

***DETERMINANTS OF FLOWER EXPORT IN ETHIOPIA: AN
EMPIRICAL INVESTIGATION***

*A Thesis Submitted To The School Of Graduate Studies Of Jimma University In
Partial Fulfillment Of The Requirements For The Award Of Degree Of Masters
Of Science In Economics (Development Economics)*

By

TIGIST BEYENE



**JIMMA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS**

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JIMMA, ETHIOPIA

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DECLARATION

I hereby declare that this thesis entitled “Determinants of Flower Export in Ethiopia: An Empirical Investigation” has been Carried out by me under the guidance and supervision of Mr Getachew Kebede and Mr Mohamedsani Ali.

The thesis is original and has not been submitted for the award of degree of diploma any university or instructions.

Researcher’s Name

Date

Signature

CERTIFICATE

This is to certify that the thesis entities “Determinants of Flower Export in Ethiopia: An Empirical Investigation”, Submitted to Jimma University for the award of the Degree of Master of Development Economics and is a record of Valuable research work carried out by Mr. Tigist Beyene, under our guidance and supervision

Therefore we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree of diploma.

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LISTS OF ACRONYMS

GDP	Gross Domestic Product
NBE	National Bank of Ethiopia
US	United State
HPEA	Horticulture Producer and Exporter Association
LDCs	Least Developed Countries
UNCTAD	United Nation Conference for Trade and Development
FDI	Foreign Direct Investment
ARDL	Auto-Regressive Distributed Lagged
ECE	Ethiopian Coffee Export
FAO	Food and Agriculture Organization
WB	World Bank
MOFED	Ministry of Finance and Economic Development
OLS	Ordinary Least Square
AEG	Augmented Engle Granger
ECM	Error Correction Model
VIF	Variance Inflation Factor

ABSTRACT

The economy of Ethiopia is characterized by low level of foreign exchange earnings from export as compared to foreign exchange earning required for importing goods and services. Increasing foreign exchange earnings by enhancing export sector required diverting export from traditional primary products to non-traditional commodities. Flower is one of the non-traditional commodities which can be produced and exported with lower cost in Ethiopia. The sector attracts the attention of policy makers in recent times of Ethiopian economy. This paper examines determinants of flower export performance in Ethiopia. The study employed gravity model and a panel data collected from different sources depending on the availability of the data and interest of the study to empirically analyze the determinants of flower export performance in Ethiopia for the period 2004/05 to 2018/19 over ten major importing countries of Ethiopia's flower based on its value of flower imported from Ethiopia. Based on the Hausman test random effect is appropriate to estimate the model for flower export of Ethiopia. Using random effect method of analysis the study found that from the demand side determinants per capital income of trading partners and population of importing country have positive and significant impact on flower export performance, while distance between the two trading nations, and real effective exchange rate have negative and significant impact on flower export performance. Whereas on the supply side determinants trade openness and real GDP of exporting country have positive and significant impact on flower export performance, While FDI and domestic population affect flower export negatively and significantly. Foreign currency reserve has negative and insignificant impact on flower export performance. This may be resulted from increase in foreign currency reserve increases import other than affecting export. Therefore the study concludes that both demand and supply side determinants have significant impact on flower export performance of Ethiopia so the government, exporters and policy makers on the sector should be due emphasis given for both demand and supply side determinants to improve flower export.

Keywords: Ethiopia, Flower, Gravity Model, Random Effect, Export, Trading Partners, Determinant

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

The objective of any countries in the world is achieving sustainable economic development and economic growth is fundamental indicators of economic development. There are many variables that contribute to economic growth. Export is one of those variables and it is very important accelerators of economic growth (Belayneh & Wondaferahu, 2012) In order to achieve this objective countries enter in to international trade by producing and exporting products in which it has comparative advantage relative to other countries. Export is the most important business activity for every country in the world and also it is a source of foreign exchange that is required for importing an item that has comparative advantage in other countries than domestic one especially for developing countries in restoring the trade balance and increasing real GDP growth.

Developing countries are highly dependent on export earnings to satisfy their import requirements and for the development of their economy. They are typically more dependent on trade than developed one. The international trades of most of them are mainly based on exporting primary agricultural commodities in which they have comparative advantage due to abundant labor and tropical climate. They face a fluctuation of earnings on commodity exports due to low price and income inelastic and unstable demand and supply leading to erratic movements in export prices (UNCTAD, 2019).

Like many developing countries in Ethiopia the export from agricultural sector are dominated by traditional primary products. High dependency on traditional primary products and recurrent world market fluctuations has exposed Ethiopia to foreign earnings instability. To reduce the high dependence on primary agricultural commodities and the associated price fluctuations, diversification of trade from traditional primary agricultural commodities into high value horticultural commodities which include flower, vegetables, and oilseeds has attracted the attention of policy makers (Dube, Ozkan, & Govindasamy, 2018).

Now a day's flower export from horticultural commodities has attracted the attention of policy makers in Ethiopia, because it has a multiplier effect in economic development, like it can be a source of foreign exchange earnings and also it is a source of employment opportunity especially for women's. Ethiopia's population is mainly women which accounts about 51% from the total population and accelerate flower production and export can increase employment for women's and as the same time their income. Since increasing the income of women means that investing on education and health of their child's. Increasing the mother's income increases survival rates for girls and also increases educational attainment for all children, while increasing the father's income decreases survival rate and educational attainment for girls and has no effect on boys' educational attainment (Qian, 2006). So flower export can plays a vital role for economic development in Ethiopia since once country development is indicated by life expectancy, educational achievement and health conditions (Todaro & Smith, 2012).

Although only 14 years old, mechanized horticulture production and export sector has shown an exponential growth in Ethiopia. Flower, fruit, vegetables and herb farms occupy 10,897.21 hectares and the sector provides employment opportunity for 199,640 persons and in 2017/18 generated earnings of about 307.04 million USD. This makes the sector the fourth largest foreign revenue generator for the country (EHPEA, Ethiopian Horticulture Producer and Exporters Association, Export Horticulture in Ethiopia, 2019).

Ethiopia now has 72 active flower farms and is the second largest flower producer and exporter in Africa next to Kenya. The country earning from flower export increases from 12.6 million USD in 2004/2005 to 243.88 million USD in 2017/18 which shows 5% growth. The country is noted for high quality flowers. In addition to the rose farms, 6 farms are engaged in production of cutting and 17 farms produce a variety of other flower varieties, including carnations, hypericum, veronica, alstromeria, gyposophila and a range of other types of flowers (EHPEA, Ethiopian Horticulture Producer and Exporters Association, Export Horticulture in Ethiopia, 2019).

The country is endowed with different agro-ecological zones with favorable climate, adequate land and water resources for the production of flower (Wubalem, 2019). Development of flower sector in Ethiopia can attract foreign investors since flower production required labor intensive inputs and Ethiopia has unemployed active labor force it can be produced with lower cost and getting comparative advantage with production and

export of flower. Producing and exporting flower in Ethiopia can be a way of managing natural resources. So by Promoting flower industry the country can absorb unwise resources.

Despite these favorable conditions, still the performance of flower export in Ethiopia is underdeveloped. Therefore analyzing the factors that results the underdevelopment of the export performance of the flower industry is essential for the policy makers in order to take any policy measures.

1.2 Statement of the Problem

Today Ethiopia faces a growing trade deficit with total imports steadily increasing over their exports. On average Ethiopia's total imports increased by 12.5% per year between 2004/05 and 2016/17 while total export earnings by value declined by 1% in 2016/2017 from the previous year. Ethiopia's imports from the US have increased steadily throughout the past decade. In 2016/2017, Ethiopia's major exports included coffee, oil seeds , cut flowers, pulses, gold and chat. Private sector access to foreign exchange is severely constrained by a large trade deficit (NBE, National Bank of Ethiopia , 2018).

The economy of Ethiopia is characterized by low level of foreign exchange earnings from export as compared to foreign exchange earning required for importing goods and services that can be produced abroad with lower cost (NBE, National Bank of Ethiopia , 2018). Increasing foreign exchange earnings by enhancing export sector required diverting export from traditional primary products to non-traditional commodities. Flower export is one of the non-traditional commodities which can be produced and exported with lower cost in Ethiopia.

Flower export sector attract the attention of policy makers in recent times of Ethiopian economy because, flower production and export have both economic and social benefits for the society. Economically it can be a source of foreign exchange, employment opportunity and socially it provides positive external benefit for those who participate in other sectors like bee keeping activity. Globalization in terms of cultural exchanges have induced people globally to use flowers as a means of sharing their feelings during celebrations of weddings, Christmas, Valentine's Day, Mothers' Day, Fathers' Day, Anniversary Day, New Year, Weeping and Memorial Day. In some cases these celebrations are acquired a one-to-one pairing with types of flowers, for example roses to Valentine's Day and carnations to Mother's Day. Flowers enhance the quality of life and used to express human feelings more

than words or other gifts. Such increased use of flowers and ornamental plants makes marketing of flowers a lucrative business in the world market (Belwal & Chala, 2008).

Despite their potential on export exchange earnings the sector has negative environmental and social impact on the economy. Intensive use of natural resources, Pollution of soil, water and air through inappropriate use of chemicals in the form of fertilizers and pesticides and poor waste disposal system are among the main sources of negative environmental impacts of the sector in Ethiopia. Socially most agricultural and forestry lands are changed to floriculture farms that resulted shortage of agricultural, and forest products (Tadele & Melkamu, 2018). To prevent these problems a number of proclamations and several rules which are properly implemented are required from the respective regulatory bodies and the Ethiopian Horticulture Producer and Exporter Association (EHPEA, 2013).

Even though the above problems have occurred the sector can contribute a lot for the country since the climatic condition of the country gets the sector the most attractive as compared to other countries and this makes the country the most preferable for the development of the sector. The share of flower in total export earnings in Ethiopia increased to 8.22% in 2017/18 from 7.35% in 2016/2017 and then it reached 9.82 percent in 2018/2019 (NBE, 2019). Despite the enormous potential, Ethiopia's flower export sector remains underdeveloped. Since it has idle resources with favorable climatic conditions the country has a potential for improving the economy through increasing flower export beyond this. There are factors that contributed to the underdevelopment of the country's flower export.

Previous researches suggest that there are a number of factors that determine the performance of flower export sector. For example (Belwal & Chala, 2008) found that foreign investments, government supports, formation of HPEA, infrastructure and product range are the major factors that determine cut flower export. (Alter & Yemane, 2015) Suggests that climate, natural resources, incentive provided by the government, investment law, Ethiopia proximity to the global market, efficiencies of Ethiopian airlines, labor force, training, finance, cost of production, freight cost, market size, price, loan payment period, packaging and flower disease determine flower export performance. (Dube et al., 2018) revealed that real effective exchange rate, Foreign GDP, real GDP of Ethiopia, real interest rate, foreign direct investment, prices and the structural break are the major determinants of horticultural export. But the factors that determine export may differ for different commodities. (Viswanadham & Endalkachew, 2019). Found that Competition barriers, unreliability in raw material supply,

customer barriers, language and cultural differences and development of Marketing Information System determines export marketing of flower industries in Ethiopia. But the study used descriptive type methods of analysis.

There are in fact many researches have been done on determinants of flower export in Ethiopia. Even though many researchers have been done a research on the study matter in different time still now there is no any research that analyzed the impact of distance on flower export in Ethiopia since flower is perishable product the export of flower requires a special attention, follow-up, support and it can be reached on the destination countries with short time.

Also there is no any research that analyzed the impact of foreign currency reserve on flower export. Foreign currency reserves play a vital role in maintaining liquidity in case of economic crises and to provide confidence in once country economy. Since most of the firms producing and exporting flowers are owned by foreigners the central bank required to assure foreign investors that it is ready to take action to protect their investments. It will also prevent a sudden flight to safety and loss of capital for the country. In that way a strong position in foreign currency reserves can prevent economic crises caused when an event triggers a flight to safety. In addition to these currency reserves are always needed to make sure a country will meet its external obligations including international payment obligations like sovereign and commercial debts.

So the aim of the study is in order to fill this gap by examining the major determinants of flower export in Ethiopia by using gravity model to analyze the impact of distance and foreign currency reserve on flower export. Therefore this paper will provide some clue for planning agents and policy makers in flower export sector.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of the study is to empirically investigate the factors that determine flower export performance in Ethiopia by specifying an econometric model for the period 2004/2005-2018/2019.

1.3.2 Specific Objective

- To examine the current performance of flower export in Ethiopia
- To investigate determinants of flower export in Ethiopia.
- To examine the effect of distance and foreign currency reserve on flower export in Ethiopia.

1.4 Hypothesis of the Study

- ❖ The export performance of flower is improved today as compared to past decades from increased value of export and its share from total export and GDP.
- ❖ Flower export is positively related with foreign direct investment, real effective exchange rate, per capital income of importing country, real GDP of exporting country, trade openness, and foreign currency reserve and negatively with distance while, the impact of population of trading partners, and population of the exporting country is indeterminate.

1.5 Significance of the Study

By examining the major determinants of flower export the finding of this study is used for better understanding of determinants of flower export in Ethiopia. The result can be helpful for planners to plan based on the performance of the country's export. The findings, recommendations and suggestions of the study may be used as a guide for policy makers to develop strategies that used to improve flower export in the country by taking any measure that can supporting factors that has positive impact and reducing factors that has negative impact on the sector. It could also be serving as a reference or as baseline information to the other related studies.

1.6 Scope and Limitation of the Study

1.6.1 Scope of the Study

The research focused only on identifying and analyzing determinants of flower export. The study also delimited geographically, conceptually, methodologically and timely. Geographically, the study covered only flower export from Ethiopia. Conceptually, the study assessed only those variables that determine the export performance of flower such as, foreign currency reserve, real GDP of exporting country, foreign direct investment, population of exporting country, population of importing country, real effective exchange rate, real GDP of importing country, distance and trade openness. The study focused only the export of flower which are legally registered and commercially known by the Horticulture Producer and Exporter Association (HPEA), it does not include other exported products. Methodologically the study has been used panel data methods of analysis. The data covered only ten trading countries and the period 2004/05-2018/19 because flower industry was developed only in recent time.

1.6.2 Limitation of the Study

It is more consequential if more other determinants of export performance included in the study, though the study include only nine variables. The study caught up in between time and cost limitations. Since the study covered only flower exports in Ethiopia the findings from the study are limited only to flower exports of Ethiopia and the conclusions to be found may not be a representative of other countries those exporting flower. The study focused only the export of flower which are legally registered and commercially known by the Horticulture Producer and Exporter Association (HPEA), because the data is disaggregated on other flower exports.

1.7 Organization of the Paper

The paper is organized as follows. The content of each chapter briefly lists as follows. The first chapter provides background of the study, statement of the problem, hypothesis, objective, scope and limitation, significance of the study and organization of the paper. Chapter two provides literature reviews including theoretical and empirical reviews conducted on determinants of flower export, overview of Ethiopia's export sector and conceptual framework. Chapter three provides methodology of the study with model specification, data source and methods of estimation. Chapter four presents results and analysis of the study. The last chapter provides summery, conclusions, policy recommendations and suggestion based on the findings of the study.

CHAPTER TWO

2. LITRATURE REVIEW

2.1 Theoretical Literature

2.1.1. Concepts and Basic Definitions

Export: Product sold abroad: a product sold and transport to another countries (Seyoum, 2009).

Horticulture: Horticulture is defined as a branch of agriculture concerned with growing plants that are used by people for food, for medicinal purposes, and for aesthetic gratification (Paiva & Duarte, 2018).

Floriculture: Floriculture can be defined as “a discipline of horticulture concerned with the cultivation of flowering and ornamental plants for gardens and for floristry, comprising the floral industry.” It can also be defined as “The segment of horticulture concerned with commercial production, marketing, and sale of bedding plants, cut flowers, potted flowering plants, foliage plants, flower arrangements, and non commercial home gardening.” Floriculture crops include bedding plants, house plants, flowering garden plants, pot- plants, cut cultivated greens, and cut flowers (Dhiman, Namita, Panwar, & Bala, 2016).

Flower: - The part of a plant that is often brightly colored, grows at the end of a steam, only survives for a short time and provides the pollen that is moved from plant to plant for pollination (www.yourdictionary.com).

Gravity model: Gravity model of international trade in international economics is a model that, in its traditional form predicts bilateral trade flows based on the economic size and distance between two countries (Carrere, Mrazova, & Neary, 2020).

Random Effect:- Is a model in panel data analysis which is applicable when we assumed that the unobserved individual heterogeneity, however formulated can be assumed to be uncorrelated with the included variables (H.Greene, 2002).

Panel Data:- Data consists of observations on the same cross-sectional, or individual, units over several time periods. It is a collection of both cross sectional and time series data (Gujarati, 2004).

Trading Partners:- It refers to one of the two or more participants in an ongoing business relationships (www.businessdictionary.com). It can also refer to a region or country that another region or country buys goods or sells goods usually on a regular basis. A person, organization or country with whom somebody customarily does business (www.collinsdictionary.com).

Foreign Currency Reserves:- It refers to the foreign currencies held by a domestic country's central bank (Amadeo, 2020).

Determinants:- A factor which decisively affects the nature or outcome of something. An element that identifies or determines the nature of something or that fixes or conditions an outcome. (www.merriam-webster.com dictionary)

2.1.2 Overview of Trade Theory

2.1.2.1 Mercantilist Trade Theory

Mercantilist theory of trade originated in the seventeen and eighteen century by groups of merchant, bankers, government official and even philosophers. Briefly, the mercantilists believed that the way for a nation to become rich and powerful was to export more than it imported. According to the theory, the revenue from export surplus will then generate bullion or precious metals like gold and silver. The accumulation this precious metals or gold and silver believed to be determines the wealth of the nation. Thus the government had to do all in its power to increase the nations export and discourage and restrict import. Mercantilist strongly preaches economic nationalism and advocate regulation like tariff, quotas and other government policy in order to restrict import and protect nations trade balance. Mercantilist also believed that world resource is fixed when one country gain at the expense of the other, so trade had zero sum game (Krugman & Obstfeld, 2003).

2.1.2.2 Classical Trade Theory

i. Trade based on absolute advantage

This theory of trade is the opposite of mercantilist theory of trade. New theory of trade was introduced by Adam Smith in (1776) in his famous book the wealth of nation. Adam Smith attacked the mercantilist view on trade and support free trade as the best policy for all nations. According to Adam Smith trade between two nation is based on absolute advantage, when one nation is more efficient than (absolute advantage over) another in the production of one commodity but less efficient than (or has an absolute disadvantage with respect to) the other nation in the production of the second then both nation can gain by each specializing in the production of the commodity of its absolute advantage and exchange part of its output with the other nation for the commodity which is absolute disadvantage (Alemayehu, Trade Theory and Policy, 2009).

ii. Trade based on comparative advantage

David Ricardo introduced trade based on comparative advantage in the 19th century. Ricardo based his law of comparative advantage on a number of simplifying assumptions such as; only two nations and two commodities, free trade, perfect mobility of labor within each nation but immobility between the two nations, constant costs of production, no transportation costs, no technical change and the labor theory of value.

According to the laws of comparative advantage, even if one nation is less efficient than (has absolute disadvantage with respect to) the other nation in the production of both commodities, there is still a base for mutually beneficiary trade. The first nation should specialize in the production and export of the commodity in which its absolute disadvantage is smaller (this is the commodity of its comparative advantage) and import the commodity in which its absolute disadvantage is greater (this is the commodity of its comparative disadvantage). Ricardo states that in the two nation two commodity world, once it is determined that one nation has a comparative advantage in one good and the other nation must necessarily have a comparative advantage in the other good. Ricardo strongly believed in free trade and perfect mobility of labor in each nation but immobility between the two nations. The main contribution of this theory to our understanding of trade was showing that there is a base for beneficiary trade whether or not there exist absolute advantage or disadvantage. i.e even if the country has an absolute disadvantage in the production of both commodities, still there is bases for mutually beneficial trade (Alemayehu, Trade Theory and Policy, 2009).

2.1.2.3 Neo Classical or Orthodox Trade Theory

Hechsher –Ohlin Model

In the 1930s Swedish economist Eli Hechsher and Bertil Ohlin developed theory known as H-O model. The model was proved by Paul Samuelsson in 1977. From this time the model refers to H-O-S. The model was based on different simplifying assumptions such as identical technology across countries, identical and homogeneous tastes across countries, and perfect competition in both product and free trading goods. Moreover the model was based on two countries, two goods two factor model. Difference in relative resource endowment was the basic and main assumption of the theory.

As compared to Ricardo H-O theory goes one step further and tried to address what was left unexplained by Ricardo, such as the determinants of comparative advantage and the impact of international trade on the earning of factors of production in the trading nation i.e explain the reason or cause for the difference in relative commodity prices and comparative advantage between the trading nations. The theory assumes trade based on difference in comparative cost but attempted to explain the factor that results in difference in comparative cost. H- O Theory explains international trade will bring about equalization in the relative and absolute return to homogeneous factor across nation (Alemayehu, Trade Theory and Policy, 2009).

2.1.2.4 New Trade Theory

I. Trade based on economics of scale

Trade based on economics of scale is characterized in their model by increasing return to scale. With an increasing return to scale mutually benefited trade can take place even if the two nations are identical in every respect. Theory of economics of scale states that production to be efficient they can be characterized by increasing return to scale or economic of scale, that is a tendency of unit cost is lower with larger output. That means double an input will more than double in the production of output (Krugman & Obstfeld, 2003).

Economics of scale allows a nation to specialize in producing few products which enable the product to be produced in a more efficient way than it tried to produce everything for itself and trade with other nation in order to consume the full range of the product. Therefore, economics of scale trade give countries an incentive to specialize and trade even in the absence of difference between countries in their resource endowment and technology. The theory highly demonstrates specialization and greater division of labor. Economics of scale leads to the imperfection of market, one of the few firms in a nation will probably capture the entire market for a given product, leads to monopoly or oligopoly (Ibid).

II. Trade based on differentiated product

Modern economics of today are concerned with the production of differentiated product rather than homogeneous product. Modern trade involves the exchange of differentiated product of the same industry or product group. Hence, a great deal of international trade is Intra-industry trade in differentiated product as opposed to Inter-industry in completely differentiated product. Intra industry trade arises in order to take advantage of important economies of scale in production. It tends to takes place between countries that have similar rates of economics development, capital labor ratio, and skilled level and so on. Intra-industry trade benefits the costumer because of the wider range of choice that is the greater varieties of differentiated product available at a lower price, which has resulted from economics of scale in production. That is international computation in tradeforce each firm in developed countries to produce only one or at most few variety and style of the same product rather than many different variety and style so that, they can produced well at a lower cost. This leads the firm to specialized and produced well advanced product from continuous operational and longer production (Alemayehu, Trade Theory and Policy, 2009).

III. Trade based on product technological gap

International trade is also affected by technology. Technological gap model was developed by ponser in 1961; the theory clearly explains the roles of technology in facilitating international trade. Technological gap model states that trade among country especially among industrialized county is based on the invention of new product and production process, which allows the innovating firm or nation a temporary monopoly power in the world market (Alemayehu, Trade Theory and Policy, 2009).

IV. Product life cycle model

Product life cycle model is an extension of technological gap model and developed by Vernon in 1966. The theory emphasized on the role of technological innovation as main determinants of trade in manufactured product. Product life cycle model state that when different manufactured good go through in trade cycle that is, nation is initially an exporter then lose its export market and finally become an importer of that product. As the product matures and acquires mass acceptance, it become standardize, it can then be produced by mass production technology and less skilled labor. Therefore, comparative advantage in the

product shift from the advanced nation that originally introduced it to less advanced nation where labor is relatively cheap(Ibid).

2.1.3 Theories of Gravity Model

Gravity model is one of the most beneficial empirical methods in international trade. The occasion for the name “Gravity Model” is its impersonation to the Isaac Newton’s law of gravitation. Newton’s law in physics enlighten gravitational force as the affiliation between the mass of two objects and the distance between them. Newton’s law of gravity is written as $F = \frac{G(M_1 * M_2)}{R^2}$ where, F is the total force between two masses, G is constant, M_1 is the mass of the first object, M_2 is the mass of the second object, and R is the distance between the two objects. In Newton’s model the gravitational force is directly related with the product of the masses of the two objects, and inversely with the distance between the objects. Newton’s law of gravity is almost similar to the simple gravity model of international trade mathematically and describe both the name of the model and the basic way in which it works.

The gravity model was first applied to international trade in the early 1960s. (Tinbergen.J, 1962) and (Pöyhönen, 1963) were the first in generating the notion of analyzing bilateral 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 trading countries are directly related with the product of the two countries’ GDP and inversely related with the distance between them (Deardorff, 1995).

After the initiative works by (Tinbergen.J, 1962) and (Pöyhönen, 1963) by using the gravity model several empirical studies have been done that have provided empirical evidence on the effect of GDP and distance on international trade since the gravity model have been many advantage over the other models in analyzing international trade. Firstly, the ability of the gravity model to incorporate the distance variable and estimate the transaction costs of trade since in order for the international trade model to hold vast simplifying assumptions are needed. Secondly simplicity and relative empirical success even in its simplest form of the gravity model provides economic understanding and gives us the ability to analyze bilateral trade in a much more scientific way than previously possible using other models. In fact, one of the simplifying assumptions made by both Ricardo’s comparative advantage theory and

Heckscher-Ohlin theory is the assumption of zero transaction costs. But gravity model incorporate distance and used to analyze the impact of transaction cost on international trade.

Nevertheless, the models have been subjected to criticism for their lack of clear theoretical foundation. In other words, they have been considered as simple intuition derived from the physical forces of attraction and repulsion. As a result, gradual improvements have been made over time to fill the theoretical gap and thus to improve the explanatory power of the model (Alemayehu & Atnafu, 2008).

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. In addition, some dummy variables have been incorporated to capture geographical, cultural, institutional and related factors that may influence bilateral trade flows. The other development in overcoming the lack of theoretical underpinnings of gravity model involves its derivation from relevant theories of international trade. Gravity equation as a reduced form of partial equilibrium model of export supply and import demand is one of the derivation of the gravity model. The other one is extended the gravity equation based on monopolistic competition model and finally deriving the gravity model of bilateral trade from two Heckscher-Ohlin (H-O) models.

In a nutshell, although a number of trade models have contributed to the empirical success of the gravity model, the importance of the H-O theory lies in explaining bilateral trade flows among countries with large factor proportion differences and high shares of inter-industry trade (so-called “North-South” trade and the differentiated product model would be responsible for explaining bilateral trade flows among countries with high shares of intra-industry trade (so called “North-North” trade) in increasing returns with monopolistic competition are worth mentioning.

2.1.4 Export and Economic Growth

International trade has been an engine of economic growth of the country. So there is a great concern whether or not developing country can accelerate their economic growth by expanding their export.

Over the last several decade economist debated on the relevance of two alternatives strategy that bring economics growth for developing country , these are import substitution and export promotion. Proponents of import substitution strategies particularly argue that relying on export as an engine of economic growth will not be favorable to economic growth because external factor constraint the benefit from export. The benefit from export is less, so export pessimist advice LDCs to adapt import oriented strategy in order to avoid dependency. The second argue that liberalization (export promotion, exchange devaluation, removals of restriction) generate rapid economic growth (Krugman & Obstfeld, 2003)

In a views of Ricardian comparative advantage an economy that is open to trade attain high production and consumption by specializing the good that a country has comparative advantage on it .However, this theory of trade is in consistent in relation to developing country export because there export are mainly primary commodity. So specializing this primary commodity and export and import manufactured goods will fail to bring any long-run gain from trade (Ibid).

Despite pessimist view there are argument in favor of promoting and diversifying export in developing countries which emphasize that export are main source of economic growth (Ibid). According to traditional trade theory, if each nation specializes in the production of the commodity of its comparative advantage, world output will be greater and each nation will be benefited from trade. With the present of distribution of factor endowment and technology between developed and developing nation, the theory of comparative advantage, thus prescribes that developing nation should continue to specialize primary in the production of and export of raw material, fuel, mineral, and food to developed nation in exchange for manufactured product (FEENSTRA & TAYLOR, 2014). International trade is important for economic development, it leads to the full utilization of unemployed domestic resource; by expanding the size of the market, trade make a possible division of lobar and economics of scale. International trade is a vehicle for transmission of new idea, new technology and new managerial and other skill. Trade also stimulate and facilitate the international flows of capital from developed nation to developing nation; and international trade is an excellent

antimonopoly weapon because it stimulates greater efficiency by domestic producer to meet foreign competition.

2.1.5 Factor Affecting Export Performance

Theoretically there are many determinants of export performance. Among several factors real effective exchange rate, real GDP of exporting country, population of exporting country, population of importing country, foreign currency reserve, per capita income of importing country, distance between trading partners, trade openness and foreign direct investment are those variables that have potentially significant impact on export performance of a given country.

Starting from the first variable real effective exchange rate it is defined as the price of foreign goods and services in terms of domestic goods and services. The real exchange rate between two countries' currencies is a broad summary of the price of one country's goods and services relative to the other countries. It has its own impact to determine export performance since it is explained by real price of a commodity. Depreciation of real exchange rate makes exports cheaper and increased demand for a given commodity in the international market. So it has positive expected sign.

Secondly, foreign currency reserve which is the amount of foreign currency held by a country's central bank. There are several reasons why banks hold reserves. The most important reason is to manage their currencies values. The countries exporters deposit foreign currency into their local banks. They transfer the currency to the central bank. Exporters are paid by their trading partners in other countries currencies. The exporters exchange them for the local currency. They use it to pay their workers and local suppliers. Thus increase in foreign currency reserve increases flower export since it increases the confidence of investors in the sector. Therefore the variable has positive expected sign.

The third variable which has significant impact on export performance is real GDP of exporting country. Real GDP of exporting country is explained by access to inputs for production and then the potential of the country's economy to more produce and export. According to gravity trade theory the size of the economy is directly related with the export performance of the country since the country with higher economic size can produce and able to provide more to export. Thus, it has expected to have positive impact on flower export.

The other important variable is population. The effect of exporter country population could be positive or negative depending on whether absorption effect or economies of scale effect is dominant. A large population may indicate a big domestic market and large resource endowment, in which case larger absorption effect may lead to less export. If this is the case, a negative sign will be expected. On the other hand, a large domestic market may imply utilization of the economies of scales so that expected sign of the population coefficient would be positive. For similar reasons, the coefficient of importing country population is indeterminate.

The fifth one is foreign direct investment which is defined as net investment inflow from foreign countries into domestic country which is the most important variable that determines flower export. Different literatures as we reviewed show varied results with regards to the impact of FDI on export performance of domestic country. The government of Ethiopia have given due attention to attract foreign investors into the horticultural sector. Consequently, the expected sign of FDI in this study was expected to be positive i.e increase in foreign direct investment increases flower export.

The other crucial variable is per capital income of importing country which defined as national income earned per person of the major flower importer countries in a given year. It is measured by dividing the total income of a given country by its total population. It has impact on export by being source of demand through since it is a measure of purchasing power of nations. Consequently, per capital income of importing country was hypothesized to influence flower export performance positively.

The other important determinant of export is the distance between the two nations, which means the geographic distance between Ethiopia and their trade partners. 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 our products, which implies this variable is expected to have negative effect on the export. Data on the distance between Ethiopia and trade partners are collected based on the distance between Addis Ababa and capital at Ethiopia's trading partners. Thus, the expected coefficient of distance is negative.

The final one is trade openness which it is defined as integration of countries with their trading partners and it is a measure of the ability of countries to exchange freely as abuyer or seller in the international market. It is also the extent to which the government interfere with free flow of goods and services among countries. As openness promotes the efficient allocation of resource through specialization and comparative advantage, it promotes

competition in national and international markets. It is measured as a ratio (X) plus import (M) to GDP. As a result, the more open an economy is, as indicated by high trade freedom, the more it is expected to trade with other economies. Thus, the variable is expected to have positive impact on flower export performance.

2.2. Empirical Literature

There has been a number of different empirical studies on determinant of flower export performance at different times and in different countries. This study reviews different literatures in both international and national findings in the study matter of determinants of export performance.

2.2.1 International Findings

MURUGI (2014) Analyzing factors influencing the export of horticultural products and found that firms competitive advantage over their competitors as well as in the international market, standards set by the international market on quality of goods exported, global market competition, legally imposed exchange controls, access to suitable distribution channels and intensity of competition are important factors which influencing the exportation of horticultural products.

Nezami, Mira, & Nikookar (2013) analyzed factors that affecting flower export in Iran province of Alborze and the result suggests that both the internal factors include the features of the product and the characteristics of the company and the external factors include the features of the major environment, the features of the market and the features of the industry are effective with significant difference from the average in development of flowers exportation but the internal factors are more effective than the external factors, and the most effective factors are respectively related to the product, major environment, market, industry, and finally the characteristics of the organization.

MABETA (2015) analyzed determinants of non-traditional agricultural exports growth in Zambia and revealed that cotton exports are affected by the real interest rate, real effective exchange rate, world price, and the real income of the trading partners in the short run and real interest rate, real effective exchange rate, and real GDP in the long run. Tobacco exports are significantly affected by real effective exchange rate, real income of trading partner and FDI in the short run while, only real effective exchange rate and real income of the trading partners in the long run.

Mwase (2015) analyzed performance of floriculture industry in east Africa and found that lack of efficient air transportation, absence of a National Horticulture Policy in place, unorganized farming systems without clusters and foreigners domination of the sector has impact on the growth of Tanzania's floriculture industry.

Moriasi, Rotich, Asienyo, & Okao (2014) analyzed factors affecting competitiveness of Kenya cut flower in the international market by using descriptive methods of analysis and found that activities along supply chain which were; extremely many and also changing; actors along the supply chain which were difficult to manage situated diversely in terms of physical distance, different laws, diverse requirements, expensive to manage and were also unpredictable and international standards which were not consistent are factors which were affects competitiveness of Kenya cut flower in the international market.

Keror, Yego, & Bartilol (2018) analyzed export competitiveness of Kenya's cut flower exports to the European market and revealed that real interest rate, real exchange rate and foreign income has significant impact on Kenya cut flower exports to European Union market competitiveness whereas agricultural GDP has insignificant impact.

MEME (2015) analyzed Export performance of the horticultural sub sector in Kenya and revealed that real exchange rate, agricultural GDP and real interest rate had significant impact on the horticultural exports. Agricultural GDP had positive impact on horticultural export while real interest rate had negative impact.

Rono., Kipkurui., & Rotich (2018) analyzed factors affecting export earnings a case study of flower industry of Kenya and revealed that the two exchange rate volatility factors notably balance of payments and government debt payment affected the export earnings of flowers. Also found out that the two inflation rate factors notably purchasing power and government securities issue affected the export earnings of the Kenya flowers to a large extent. Findings from the analyzed data showed that foreign capital flows affected the export earnings of the Kenya flowers. Findings showed that export volumes factors notably demand for flowers and production capacity affected the export earnings of the Kenya flowers to a large extent.

Mwansakilwa, Tembo, & Mugisha (2013) investigated determinants of growth and competitiveness of Zambia's flower exports to three main export destinations the Netherlands, the UK and Germany and found that domestic flower production, real GDP and population of importing countries, relative depreciation of domestic currency and world export prices have positive impact on supply and competitiveness of flower exports while, exports from competing countries and real interest rates were found to be negatively affect flower exports.

2.2.2 National Findings

Belwal & Chala (2008) on the study titled that catalysts and barriers to cut flower export a case study of Ethiopian floriculture industry suggested that foreign investments, government support and the formation of the horticulture producers and exporters association are the major catalysts in the sector and infrastructural bottlenecks appended by shortage of agricultural inputs, narrow product range and lack of adherence to international codes of practices are major among the perceived barriers.

Dube et al (2018) analyzed the export performance of the horticultural sub-sector in Ethiopia and revealed that real effective exchange rate, real GDP of Ethiopia, foreign direct investment, prices and the structural break had significant impact on the horticultural export performance both in the short-run and the long-run. Foreign GDP and real interest rate were revealed significant only in the long-run.

Alter & Yemane (2015) conducted the study on the factors that affect Ethiopian flower companies export performance which are located around Addis Ababa and revealed that attractive climate, the availability of natural resources like water, incentive provided by the government like land, good investment law, and Ethiopia proximity to the global market, efficient Ethiopian airlines and the availability of abundant and cheap labor force has positive impact on export performance of flower, whereas untrained labor, shortage of finance, high cost of production, expensive air freight cost, market limitation, price fluctuation, short loan payment period, poor packaging and flower disease have negative effect on flower export performance.

SAMUEL (2012) analyzed determinants of agricultural export in Ethiopia by using co integration and error correction model and found that terms of trade, gross domestic product, world price, kilometers paved roads and fertilizer input import over a period are significant impact on export performance in the long run but domestic price has insignificant impact. While in the short run terms of trade, world price, kilometers paved roads and fertilizer input import over a period found to be significant but domestic price was also insignificant and gross domestic product become insignificant and negative in sign contrary to the expected sign. On the other hand, out of variables significantly affected agricultural export both in the short run and long run; terms of trade, world price, kilometers of paved roads and fertilizer input import over a period affected agricultural export positively consistently with the expectation. Kilometers of paved roads have strong positive impact on agricultural export.

Hailegiorgis (2011) on the study titled Export performance of oilseeds and its determinants in Ethiopia revealed that real output and nominal exchange rate has significant and positive impact on oilseeds export performance in the short run while other variables are insignificant. The long run estimate suggests that world price; real output and nominal exchange rate has positive impact on oilseeds export performance while domestic price has negative impact.

Viswanadham & Endalkachew (2019) analyzed export marketing challenges of Ethiopian floriculture industry by using descriptive methods of analysis and the study revealed that Competition barriers emanates from meeting foreign competitors price, aggressive competition in foreign market and that of unreliability in raw material supply. On the other hand, customer barriers which is a product poor image goodwill of a country and the product in foreign country and language and cultural difference has also been a challenge for the companies. From the government point of view, development of marketing information system for floricultural produces and make it easily accessible via affordable means. The supply of information by government especially with respect to the location/ market analysis of foreign country, provision of various tax and other financial incentives to beat aggressive price competition in international market has a paramount significance for export marketing.

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Table2. 1: Review of Literatures summary

S. No.	Year	Author's name	Title of the study	Objectives	Model used	Major findings
1.	2016	Manamb a EPAPHR A	Determinants of Export Performance in Tanzania	Examining factors affecting export performanc e in Tanzania	Johansen co- integration and Granger causality approach	The study finds that real per capita GDP, trade liberalization, and exchange rate have a positive impact while official development assistance has negative impact on Tanzania export.
2.	2017	Md Tariq Hassan	An analysis of prime determinants and constraints of Bangladish export market stochastic frontier gravity model approach	Investigatin g the prime determinan ts and constraints of Bangladesh 's export industry	Stochastic frontier gravity model approach	The study revealed that GDP, population, trade agreements and exchange-rate depreciation have positive and significant effect on exports, but distance and tariff levels negative and significant impact on trade. The study also finds that socio-political-institutional, 'behind-the-border' constraints, such as customs procedures, port inefficiencies and corruption, are restricting trade.
3.	2019	Rao Muhamm ad Atif,	Determinants and efficiency of Pakistan's	Investigatin g the main determinan	Stochastic frontier gravity	This study finds that import tariff has negative and significant impact on exports of chemical products while devaluation has positive. Also the study finds that

		Haider Mahmood, Liu Haiyun, Haiou Mao	chemical products' exports: An application of stochastic frontier gravity model	ts of chemical products' exports of Pakistan	model	Preferential Trade Agreements (PTA), colonial links, common language, political disputes and contiguity have positive and significant except an insignificant effect of Contiguity. Further, the negative impact of political disputes is observed.
4.	2019	Redwanur Rahman, Saleh Shahriar & Sokvibol Kea	Determinants of exports: a gravity model analysis of the Bangladeshi textile and clothing industries	Find out the determinants and issues influencing Bangladesh i textile and clothing exports	Gravity model	Gross domestic product (GDP), real exchange rate and per capita GDP of the importers have appeared to be major determinants of Bangladesh's textile exports trade. Also, Bangladesh and world trade organization membership have a strong positive significant impact on T&C exports. The geographical distance has no strong significant effect on textile trading.
5.	2014	Alelign Ademe Mengistu	Ethiopia's Export Performance with Major Trade Partners	Analyzing factors that determine export flows between Ethiopia and its trading	Gravity model approach	Per capita GDPs of the trading partners and exporting countries, population of importing and exporting country was found to be positive and significant impact paved roads positive but insignificant, distance and real exchange rate are negatively and significantly affect export of Ethiopia.

				partners		
6.	2015	Tadese Gebreyesus	Determinants of Coffee Export Performance in Ethiopia	Investigating the major determinants of coffee export supply in Ethiopia	Vector Autoregressive and Error Correction approach	The study found that real export price of coffee, domestic production of coffee, physical infrastructure and world supply of coffee affects coffee export supply significantly. Trade openness affects only in the long run. While real exchange rate is statistically insignificant both in the long run short run.
7.	2019	Wondesen Teshome Bekele & Fekadu Gelaw Mersha	Determinant Factors of Ethiopia's Coffee Export	Analyze determinant Factors of Ethiopia's Coffee Export	Dynamic panel gravity model	The study revealed that lagged ECE performance, real gross domestic product (GDP) of importing countries, Ethiopian population, Ethiopian real GDP, trade openness of importing countries, Ethiopian institutional quality, and weighted distance are the determinant factors of Ethiopia's coffee exports performance.

2.3 Research Gaps Based on Literature Review

In fact there were many studies have been done on determinants of export performance in Ethiopia but each have been its own limitations. The existing studies by (SAMUEL, 2012) and (Hailegiorgis, 2011) didn't focus on the specific commodity flower since flower is a perishable good it required a special attention and follow up. (Alter & Yemane, 2015) considers only flower export farms which are located around Addis Ababa and also the study does not consider the impact of foreign currency reserve and distance on flower export of Ethiopia. So far no study was done using the gravity model to analyze determinants of flower export in Ethiopia. Analyzing determinants of flower export of the country helps to improving the sectors export performance by improving the determinants which have positive impact and by reducing the factors which have negative impact on the sector. The gravity model enables to analyze the impact of transport cost on trade between countries.

Studies that have been done in the international areas may not be applicable in all perspectives to the domestic country due to differences in social, environmental, political and economic aspects of the country.

2.4 Overview of the Ethiopia's Flower Export Sector

2.4.1 Overview of Floriculture Industry in Ethiopia

Ethiopia has been entering in the floriculture industry around 1980s since two State-owned enterprises such as Horticultural Development Enterprise and Upper Awash Agro-Industry Enterprise started to export flowers to Europe. Since then, foreign investors particularly, British, Dutch, and Kenyan and local entrepreneurs have entered the industry. The first private floriculture producer Meskel flower Plc was the first private company to engage in export oriented flower farming in Ethiopia, the farm in Meki, 160 kms south of the capital city Addis Ababa started around 1993. A second private farm, Ethio-Flora, was established in 1999 around Zeway, 98 kms south of Addis Ababa soon after. Both farms are Ethiopian owned and produce summer flowers (field produced) such as alliums, statice, and carnations for export to EU market (Mulu & Michiko, 2010).

The Ethiopian flower industry represents an extraordinarily fast and successful diversification into a non-traditional export product. Despite its late entry into the flower export industry, In the last five years, the floriculture industry in Ethiopia has become a fast growing export business. The country's rank among top exporters of cut flowers and became the 5th largest non-EU exporter to the EU cut-flower market and the second largest after Kenya flower exporter from Africa.

The rapid growth was mainly come from due attention given by the government to this sector and the unparalleled advantages that Ethiopia has in this sector compared to any other commodities and also a substantial number of investors have started investing in the country. The Government provides incentives to exporters in the industry through various methods such as export credit guarantees and foreign exchange retention schemes. According to (EHPEA, 2007), investors are attracted by an improved investment code, a five year tax holiday, duty-free import of machinery and easy access to bank loans and land acquisition. Also favorable climatic condition of the country, the abundant cheap and easily trained labor, proximity to EU and Middle East markets encourage investors for the progressive development of the sector (Sutton & Kellow, 2010).

The contribution of the sector for employment opportunity and export earning has been progressively increased over the last few years. The sector employs about 50,000 people but the government's target is to increase it to 70,000. In 2018/19, Ethiopia exported 57.85 million flower stems and earned 257.65 millionin USD export revenue. Currently Ethiopian flowers are exported to the Netherlands, Saudi Arabia, Norway, Belgium, the United Arab Emirates, Japan, Germany, USA, France and Italy. In terms of flower type roses are the most exportable one. In addition to the rose farms, 6 farms are engaged in production of cutting and 17 farms produce a variety of other flower varieties, including carnations, hypericum, veronica, alstromeria, gyposophila and a range of other types of flowers (EHPEA, 2019).

It is important to note that the extremely tightly controlled time dimension of the logistics process, given the product attributes desired and the fragility and perishability of the roses. Another characteristic of the Ethiopian floriculture sector is the lack of domestically produced inputs that flower producers can access. The export volume and value of cut-flowers accounts for a small proportion of the total exports of Ethiopia. In recent years the sector is showing improvements in terms of the quality and quantity of exports to the international market.

2.4.2 Opportunities for Expansion of Floriculture in Ethiopia

Favorable climate, availability of excess land, vast water resources, fertile soil, abundant young labor force that is keen to learn and participate in the sector development and the incentive packages provided by the government to attract both foreign and domestic investors engaged in flower production have all contributed to the successful growth of the floriculture industry in the last 14 years. Besides the natural endowments the country geographic proximity to Europe, USA, Middle East and Asia adds further for more competitiveness in the world market. In addition to these, the exceptional air connections of Ethiopian Airlines make it an ideal place to connect with all major and emerging markets including Western Europe, the Middle and Far East, Russia and the USA (EHPEA, 2019).

2.4.3 Importance of Floriculture in Ethiopia

Floriculture is the field of agriculture which deals with flowers and such products. It is one of the most potential components of the horticulture industry, being important from aesthetic, social and economic points of view. It has many importances in Ethiopia. It is used as a source of foreign currency, a means of product diversification, source of job opportunity, encourages supportive industries and it promotes investment. In addition to this they are used in the manufacturing of green tea, perfumes, essential oils and many other products (Bulti, 2017)

2.4.4 Important Flower Crops Grown and Exported from Ethiopia

According to horticultural producers and exporters association the following are important flowers grown and exported from Ethiopia.

Roses- Roses are one of the most popular garden plants. It is an important plant from various aspects. It is widely used through out the world for love moments, medical purposes, cosmetic uses, happy events, celebrations, welcome parties, ornamentally as well as food tonic supplement, so they have value, but the same time, they are cultivated at small area in the country due to several reason (Leghari, Laghari, Laghari, & Bhutto, 2016). They may also be used as flowering shrubs in the landscape, but they are at their best in properly spaced solid plantings. Some gardeners try to grow too many varieties or too many plants for the space available. Ten well-chosen varieties, carefully maintained, produce more blooms and give far more pleasure than 50 poorly maintained plants (Byford, 2005).

Poinsettia- Poinsettia is one of the most important potted plants in the ornamentals industry. The most attractive parts of the poinsettia are its bracts and cyathia. It is the most popular Christmas season plant. It is sold for its colorful inflorescence (cyathia) and bracts (transition leaves). It may be purchased in colors ranging from white and cream through the various shades of pink and red. Important indicators of a good post harvest quality in poinsettia plants are fully formed, turgid, blemish free evenly coloured bracts and leaves along with intact, fresh-looking cyathia (Islam & Joyce, 2015).

Geranium/Pelargonium:- Geraniums are among the most popular flowering plants grown in the United States. They are easy to grow and can be used in many types of gardens such as ground beds, planter boxes, hanging baskets and pots. *Pelargonium graveolens* L.Her.ex Ait (Synonym *P. roseum* Willd.) is a species in the pelargonium genus and is often called a geranium because it falls within the plant family of Geraniaceae. *P. graveolens* is an important, high-value perennial, aromatic shrub that can reach a height of up to 1.3 m and a spread (lateral growth) of 1 m. Traditionally Geranium is used to staunch bleeding, healing of wounds, ulcers and skin disorders and also in the treatment of diarrhoea, dysentery and colic (S Shaw, Shabir, Kumar, & Chishit, 2006).

Chrysanthemum:- Chrysanthemums are one of the most important floricultural crops in the cutflower, flowering potted plant, and herbaceous perennial markets of the world (Anderson, 2007). *Chrysanthemum indicum* has been used as a herbal medicine, which is prescribed for anti-inflammatory, analgesic, antipyretic purposes and the treatment of eye disease in Chinese traditional preparations (Wu, Ye, Lu, Liang, Gao, & Wang, 2010)

Carnation:- Carnation is one of the most important cut flowers of the world. Carnations are grown in almost every climate. In temperate zones mostly in glasshouses, in sub tropic areas, in plastic and glasshouses as well as in open air and in tropic areas more or less shaded. Carnation belongs to the family Caryophyllaceae, the genus *Dianthus* and species *caryophyllus*. They are excellent for cut flowers, bedding, pots, borders, edging and rock gardens. Due to its excellent keeping quality, wide range of forms, ability to withstand long distance transportation and remarkable ability to rehydrate after continuous shipping. Carnation is preferred by growers to rose and chrysanthemums in several flower-exporting countries.

Gypsophila:- Gypsophila paniculata (babys breath or perennial gypsophila) is a member of the caryophyllaceae family. The flower is commonly used in wedding bouquets and as filler behind roses (Tregea, 2003)

Statice:- Statice, also called winged sea-lavender, is a winter annual herb with a basal rosette, waxy lobed leaves, erect broadly winged stems and one sided clusters of purple and white flowers.

Freesia:-It was first grown in Europe in the mid eighteenth century and becomes one of the more popular plants in horticulture in the last half of the 19th century. It used for weddings and make fragrant additions to bouquets and body flowers. Freesia is also uses as a forced pot crop, becoming popular when cultured in coolhouses or in hobby greenhouses. As most of the cultivars are highly fragrant, theflowers can also beused to produce floral essences. In the language of flowers, freesia are said to symbolize innocence and friendship.

2.4.5 Role of Flowers in Human Life

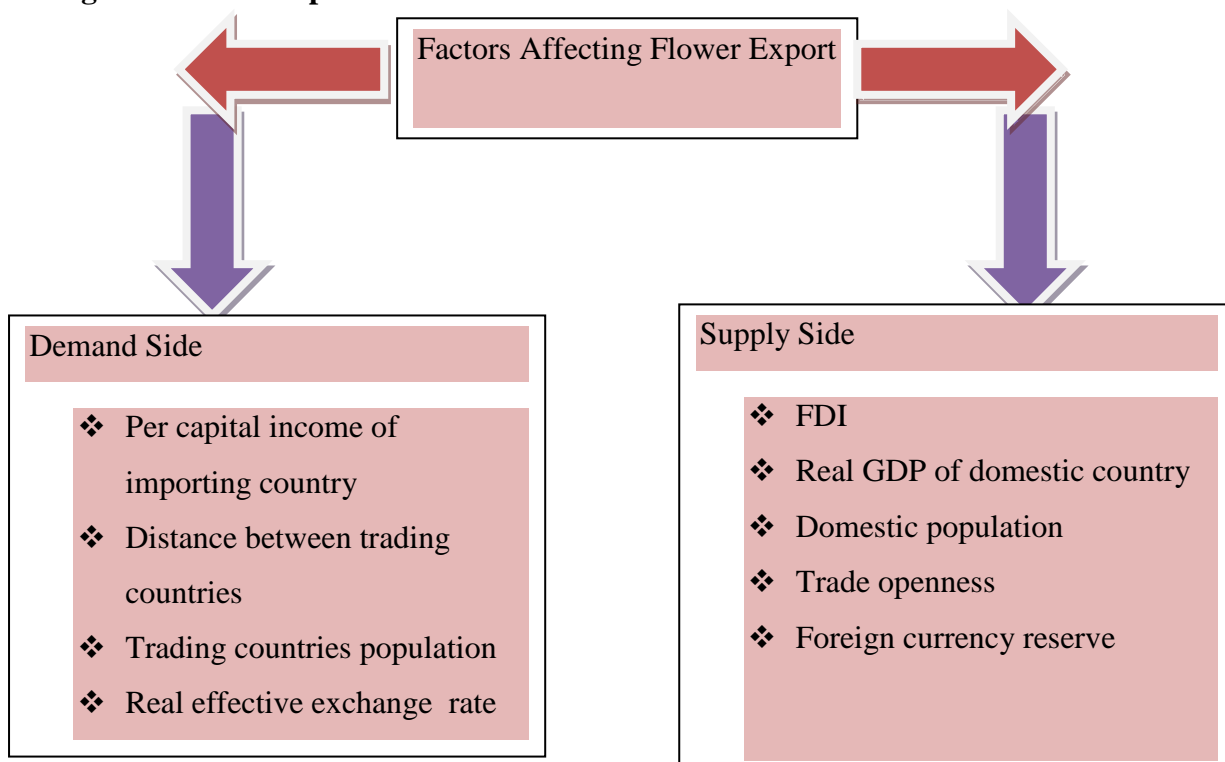
Flowers play a vital role in human life. People all over the world realize that flowers enhance the quality of life and influence human feelings more than words or other gifts. It serves as nature's gift since their fragrance and beauty brings joy and happiness. It also used as a symbol of grace and elegance means most ladies adorn their hairstyles with flowers, gentlemen put flowers in their pocket to be elegant, to live in a fashionable way and well made garden reflects the wealth of the owner. In addition to this it serves as a symbol of beauty, love and peace also to convey feelings. For instance American Floriculture society has a quote "Say it always with Flowers" To say Thank you!, I Love You! and Congratulations! (Bulti, 2017).

Flowers are also important items in all religious and festive occasions. Usually it is offered by devotees in the mosques, in the churches and given as birth day presents, wedding gifts, funeral occasions. Rosa damascene, Jasminumgr and florum and Polyanthus tuberosa has an importance in perfume and pharmaceutical industries.

2.5 Conceptual Framework

Factors that determine exports can be classified in to two broad categories: demand side determinants and supply side determinants. Supply side determinants are those that affect exports on the side of exporting country through different ways such as FDI, trade openness, real GDP of exporting country, foreign currency reserve and domestic population. On the other hand demand side determinants are those that affect export in the side of importing country such as per capital income of importing country, distance between trading countries, population of trading partners and real effective exchange rate.

Figure 2-1:- Conceptual Framework



Source: From Literatures Under Reviewed, 2020

CHAPTER THREE

3. METHODOLOGY OF THE STUDY

3.1 Data Source and Type

To attain the above objectives this study utilizes secondary quantitative data which collected from different sources depending on the availability of the data and interest of the study. This study used balanced panel data for the period 2004/05 to 2018/19 over ten major flower importing countries based on its value of flower imported from Ethiopia. Panel data can be better to detect and measure effects of explanatory variables on the dependent variable that simply cannot be observed in pure cross-section or pure time series data also by combining time series and cross-section observations, panel data give “more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency. (Gujarati, 2004). In addition to this since flower is the new sector in Ethiopia the data on the sector was limited only few years. Therefore, banal data was appropriate for this study. All monetary values are measured in dollar at the current price.

3.2 Econometrics Model Specification

The study was focused on both demand and supply side determinants of flower export in Ethiopia. The model employed in this study has been gravity model in which the dependent variable is going to be explained by a set of independent variables and it has been analyzed by fixed random methods of estimation. The model is expressed as follow,

$$EXP_{ijt} = f(GDP_{jt}, GDP_{it}, POP_{jt}, POP_{it}, DIS_{ijt}, OPEN_{jt}, FDI_{jt}, FCR_{jtjt}, REER) \dots \dots \dots (1)$$

Gravity model is one of the most important empirical approaches in international trade. (Tinbergen.J, 1962) and (Pöyhönen, 1963) were the first authors to develop gravity models of international trade. After the initiative works by these two scholars heaps of literature has been conducted in international trade by using this model.

There are many reasons for the central role played by the gravity model. The first has to do with the high explanatory power of bilateral trade flows and enables us to incorporate the dynamic effects among economies. The second reason is that it provides an easy method to test the role that other variables play in affecting trade (Alemayehu, 2009) and (Egger, 2002).

Particularly, the gravity model can incorporate additional variables to control for the differences in factor endowments that could aid or impede exports between countries (Alemayehu, 2009).

$$EXPI_{ijt} = k(GDP^{\alpha}_{it} \cdot GDP^{\beta}_{jt}) / DIS^{\lambda}_{ij}$$

The basic formulation of the gravity model explains bilateral trade flows in analogy to Isaac Newton’s law of gravity, export of a given country is increased by the attraction of the two countries masses measured by GDP or population and reduced by the distance which is a proxy transport costs and other factors. The model assumes that country size and distance are important determinants of trade. According to the gravity model, large economies spend more on imports and exports. Higher GDP means more trade for a country and trade flows between two countries therefore trade between nations depends positively on their income and negatively on the distances between them (Egger, 2002) and (Nguyen, 2010).

Hence, in general form the gravity model becomes extended as follow in order to include more variables other than GDP and Distance to the model based on the assumption of extended gravity model which is export is determined by other variables other than GDP and Distance;

$$EXPI_{ijt} = \beta_0 GDP_{jt}^{\beta_1} CIP_{it}^{\beta_2} POP_{jt}^{\beta_3} POP_{it}^{\beta_4} DIS_{ij}^{\beta_5} OPEN_{jt}^{\beta_6} FCR_{jt}^{\beta_7} REER_{ijt}^{\beta_8} FDI_{ijt}^{\beta_9} \dots \dots \dots (2)$$

Where

β s are parameters of the model.

$EXPI_{ijt}$ is the value of Ethiopian flower export in to country j (in USD million) at time t

GDP_{jt} is the value of Ethiopia’s GDP at current market prices (in USD million) at time t

PCI_{it} is the value of per capital income of importing countries at current market prices (in USD million) at time t

POP_{jt} is population of Ethiopia in (in million) at time t

POP_{it} is population of trading partners in (in million) at time t

DIS_{ij} is distance between Ethiopia and trading partners

FCRjt is foreign currency of Ethiopia reserved by central bank at time t

REERijt is real effective exchange rate between country i and j at time t

FDIjt is foreign direct investment of Ethiopia at time t

ϵ_i is the disturbance term

Despite the fact that the gravity model is formulated in the multiplicative form, the model can be linerized by taking natural logarithm of the model for estimation of the parameters (Egger, 2002) and (Nguyen, 2010).

$$\begin{aligned} \log EXP_{jit} = & \beta_0 + \beta_1 \log(GDP_{jt}) + \beta_2 \log(PCI_{it}) + \beta_3 \log(POP_{jt}) + \beta_4 \log(POP_{it}) \\ & + \beta_5 \log(DIST) + \beta_6 \log(OPEN_{jt}) + \beta_7 \log(FCR_{jt}) + \beta_8 \log(REER_{jt}) \\ & + \beta_9 (FDI_{jt}) + \epsilon_t \dots \dots \dots (3) \end{aligned}$$

3.2.1 Description of Variables and Their Expected Sign

Flower export:— Flower export is the dependent variable of this model. It has been defined as the total values of Ethiopian flower exports in million USD at time t for country i. This dependent variable is determined by the explanatory variable described below.

Per capital income of trading partners:—It has been refers to the national income per total population of each trading partners of Ethiopia at time t. It is a variable which is indicative of the consumer's purchasing power of importing countries. It affects the exports mainly through the income effect. Income effect occurs when there is a change in consumption due to a change in income. It has been expected to positive impact on export performance of domestic country.

Distance:— It has been the distance between the two trading nations. Data on the distance between Ethiopia and her trade partners was collected based on the distance between Addis Ababa and capital of trading partners. Thus, having long distance between Ethiopia and its trading partner would directly result into high cost of transportation and increases the purshibiity of the product, then there will be reduction in the demand of foreigners to our products. It has been expected to negative impact on export performance of a given country.

Real GDP of domestic country:-It has been defined as the average real GDP of exporting countries which is Ethiopia, in this case. It is an indicative of the productive capacity of a country. It has been expected as positive impact on export performance.

Domestic Population: –It refers to the number of population live in a domestic country in a given time. Increase in population increases domestic demand of flower when absorption effect exceeds economies of scale which leads to decrease exports of flower and decrease income gain from flower export. Increase in population increases flower export when economies of scale exceeds absorption effect and leads to increase in income gain from flower export. The expected sign of population has been indeterminate.

Population of trading countries:– It refers to the number of population live in an importing country in a given time. Increase in population increases demand of flower when absorption effect exceeds economies of scale which leads to increase exports of flower and increase income gain from flower export. Increase in population decrease flower export when economies of scale exceed absorption effect and it leads to decrease in income gain from flower export. The expected sign of population has been indeterminate.

Foreign currency reserve:-It refers to the amount of foreign currencies in the form of bank notes, deposits, bonds, treasury bills, and other government securities held by a countries central bank reserved for different purposes like, keep fixed rate values of their currencies, maintain competitively priced exports, remain liquid in case of crises and provide confidence for investors in the economy and it has been positive and significant impact on flower export.

Openness:-Trade openness of an economy defined as the countries freedom to keep at economic policies of its choice and the exposure of the country to international economy. It is a measure of the extent to which an economy depends on trade with other countries or regions i.e the ratio of the sum of total imports and exports to GDP. Thus the trade policies of the trading partner country j at time t are captured through degree of openness. The expected sign of openness has been positive.

Real effective exchange rate:-It refers to the value of a given country currency against another countries currency. It represents the value that an individual consumer pays for an imported good at the consumer level. Since the export price and the real exchange rate are highly correlated, this study uses the real exchange rate variable and leaves out the price of

flower exports. An increase in real effective exchange rate means exports become cheaper and imports become expensive. It has been positive expected sign.

Foreign direct investment (FDI): It was defined as new investment made by foreign investors in horticultural sub-sectors. The results of the reviewed literature show varied results with regards to the impact of FDI on export performance. However, in Ethiopia, the government have given due attention to attract foreign investors into this potential sub-sector. Consequently, the expected sign of FDI in this study was expected to be positive.

Table 3-1: Table Summary of Definitions, Measurement and Hypothesis of Variables

Types of Variables	Variable Code	Definition	Source	Measurement	Expected Sign
Dependent variable	EXP	Value of flowers exported	National Bank of Ethiopia annual report	Millions of dollars	
Independent variable	PCIit	Per capital income of importing country	Data files of OECD National Accounts and World Bank national accounts data.	Millions of dollars	+
	GDPjt	Real GDP of exporting country	Data files of OECD National Accounts and World Bank national accounts data.	Millions of dollars	+
	FCRit	Foreign Currency Reserves	National Bank of Ethiopia annual report	Millions of dollar	-
	DISij	Distance between trading countries	Data files of OECD National Accounts and World Bank national accounts data.	In mille	-
	POPit	Number of population in the domestic country	World development indicators of world bank data.	Number	+-
	POPjt	Number of population in the importing country	World development indicators of world bank data	Number	+-
	OPENjt	Trade openness of	World development indicators	United State dollars	+

	exporting country (Ethiopia)	of world bank data		
REERijt	Real effective exchange rate between Ethiopia and its trading countries	World development indicators of world bank data	Birr/Foreign currency	+
FDIijt	Foreign direct investment	National Bank of Ethiopia annual report	United State dollars	+

3.3 Estimation Issue and Technique

Before regressing the data this paper has been tested different issues to ensure the soundness of the analysis. These are:-

3.3.1 Panel Unit Root Test

The above model was used a panel data so, like time series data the first step in econometrics analysis is to test for stationarity of variable. The major difference to time series test of unit root is that we have to consider the asymptotic behavior of both time series dimension and cross section dimension. Because regressing of a non-stationary variable on another non-stationary variables result spurious regression (false regression result) in a sense that any correlation exists is due to time trend in variables it is not causal relationships. Another importance for stationarity of the data in analyses is to forecasting in to the future based on past data, without stationarity it is impossible to predict the future based on past data. Non-stationary variable will only allow studying their current behavior not include past and future prediction. A widely used test for stationarity in panel data is the panel unit root test. The presence of unit root indicates that the variables are not stationary. This is happened when the calculated test statistic in absolute value is less than critical values at different level of significance otherwise the variable is stationary. To identify the existence of unit root Levin-Lin-Chu, Harris-Tzavalis, Im-Pesaran-Shin, and Fisher type test will be used (Banerjee, Dolado, Galbraith, & Hendry, 2003). If a unit root exists in the variables there are two ways to ensures that stationary series. These are differencing variable, differencing a variable L times if L unit root exist ensures that a stationary series and trend taking out the trend ensure a stationary of variables (Gujarati, Basic Econometrics, 2004).

3.3.2 Normality Test

The model assumes that the random variable ε has a normal distribution. ε is normally distributed around zero mean and constant variance. This means that small values of ε 's have a higher probability to be observed than the large values. This assumption is necessary for conducting statistical test of significance of the parameter estimates and for constructing confidence intervals. If the assumption of normality is violated, the estimate of parameters are still unbiased but the statistical reliability by the classical tests of significance (t-statistic and F-statistic) of the parameter estimates cannot be assessed because these testes are based on the assumption of normal distribution of the ε 's (Gujarati, Basic Econometrics, 2004). The normality of the data was checked through Shapiro swilk test.

3.3.3 Multicollinearity Test

Multicollinearity is the existence perfect or exact linear relationship among some or all explanatory variable on the regression model. Multicollinearty leads to the standard error of the estimated regression coefficient would be very high and the parameter estimate will unstable and insignificant to the overall degree of multiple correlations. The problem of multicollinearity can be detected through high R^2 and high variance inflation factor (VIF), when VIF is greater than 10 indicates the problems of multicollinearity problem. To alleviate this problem there are many alternative measures such as no nothing, decrease correlation among explanatory variables, combine variables which are conceptually related, drop some of the explanatory variables, increase the variance of explanatory variables (Gujarati, Basic Econometrics, 2004).

3 .3.4 Hetroscedasticity Test

The hetroscedasticity assumption is one of the CLRM assumption and it is assumed that if the variance of the error term is not constant it is said to be hetroscedasticic. Assuming the homoscedasticity disturbances, when the presence of hetroscedasticity will result in consistent estimates of the regression coeffiecient, but this estimates will not be efficient. The loss of efficiency will lead to biased standard error and hence the inference from the estimate becomes invalid. In this study the Breush Pagan test for hetroscedasticity have been used .

H0: Homoscedasicitic (constant variance)

H1: Hetroscedasicitic

The Breush Pagan test can be computed by multiplying the R^2 of an auxiliary regression obtained from regressing the square of the residual on the explanatory variables by $N(T-1)$. The resulting test statistic would have a chi-square distribution with J degree of freedom where J represent the number of explanatory variables used in the regression. From results of Breush Pagan–Godfrey test if the p value is less than 5 % reject the null hypothesis indicating that presence of heteroscedasticity (Gujarati, Basic Econometrics, 2004).

3.3.5 Hausman Specification Test

Two approaches are used in panel data i.e. the random effects model and the fixed effects model to decide on which method to use. Hausman specification test has been used to test the orthogonality of the random effects and the regressor's and choose between random and fixed effects which was based on the null hypothesis in favor of random effect model estimator. When the test is made it is important to see the p-value because the decision was made on the basis of this value, accordingly the p-value is higher than 0.05 percent (it is insignificant) hence random effect is preferable or where as p-value is lower than 0.05(it is significant) fixed effect is preferable (Gujarati, Basic Econometrics, 2004).

3.3.6 Test for Autocorrelation

The term autocorrelation is defined as a correlation between disturbance or error term in a series of observations ordered in time in time series data or space as in cross-sectional data. When the random term is auto correlated, the parameter estimates are still unbiased but the variance of the parameters estimate are large or the variance of the random term may be seriously underestimated or the prediction of the parameter estimate will be inefficient when the variance is larger (Gujarati, Basic Econometrics, 2004). Unlike Durbin Watson test statistics, Lagrange Multiplier (LM) test is used to test the presence of higher correlation among errors and is applicable whether or not there are lagged dependent variable. So this study was used Lagrange Multiplier (LM) test to check whether or not the correlation exists between the error terms in different time period. It can be computed mathematically as follow

$$LM = (n - p)R\epsilon^2$$

The null hypothesis to be tested is that

H_0 : There is no autocorrelation versus

H_1 : $\epsilon_t = AR(P)$ or $\epsilon_t = MA(P)$.

If $(n - p)R\epsilon^2$ exceeds the critical chi-square value at the chosen level of significance, we reject the null hypothesis.

CHAPTER FOUR

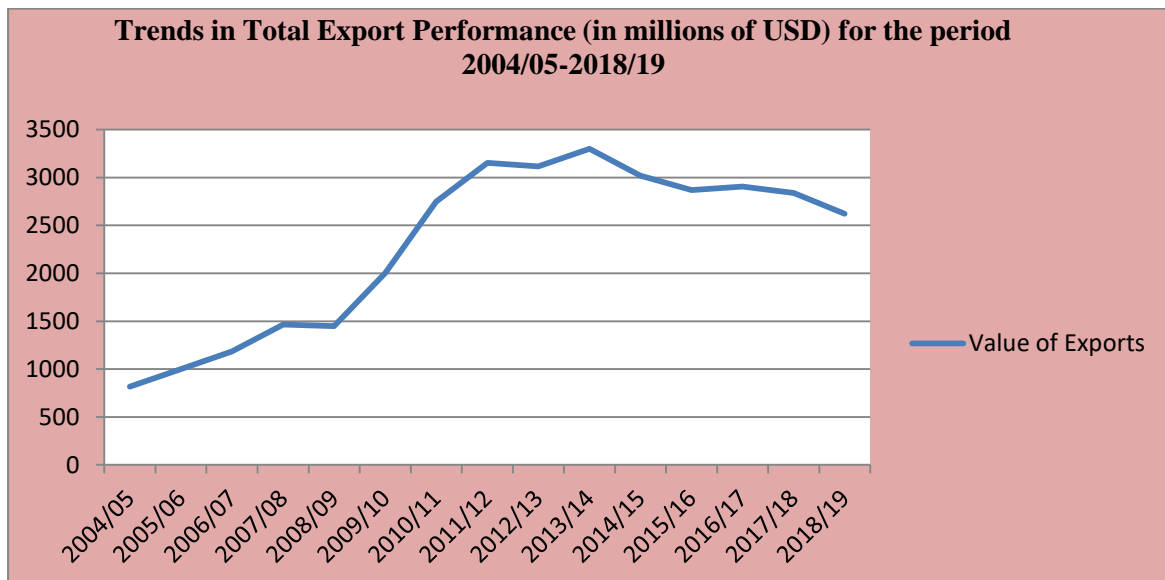
4. RESULTS AND DISCUSSION

This chapter provides descriptive and econometric analysis of the study. Firstly, descriptive analysis showing the performance of flower exports measured in value and its share in total export and GDP of the country presented. The second part were empirical analysis. The models are developed based on the economic theory in methodological part of the study and determinants of flower export are discussed. The organized data were estimated based on the panel model for ten major trading partner over the period 2004/05 to 2018/19. In this chapter the organized data were presented and important correlation and regression results were discussed. Accordingly, first different diagnostic test were made and secondly Hausman specification test (fixed versus random effect model test) was made in order to choose the appropriate methods of estimation. Finally the results of random effect panel data regression model and detail discussion were presented.

4.1 Descriptive Analysis

4.1.1 Trends in Total Export Performance

Figure 4-1:- Trends in Total Export Performance (in millions of USD) for the Period 2004/05-2018/19



Source:-Own computation from World Bank Data

To look at the trends of Ethiopia's total export in the last 15 years the trends of export has been showed slight fluctuations. It has been started to increase from 817.7 million USD in the year 2004/05 to 1465.9 million USD in the year 2007/08 and it has been showed slight declines from 1465.9 in 2007/08 to 1447.9 in the year 2008/09. After this declines it has been starts to increased to 3152.7 million USD in the year 2011/12 and it has been declined to 3115.8 in the year 2012/13. After reaching a maximum of 3300.1 in the year 2013/14 the trend shows the export sector is unsatisfactory still now.

4.1.2 Structure and Composition of Ethiopia's Exports

Developing nations face a fluctuation of price of their primary export because of inelastic and unstable demand and supply. The demand for primary export of developing nation is price inelastic because individual house hold in developed nation spend only small portion of their income on such commodity as coffee, cacao, tea, and sugar. When the price of those commodity change house hold dose not significantly change their demand of those commodity resulting price inelastic demand due to this developing nation face large fluctuation of export price and earning this unstable and inelastic demand results low export performance. The supply of primary export of developing nation is price inelastic because of inflexibility and rigidity of supply in developing nations especially in tree cropping that involve long gestation period (Todaro & Smith, 2012).

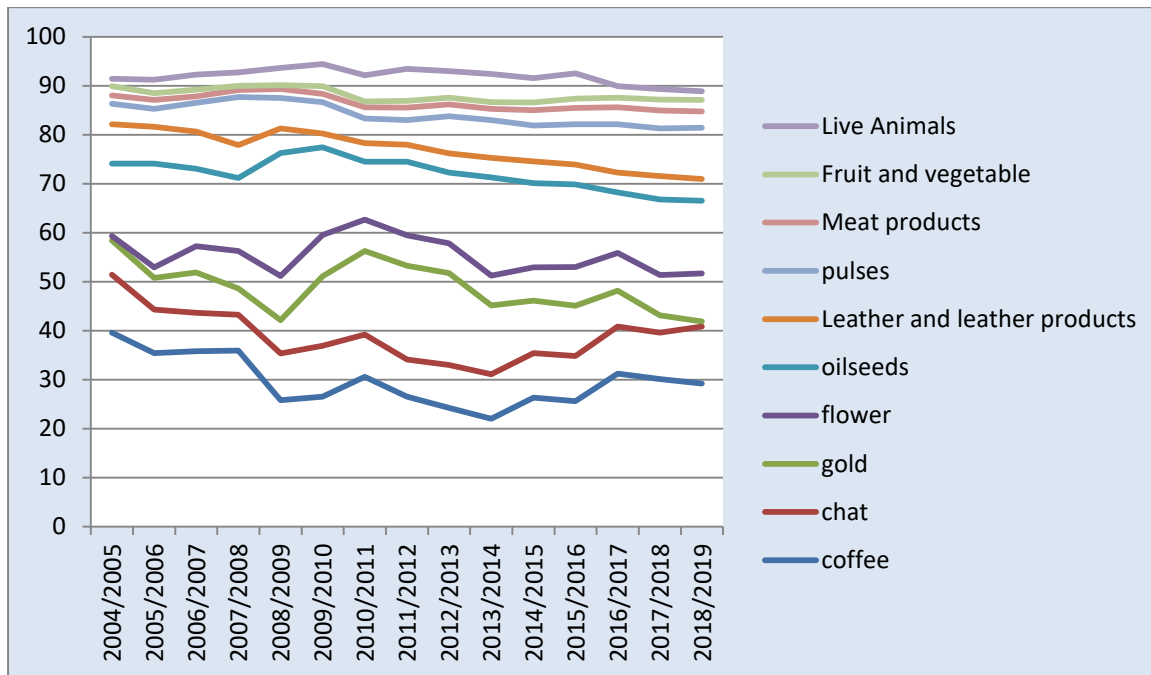
As in the case of many developing countries in Ethiopia's the export structure is still characterized by predominantly composed of few primary agricultural commodities mainly coffee, pulses, hide, skin and oilseeds besides tourism that earn very small amounts in the international market. This has made the export sector to be more vulnerable to fluctuations in world prices. But now a time certain non-traditional exports such as meat and horticultural products have experienced rapid growth and are become the major exported agricultural product. Manufactured goods make only a small proportion of total exports. Besides horticultural products coffee and pulse still remain key export commodities. The share of manufactured exports has not only remained small but has also been declining. Consequently, export growth has been highly erratic, based on fluctuations in earnings from a few traditional primary exports and the tourism sector. Dependency in few export commodity especially primary products suffer two main problems. first, these product are sensitive to sudden natural and international price fluctuation and resulting in unpredicted source of foreign exchange. Second, commodity exports are not supported by technology transfer (Ibid).

Table 4-1: Shares of Major Exporting Commodities in % of Total Exports Values in Millions of USD

Year/Commodity	coffee	chat	gold	flower	oilseeds	Leather and leather products	pulses	Meat products	Fruit and vegetable	Live Animals
2004/2005	39.6	11.8	7	0.9	14.8	8	4.2	1.72	1.89	1.51
2005/2006	35.4	8.9	6.47	2.18	21.13	7.5	3.69	1.85	1.32	2.75
2006/2007	35.8	7.81	8.26	5.37	15.82	7.55	5.92	1.3	1.36	3.1
2007/2008	35.9	7.34	5.39	7.61	14.94	6.73	9.78	1.42	0.87	2.76
2008/2009	25.8	9.52	6.8	9.03	25.1	5.02	6.22	1.8	0.82	3.55
2009/2010	26.5	10.4	14.2	8.44	17.88	2.8	6.42	1.69	1.58	4.51
2010/2011	30.6	8.61	17.04	6.39	11.86	3.8	5.01	2.3	1.15	5.36
2011/2012	26.5	7.6	19.12	6.24	15	3.48	5.07	2.49	1.42	6.54
2012/2013	24.2	8.79	18.77	6.06	14.43	3.93	7.57	2.41	1.42	5.38
2013/2014	22	9.11	14.01	6.13	20.04	3.97	7.7	2.29	1.41	5.71
2014/2015	26.3	9.13	10.69	6.83	17.15	4.42	7.36	3.12	1.6	4.97
2015/2016	25.6	9.23	10.23	7.93	16.87	4.06	8.18	3.39	1.89	5.17
2016/2017	31.2	9.6	7.35	7.7	12.39	4.02	9.85	3.48	1.97	2.36
2017/2018	30.1	9.46	3.58	8.23	15.39	4.75	9.8	3.66	2.2	2.12
2018/2019	29.2	11.6	1.05	9.82	14.84	4.46	10.41	3.38	2.32	1.75

Source: Own Computation Based on NBE 2019 Annual Report

Figure 4-2: Shares of Major Exporting Commodities in % of Total Exports Values in Millions of USD



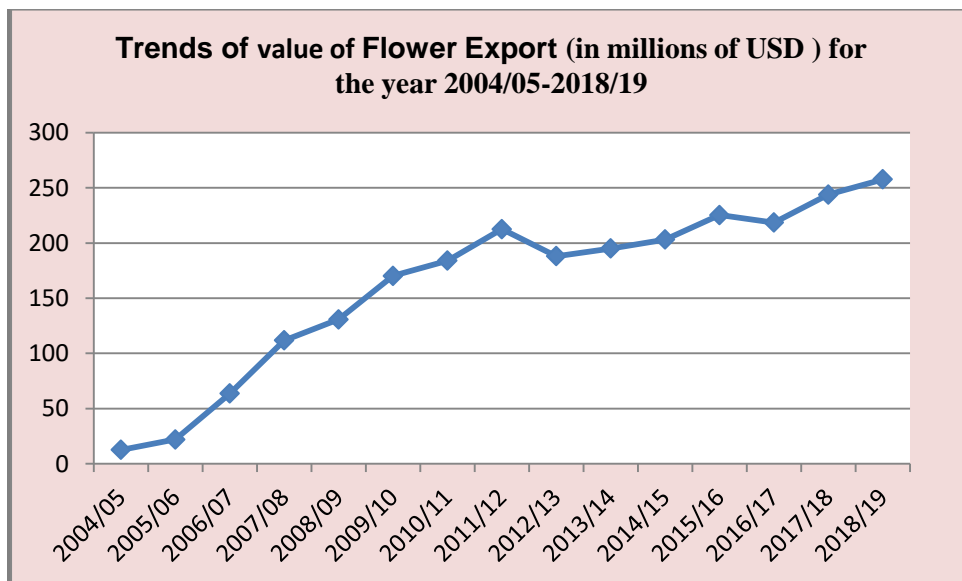
Source: Own computation Based on NBE 2019 Annual Report

As we observe from the above figure the structure of commodities export shows some fluctuations from the year 2004/05 to 2018/19. When we see the share from the total export coffee announce the first level followed by chat, gold, flower, oilseeds and leather and leather products. But the share of pulses, meat products and fruit and vegetable share almost the same amount from the total export of Ethiopia. Live animal from the top ten major exporting commodities is the least but not the last commodity which shares the lowest amount from the total export of Ethiopia.

4.1.3 Trends of Value of Flower Export

In assessing flower export performance of a country it is important to consider the value of flower export of the country. If the value it earns is high, it can be said that the country is largely involved in flower export and is benefiting a lot from it. If it is low, this may mean that the country is less involved in flower export or it does not earn passable revenue from flower export. The figure below shows the value earned from flower exports of Ethiopia.

Figure 4-3: Trends of Value of Flower Export (in millions of USD) for the Year 2004/05-2018/19



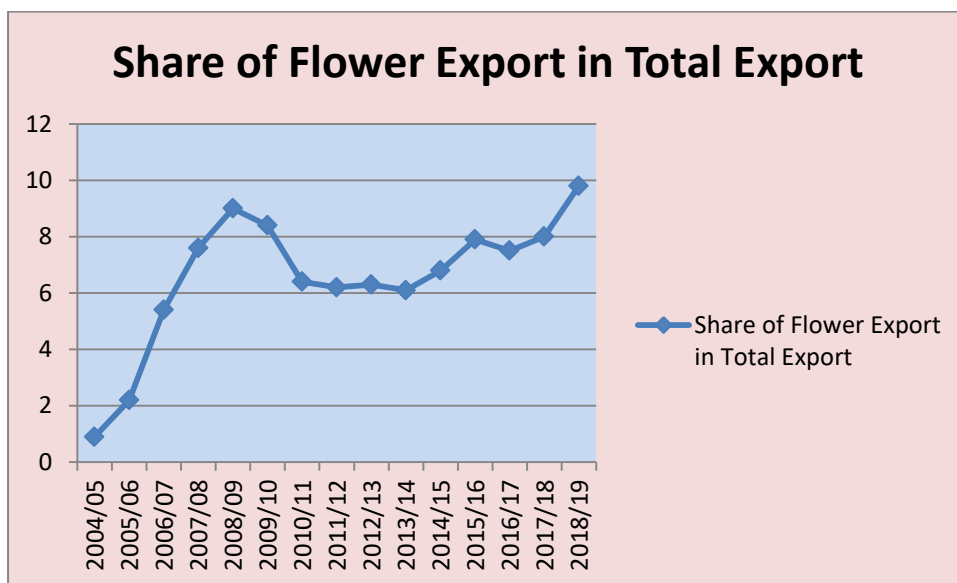
Source: Own Computation Based on NBE 2019 Annual Report

As we can observe from the diagram above value of flower export in millions of USD has been shown increasing over the period 2004/05-2011/12 from 12.6 to 212.56 however it has been decreased to 188.02 in the period 2012/13. The period that followed showed increase in value of flower export and this mainly due to government incentives for the sector. So performance of flower export measured in value of flower export showed improves over time.

4.1.4 Trends of Share of Flower Export in Total Export

In assessing flower export performance of a country it is important to consider the share in the total export of the country. If the share is high, it can be said that the country is largely involved in flower export and is benefiting a lot from it. If it is low, this may mean that the country is less involved in flower export or it does not earn passable revenue from flower export. The figure below shows the percentage share of earnings from flower exports in the total export of Ethiopia.

Figure 4-4: Trends of Share of Flower Export in Total Export (in millions of USD) for the Year 2004/05-2018/19



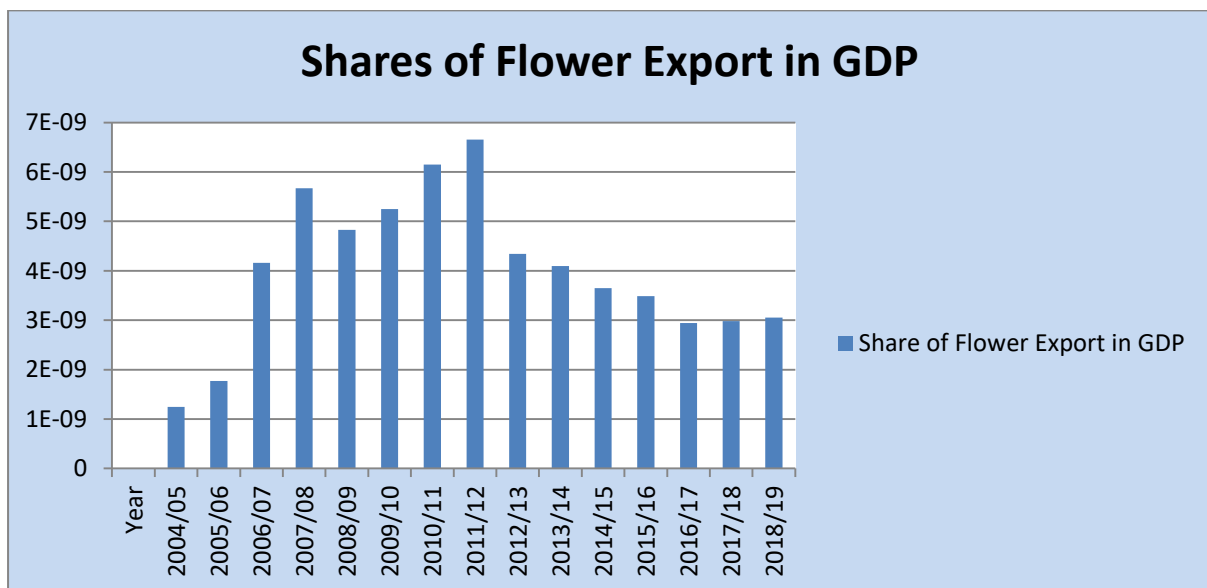
Source: Own Computation Based on NBE 2019 Annual Report

As we can observe from the diagram above performance of flower export as measured by the ratio of value of flower export to total export value has been shown increasing over the period 2004/05-2008/09 from 0.9 to 9 however it has been decreased to 6.1 in the period 2013/14. The period that followed showed increase in flower export performance and this mainly due to government incentives for the sector.

4.1.5 Shares of Flower Export in GDP

In assessing flower export performance of a country it is also important to consider the share in the overall GDP. If the share is high, it can be said that the country is largely involved in flower export and is benefiting a lot from it. If it is low, this may mean that the country is less involved in flower export or it does not earn passable revenue from flower export. The figure below shows the percentage share of earnings from flower exports in the total GDP of Ethiopia.

Figure 4-5: The Share of Flower Export in GDP



Source: Own Computation Based on NBE 2019 Annual Report

As we observe from the figure the share of Ethiopia's flower export in GDP during the period 2004/05 was 1.24 percent which is the minimum in the study period and it reaches a maximum of 6.65 in the year 2011/12 percent. During the year 2018/19 the share of flower export to GDP is 3.05 percent which is low as compared to the consecutive year 2006/07 up to 2011/12.

4.2 Econometric Analysis

4.2.1 Test for Normality Assumption

Table 4-2: Shapiro-Wilk W test for Normal Data

Variable	Obs	W	V	Z	Prob>Z	
lnvfex	150	0.71595		33.050	7.930	0.00000
lnfcr	150	0.93204		7.908	4.688	0.00000
lnpopi	150	0.94270		6.668	4.301	0.00001
lnpopj	150	0.97363		3.068	2.542	0.00552
lndisij	150	0.90562		10.982	5.432	0.00000
lnpcii	150	0.92449		8.785	4.927	0.00000
lnrgdpj	150	0.95727		4.971	3.636	0.00014
lnfdij	150	0.92589		8.623	4.884	0.00000
lnreeri	150	0.97774		2.590	2.158	0.01547
lnopen	150	0.96260		4.352	3.334	0.00043

Source: Own Computation from Stata Software Version 15.1

As we observe from the above table the result suggests that the variables are not normally distributed since the calculated P value for all variables in the specified model is close to zero.

4.2.2 Multicollinearity Test

Table 4-3: VIF test for Multicollinearity

VIF

Variables	VIF	1/VIF
Inpopj	136.96	0.007301
Inrgdpj	127.57	0.007839
Infdij	10.78	0.092801
Infc	6.79	0.147239
Inreeri	6.31	0.158436
Indisij	5.66	0.176756
Inpcii	4.36	0.229166
Inpopi	3.90	0.256686
Inopen	3.68	0.272030
Mean VIF	34.00	

Multicollinearity is the existence of perfect or exact linear relationship among some or all explanatory variable on the regression model. Multicollinearity leads to the standard error of the estimated regression coefficient would be very high and the parameter estimate will unstable and insignificant to the overall degree of multiple correlations. The problem of multicollinearity can be detected through high R^2 and high variance inflation factor (VIF), if VIF of a variable exceeds 10, which will happen if R^2 exceeds 0.90, indicates that variable is said be highly collinear (Gujarati, Basic Econometrics, 2004).

High R^2 but few significant t-ratios are the “classic” symptom of multicollinearity. If R^2 is high, say, in excess of 0.8, the F test in most cases will reject the hypothesis that the partial slope coefficients are simultaneously equal to zero, but the individual t tests will show that none or very few of the partial slope coefficients are statistically different from zero (Ibid).

VIF (TOL) as a measure of collinearity is not free of criticism. Since variance depends on not only VIF a high VIF can be counter balanced by other variables. To put it differently, a high

VIF is neither necessary nor sufficient to get high variances and high standard errors. Therefore, high multicollinearity, as measured by a high VIF, may not necessarily cause high standard errors (Ibid). Therefore, the remedial measure is Do Nothing since VIF exceeds 10 but R^2 is less than 0.90 and also the t-ratios are significant.

4.2.3 Heteroscedasticity Test

Table 4-4:- Breush-Pagan test for Heteroscedasticity

H0: Homoscedastic residual		
H1: Heteroscedastic residual		
Model	Chi ² (1)	Prob > Chi ²
LNFEEX	36.45	0.0000

The Breush-Pagan heteroscedasticity test above indicates that the error term is heteroscedastic since the P-value 0.0000 is actually less than the level of significance 0.05. To alleviate this problem the study used robust methods of estimation.

4.2.4 Autocorrelation Test

Table 4-5:- Breush Pagan Lagrangian Multiplier Test for Random Effect

The Breusch-Godfrey LM test produces a test statistic of $(T - 1) R^2 = 1.000$, which is less than the 5% critical value of 3.84 of a Chi-squared distribution with one degree of freedom so we have to accept the null hypothesis of no serial correlation.

4.2.5 Hausman Specification Test

Hausman specification test is used to test the orthogonality of the random effects and the regressor's and choose between random and fixed effects.

Table 4-6:- Hausman Specification Test

Test for the model				
H0: RE model is appropriate				
H1: FE model is appropriate				
Test Summary	Chi-sq (statistics X2)	Chi-sqdf	Prob.	Appropriate Model
Cross-Section Model	3.32	8	0.9129	Random effect

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Source: Own Computation from Stata Software Version 15.1

Based on the estimated result in the above table random effect is the appropriate one since the p-value 0.9129 is higher than 0.05 percent.

4.2.6 Panel Unit Root Test

Table 4-7:- The Levin- Lin- Chu panel unit root test

Variables	At levels		At 1st difference		Order of Integration
	t-Statistic	p-value	t-Statistic	p-value	
LNVFEX	-33.4151	0.0000	-17.1757	0.0000	I(0)
LNRGDP	-6.0516	0.0000	-10.3750	0.0000	I(0)
LNPCI	-3.8643	0.0556	-9.4197	0.0000	I(1)
LNPOPi	-7.0828	0.0000	-10.5333	0.0000	I(0)
LNPOPj	-6.0012	0.0000	-10.7152	0.0000	I(0)
LNFDI	-0.9637	0.9948	-8.2662	0.0296	I(1)
LNREER	-5.7282	0.0000	-11.9960	0.0000	I(0)
LNFCR	-2.9272	0.2399	-12.8675	0.0000	I(1)
LNOPENN	-3.4015	0.4770	-9.4348	0.0000	I(1)

Source: Own Computation from Stata Software Version 15.1

Unit root test is carried out to know the degree of integration of the variables. This is important to know the stationarity of the variables meaning the variables have constant mean (move around the mean), constant variance and normally distributed over the constant mean and variance. The study used the Levin- Lin- Chu panel unit root test. From the stata result the above table confirms that five variables which are flower export, real GDP of domestic country, population of importing countries, domestic population, and real effective exchange rate are stationary at level and no further adjustment is needed to make them stationary while variables per capital income of importing countries, foreign direct investment, foreign currency reserve and trade openness are non stationary at level and the researcher used further adjustment to make them stationary and after their first difference those variables are stationary at first difference.

4.2.7 Results and Discussions

After analyzing the various econometric issues that has taken in to consideration, the estimation technique which result in consistent and unbiased estimates is selected. In this study a random effect estimation technique is chosen because the estimation technique yields efficient and consistent result. The regression result have their own implication, and hence the coefficient indicates each variable's level of influence on the dependent variable which may has a coefficient of positive or negative results.

In order to see the implication of both demand and supply side factors of the flower export performance the study uses random effect model. As table below shows a number of variable are found to be statistically significant with their estimated sign. As per the STATA output, the most important determinant of Ethiopia flower export performance are the per capita income of the trading partner, real GDP of exporting country, trade openness, real effective exchange rate, foreign direct investment, domestic population and distance between trading partners.

4.2.7.1 Robust Random Effect Regression Result

Table 4-8: Robust Random Effect Regression Result

Variable	Coefficient	Robust Std. error	Z	P>/Z/	[95% Conf.Interval]
Lnfcf	-0.0691689	0.0499468	-1.38	0.166	0-.1670629 0.0287251
lnpopi	0.0369695	0.0209224	1.77	0.077*	-0.0040376 0.0779765
Lnpopj	-5.562236	0.7220176	-7.70	0.000***	-6.977365 -4.147108
Lndisij	-0.1165903	0.0516253	-2.26	0.024**	-0.2177741 -0.0154066
Lnpcii	0.246417	0.0668172	3.69	0.000***	0.1154578 0.3773762
lnrgdpj	2.746897	0.2244962	12.24	0.000***	2.306892 3.186901
Lnfdij	-0.1940148	0.0341844	-5.68	0.000***	-0.261015 -0.1270146
lnreeri	-0.890944	0.3241618	-2.75	0.006***	-1.526289 -0.2555985
lnopen	0.3645991	0.0919641	3.96	0.000***	0.1843529 0.5448454
cons	43.66537	8.016406	5.45	0.000***	27.9535 59.37724
R ²	0.8855				
Ch ²	9.93e+07				
Propability	0.0000				
> Ch ²					

NB “***”, “**” and “*” indicates the significance level at 1%, 5% and 10% respectively.

Source: Own Computation from Stata Software Version 15.1

The estimated equation of the real values of export can be written as:-

$$\begin{aligned} \text{LNEXP} = & 43.66537 - 0.0691689 \text{LNFCR} + 0.369695 \text{LNPOPI} - 5.562236 \text{LNPOPj} - \\ & (8.016406) \quad (0.0499468) \quad (0.0209224) \quad (0.7220176) \\ & 0.1165903 \text{LNDISij} + 0.246417 \text{LNPCIi} + 2.746897 \text{LNRGDPj} - 0.1940148 \text{LNFDIj} - \\ & (0.0516253) \quad (0.0668172) \quad (0.2244962) \quad (0.0341844) \\ & 0.890944 \text{LNREERij} + 0.3645991 \text{LNOPENj} \\ & (0.3241618) \quad (0.0919641) \end{aligned}$$

The result shows that Ethiopia’s flower export was found to be positively and significantly determined by per capital income of importing country, real GDP of Ethiopia, population of trading partners, and trade openness of the country. While, distance between the two countries, real effective exchange rate, foreign direct investment and population of the exporting country were found to have negative and significant impact on flower export of Ethiopia. The remaining variables foreign currency reserve was found to have insignificant impact on Ethiopia’s flower export.

The coefficient of per capital income of importing countries was found to be positive and statistically significant at 1% significance level which is consistent with the expected sign of the study and the theory of gravity trade model which states that the size of an economy of importing country is directly related to the volume of their imports because larger economies can generate more income from goods and services they sold, so they are able to buy more imports. The estimated coefficient suggests that at ceteris paribus a 1% increase in income of importing country leads to an increase in flower export by 0.25%. Importing countries with higher per capital income indicates more demand for flower export of Ethiopia. This is similar to the result found by (Bekele & Mersha, 2019) by using dynamic panel gravity model; the study revealed that real GDP of importing country had positive and significant impact on Ethiopia’s coffee export.

The study revealed that real GDP of domestic country had positive and significant at 1% significance level which is consistent with the expected sign of the study and the theory of gravity trade model, which states that the size of domestic countries economy is directly related to the volume of their exports because larger economies can produce more goods and services, so they have more to sell in the export market. The result is also consistent with the study by (Nsabimana & Tirkaso, 2019) in examining coffee export performance in Eastern and Southern African countries by using static and dynamic gravity model the study revealed that positive and significant impact of GDP of exporting country. The result of study suggests that at ceteris paribus a 1% increase in real GDP of Ethiopia increases its flower export by 2.74%. This may result from increasing the productive capacity of the country through as a source of purchasing production factors and also improving the health of workers.

The coefficient of population of importing countries was found to be positive and significant at 10% level of significance, which is consistent with the expected sign of the study. The result of the study suggests that, holding other things remain unchanged a 1% increase in population of importing countries leads to 0.03% increase in Ethiopia's flower export. This resulted from increase in demand as population increases. The result confirms the study by (Hassan, 2017) on analysis of prime determinants and constraints of Bangladesh's export market by using stochastic frontier gravity model approach founds positive impact of trading partner's population on export.

Besides, trade openness of the country found to positively determine flower export of Ethiopia and it is significant at 1% level of significance. This result is consistent with the theoretical expectation of trade liberalization. At ceteris paribus a 1% improvement in trade openness of the country would increase Ethiopia's flower export to by 0.36%. This may result from reduction of trade barriers with different countries in the world. Also it is consistent with the study by (Tigist, 2018) in determinants of export performance in Ethiopia by using fixed effect method and found that trade openness positively and significantly determines export.

The estimated coefficient of distance was negative and significant at 5% significance level which is similar to the expected sign. The result confirms the theory of gravity model which states that distance between market influences transportation costs and therefore the cost of imports and exports. It is also consistent with different empirical results such as (Alelign, 2014) in determining export flow between Ethiopia and its trading partners by using gravity model approach found that significant and negative impact of real distance and (Bekele & Mersha, 2019) in identifying the main determinant factors of Ethiopia's coffee export performance by using dynamic panel gravity model found similar result of distance on export. Holding other things remains constant, an increase in distance by one kilometer between trading partners decreases Ethiopia's flower export by 0.12%. This is resulted from as distance increases it increase the cost of transport and since flower is a perishable product it can be reached at destination with in short time.

The estimation result revealed that the coefficient of real effective exchange rate is statistically significant at 1% level of significance, but the sign of the variable is inconsistent with the hypothesis and the theory of marshal-learner condition which states that real effective exchange rate are positively related with export performance. The result also contradicted the result found by (Tadese, 2015) which suggests that real exchange rate had positive and insignificant impact. But the result is consistent with (Hassen, 2015) estimating determinants of Coffee export supply in Ethiopia by using error correction modeling approach found that real exchange rate had negative and significant impact. It is also similar to (Kebede, 2011) in the study does real exchange rate matter for Ethiopia exports by using gravity model found that real exchange rate have negative and significant impact on Ethiopia exports. Other things remain constant, a 1% increase in real effective exchange rate leads to a decrease in flower export by 0.89%. This may be due to the fact that an increase in real effective exchange rate (devaluation) worsens export by decreasing the country's competitiveness in international market or price inelastic domestic flower export supply.

The estimated coefficient of population of the exporting country was found to be negative and significant at 1% level significance. The result is consistent with the hypothesis of the study. The finding confirms the theory of gravity model which states that population size in the domestic country increases the domestic market this leads to decrease the volume of export. The result also confirms the result found by (Hassan, 2017) on analysis of prime determinants and constraints of Bangladesh's export market by using stochastic frontier

gravity model approach founds negative impact of trading partner's population on export. Holding other things unchanged, increase in domestic population by 1% leads to a decrease in Ethiopia's flower export by 5.56%. This may be resulted from increase in population increases the market size in the home country and which increases demand for flowers in the domestic market which leads to decrease in flower export. But the result contradicts with the result found by (Bekele & Mersha, 2019) in identifying the main determinant factors of Ethiopia's coffee export performance by using dynamic panel gravity model found positive impact of domestic population.

Foreign direct investment was found to be negative impact on flower export and significant at 1% level of significance. The result is against the hypothesis. At ceteris paribus, increase in foreign direct investment by 1% leads to decrease in flower export by 0.19%. This is may be due to crowding out effect which implies that foreign direct investment made on other sectors other than flower exporting and producing sector resulted a shift of productive factors from flower sector towards other sectors. Therefore increase in foreign direct investment may result a decrease in flower export. The result contradicts with the result found by (Bishnu, 2012) on the study titled impact of foreign direct investment, trade openness, domestic demand, and exchange rate on the export performance of Bangladesh by using a vec approach found positive and significant impact of foreign direct investment.

Finally, the study revealed that foreign currency reserve has negative and insignificant impact on flower export which is against the hypothesis. Insignificant does not mean the variable has no impact on flower export but it means that a 1% increase in foreign currency reserve decreases flower export only by 0.06%. The result confirms with economic theory which suggests that as the level of exchange reserves increases, it may affect the demand for imports since more funds will be available for imports and also it increases export since it increases the confidence of producers and exporters. The result is similar implication with (Arize, 2012) on the study titled foreign exchange reserves in Asia and its impact on import demand by using dynamic error-correction model found that foreign exchange reserves matter for import demand both in the long and in the short run. In addition, the sign of the estimated coefficient of reserves is positive, as expected. While the statistical impact is significant, the economic impact of foreign reserves on import demand is small.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary and Conclusion

Flower is one of the non-traditional commodities which can be produced and exported with lower cost in Ethiopia. Now a day's flower export from horticultural commodities has attracted the attention of policy makers in Ethiopia, because the country has snug environment for the production of flower and it has a multiplier effect in economic development, like it can be a source of foreign exchange earnings and also it is a source of employment opportunity.

The general objective of the study was analyzing determinants of flower export in Ethiopia and specifically analyzing the impact of distance and foreign exchange reserve on flower export. The study employed panel data covering ten major flower importing countries over 2004/05-2018/19. The study used gravity model which is analyzed by random effect methods of estimation. Nine independent variables namely, foreign currency reserve, population of importing country, population of domestic country, per capital income of importing country, real GDP of exporting country, real effective exchange rate, distance between the two trading partners, trade openness and foreign direct investment were used in the study. The dependent variable was the total value of flower exported from Ethiopia. All the variables are in logarithm form. Different diagnostic tests were carried out to test the consistency of the data before regression was carried out. The study revealed that population of exporting country, distance between trading countries, population of importing country, per capital income of importing countries, real GDP of exporting countries, foreign direct investment, real effective exchange rate and trade openness determines Ethiopia's flower export.

Based on the results the study concludes that the major factors affecting flower exports of Ethiopia includes; population of exporting country, distance between trading countries, per capital income of importing countries, real GDP of exporting countries, foreign direct investment, real effective exchange rate and trade openness. However it was concluded that domestic population is the major determinants of flower exports of Ethiopia followed by real GDP of exporting country, real effective exchange rate, trade openness of the country, per capital income of trading partners, foreign direct investment net inflow to the domestic

country and lastly distance between the two trading countries. Domestic population plays a vital role in determining flower export of Ethiopia in the sense that it determines the market size of the country.

5.2 Recommendation

- ❖ Based on the finding the study suggests that policy makers should give equal emphasis for demand and supply side factors to improve flower export performance of the country since both demand and supply side determinants have significant impact to determine flower export performance.
- ❖ As openness to trade has a positive and significant impact on Ethiopia's flower exports performance. Thus further reduction of any of the barriers on the export import of the country is advisable.
- ❖ Increase in FDI increases production in other sectors other than flower producing and exporting sectors this may resulted a decrease in flower export due to transfer of productive resources from flower sector to other sectors. Thus there should be a system that fairly allocate the FDI of a country to each sectors of the country.
- ❖ It is believed that depreciation of a countries' real exchange rate will cause a gain in international competitiveness of one country. In this study depreciation of exchange rate would affect the Ethiopia's flower export negatively. This may be resulted from exports of LDCs are price inelastic in the international market due to nature of the product that LDCs produces. Hence this result is consistent with this fact.
- ❖ Per capital income of trading partners have positive and significant impact on flower export of Ethiopia. Thus to cushion the impact of per capital income of the trading partner, the government should exploit available markets for flower by increased participation actively in regional integration with countries which have higher per capital income.
- ❖ Real GDP of exporting country have positive and significant impact on flower export of Ethiopia. Thus there should be better improving the real GDP of the country.
- ❖ Distance between trading partners have negative and significant impact on flower export of Ethiopia. Thus there should be participating in different affairs that facilitate trade with the neighboring countries.
- ❖ Domestic population has negative and significant impact on flower export of Ethiopia. Thus the government should be encouraging policies that patronage labor force to accelerate production in order to increases production over domestic consumption.

5.3 Suggestion for Further Studies

The study analyzed determinants of flower export in Ethiopia. The study therefore suggests further studies to be done in other horticultural and other commodities in order to determine the factors that affecting those commodities export and assist the exporting agents and policy makers. Since the study founds insignificant impact of foreign currency reserve on flower export of Ethiopia the study suggest further researchers analyze the impact of foreign currency reserve on export of the country.

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ANNEXES

Annex 1: List of Major Flower Importing Countries of Ethiopia

1. Belgium
2. Netherland
3. Japan
4. Saudi Arabia
5. United States
6. Italy

7. France
8. Norway
9. United Arab Emirates
10. Germany

Annex 2: Hausman Test

Hausman fixed random

. hausman fixed random

	—— Coefficients ——			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lnfcr	-.0576344	-.0691689	.0115345	.0725428
lnpopi	-.0960292	.0369695	-.1329987	.3576632
lnpopj	-5.943549	-5.562236	-.3813129	.7442331
lnpcii	.5514168	.246417	.3049999	.2835549
lnrgdpj	2.760817	2.746897	.0139206	.2940779
lnfdij	-.1742025	-.1940148	.0198123	.0235035
lnreeri	-.9086167	-.890944	-.0176727	.3474681
lnopen	.3162505	.3645991	-.0483486	.1307785

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 3.32
 Prob>chi2 = 0.9129

Annex 3: Panel Unit Root Test

```
. xtunitroot llc lnvfex
```

Levin-Lin-Chu unit-root test for lnvfex

Ho: Panels contain unit roots Number of panels = 10
Ha: Panels are stationary Number of periods = 15

AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	-33.4151	
Adjusted t*	-29.2592	0.0000

```
. xtunitroot llc lnfc_r_d1
```

Levin-Lin-Chu unit-root test for lnfc_r_d1

Ho: Panels contain unit roots Number of panels = 10
Ha: Panels are stationary Number of periods = 14

AR parameter: Common Asymptotics: N/T -> 0
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)

	Statistic	p-value
Unadjusted t	-12.8675	
Adjusted t*	-7.4355	0.0000

```
. xtunitroot llc lnpopi
```

```
Levin-Lin-Chu unit-root test for lnpopi
```

```
Ho: Panels contain unit roots          Number of panels = 10  
Ha: Panels are stationary              Number of periods = 15
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included
```

```
ADF regressions: 1 lag
```

```
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-7.0828	
Adjusted t*	-7.0861	0.0000

```
. xtunitroot llc lnpopj
```

```
Levin-Lin-Chu unit-root test for lnpopj
```

```
Ho: Panels contain unit roots          Number of panels = 10  
Ha: Panels are stationary              Number of periods = 15
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means: Included  
Time trend: Not included
```

```
ADF regressions: 1 lag
```

```
LR variance: Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-6.0012	
Adjusted t*	-6.4794	0.0000

```
. xtunitroot llc lnpcii_d1
```

```
Levin-Lin-Chu unit-root test for lnpcii_d1
```

```
Ho: Panels contain unit roots          Number of panels =    10  
Ha: Panels are stationary              Number of periods =   14
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means:  Included  
Time trend:   Not included
```

```
ADF regressions: 1 lag
```

```
LR variance:      Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-9.4197	
Adjusted t*	-4.9331	0.0000

```
. xtunitroot llc lnrgdpj
```

```
Levin-Lin-Chu unit-root test for lnrgdpj
```

```
Ho: Panels contain unit roots          Number of panels =    10  
Ha: Panels are stationary              Number of periods =   15
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means:  Included  
Time trend:   Not included
```

```
ADF regressions: 1 lag
```

```
LR variance:      Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-6.0516	
Adjusted t*	-5.4872	0.0000

```
. xtunitroot llc lnfdij_d1
```

```
Levin-Lin-Chu unit-root test for lnfdij_d1
```

```
Ho: Panels contain unit roots          Number of panels =    10  
Ha: Panels are stationary              Number of periods =   14
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means:  Included  
Time trend:   Not included
```

```
ADF regressions: 1 lag
```

```
LR variance:      Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-8.2662	
Adjusted t*	-1.8872	0.0296

```
. xtunitroot llc lnreeri
```

```
Levin-Lin-Chu unit-root test for lnreeri
```

```
Ho: Panels contain unit roots          Number of panels =    10  
Ha: Panels are stationary              Number of periods =   15
```

```
AR parameter: Common                  Asymptotics: N/T -> 0  
Panel means:  Included  
Time trend:   Not included
```

```
ADF regressions: 1 lag
```

```
LR variance:      Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-5.7282	
Adjusted t*	-4.1634	0.0000

```
. xtunitroot llc lnopen_d1
```

```
Levin-Lin-Chu unit-root test for lnopen_d1
```

```
Ho: Panels contain unit roots          Number of panels =    10
Ha: Panels are stationary              Number of periods =   14
```

```
AR parameter: Common                  Asymptotics: N/T -> 0
Panel means:   Included
Time trend:    Not included
```

```
ADF regressions: 1 lag
```

```
LR variance:      Bartlett kernel, 7.00 lags average (chosen by LLC)
```

	Statistic	p-value
Unadjusted t	-9.4348	
Adjusted t*	-4.9779	0.0000

Annex 4: Normality Test

```
. swilk lnvfex lnfcr lnpopi lnpopj lndisij lnpcii lnrgdpj lnfdij lnreeri lnopen
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
lnvfex	150	0.71595	33.050	7.930	0.00000
lnfcr	150	0.93204	7.908	4.688	0.00000
lnpopi	150	0.94270	6.668	4.301	0.00001
lnpopj	150	0.97363	3.068	2.542	0.00552
lndisij	150	0.90562	10.982	5.432	0.00000
lnpcii	150	0.92449	8.785	4.927	0.00000
lnrgdpj	150	0.95727	4.971	3.636	0.00014
lnfdij	150	0.92589	8.623	4.884	0.00000
lnreeri	150	0.97774	2.590	2.158	0.01547
lnopen	150	0.96260	4.352	3.334	0.00043

Annex 5: Multicollinearity Test

```
. vif
```

Variable	VIF	1/VIF
lnpopj	136.96	0.007301
lnrgdpj	127.57	0.007839
lnfdij	10.78	0.092801
lnfcr	6.79	0.147239
lnreeri	6.31	0.158436
lndisij	5.66	0.176756
lnpcii	4.36	0.229166
lnpopi	3.90	0.256686
lnopen	3.68	0.272030
Mean VIF	34.00	

Annex 6: Heteroscedasticity Test

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of lnvfex

chi2(1) = 36.45

Prob > chi2 = 0.0000

Annex 7: Autocorrelation Test

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

$\lnvfex[\text{country2},t] = Xb + u[\text{country2}] + e[\text{country2},t]$

Estimated results:

	Var	sd = sqrt(Var)
lnvfex	.7723399	.8788287
e	.0971435	.3116786
u	0	0

Test: $\text{Var}(u) = 0$

$\underline{\text{chibar2}}(01) = 0.00$

Prob > $\text{chibar2} = 1.0000$

Annex 8: Estimation Result for Flower Export

```
. xtreg lnvfex lnfcr lnpopi lnpopj lndisij lnpcii lnrgdpj lnfdij lnreeri lnopen, re robust
```

```
Random-effects GLS regression           Number of obs   =           150
Group variable: country2                Number of groups =            10
```

```
R-sq:                                     Obs per group:
  within = 0.0000                          min =           15
  between = 0.0000                         avg =          15.0
  overall = 0.8855                          max =           15
```

```
corr(u_i, X) = 0 (assumed)                Wald chi2(9)    =    9.94e+07
                                                Prob > chi2     =    0.0000
```

(Std. Err. adjusted for 10 clusters in country2)

lnvfex	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	
lnfcr	-.0691689	.0499468	-1.38	0.166	-.1670629	.0287251
lnpopi	.0369695	.0209224	1.77	0.077	-.0040376	.0779765
lnpopj	-5.562236	.7220176	-7.70	0.000	-6.977365	-4.147108
lndisij	-.1165903	.0516253	-2.26	0.024	-.2177741	-.0154066
lnpcii	.246417	.0668172	3.69	0.000	.1154578	.3773762
lnrgdpj	2.746897	.2244962	12.24	0.000	2.306892	3.186901
lnfdij	-.1940148	.0341844	-5.68	0.000	-.261015	-.1270146
lnreeri	-.890944	.3241618	-2.75	0.006	-1.526289	-.2555985
lnopen	.3645991	.0919641	3.96	0.000	.1843529	.5448454
_cons	43.66537	8.016406	5.45	0.000	27.9535	59.37724
sigma_u	0					
sigma_e	.31167856					
rho	0	(fraction of variance due to u_i)				

.