positive effect on improving the export of coffee. This variable has a positive coefficient of 0.09, which implies that devaluation of the domestic currency would result into an increment in the coffee export value of the country by 0.09 percent.

Table 7. Gravity model result (Dependent variable, Coffee export value)

Variables	Coefficient	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
Lfgdp	1.24173	0.29974	4.14	0.000*	0.654252	1.82921
Ldistance	-1.23139	0.49745	-2.48	0.013*	-2.20638	-0.25641
Lddgdp	0.19949	0.30699	0.65	0.516	-0.402193	0.8017
Lpopulation	-0.54296	0.32238	-1.68	0.092***	-1.174806	0.08889
Letpopula	-2.94458	2.66464	-1.11	0.269	-8.16717	2.27801
Lfdi	-0.02402	0.08987	-0.27	0.789	-0.20015	0.15212
beingeurope	-0.25870	0.47639	-0.54	0.587	-1.19240	0.67500
Exgr	0.09014	0.05166	1.74	0.081***	-0.01111	0.19138
Cons	49.3925	42.6463	1.16	0.247	-34.19278	132.9777
sigma_u	1.1356464					
sigma_e	1.2088499					
rho	<b>0.46880687</b> (fraction of variance due to u <sub>i</sub> )					

Source: Model result, 2013. \*\*\* =10%, \*=1%

All variables representing the domestic economic system as supply side factors are found to have insignificant effect on coffee export of the country. This might be due to the fact that the majority of exported coffee is sourced from smallholders who are not much sensitive to the changes on the domestic national economy. In general, the production system of our smallholders is not related to the GDP of the country but rather it is because of being their source of life.

## 5. Conclusion and Recommendation

Coffee is the main actor and source of revenue for Ethiopia in most of the times. It is the back bone of the nation's economy in generating foreign exchange and in helping the economy to have a better performance. Accordingly, this study tried to assess the effect of demand and supply side factors on the coffee trade of the country. Moreover, some additional variables were included on the basic gravity model to make it more representative and hence known as augmented gravity model.

From results of descriptive analysis, it can be observed that European nations are the dominant importers of Ethiopian coffee accounting for over 35% of the country's export in 2009/10. Furthermore, coffee import by this continent is relatively consistent as compared to other continents such as Asia in general and China in particular. The coffee export revenue of the country in recent times showed that of smooth movement as of relative stability in the world price of the item after 2008 drastic reduction. Given this, value of Ethiopian coffee export showed relative a stable increment as compared with the volume of export.

As the model result revealed that successive enlargement of the foreign GDP, especially Ethiopian coffee importers, has a positive and significant demand effect, which means increment of it would directly result into increment in the export revenue of the country from coffee.

The study had also tested the Mundell-Fleming hypothesis, which states that successive devaluation of the nominal currency would result in long run improvement of the revenue generated from export. The model result of this research was going as side with this hypothesis in which devaluation of Ethiopian birr has a positive and significant contribution in improving the coffee export value of Ethiopia for the last decade. Thus, devaluation of the Ethiopian Birr would result into improvement in the export level of specific commodities.

Though encouraging results, domestic variables expected to affect coffee export of the country are not significant implying that Ethiopian government has not paid more attention on production and processing aspects of the crop. Thus, the government has to expedite its effort that increases the value addition of exported coffee to

improve the performance of nation's economy in general and the livelihood of smallholders in particular. Since coffee is the main source of foreign exchange and income source of many smallholders.

Though it may not be sufficient enough to generalize about the whole domestic macro economic variables our model showed that the domestic macro economic variables considered in this research are not significant enough in affecting the production and export of the crop. Thus, it will be better for anyone who will be interested for further study in connection of this crop if he/she pays attention to micro variables rather than domestic macro variables.

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## Appendix

Table 1. Ethiopian coffee importers that import more than one percent per year

No	COUNTRY	2005/06	2006/07	2007/08	2008/09	2009/10	Average
1	Germany	9.82	11.77	9.52	9.17	9.81	10.018
2	China	13.34	5.04	4.98	12.76	11.65	9.554
3	Saudi Arabia	5.43	6.18	7.93	7.70	6.12	6.672
4	Netherlands	3.78	4.75	6.88	8.39	7.38	6.236
5	Switzerland	6.62	4.99	5.49	7.45	6.10	6.130
6	USA	4.72	4.99	7.18	4.85	3.89	5.126
7	Italy	5.48	6.34	5.21	4.19	2.35	4.714
8	Japan	7.83	6.12	6.15	0.47	1.19	4.352
9	Somalia	3.81	2.22	4.91	2.05	8.61	4.320
10	Sudan	2.42	4.37	3.85	4.86	5.76	4.252
11	Djibouti	5.65	4.15	3.66	3.13	2.51	3.820
12	Israel	1.99	2.11	3.24	6.80	2.61	3.350
13	Belgium	2.64	3.72	3.37	2.44	2.24	2.882
14	U.A.E.	2.15	2.62	3.82	4.09	3.88	3.312
15	UK	2.59	2.82	2.16	4.09	2.18	2.768
16	Yemen	2.33	2.36	1.89	4.06	0.82	2.292
17	Turkey	1.43	3.16	2.73	1.58	1.67	2.114
18	France	2.02	2.03	1.38	2.76	1.20	1.878
19	India	0.75	1.17	1.01	1.03	1.22	1.036
20	Egypt	1.45	0.66	0.60	1.03	1.56	1.060
21	Others	15.20	18.46	14.05	7.11	17.26	14.416
22	<b>Grand Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.0</b>	<b>100.00</b>

Source; WDI, 2013

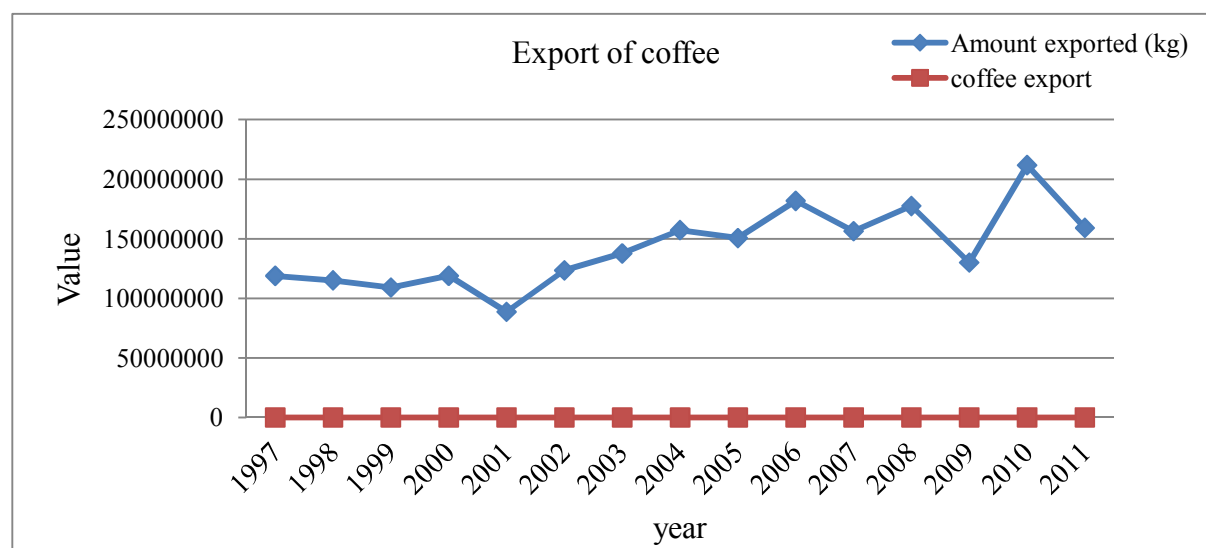


Figure1. Trend of Coffee Export Value and Volume

Source, Researcher's own conversion from WDI, 2013

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