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DETERMINANTS OF ETHIOPIAN COFFEE EXPORTS TO ITS MAJOR TRADE PARTNERS: A DYNAMIC GRAVITY MODEL APPROACH

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Fassil Eshetu[1+]
Degye Goshu[2]

[1]Assistant Professor and PhD Scholar, Haramaya University, Ethiopia.
Email: bekatfech@gmail.com

[2]Associate Professor of Economics, Kotebe Metropolitan University, Ethiopia.

(+ Corresponding author)

ABSTRACT

The aim of this paper was to examine export determinants of Ethiopian coffee to 31 trade partners' countries. The export determinants were examined using a dynamic gravity model and system generalized moment method of estimation from a year 1998-2016. The results of the descriptive analysis showed that Ethiopia was ranked fifth in terms of production and exports of coffee in the world and was also exporting only 39% of its total coffee production. On average, 53.5 and 34.13 percent of Ethiopian coffee exports were directed to European and Asian countries respectively over the period 1998-2016. The regression result of system generalized moment method revealed that trade openness, population size of Ethiopia, foreign direct investment and institutional quality index of Ethiopia has positively and significantly affected the volume of Ethiopian coffee export. But, population of partner countries, weighted distance, lagged export volume and real exchange rate had negatively and significantly influenced the export volume of Ethiopian coffee. Hence, Ethiopia needs to diversify its export destinations and export items a way from primary products to secondary products in order to secure dependable source of foreign currency. As well, improving the institutional quality, promotion of foreign direct investment and swelling trade liberalization would help to boost the volume of Ethiopian coffee export.

Contribution/ Originality: The paper contributes the first logical analysis of the Determinants of Coffee Export of Ethiopia to Its Major 31 Trade Partners using system GMM estimator. This method allows us to obtain robust and unbiased estimates of parameters our model by accounting for the problem of heteroskedasticity, autocorrelation, multicollinearity and endogeniety.

1. INTRODUCTION

Export is an engine of economic growth, development, social and economic structural transformation as predicted by economic theories and evidenced from East Asian countries. Export affects economic growth and structural transformation by providing foreign exchange and promoting capital inflow, Razmi, Rapetti, and Skott (2011) and Balassa (1978). As predicted by classical theory of international trade, foreign trade increases the income of participating countries, world outputs and welfare via better production efficiency. Therefore, export of agricultural products has paramount importance for developing economies since the majority of their population is employed in agricultural sector, Alemayehu and Seid (2015).

Developing countries are expected to import capital goods, technologies and other inputs so as to increase their production base and accelerate economic growth in general and export growth in particular. However, developing countries need to export some products in order to finance their imports. Though the share of developing countries in international trade has been rising over the last two decades, owning to the success stories of some Asian countries like China, Japan, Vietnam, South Korea, Taiwan, Singapore and the like, the share of Africa in international trade has remained below 3 percent, Bacchetta (2007).

As Alekaw (2016) stated, Ethiopia, as one African country, has faced similar problems in its export sector. For instance, the ratio of export value to gross domestic product was 13.4% in 2010 where this ratio decreased to 7.7 percent in 2016, National Bank of Ethiopia (2018). On the other hand, the ratio of export value to import value of Ethiopia was 35 percent in 2000 and due to continuous deterioration of the trade balance of the country, this ratio declined to 18 percent in 2016, National Bank of Ethiopia (NBE) (2018). Regarding the destination of Ethiopian exports, on average 39.8, 28.7 and 20.9 percent of the total exports of Ethiopia are directed to Asian, European and African countries respectively for the period 1998-2016. In similar vein, 53.51 and 34.13 percent of Ethiopian coffee export are directed to European countries and Asian countries respectively over the same period. Despite the colossal effort that has been made by Ethiopian government to diversify the export items, coffee and oilseeds alone still account for 47 percent of the total export of the country. Against this background, this paper aimed at examining the determinants of Ethiopian coffee export to its 31 trade partners using dynamic Gravity model and system generalized moment method of estimation.

2.MATERIALS AND MERTHODS

2.1. Data Sources and Variables

Secondary data was collected from various sources to attain the objectives of the study. Accordingly, information's like: gross domestic product, export volume to each country, total population and exchange rate were obtained from Food and Agricultural organization (FAO). In addition, data on total export and import values were collected from the annual report of the National Bank of Ethiopia. Moreover, data on consumer price index, foreign direct investment and openness were obtained from World Development Indicator (WDI). Finally, data on institutional quality index and distance between Ethiopia and its major trade partners were obtained from Worldwide Governance Index (WGI) and online distance calculator respectively. A total sample[1] of 31 major trade partners of Ethiopia from Asia, Europe, America, Africa and Oceanian countries were included in this study depending on the data availability. Likewise, about 97.13 percent of the total coffee export of Ethiopia is directed to the selected 31 partner countries.

2.2. Model Specification and System GMM Estimator

In international trade, the absolute advantage theory, the comparative advantage theory, the Hecksher – Ohlin theory, the Linder preference similarity theory and the Krugman new trade

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[1]From the total sample of 31 partner countries,15 countries were selected from European countries namely; Belgium, Denmark, Finland, France, German, Greece, Italy, Netherland, Norway, Poland, Spain, Sweden, Switzerland, and United Kingdom. Still depending on data availability, 9 countries were included from Asian countries namely; China, Israel, Japan, Jordan, South Korea, Russia, Saudi Arabia, United Arab Emirate and Yemen. From African countries, only three countries such as Djibouti, South Africa and Egypt were selected for this study. Finally, two countries from North America (United State of America and Canada) and two countries from Oceania (Australia and New Zealand) were selected.

theory had explained the causes and benefits of international trade, Salvatore (1998); Carbaugh (2006); Anderson (2004); Hill (2009); Suranovic (2006); Dunn and Mutti (2005). However, these theories are silent about the size of trade flows between countries. Therefore, the gravity model was developed to deal with the magnitude of trade flows between countries. The gravity model depends on Newton's theory which states that "two bodies attract each other in proportion to their masses and inversely to the square of the distance between them." Economists applied this theory to international trade and tried to examine the flows of products between two countries in proportion to their economic sizes or gross domestic products and inversely to distance between them. This model was applied in international trade for the first time by Tinbergen (1962). Thus, the general gravity model can be specified as follow.

$$X_{ijt} = A \frac{(Y_{it} \; Y_{jt})}{D_{ij}} \qquad (1)$$

Where X_{ij}, Y_i and Y_j refer to the trade flow of particular commodity from sending country to receiving country, the gross domestic product of sending country and the gross domestic product of receiving country respectively. In the above gravity model, A refers to constant term of the gravity equation. The gross domestic product of exporting country measures its ability to export while the gross domestic product of partner country measures its ability to import. Finally, a dynamic gravity model for dynamic panel data can be specified by taking the natural log of Equation 1 and augmenting with others covariates which are assumed to affect volume of coffee exports of Ethiopia to its major trading partners.

$$LX_{it} = \beta_0 + \beta_1 LX_{it-1} + \beta_2 LGDP_{it} + \beta_3 LGDP_{jt} + \beta_4 LWDS_{ijt} + \beta_5 LRER_{ijt} + \beta_6 LOPN_{it} + \beta_7 LOPN_{jt} + \beta_8 LPOP_{it} + \beta_9 LPOP_{jt} + \beta_{10} LFDI_{it} + \beta_{11} LIQI_{it} + \alpha_i + U_{it} \qquad (2)$$

Thus, Equation 2 shows a dynamic panel data model where the lagged value of the outcome variable is included as one covariate on the righthand side of the equation. In this equation, t refers to time which ranges from 1998 to 2016 for this study while i refers to the number of observation or partner countries which ranges from 1 to 31 since the study include 31 partner countries. According to Roodman (2009) the generalized moment method should be used if there is short panel, measurement errors, lagged dependent variable as regressors, omission of variables, fixed individual effects, heteroskedasticity and autocorrelation within individuals but not across them.

Thus, following Blundell and Bond (1998) the system generalized moment method (GMM) is used to estimate Equation 2. However, system GMM uses two equations, one at level and the second at first difference so as to get additional instruments. The first difference is used as instrument for the level equation while the level value is used as instrument for the differenced equation and this leads to higher efficiency of estimates. According to Manuel and Bover (1995) and Blundell and Bond (1998) the system GMM estimators can be specified as follow.

$$LX_{it} = \beta_0 + \beta_1 LX_{it-1} + \beta_2 LGDP_{it} + \beta_3 LGDP_{jt} + \beta_4 LWDS_{ijt} + \beta_5 LRER_{ijt} + \beta_6 LOPN_{it} + \beta_7 LOPN_{jt} + \beta_8 LPOP_{it} + \beta_9 LPOP_{jt} + \beta_{10} LFDI_{it} + \beta_{11} LIQI_{it} + \alpha_i + U_{it} \qquad (3)$$

$$\Delta LX_{it} = \beta_1 \Delta LX_{it-1} + \beta_2 \Delta LGDP_{it} + \beta_3 \Delta LGDP_{jt} + \beta_4 \Delta LWDS_{ijt} + \beta_5 \Delta LRER_{ijt} + \beta_6 \Delta LOPN_{it} + \beta_7 \Delta LOPN_{jt} + \beta_8 \Delta LPOP_{it} + \beta_9 \Delta LPOP_{jt} + \beta_{10} \Delta LFDI_{it} + \beta_{10} \Delta LIQI_{it} + \Delta U_{it} \qquad (4)$$

Thus, the system GMM estimator is a weighted average of the difference coefficients from Equation 3 and the level coefficients from Equation 4. According Manuel and Bover (1995) an asymptotically efficient estimator can be obtained through two-step system GMM estimation. Therefore, this paper has estimated both the one step and two step system GMM in order to get consistent and asymptotically efficient estimates for the parameters of Gravity Model of Ethiopian coffee export.

2.3. Variable Description and Expected Sign

X_{ijt} referring to annual volume of coffee export of Ethiopia to its major trade partners which is measured in kilograms while X_{ijt-1} stands for one period lagged volume of coffee exports to each country. In addition, Egger (2002) recommended using only the first lag of the outcome variable as covariate rather than searching for some optimal lag length. RER_{ij} referring to real exchange rate which is obtained by multiplying the nominal bilateral exchange rate between Ethiopia and its partner countries by the ratio of consumer price index of partner countries to consumer price index

of Ethiopia. The coefficient of this variable is expected to be positive since currency devaluation is assumed to improve the competitiveness of devaluating country. Moreover, the coefficient of foreign direct investment of Ethiopia, FDI_i, is also expected to be positive and this because, economic theory predicts that foreign direct investment increases the export capacity of a nation by suppling capital goods and services.

The variable GDP_{it} and GDP_{jt} refer to the gross domestic product of Ethiopia and its major trade partners respectively and trade theory predicts they have positive effect on the volume of trade flows, Head (2003). The sign of the coefficients of population size of exporting country POP_{it} and the population size of partner country, POP_{jt} depend on the relative strength of the absorption effect and economies of scale of large population. An exporting nation with large population can either export more because of higher production capacity or export less because of more consumption capacity. Similarly, a partner country with large population may produce more due to economies of scale and reduce imports or consume more and increase imports, Wondesen and Fekadu (2019) and Gebreyesus and Gebru (2015). The coefficient of the weighted[2] distance between exporting country and partner country, WDS_{ijt} is expected to be negative, Karagoz and Saray (2008). The coefficients of trade openness of Ethiopia, (OPN_{it}) and trade openness of partner country (OPN_{jt}) are expected to be positive in in the above model. Finally, the institutional quality index of Ethiopia is expected to affect trade flows between Ethiopia and its partner countries positively, Wondesen and Fekadu (2019) and Alekaw (2016).

3. RESULT AND DISCUSSION

3.1. Result of Descripive Data Analysis

Ethiopia is ranked the fifth in terms of both the production and export of coffee in the world as evidenced from Figure 1. The mean annual coffee export of Ethiopia is only about 10 percent of the mean annual coffee export of Brazil for the period 1998-2016. Moreover, using 25 years data on coffee prodiuction and export, Ethiopia has been on average exporting only 39% of its total coffee production while the remaining 61% of the production has been consumed domestically.
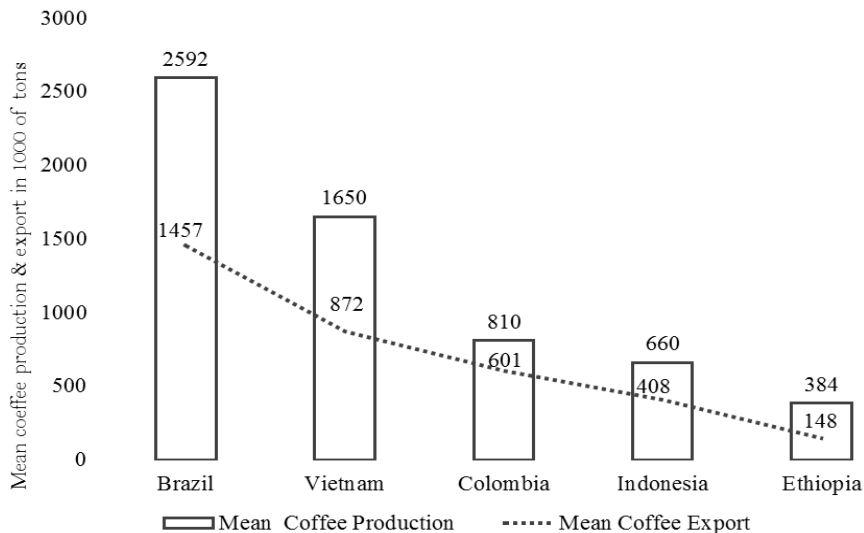

Figure-1. Mean volume of coffee production & exports by top five exporters in the world.
Source: FAOSTAT 2019.

On the other hand, Brazil, the top coffee producer in the world, on average, consumed 44% of its coffee production domestically and supplied only 56% to international market. Thus, compared

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[2] A weighted distance is obtained by multiplying the GDP of exporting country by the physical distance and dividing by the sum of the GDP of exporting country over the period under consideration.

to the other top producers of coffee in the world, Ethiopia is consuming higher percentage of its major export commodity.

As indicated in Figure 3, 53.51 percent of the total coffee export of Ethiopia is directed to European countries from a year 1998-2016. Furthermore, on average, 34.13% of Ethiopian coffee export is directed to Asian countries over the same period and therefore, Asian countries are the second major trade partners of Ethiopia in terms of coffee exports.
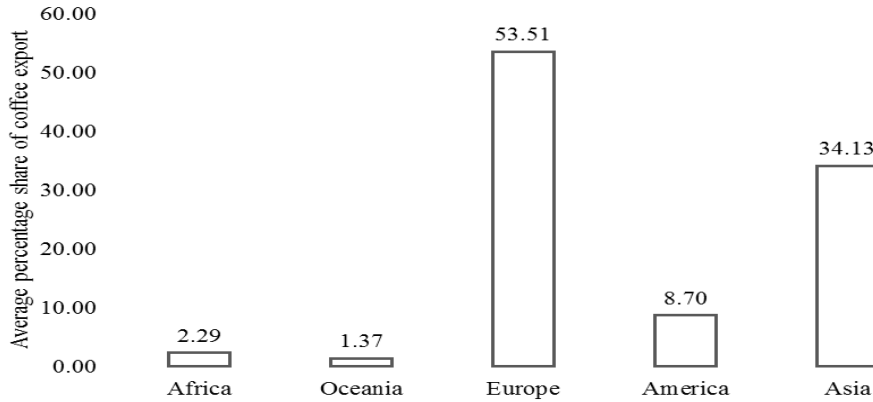

Figure-2. Average percentage share of ethiopian coffee exports for the period 1998-2016.
Source: FAOSTAT, 2019.

Similarly, from a year 1998-2016, only 2.29 percent of Ethiopian coffee exports was directed to African countries and this shows the low level of Ethiopian trade wih African countries as indicated in Figure 2. Likewise, on avarage, 8.7% percent of coffee export of Ethiopia was directed to America over the same period and the remaining 1.37 percent of Ethiopian coffee was exported over the same period to oceanian countroies.

Exports of Ethiopia are largely comprised of primary agricultural commodities which are subject to sharp fluctuations of internal and external factors. Like other developing countries, the commodity concentration of Ethiopia exports has been blamed for the short run ups and downs or instability of the country's exports.
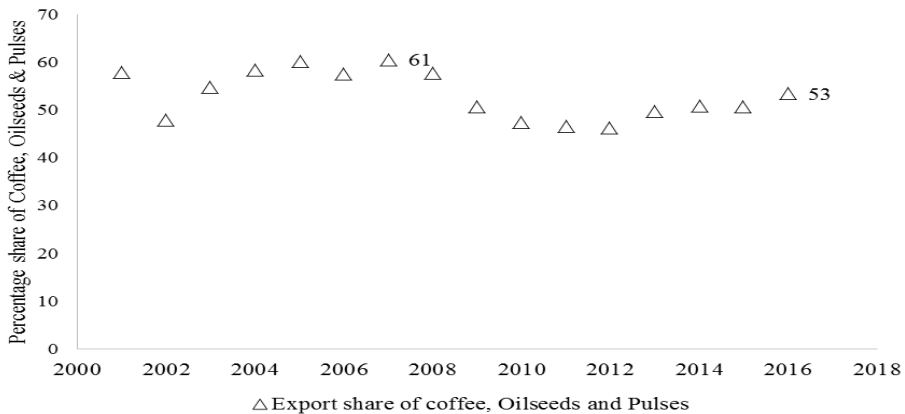

Figure-3. Trend of percentage share of coffee export of Ethiopia for the period 2000-2016.
Source: Ethiopian Economic Association EEA (2018).

The average percentage share of the export value of coffee, oilseeds and pulses has remained above 50 percent from a year 2000-20016 as evidenced from Figure 3. Thus, only these three primary agricultural exports accounted for nearly 61 percent in 2007 while this value decreased to 53 percent in 2016. Additionally, the average share of the export values of coffee, oilseeds, pulses, gold and chat was 74.2% of the total export of Ethiopia from a year 2000-2016. This showed the

limited diversification of Ethiopian exports a way from agricultural primary products to secondary manufacturing products. Despite the colossal effort that has been made by the current Ethiopian government to diversify and improve the performance of the sector using fiscal incentives and credit facilities, the sector has still been dominated by the exports of very few primary, price and income inelastic agricultural products. For supply constrained economy like Ethiopia, swelling export diversification within agricultural exports, promoting import computing industries and enhancing export productivities have paramount importance to improve the external balance.
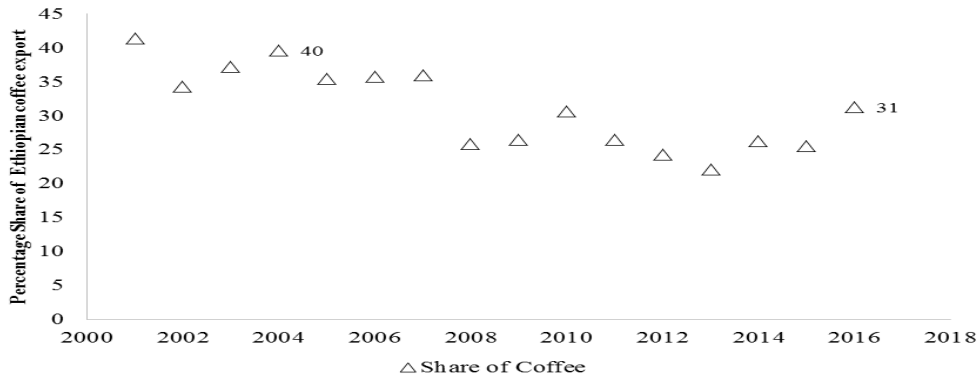

Figure-4. Trend of percentage share of Ethiopian coffee exports for the period 2000-2016.
Source: EEA Database (2018).

As it can be seen from Figure 4 above, despite the colossal effort that has been made by Ethiopian government to diversify exports, the share of coffee in the total export value has remained well above 30 percent. Following the demise of the socialist government in 1991, the new government has provided fiscal incentives and credit facilities to the export sector so as to diversify the sector and swell its performance. However, the sector has remained dependent on few primary, vulnerable, price and income inelastic agricultural exports as evidenced from secondary data.

3.2. Regression Results of Dynamic Panel Data Model

Since panel data has both the characterics of time series and cross-sectional data, the univariate characterics of all variables were examined using the Harris -Tzavalis unit root test of panel data as presented in Table 1. Accordingly, the Harris-Tzavalis panel data unit root test found that the volume of Ethiopian coffee export, real exchange rate, weighted distance and institutional quality index of Ethiopia are I(0) variables while the remaining variables are I(1) variables.

Table-1. The harris-tzavalis unit root test results for all variables in the model.

Variables in the models	Ethiopia		Partner countries	
	Level	Difference	Level	Difference
Gross domestic product, log	6.67	–17.88***	2.98	–29.72***
Openness, log	–1.035	–5.8114***	–1.109	–28.87***
Population, log	5.06	–30.51***	4.406	24.45***
Consumer price index, log	6.41	–19.72***	1.79	–12.34****
Percapita GDP, log	6.83	–17.72***	2.97	–19.50***
Foreign direct investment, log	–0.615	–39.13***		
Weighted distance, log	–17.88***			
Real exchange rate, log	–5.064***			
Ethiopian coffee export, log	–34.32***			
Institutional quality Index[3]	–13.87***			

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[3]According to worldwide governance indicator (WGI), there are six indicators for measuring institutional quality of a nation namely; corruption control, rule of law, government effectiveness, voice and accountability, regulatory quality and political stability. The values for these six indicators range from –2.5 (weak governance) to 2.5 (strong governance). Based on the values of each of the six indicators, a single

Subsequently, all I (1) variables were transformed in to I (0) variables before the estimation of one step and two step system generalized moment method of estimation. Accordingly, all non-stationary variables except the population data of Ethiopia were converted in to stationary by first differencing; but the data of Ethiopian population was converted in to stationary by mean demeaning.

As indicated in Table 2, a percentage increase in Ethiopian openness to trade is associated with 1.76 percent increase in coffee export at 5% significant level, on average citrus paribus. Moreover, the trade openness of partner nation positively and statistically significantly affects the export volume of Ethiopia at 10% significant level, on average citrus paribus. This result is in line with studies conducted by Alekaw (2016); Bonuedi (2013) and Wondesen and Fekadu (2019). Moreover, the study conducted by Babatunde (2009) found that trade openness promotes export by increasing access to imported inputs or raw materials. As evidenced from the estimation result of the twostep system GMM, the coefficient of the gross domestic product of Ethiopia is 4.17 which means that a percentage increase in the gross domestic product of Ethiopia increases the export volume of coffee by 4.17 percent and statistically significant at 1% significant level, on average citrus paribus. Regarding this variable, studies conducted by Alelign (2014); Negussie and Dessalegn (2014); Gebreyesus and Gebru (2015) and Puruweti (2016) found similar results. Thus, a percentage increase in the population of Ethiopia is associated with 13.1 percent increase in the export volume of Ethiopia coffee and statistically significant at 1% significant level.

Table-2. Regression results of one step and two step system GMM estimation.

Outcome variable: Log of Ethiopian coffee export (ECE, log). Number of observations:558				
F (11,30) = 16.83, Prob>F=0.00			Number of instruments: 42	
Covariates	One step system GMM estimation		Two step system GMM estimation	
	Coefficient	t-statistics	Coefficient	t-statistics
ECE_1, log	-.094591***	-2.93(0.006)	-0.1076875**	-2.24(0.033)
Openness, log	1.75868***	2.78(0.009)	1.709842**	2.27(0.031)
Openness^p, log	2.39507***	3.19(0.003)	2.536629*	1.78(0.085)
GDP, log	4.26575***	5.65(0.000)	4.168431***	4.63(0.000)
GDP^p, log	-0.45366	-0.45 (0.652)	-0.2429751	-0.18(0.858)
POP, log	12.5361***	4.65(0.000)	13.08582***	3.64(0.001)
POP^p, log	-68.69795*	-1.78(0.085)	-59.15904	-1.21(0.237)
RER, log	-0.670396*	-1.90(0.067)	-0.7870216	-1.49(0.147)
FDI, log	0.3984632***	5.09(0.000)	0.4018844***	3.71(0.001)
WDS, log	-1.784548***	-4.00(0.000)	-1.760604**	-2.73(0.010)
IQI, log	4.272843*	1.97(0.058)	4.537712*	1.83(0.076)
Constant	-23.89527	-2.72(0.011)	-25.77375	-2.22(0.034)
Arellano and Bond test for second order autocorrelation:				
Arellano-Bond test for AR (1)	Z=-5.00 Prob>Z=0.000		Z=-4.57, Prob>Z= 0.000	
Arellano-Bond test for AR (2)	Z=1.62, Prob>Z=0.106		Z=1.22, Prob>Z=0.234	
Hansen and Sargan test for the validity of all instruments as a group:				
Sargan test of over identification restriction		$\chi^2(30) =196.68$		Prob> χ^2=0.000
Hansen test of over identification restriction		$\chi^2(30) =30.18$		Prob> χ^2=0.457

Note: ***, ** and * are statistical significance at 1%, 5% and 10% level respectively.

The result of this study is similar with the study conducted by Gebreyesus and Gebru (2015) and Shinyekwa and Lawrence (2013) and Wondesen and Fekadu (2019). Moreover, the population size of partner countries is negatively and statistically significantly affecting the export volume of Ethiopian coffee at 10% significant level. This is due to the fact that partners countries with higher population have the capacity to produce and hence supply more outputs to the world markets and

measure of institutional quality was calculated. First, the value of each indicator was transformed in to an index whose value lies between 0 and 1 by taking the ratio of the sum of the maximum and the actual values to the sum of the maximum and minimum values.

reduce imports from other countries. Concerning this issue, studies conducted by Gebreyesus and Gebru (2015); Abdulaziz (2013) and Alelign (2014) also found the same results.

As shown in Table 2, a percentage increase in institutional quality increases the volume of Ethiopian coffee export by 4.54 percent, holding other factors constant. Studies conducted by Gert-Jan, Arjen, Henri, and Sjoerd (2005) and Wondesen and Fekadu (2019) found positive and significant relationship between export volume and institutional quality of exporting and partner countries. Citrus paribus, a percentage increase in one period lagged value of the volume of Ethiopian coffee export to each partner country is associated with 0.108 percent reduction in the current volume of coffee export and statistically significant at 5% significant level. A closer look at the volume of Ethiopian coffee export to its major partners showed that the volume of coffee export to each partner country has been declining through time while the value of coffee export to each partner country has been rising. Regarding the effect of foreign direct investment, the result of both one step and two step system GMM estimations revealed that a percentage increase in foreign direct investment increases the volume of Ethiopian coffee export to its major trade partners by 0.40 percent and statistically significant at 1 percent significant level. Studies conducted by Bonuedi (2013) and Negussie and Dessalegn (2014) found similar results.

Regarding the coefficient of weighted distance, a percentage increase in weighted distance between Ethiopia and its trade partners decreases the volume of Ethiopian coffee export to each partner country by 1.76 percent, on average citrus paribus. This result is consistent with studies conducted by Abdulaziz (2013); Gebreyesus and Gebru (2015); Wondesen and Fekadu (2019); Nguyen (2013) and Negussie and Dessalegn (2014). Finally, the Arellano-Bond test for second order autocorrelation failed to reject the null hypothesis of no autocorrelation in the residuals data at level since the probability of chi-square is higher than 5 percent. In the same way, the Hansen test for the validity of all instruments as a group is also failed to reject the null hypothesis of the exogeneity of all instruments as a group.

4. CONCLUSION AND POLICY IMPLICATIONS

According to the result of descriptive analysis, Ethiopia is ranked fifth in terms of both the production and export of coffee in the world. Besides, the mean annual coffee export of Ethiopia is only 10 percent of the mean coffee exports of Brazil. Moreover, Ethiopia has been exporting only 39% of its total coffee production while the remaining 61% of the production has been consumed domestically as evidenced from time series data. On average, 53.51 and 34.13 percent of the total coffee exports of Ethiopia directed to European and Asian countries respectively while only 8.7 and 2.29 percent of Ethiopian coffee exports were directed to north America and African countries respectively. Despite the colossal effort that has been made by Ethiopian government to diversify the export items, the sector is still dominated by only few primary agricultural export commodities where coffee and oil seeds alone account for more than 50 percent of the total export of Ethiopia.

The result of the system generalized moment method of estimation revealed that trade openness of Ethiopia and its partner countries, population size of Ethiopia, foreign direct investment and institutional quality index of Ethiopia positively and significantly affect the volume of coffee export to its major trade partners. Furthermore, population of partner countries, weighted distance, lagged export volume and real exchange rate between Ethiopia and its partner countries negatively and significantly influence the export volume of Ethiopian coffee to its major trade partners. Thus, most of the variables of the original gravity equation are found to be statistically significant.

Hence, Ethiopia needs to diversify its export destination to African countries to reduce distance cost and increase its competitiveness in international trade. Moreover, diversification a way from primary, income inelastic, price inelastic and highly vulnerabile agricultural products to secondary and resilient export items has paramount importance to stabilize the export earning of the country. Above and beyond, government may need to be conservative in using exchange rate policy to improve the external balance. The country on the process of industrialization first needs to import capital goods which cannot be favored by devaluation. Then, once the production gets its way, devaluation would make a sense. As well, improving the institutional quality, promotion of foreign direct investment and swelling trade liberalization would help to boost the volume of Ethiopian coffee export to its trade partners.

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