

## The Determinants of Trade Flow and Potential between Ethiopia and Group of Twenty

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### ABSTRACT

This study is intended to assess Ethiopia's trade flow determinants and trade potential with G20 countries whether it was overtraded or there is/are trade potential by using trade gravity model. The sources of panel data used were IMF, WDI, United Nations population division, The Heritage Foundation, Washington's No. 1 think tank online website database, online distance calculator and others for the duration of 2010 to 2019 for 10 consecutive years. The empirical data analyzing tool used was Random effect model (REM) which is effective in estimation of time-invariant data. The empirical data analyzed using STATA software result indicates that Ethiopia has a trade potential with seven countries of G20, whereas Ethiopia overtrade with 12 countries and EU region. The Ethiopia's and G20 countries/region bilateral trade flow statistically significant/ $p < 0.05$ /determinants were the population of G20 countries, growth domestic products of G20 countries, growth domestic products of Ethiopia, geographical distance between Ethiopia and G20 countries. The top five G20 countries exported to Ethiopia were china, United State of America, European Union, India and South Africa, whereas, the top five G20 countries imported from Ethiopia were EU, China, United State of America, Saudi Arabia and Germany respectively. Finally, the policy implication were Ethiopia has to Keep the consistence of trade flow with overtraded countries and improve with under traded countries through trade policy revision and secondly, focusing on the trade determinants to improve trade flow is recommended.

**Keywords:** Trade Gravity Model, Trade Determinants, G20, International Trade, Trade Potential

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### INTRODUCTION

This research is conducted to examine the trends of trade flow, determents of trade flow and trade potential of Ethiopia with Group of twenty members.

The group of twenty is comprised of Argentina, Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South

Korea, Turkey, the United Kingdom, and the United States. Collectively, G20 members account for around 85% of global gross domestic product (GDP), 75% of world trade, 80% of global carbon dioxide emissions (CO<sub>2</sub>) and 70% of global plastic production as well as two-thirds of the world's population (Organization for Economic Co-operation and Development/OECD, 2019). It excludes about 148 global countries and only contains medium and high income countries, but takes a loin share in trade, economic, world population, and carbondioxed emmission. South Africa is the only African country member of group of twenty. The major international trading partners of Ethiopia were China, the United States, Somalia, Kuwait, Switzerland, Saudi Arabia, Germany, Italy, Djibouti, Japan, and UK. (Oumer N. & Eunice L., 2017). Except Somalia, Kuwait, Switzerland and Djibouti the rest countries are a group of twenty members. Ethiopia's industrialization strategy emphasis on labor intensive economy, whereas most of group of twenty memebbers are capital intensive and the trade between Ethiopia and a group of twenty is better off as Heckscher-Ohlin theory of trade. This theory is comparative advantage in international trade. According to this theory capital intensive nations exports capital intensive goods and imports labor intensive goods, while countries in which labor intensives are expected to export labor intensive goods and imports capital intensive goods (Arndt, S. W. 1997).

As of world trade organization the Ethiopia's merchandize world total trade share in 2019 were 0.01% export and 0.08% import (WTO, 2020). In 2019, Ethiopia exported \$7.6 billion and imported \$20.0 billion, resulting in a negative trade balance of -\$12.4 billion.

In 2015, Ethiopia's largest export sector was Vegetable, with 64.69% of total exports. Ethiopia exported 1,654 different products in 2015 foreign direct investment was \$2.5 billion or 2.62% of the GDP, as of 2019. Ethiopia's annual GDP growth was 8.36% per year in 2019. Its total investment rate was 39.00% of GDP in 2017. Inflation was 10.69, as of 2017. (The World Bank, 2019). As of World Bank national and the Organization for Economic Co-operation and Development (OECD) national account data file the Ethiopia's international trade/export and import/contribution to GDP is 48.23% in 2011 and 28.42% in

2019. It decreased continuously from 2011 to 2019 by 2.43% in average. Now days, lot of literatures are accessible on gravity model approach trade flow determinants and potentials analysis. (Negussie Z. and Dessalegn G., 2014) conducted a research on Determinants of Bilateral Trade between Ethiopia and its Major Trading Partners'. Its result were total trade flow was determine by mass (economic size) of the importing and exporting countries, real bilateral exchange rate, FDI of Ethiopia, weighted distance and bordering between Ethiopia and the major trading parents.

Another recent study conducted on a Dynamic Panel Gravity Model Application on the Determinant Factors of Ethiopia's Coffee Export Performance. It's results suggested that lagged Ethiopia's coffee export performance, real gross domestic product (GDP) of importing countries, Ethiopian population, Ethiopian real GDP, openness to trade of importing countries, Ethiopian institutional quality, and weighted distance were found to be the determinant factors of Ethiopia's coffee exports performance (Wondesen T. and Fekadu G., 2019).

Another study on the Determinants of Ethiopia's Live Animal Export Using a Gravity Model Approach by Hayat Mohammed in 2019. The study result indicates the Partner country's Gross domestic Product, weighted distance between Ethiopia and partner countries', partners country's population and total road network of Ethiopia found to be a significant factors affecting Ethiopia's live animal export in the period between 2000 and 2017 ([Hayat Mohammed, 2019](#)).

(Murad M. and, Beyan A, 2020) studied the Determinant of Sesame Export Performance in Ethiopia using a Panel Gravity Model Application. The study results were real gross domestic product of importing countries; Ethiopian real gross domestic product, real exchange rate and weighted distance were found to be the determinant factors of Ethiopia's sesame exports performance.

The study conducted on Determinants of Ethiopia's Livestock Exports: Analysis of Gravity Model of Trade analysis revealed that real gross domestic product, real gross domestic product per capita, the population size of the importing partner countries, and the real

exchange rate were the major gravity factors affecting positively livestock export earnings (Yibrah H. and Gabriel T., 2020). From above literatures, it is possible to observe the gaps and limitations of the previous studies that:

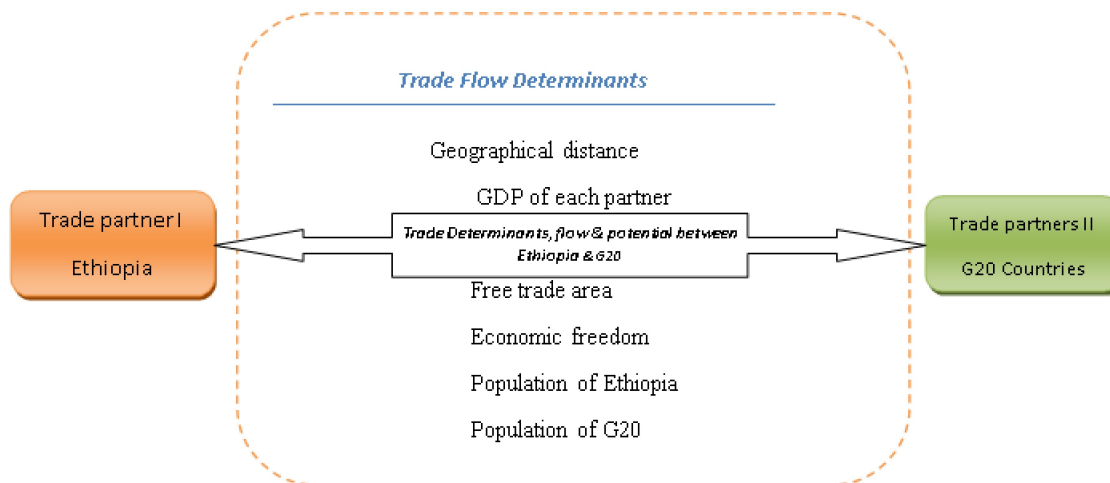
All literatures covers the basic trade gravity model factor economic sizes, and distances but different in other independent variables however, there is no single study, which considered the economic freedom index in its study.

Thus, this research is intended to identify the trade determinants, trends of trade flow and assesses where the Ethiopia's international trade potential is/are in the members of group of twenty, the main factors that can affect the Ethiopia's international trade, and international trade tends flow using traditional gravity model of trade and dummy variables like FTA and EF.

## CONCEPTUAL FRAMEWORK

The conceptual framework for overall study is shown as the following diagram.

Figure 1.1. Conceptual framework



## METHODOLOGY OF THE STUDY

This chapter discussed the research methodology used for data collection, data generation and analysis. The main methodologies discussed were model specification, sources of data and data analysis. Research methodology allows the reader to critically evaluate a study's overall validity and reliability of the study. It discusses the way trade flow determinants and potential between Ethiopian and Group of twenty countries data collected, generated and analyzed.

## MODEL SPECIFICATION

The basic form of the gravity model of trade can be described as follows:

$$T_{ij} = \beta_0 * \frac{GDP_i * GDP_j}{\dots\dots\dots} \quad (1)$$

Where  $T_{ij}$  is bilateral trade volume between Ethiopia and each G20 member countries,  $\beta_0$  is constant;  $GDP_i$  and  $GDP_j$  are Ethiopia's and Group of twenty member countries GDP respectively,  $D^2$  the square of Geographical distance of capital city of Ethiopia (Addis Ababa) to other group of twenty member countries capital city.

Based on the above basic gravity model of trade above, the other variables used were population, economic freedom index of Ethiopia and G20, Common free trade area, and error terms. To satisfy the requirements of linear estimation the natural logarithm transformation of equation (1) above were expressed as:

$$\ln T_{ijt} = \beta_0 + \beta_1 \ln GDP_{prt_{it}} + \beta_2 \ln GDP_{eth_{it}} + \beta_3 \ln D + \beta_4 \ln pop_j + \beta_5 \ln pop_i + \beta_6 \ln EF_j + \beta_7 \ln EF_i + \beta_8 \ln FTA + ei \dots (2)$$

$T_{ijt}$  is the value of international trade (export and import) between country  $i$  (Ethiopia) and country  $j$  (G20 member countries) in year  $t$ . the total trade value is used as dependant variable.

$GDP_{eth_{it}}$  is Growth Domestic Products of country  $i$  (Ethiopia) in year  $t$

$GDP_{prt_{jt}}$  is Growth Domestic Products of country  $j$  (G20 member country) in year  $t$

$D_{ij}$  is distance between capital city of country  $i$  and  $j$   
 $FTA_{ij}$  is a dummy variable that takes the value of 1 if both countries have PTA together; otherwise 0.

Economic Freedom (EF) is a dummy variable that has 5 categories: free, almost free, moderately free, mostly unfree and repressed. It takes the value of 4 if a country  $i$  economic freedom rank is free, 3 mostly free, 2 moderately free, 1 mostly unfree and 0 repressed, and some for country  $j$ .

$ei$  is error term.

Population ( $pop_i$ ,  $pop_j$ ) is a total population of Ethiopia ( $i$ ) and G20 countries/region ( $j$ ) respectively.  
 $ei$  is error term and  $\beta_1$  to  $\beta_8 > 0$ .

## VARIABLE DEFINITIONS AND DATA TYPE

For the effectiveness of this research, the types of data used were Panel data, which is the Hybrid of cross-sectional & time-series data. This is because of the fact that cross-sectional or time series data alone is not sufficient to study these types of research as it needs further data, which were collected from IMF, WDI, United Nation population division, and other sources. Both quantitative and qualitative data were collected. Survey data collection instrument was Online Surveys or secondary data. The type of data collected were export values from Ethiopia to each group of twenty countries, import values from each country to Ethiopia, geographical distance of capital city of Ethiopia from each country or vis., GDP, Population, and dummy variables (FTA, and economic freedom) of each countries/region.

### Total Trade Value (Tv)

The Total trade values of bilateral are export (EX) and import (IM) of goods and services of Ethiopia with G20 countries/region partners in USD. Therefore, total trade value is the sum of bilateral exports and imports. Data on bilateral exports and imports were collected from IMF, direction of trade statistics database Online.

### Growth Domestic Products (Gdp)

It is the market value of total production of goods and services in a country. In this paper G20 countries/region and Ethiopia's GDP were used. The Data on GDPs' were obtained from the World Bank-World Development Indicators online database.

### Geographical Distance (Dist)

It is the geographical distance between the capital city of economic center from Ethiopia to G20 trading partners, measured in kilometers (km) and it is flight distance. Data on distance is sourced from an online distance calculator website. For geographical distance center of European Union, the average center place was used as the flight distance from Ethiopia to EU.

### Population (POP)

The data for the countries and region included in the study were obtained from United Nations population division, department of economic and social affairs, world population prospects 2019 online database. The population in this study includes both sexes





combined by region, sub-region and country annually for 2010- 2019 estimations. The populations of EU countries were taken the sum of all 27 members of EU member countries for each year.

#### **Economic Freedom Index**

It is the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please. In economically free societies, governments allow labor, capital, and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself. The economic freedom index has 12 factors to evaluate EF score of a country. A country's scores in each area are then compiled into a single score, according to which countries are ranked from most (highest score) to least free. These factors are Property rights, Judicial effectiveness, Government integrity, Tax burden, Government spending, Fiscal health, Business freedom, Labor freedom, Monetary freedom, Trade freedom, Investment freedom and Financial freedom.

Economic freedom data of each countries and region were obtained from index of economic freedom, an annual guide published by The Heritage Foundation, Washington's No. 1 think tank online website database.

#### **Common Free Trade Area (FTA)**

Ethiopia has no bilateral free trade area with any of G20 countries/regions, but Africa as a continent and developing countries has the free trade with USA and EU. Therefore, Ethiopia shared the opportunities with others. The two Free trade areas (opportunities) are generalized system of preference (GSP) everything but army (EBA) which removes tariffs and quotas for all imports of goods (except arms and ammunition), coming into the EU from least developed countries and African Growth and Opportunity Act (AGOA) which is designed to assist sub-Saharan Africa and improve the economic relationship between United State and the region.

#### **DATA ANALYSIS**

After the completion of data collection, the data analyzing was done using gravity model approach and Random Effect Model (REM) and Generalized Least Square (GLS) econometric techniques. The panel data were collected from IMF, WDI, United nation population division and other sources were quantifiable, and it organized and analyzed systematically with the help of statistical software (STATA 14.00). Gravity model is the equation easily fits with some important stylized facts; gravity model has become a popular model to measure an elasticity of trade volumes. It also noted that the model is easily estimates using Random effect Model (REM) which uses GLS. Gravitational equations have proven to be very effective used as linear equations that can be used to measure elasticity. An advantage of the REM is that it allows us to estimate the effect of time-invariant variables which cancel out in fixed effects estimation.

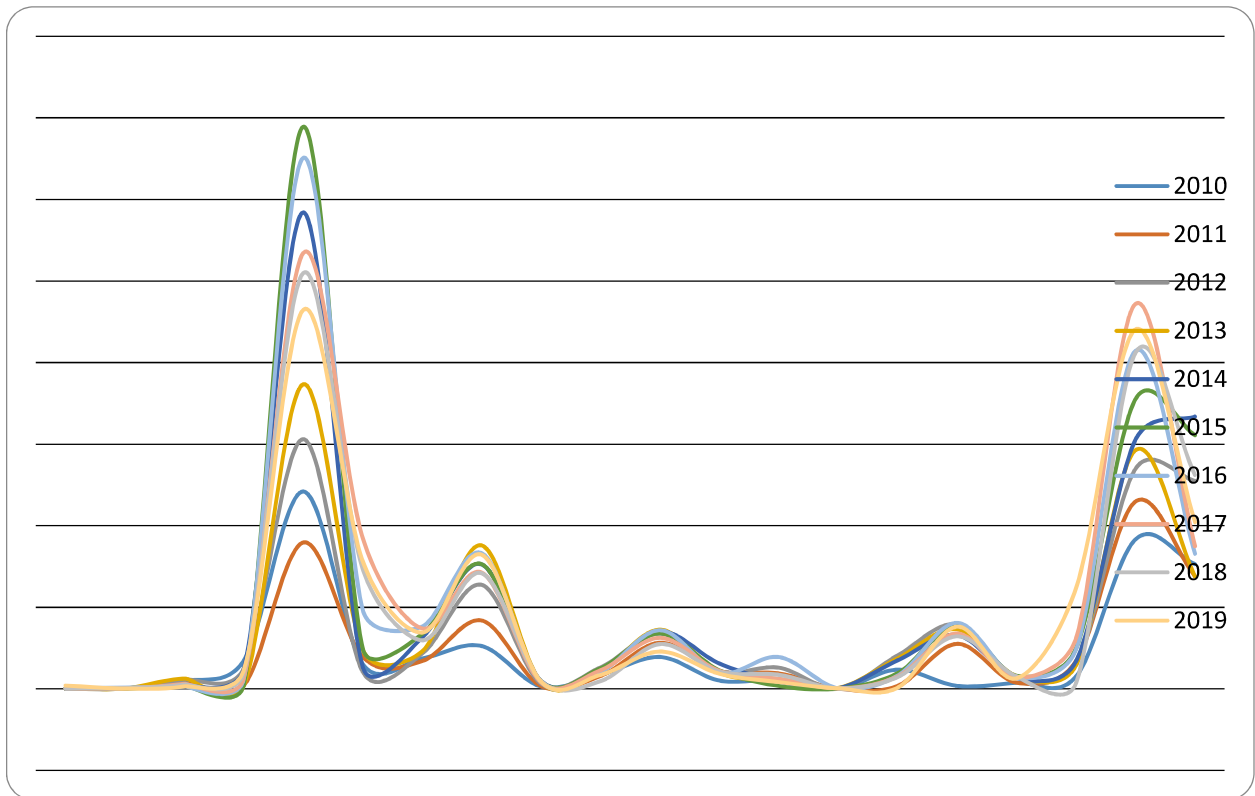
#### **RESULT, DISCUSSION AND ANALYSIS**

This chapter discussed the Ethiopia's international total trade trends with G20 countries, descriptive of empirical results of the study, correlation and regression analysis. The descriptive empirical analysis focused on the describing and characterizing of each continuous and dummy variable. The continuous variables are natural logarithm of total trade value, natural logarithm of Growth Domestic Products of G20 countries and Ethiopia, natural logarithm of geographical distance between Ethiopia and each G20 country, natural logarithm of G20 and Ethiopia's population. The discrete/dummy variables are economic freedom of Ethiopia and G20 member countries/region, and the free trade area between Ethiopia and G20 countries/region.

#### **Ethiopia's Import trade trends with G20 countries (2010 -2019)**

Even though, there were variations in the value of trade trends Ethiopia has the trade trends with all group of twenty countries/ region (G20). The import trade trends of Ethiopia with G20 countries/ region from 2010 to 2019 are shown as the following line graph. As it can be observed from the graph 3.1 Ethiopia's importing trends are increasing from time to time.

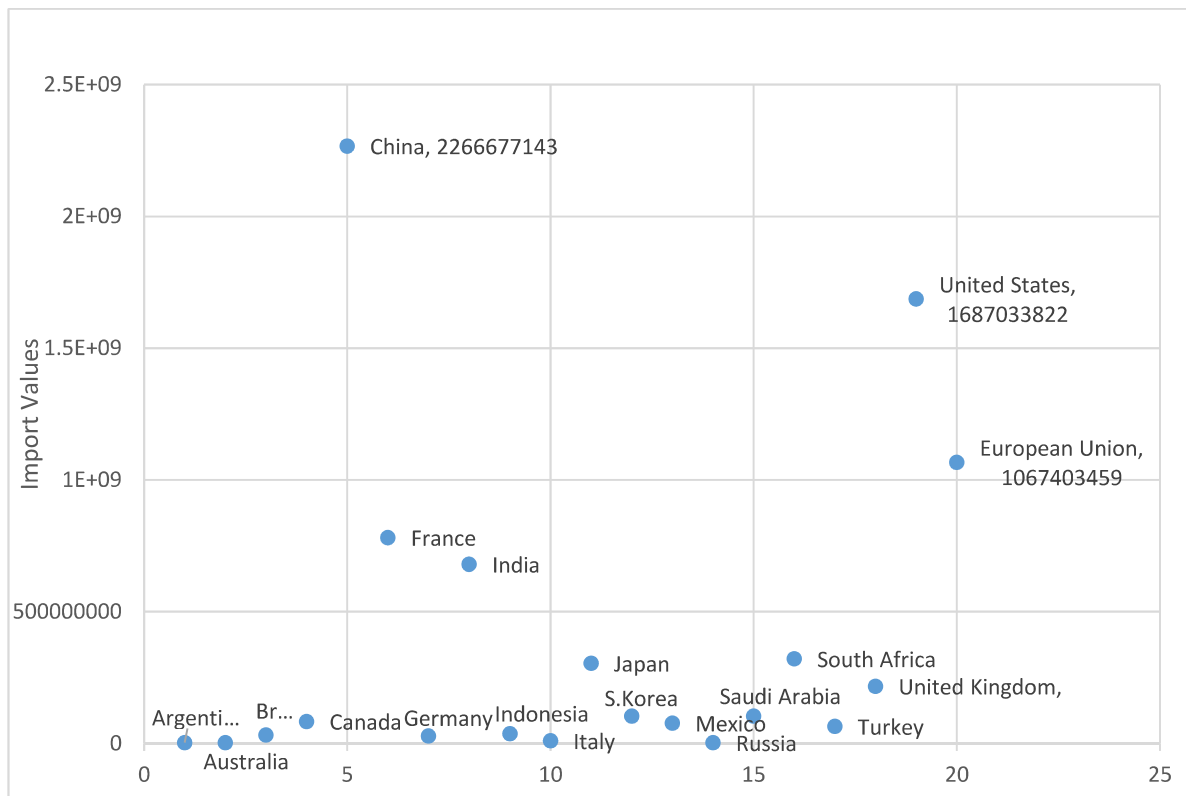
Figure 3.1 Ethiopia's Import trade trends with G20 members (2010 -2019)



Source: Researcher Analysis Based on Data from IMF

The average import trade trends of Ethiopia with G20 countries/region was as shown in the following graph. In the graph, it shows that Ethiopia's import trade with china higher than other G20 countries/region in average. The average value of import trade of Ethiopia from china during 2010 to 2019 was estimated to 22,666,771,427 USD. The top three lowest import trade trends of Ethiopia with G20 countries was observed with Russia, Austria and Argentina. The imported trade values were estimated to 26,183,000 USD, 30,552,084 and 31,946,392 respectively.

Figure 3. 1 Ethiopia's Average Import trade trends with G20 members (2010 -2019)



Source: researcher analysis based on data from IMF

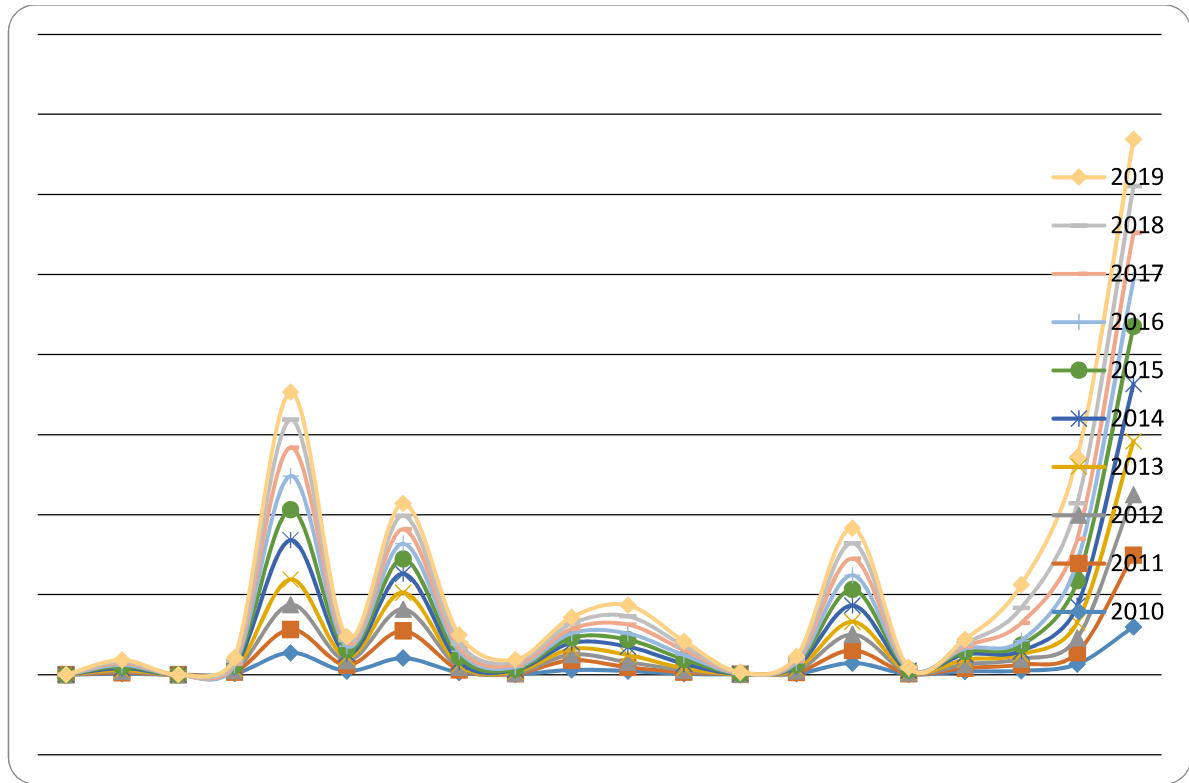
The top five G20 countries/region suppliers to Ethiopia from 2010 to 2019 were China, United State, European Union, India and South Africa. In other words, they are top five G20 countries or region import destination of Ethiopia. The Ethiopia's import values were 22,666,771,427USD, 16,870,338,218USD, 10,674,034,587USD, 6,798,276,873 USD and 3,210,659,900 USD respectively.

#### Ethiopia's Export trade trends with G20 countries (2010 -2019)

Ethiopia has the long history of export trade starting from barter trade. The export trade trends of Ethiopia with G20 countries/region from 2010 to 2019 were discussed in this paper. Though the import and export trade tends of Ethiopia with G20 countries/region were unbalanced or deficit trade the export trade trends of Ethiopia was increased from time to time. The average total Ethiopia's import trade trends from 2010 to 2019 were 78,390,158,682USD, whereas the

total average exports trade trends of Ethiopia with G20 countries/region were 22,417,977,696 USD. The total average trade deficits of Ethiopia with group of twenty countries / region were 55,972,180,986 USD. The Ethiopia's export trade trends were more than three times lower than that of imported commodities from group of twenty countries/regions. The following line graph 2.4 shows the Ethiopia's export trade trends from 2010 to 2019 with G20.

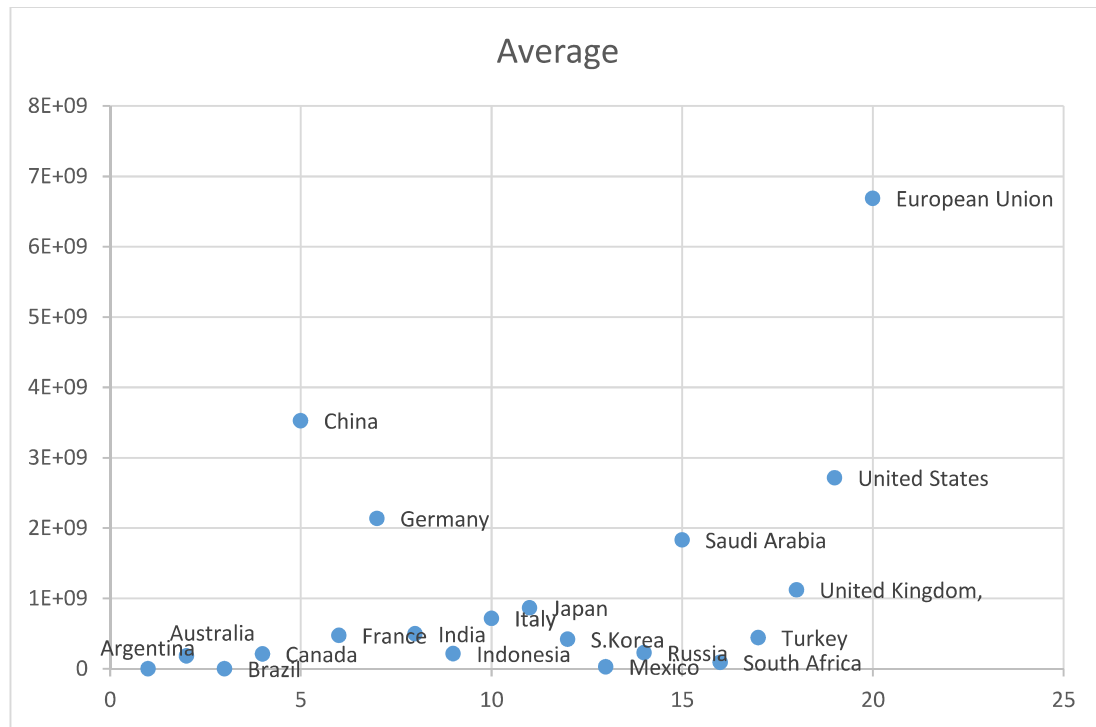
Figure 3. 3 Ethiopia's Export trade trends with G20 countries (2010 -2019)



Source: researcher analysis based on data collected from IMF

The highest export destination of Ethiopia from 2010 to 2019 was European Union. The estimated total export value to EU was 6,689,489,925 USD. The top three lowest Ethiopia's export destination from G20 member countries were Brazil, Argentina, and Mexico. The average exported values to these countries were 1158235 USD, 1310332 USD and 31339620 USD respectively. The following line graph 6 shows the average export destination of Ethiopia from 2010 to 2019.

Figure 3. 4 Average Ethiopia's Export destination with G20 countries (2010 -2019)



Source: researcher analysis based on data collected from IMF.

The top five Ethiopia's export destinations of G20 countries/region from 2010 to 2019 were EU, China, United States, Saudi Arabia and Germany. The total Ethiopia's export values to these countries were 6689489925 USD, 3529508319 USD, 271660612 USD, 213975669 USD and 1831936066 USD respectively. The following bar graph 2.7 shows the top five Ethiopia's export destination of G20 countries from 2010 to 2019.

#### Descriptive, correlation and regression analysis

This sub topic discussed the descriptive, correlation and regression analysis. The descriptive analysis

focused on the describing and characterizing of each continuous and dummy variable. The continuous variables are natural logarithm of total trade value, natural logarithm of Growth Domestic Products of G20 countries and Ethiopia, natural logarithm of geographical distance between Ethiopia and each G20 country, natural logarithm of G20 and Ethiopia's population. The discrete/dummy variables are economic freedom of Ethiopia and G20 member countries/region, and the free trade area between Ethiopia and G20 countries/region.



Table 3: 1 The continuous descriptive variables empirical results

Variables	Observation	Mean	Std.dev	Variance	Skewness	Kurtosis
ln_tradevalue	200	18.91043	1.760832	3.100529	-0.61438	3.427845
ln_GDP_prt	200	28.42133	1.077938	1.161951	0.4830461	2.443371
ln_GDP_eth	200	24.7624	0.3879544	0.1505086	-0.3480927	1.812824
ln_distance	200	8.869385	0.5153695	0.2656057	-0.922934	3.713576
ln_popeth	200	18.41371	0.0789117	0.0062271	-0.042166	1.768671
ln_poppart	200	18.51701	1.161137	1.348239	0.6864482	3.07655

Sources: Researcher own analysis based on data collected (IMF, WDI, UN Population Division)

From table 2.1 above it is possible to know the characteristics of data distribution or normality of the data. The skewness measures the degree of asymmetry of the series. The normal skewness has 0 skew. It shows whether distribution is symmetry around its mean or not. The positive value of skewness shows the long right tail of the distribution and the negative value shows the long left tail of the distribution. Kurtosis shows the flatness/peakness of the curve. A normal distribution is with the kurtosis value of 3. Positive kurtosis value shows the peak curve and negative value shows the flat/lower curve. There are different literatures on the acceptance level of skewness and kurtosis. Some literatures says the acceptance level of skewness is  $\pm 1$  and acceptance of kurtosis 3 whereas other literature says  $\pm 2$  and  $\pm 7$  respectively.

Based on the concepts discussed above and the STATA result table 4.1 it can be concluded that skewness of trade value, population of Ethiopia, GDP Ethiopia and distance are negative value and slightly twisted to the left, but with the acceptance level of below  $-1$ . The skewness of the variables GDP of G20, population of G20 is positive and slightly twisted to the right with the acceptance level less than 1. The kurtosis statistical data result shows that the values of trade value, population of G20 and distance are slightly greater than 3 and it implies that there is a thin "bell" with a high peak for each variable, whereas the variables for kurtosis in STATA result for population of Ethiopia, GDP of Ethiopia and GDP of G20 are less than 3 and shows its tails are shorter and thinner, and its central peak is lower and broader compared to a normal distribution. In general, the statistical result of both skewness and kurtosis are within the acceptable level.

In the study economic freedom index (EF) and free trade areas (FTA) were considered as discrete/dummy variables. EF is a dummy variable that have 5 categories as of The Heritage Foundation, Washington's No. 1 think tank online website database of 2010 to 2019 Economic freedom index. The categories were: free, almost free, moderately free, mostly un-free and repressed. ef\_categoryeth and ef\_categoryprt are designated for economic freedom of Ethiopia and G20 member countries/region respectively. As data sourced indicates, EF score of Ethiopia from 2010 to 2019 were ranged from 43.8 to 53.6 and it is categorized as the score less than 50 are repressed and 50-60 is mostly un-free economic freedom. Since, the Ethiopia's economic freedom score failed between these two categorize it is a dummy variables which takes 1 for mostly un-free (50 -60) and 0 for less than 50 is repressed. Thus, comparing with 183-world countries economic freedom index the statistics result shows 20 % of the Ethiopia's economic freedom index category from 2010 to 2019 were repressed, whereas 80% were mostly un-free.

The economic freedom of G20 member countries/region were categorized as 4 if a G20 countries economic freedom rank is free, 3 mostly free, 2 moderately free, 1 mostly un-free and 0 repressed. The statistical analysis shows 2% of G20 countries/region were categorized as repressed, 26.5% as mostly un-free, 38.5% moderately free, 26.5 % mostly free and 6.5% is free.

Another dummy variable included in the study was FTA which shows that the common free trade area between Ethiopia and each G20 countries/region. The statistical result shows that Ethiopia and G20 members have 25% common free trade area whereas with 75% Ethiopia has no common free trade area with G20. The Ethiopia's common free trade area with



G20 members that covers 25% are generalized system of preference (GSP) everything but arms (EBA) which removes tariffs and quotas for all imports of goods (except arms and ammunition), coming into the EU from least developed countries and African Growth and Opportunity Act (AGOA) which is designed to assist sub-Saharan Africa and improve the economic relationship between United State and the region.

#### **Regression Analysis of Alternative Model Result**

This part of the study is to presents the empirical results of the Fixed Generalized least square (FGLS), fixed effects (FE), random effects (RE) estimators and RE robust. The section is also help to choice the appropriate estimator based on the time invariant of data.

#### **Analysis of the Estimated FGLS, Fixed Effects and Random Effects Models**

In view of the nature of dataset employed in this study, it is essential that we select an appropriate estimation method, which accounts for the heterogeneity and correlation in the gravity models resulting from the presence of individual and time effects in the panel data. Therefore, first estimate the FGLS model, fixed effects (FE) and random effects (RE) models, with total bilateral trade of Ethiopia with G20 as the independent variable. The preliminary results of these models are presented in Table 5.3.

Table 3.2 GLS, FE, RE and Random Effect Robust (RER) Models Estimates of Trade Gravity Model of Ethiopia's Total Trade Values From (2010 - 2019)

Dependent Variables	Fixed Generalized Least Square (FGLS) Model	Fixed Effect (FE) Model	Random Effect (RE) Model	Random Effect, Robust
Dependent Variables	LnTij	LnTij	LnTij	LnTij
ln GDP_prt	0.5413824 *** (0.000)	0.2465448 (0.325)	0.7056942 *** (0.000)	0.7056942 ** (0.011)
ln GDP_eth	1.209303 (0.255)	1.014466 * (0.063)	1.089744 * (0.051)	1.089744 ** (0.032)
lnDis	-1.574686 *** (0.000)	omitted	-1.367755 *** (0.000)	-1.367755 *** (0.000)
Ln_poppart	0.8541629 *** (0.000)	0.0775861 (0.513)	0.2258836 ** (0.037)	0.2258836 (0.141)
Ln_popeth	-4.08198 (0.433)	-2.879266 (0.283)	-3.455918 (0.209)	-3.455918 (0.211)
ef_categoryprt	0.831167 *** (0.000)	0.1424604 (0.264)	0.2003922 * (0.087)	0.2003922 (2.47)
ef_categoryeth	0.0212935 (0.891)	-0.015734 (0.843)	0.007528 (0.927)	0.007528 (0.886)
FTA	0.3285348 (0.104)	omitted	0.4428466 (0.351)	0.4928468 (0.315)
constant	45.05642 (0.520)	38.07883 (0.29)	42.900000 (0.247)	42.90566 (0.25)
R <sup>2</sup>		0.4415	0.6845	0.6845
No. of countries	20	20	20	20
No. observation	200	200	200	200
Hausman (x2)	-	0	119.85	-

\*\*\*, \*\*, and \* indicate statistical significance at 1%, 5%, and 10% error level respectively. The values in parenthesis are the p-values of associated with the parameters. The results obtained with the aid of STATA14.

#### Models fitness

The fitness of the model or the independent variables reliably to predict the dependent variable is identified in the regression model. The significance level taken for this study is 5%. It means alpha level is 0.05. From the regression analysis 3.2, the p-value is 0. P-value

less than significance level means the group of independent variables reliably predicts the dependent variable. If p-value greater than alpha level then the independent variables are not consistently predicts the dependent variable. In this study the  $p < \alpha$ , therefore the model is fit. The other is R squared it

shows an overall measure of the strength of association independent variables and dependent variables. It does not reflect to what extent particular independent variable is associated with the dependent variable. It believed that the higher R-squared value and Adjusted R are better. Thus, the model has no problem in both R-squared and P-value. In this study the R-squared are 44.15% for fixed effect model, 68.45% for random effect model. R-squared value indicates that the variance in total trade value between Ethiopia and G20 can be predicted by the independent variables GDP of Ethiopia, GDP of G20, the geographical distance between Ethiopia and G20, population of Ethiopia, population of G20, economic freedom of Ethiopia, economic freedom of G20 and common free trade area.

According to the FGLS results, the trade of all the conventional gravity variables domestic income ( $GDP_i$ ), foreign incomes ( $GDP_j$ ) and geographical distance (Dist) have their theoretically stipulated signs with statistically significance of GDP of G20 and geographical distance at 1% error level. Others independent variables which are statistically significant at 1% error levels are economic freedom index and population of G20 with positive sign of coefficient.

For the Fixed effect (FE) model only GDP of Ethiopia is significant at 10% of error level whereas all  $GDP_i$ ,  $GDP_j$  and Distance are found as per the theory of trade gravity model.

The random effect model statistical result shows the  $GDP_i$ ,  $GDP_j$  and Geographical distance confirms both theory of gravity model and empirical. The  $GDP_j$  (G20) and Distance are statically significant at 1% error level and  $GDP_i$  (Eth) is statistically significant at 10% error level. The robust random effect statistical result shows  $GDP_i$ ,  $GDP_j$  and distances are statistically significant at 1%, 1% and 5% error level and theoretical fit with the gravity model of trade.

#### Coefficient Estimation and Model Selection

According to the FGLS results, the trade of all the conventional trade gravity model variables growth domestic income ( $GDP_i$ ), foreign incomes ( $GDP_j$ ) and geographical distance (Dist) have their theoretically stipulated signs with statistically significance of GDP of G20 and geographical distance at 1% error level.

Others independent variables, which are statistically significant at 1% error levels, are economic freedom index and population of G20 with positive sign of coefficient. For the Fixed effect (FE) model, only GDP of Ethiopia is significant at 10% of error level whereas all  $GDP_i$ ,  $GDP_j$  and Distance are found as per the theory of trade gravity model. The random effect model statistical result shows the  $GDP_i$ ,  $GDP_j$  and Geographical distance confirms both theory of gravity model and empirical. The  $GDP_j$  (G20) and Distance are statically significant at 1% error level and  $GDP_i$  (Eth) is statistically significant at 10% error level. The robust random effect statistical result shows  $GDP_i$ ,  $GDP_j$  and distances are statistically significant at 1%, 1% and 5% error level and theoretical fit with the gravity model of trade.

The random effect model uses GLS and fixed effect model uses OLS for estimations. With fixed effects models, we do not estimate the effects of variables whose values do not change across time and the REM allows estimating the effect of time invariant variables, which cancel out in fixed effects estimation. As this study includes independent variables, which do not changed through time series, Random effect model is preferable over fixed effect model. The fixed effect model omitted Geographical distance between trade partners and FTA as it indicated in table 3.2

The predicted total trade value flow between Ethiopia and G20 members' were estimated using REM and eight independent variables that help to predict total trade flow. The results of each coefficient and corresponding p-values show the statistical significance or insignificance of each independent variable on dependent variable. Increasing every unit independent variables increases or decreases the dependent variable by the value of estimated coefficients. The study result shows the geographical distance and population of Ethiopia adversely affect the trade flow between them. The other independent variables affect the trade flow positively as its results are positives. The coefficient for GDP of G20, geographical distance, GDP of Ethiopia, and population of G20 are 0.7056942, -1.367755, 1.089744 and 0.2258836 respectively, which their p-values are significantly different from 0 using alpha of 0.05 because their p-values are less than 5% error level. The rest variables are not significantly different from zero

using alpha 0.05 because their p-values are greater than alpha level.

### The existence of trade positional between Ethiopia and G20 member countries

This study estimates trade potential of Ethiopia with group of twenty countries/region using trade gravity model analysis. After the average trade estimation from 2010- 2019 for each countries has been estimated the comparison of average actual trade between Ethiopia and G20 countries/region take place. If the actual value is lower than the estimated value, it is called “trade inadequate/under trade/un taped”, and if actual trade value is greater than estimated value then it is called over trade (ZHANG Hai-sen,XIE, ZHNG jain-ming, 2010). The regression equation used to analysis the coefficients and estimated trade value was linear regression model of REM. As the ratio result of actual trade value to estimated trade value shows there are different results of estimated trade values. The G20 countries actual trade value is less than estimated trade values include Argentina, India, Indonesia, Brazil, Mexico, Russia and Australia. The G20 member countries/region actual trade value is greater than estimated trade values consists of EU, USA, Germany France, Saudi Arabia, china, Canada, south Africa, turkey, south Korea, Japan, Italy, and United Kingdom. The estimated trade between G20 and Ethiopia is shown in appendix 1.

## CONCLUSIONS AND POLICY IMPLICATIONS

### *Policy Implication*

Based on the study findings the policy implications of the study were indicated as follows:

1. The finding shows that seven G20 countries (Argentina, Brazil, Russia, Indonesia, India, Mexico, and Australia) were under traded with Ethiopia, whereas 12 G20 countries and EU region (Saudi Arabia, Japan, EU, France, USA, Germany, South Africa, United Kingdom, turkey, china, South Korea, Italy, and Canada) were overtraded. It implies that Ethiopia were under traded with least GDP countries and overtraded with high GDP countries. Therefore, the study would like to recommend Ethiopia to Keep the consistence of trade flow with overtraded countries and

improve with under traded countries through trade policy review.

2. The study discovered that Ethiopia has no trade bilateral agreement with any G20 countries/region. The common free trade area considered in this study were EBA and AGOA which are the trade opportunity of developing and African countries rather than bilateral. Even though it is common advantages for African trade, it improves the trade flow between Ethiopia and G20 members. Therefore, the researcher would like to recommend Ethiopia to consider bilateral trade agreement with G20 countries in its trade policy.
3. One of the main objective of this study was assessing the determinants of trade flow between Ethiopia and G20. Finally, the study discovered, the population of G20 member countries/region, economic freedom of G20 countries/region, growth domestic products of G20 member countries/region, common free trade area and geographical distances were the factors that affects the trade flow between Ethiopia and G20. Therefore, this study finding indicates trading with high-populated countries/region, nearest located countries, high GDP and FTA brings better achievements.

### *Conclusion*

This thesis conducted on the determinants of trade flow between Ethiopia and Group of twenty countries/region. It was to identify the trade flow determinants, the trade trends and the trade potentials between trade partners. To conduct the research the independent variables considered were GDP, population, geographical distance, economic freedom and common free trade area of Ethiopia and G20 member countries. The panel data for 10 consecutive years 2010 to 2019 has been analyzed using Random effect model (REM) estimation technique. The trade gravity model fits the panel data. All three of the trade traditional gravity effects are intuitively reasonable, with statistically significant p-values with significance level 1% and 5%. The statistical results of trade determinants shows that the population, economic freedom, and growth domestic products of G20 member countries/region, common free trade area and geographical distances of



trade partners were the factors that affects the trade flow between Ethiopia and G20. The thesis empirical results also indicates that Ethiopia was under traded with seven g20 countries (Argentina, Brazil, Russia, Indonesia, India, Mexico, and Australia) and overtraded with 12 G20 countries and EU region (Saudi Arabia, Japan, EU, France, USA, Germany, south Africa, United Kingdom, turkey, china, south Korea, Italy, and Canada). Another point this research identified were the top five-export destination of Ethiopia and top five supplier trade partners. The quantitative data analyzed shows that the Ethiopia's top five export destination g20 member countries were EU, China, united State, Saudi Arabia and Germany respectively, whereas the top five G20 countries/region exports to Ethiopia from 2010 to 2019 were China, United State of America, European Union, India and South Africa respectively. The study satisfies the basic trade gravity model, the bilateral trade flow improved with increasing the trading partners GDP & GDP of Ethiopia, decrease with increasing of the distance between the partners. The econometric estimation result implies as distance and increasing in population of Ethiopia affects the trade flow adversely, however the increasing of the population of Ethiopia was not statistically significant. The study implies that Ethiopia should Keep the consistence of trade flow with overtraded countries, improve with under traded countries through trade policy review, and better to consider bilateral trade agreement with G20 countries in its trade policy. However, this study left the trade determinants and trade potential of export and import of Ethiopia with G20 member countries/region independently for future study, as this study emphasized on total trade flow.

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## APPENDICES

	Argentina with Ethiopia			EU with Ethiopia			US with Ethiopia		
year	Actual value	Estimated	Actual/Est	Actual value	Estimated	Actual/Est	Actual value	Estimated	Actual/Est
2010	1.11	66.23	0.02	1362.27	721.47	1.89	1049.73	500.60	2.10
2011	1.13	560.02	0.00	1587.39	56.18	28.26	1292.31	423.73	3.05
2012	1.31	48.41	0.03	2030.53	522.76	3.88	1531.50	364.27	4.20
2013	1.84	55.26	0.03	1354.36	555.19	2.44	1656.17	414.46	4.00
2014	1.92	63.52	0.03	2384.75	614.66	3.88	1733.68	474.84	3.65
2015	1.16	75.00	0.02	2272.59	620.00	3.67	2085.12	562.00	3.71
2016	1.45	57.85	0.03	1409.58	443.87	3.18	2307.74	429.59	5.37
2017	2.04	64.57	0.03	1465.46	506.89	2.89	2650.89	477.85	5.55
2018	1.51	5.93	0.25	1891.15	429.48	4.40	2504.26	438.29	5.71
2019	19.77	52.83	0.37	1605.45	385.52	4.16	2775.54	388.28	7.15
Average	3.32	104.96	0.08	1736.35	485.60	5.86	1958.69	447.39	4.38
	Turkey with Ethiopia			Italy with Ethiopia			Germany with Ethiopia		
Year	Actual	Estimated	Actual/Est	Actual value	Estimated	Actual/Est	Actual value	Estimated	Actual/Est
2010	78.31	72.32	1.08	145.76	96.10	1.52	394.20	130.93	3.00
2011	330.89	99.88	3.31	199.19	81.03	2.46	510.70	109.95	4.64
2012	399.76	86.59	4.62	202.58	69.45	2.92	488.26	93.92	5.20
2013	453.43	99.46	4.56	176.75	78.81	2.24	436.42	106.33	4.09
2014	454.69	115.08	3.95	184.86	90.03	2.05	550.70	121.45	4.53
2015	426.62	137.00	3.11	190.75	106.00	1.80	522.06	143.00	3.65
2016	435.98	106.17	4.11	161.01	80.68	2.00	569.92	109.31	5.21
2017	423.05	119.24	3.55	169.23	89.18	1.90	550.90	121.50	4.53
2018	379.50	110.33	3.44	113.98	81.23	1.40	468.51	111.38	4.20
2019	366.09	98.44	3.72	163.64	71.44	2.29	496.98	98.54	5.04
Average	374.83	104.45	3.54	170.77	84.40	2.06	498.87	114.63	4.35
	France with Ethiopia			Saude Arabia with Ethiopia			Russia with Ethiopia		
Year	Actual value	Estimated	Actual/est	Actual value	Estimated	Actual/est	Actual value	Estimated	Actual/Est
2010	198.30	101.86	1.95	263.61	44.42	5.93	12.54	232.42	0.05
2011	269.29	85.97	3.13	177.01	38.44	4.60	18.24	195.42	0.09
2012	162.65	73.73	2.21	403.77	33.82	11.94	20.66	167.02	0.12
2013	281.92	83.69	3.37	344.14	39.37	8.74	27.96	189.05	0.15
2014	176.37	95.67	1.84	377.93	46.08	8.20	37.68	215.55	0.17
2015	295.70	113.00	2.62	297.11	56.00	5.31	26.21	254.00	0.10
2016	529.32	86.00	6.15	258.50	43.15	5.99	23.38	193.21	0.12