



ST. MARY'S UNIVERISITY

**MACROECONOMIC FACTORS THAT AFFECT EXPORT PRICES OF COFFEE IN
ETHIOPIA**

BY

BERIHUN AMSALU EPHREM

**JUNE, 2021
ADDIS ABABA, ETHIOPIA**

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ST. MARY'S UNIVERSITY
SCHOOL OF GRADUTE STUDIES
INSTITUTE OF AGRICULTURAL ECONOMICS AND DEVELOPMENT STUDIES

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DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of my advisor, Dr. Kurabachew Menber. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

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ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

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ABBREVIATIONS AND ACRONYMS

ECTA	Ethiopian Coffee and Tea Authority
ECC	Ethiopian Customs Commission
ECX	Ethiopia Commodity Exchange
FGLS	Feasible Generalized Least Square
GDP	Gross Domestic Product
GLS	General Least Square
ICE	Intercontinental Exchange
ICO	International Coffee Organization
IID	Independent Identical Distribution
IMF	International Money Fund
ITC	International Trade Center
LDC	Least Developed Country
LSDV	Least Square Dummy Variable
NBE	National Bank of Ethiopia
OLS	Ordinary Least Square
PCI	Per Capita Income
PPP	Purchasing Power Parity
SD	Standard Deviation
SSA	Sub Saharan African
TOT	Terms of Trade
USD	United States Dollar
WB	World Bank

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ABSTRACT

This study investigates macroeconomic factors that affect export prices of coffee in Ethiopia using panel data that span the period 2001-2020 in 40 Ethiopian coffee destinations. The quantitative data were collected from the National Bank of Ethiopia (NBE), Ethiopian Coffee and Tea Authority (ECTA), International Coffee Organization (ICO), Ethiopia Customs Commission (ECC), WB and IMF. Results of the panel data econometric models show that over 54% of the coffee export price variability was explained by the macroeconomic variables included in this study. The findings of the study revealed that the parameter estimates of inflation rate, exchange rate, GDP growth rate and per capita income of coffee buyers were statistically significant and have a positive effect on the export price of coffee in Ethiopia. However, terms of trade and world coffee supply change were statistically significant and have negative effect on coffee export price. The results of the study have important policy implications in areas that seek to improve value chain development, market expansion, and productivity and export diversifications.

Keywords: Export Price Instability, Panel Data, Fixed Effects Model, Ethiopia

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Many economists have advocated the contribution of international trade for the welfare of nations (as engine of growth) in the overall process of economic development (Onafowora and Owoye, 1998; Arndt, 1999). In several developing countries, agriculture commodity-based export plays an important role in fostering economic growth and generating foreign currency. As Evita (1993) explained a commodity, which is largely traded in the international markets, plays a significant role in economic growth of SSA countries (e.g., Burundi: 68% coffee, Mali: 74% cotton; Rwanda: 81% coffee).

With this regard, coffee is one of the commodities that have been widely traded all over the world and world's most popular beverage. Some claim it is the most widely consumed liquid in the world aside from water. Coffee has only one value to give the consumer pleasure and satisfaction through flavor, aroma and desirable physiological and psychological effects (Yigzaw, 2005). It is consumed as a refreshing drink world over in various forms. As result, an estimated 22 billion pounds of coffee were exported by coffee producing countries around the world, which was of great significance in world economy as the largest single commodity entering the international trade after petroleum and petroleum products (ICO, 2019). So, coffee plays exceptional importance in the economies of many countries.

Coffee beans are mainly produced in Brazil, Columbia, Mexico, Ethiopia, Uganda, Honduras, Castalia, Peru, Vietnam, Indonesia and India, of which Brazil is on top and Ethiopia stands at 5th position. On the other side, European, African and South East Asian countries are the major coffee consuming countries. Brazil, Vietnam and Columbia have remained being major suppliers in the global market; hence they command the world market which means a change in production pattern of coffee in these countries influence the international coffee market.

Ethiopia, the motherland of coffee Arabica, has endowed with enormous genetic sources. Coffee beans in Ethiopia have wide ranges of taste profiles, distinct feature of flavor, with suitable ecology and fertile soil to draw considerable economic and social benefits. It has a long history tied with social, economic, psychological and cultural functions. Coffee in Ethiopia is a single commodity that has been contributing crucial importance to economy of the nation by generating a considerable amount of foreign currency which in turn expended in importing substantial inputs and goods used building social and economic programmes. It has remained for a long time as a major commercial commodity which plays vital role being source of income, employed more than 15 million people, generates more than 30% foreign currency, being source for local consumption (accounts for half of production).

The existence of diverse genetic resources, conducive and diverse agro-ecologic zones, adapted organic production practices, availability of ample labor resource provide Ethiopia with better opportunity to enhance comparative advantage gained by trading coffee in international markets. Moreover, Ethiopian coffee Arabica is a high quality valued which has been widely favored by consumers long before countries like Vietnam, Colombia Brazil got into coffee scene.

In contrast, actors along value chain have been facing challenges of market competition due to the steady state coffee industry. For example, small farm producers are greatly susceptible to risks especially in the year of price slump. The farmers largely depend on coffee for income, including food purchase and where indebtedness has been incurred, and are either more heavily indebted or have been forced to abandon their farms or switch to alternative crops (e.g., Khat in Eastern Harerge).

This study has aimed to investigate relationships between export price of coffee and the macroeconomic variables; hence it is very important to determine whether these factors affect export prices differently at different levels in order to draw up policy lessons.

1.2. Statement of the problem

Despite its aforementioned comparative advantages and endowed potentials, Ethiopian coffee has a limited share in world markets and is not generating significant economic benefits due to various impeding factors; among others, instability and decline of export price is found to be main problem. Primary products, in many SSA countries, have indeed been experiencing prolonged swinging of export prices (Cleaver and Donovan, 1995; Maunduna, 2005). Agricultural primary products are usually characterized with a combination of short periods of high and volatile prices and long periods of low prices and low volatility (Deaton & Laroque, 1992). Likewise, coffee export prices in Ethiopia, like prices of other primary products, have remained unstable and declined over time.

Therefore, the long run decline of price of primary products in LDCs, as income elasticity of demand for commodities is less than that of manufactured goods, worsens terms of trade (PSH, 1950) in which fair and equitable benefits have not been trickled down to actors especially small farm producers. Julie Subervie (2008) noted that producers from agricultural commodity exporting countries are particularly vulnerable to the fluctuations of world market prices as they are widely exposed to price shocks and have little ability to cope with them. As a result, the question of fair and stable export price for coffee has long been raised by many coffee producing countries; while Ethiopia is among seriously affected by coffee price variability and long-term decline. For example, over period of 2012 to 2020 average export price of coffee in Ethiopia has been falling by 2.61 % for every fiscal year. Due to this fact and other associated problems, the share of Ethiopian coffee in the world market has not exceeded 4% for the last 5 decades. Thus export price of coffee is usually subjected to unpredictable price volatility trend and long-term declining as reflection of deteriorated prices of primary commodity exports in developing countries.

A lot of studies were conducted focusing on the effects of export performance of different commodities using different econometric models. Many other research papers explain that export performance is affected by microeconomic and macroeconomic factors such as production costs, competitiveness, infrastructure, terms of trade, world market price and

production and productivity, exchange rate, inflation (ITC, 2011; Mold and Morrissey, 2006; Belayneh, 2012).

But only a few were conducted on macroeconomic variables causes for a commodity price volatility and decline. For example, Jeffrey Frankel (2006) explained in his “carry-trade model” and “overshooting model” studies that commodity price volatility determined by overall economic activities (GDP), monetary policy (real interest rates) and exchange rate. Also, Julie Subervie (2008) noted that influence of macroeconomic factors (infrastructure, inflation and financial deepening) on the price instability by study conducted by using panel data. Farther he ascertained that high inflation, weak infrastructure and poorly developed financial system exacerbate the effects. Jia et al (2016) examined linkage between commodity price bubbles and macroeconomic factors on agricultural commodity markets in China. A Zero-inflated Poisson Model used to analyze the factors contributing to price bubbles in which economic growth, money supply and inflation have positive effects on price bubble occurrences. Thus, instability of commodity price is mainly due to instability in key macroeconomic factors embedded along the supply and demand sides of export.

However, as far as the author is concerned, there has been no comprehensive study in the literature that directly examines the linkage between export price of coffee and macroeconomic variables.

Therefore, this study is found to be worth to identify underlying factors and their significant impact on prices of coffee export in Ethiopia, and generate information on the future challenges and prospects in the sub-sector are some of the research gaps that should be addressed.

1.3 Objective of the study

The general objective of the study is empirically to investigate the factors that influence export prices of coffee in Ethiopia.

More specifically the study attempted:

1. To review economic contribution of coffee sector in Ethiopia.

2. To analyze the export performance and trend of export prices of coffee in Ethiopia.
3. To investigate effects of macroeconomic factors on export prices of coffee.

1.4 Research questions

The study addressed the following research questions.

1. How coffee export performance and price trend are going in Ethiopia?
2. To what extent macroeconomic factors including inflation rate, exchange rate, GDP growth rate, terms of trade influence export prices of coffee in Ethiopia?
3. Is the export price of Ethiopia's coffee negatively associated with world coffee supply?

1.5 Significance of the study

Ethiopian export predominantly depends on coffee as a primary commodity is susceptible to export price volatility. Hence, determining the macroeconomic factors that affect the export price of coffee is helpful to provide important policy recommendations used in facilitating coffee sub-sector growth aligned with important macroeconomic indicators.

On the other hand, even if the importance of export as an economic activity and a driver of growth have long been established in various research endeavors, model-based analysis of determinants of commodity price, specifically coffee is inadequate in Ethiopia. It is very important to investigate particular study on factors affecting export price of coffee and guiding for additional research in the future.

Thus, implementing bodies that are going to apply the recommended research results will be able to design and implement viable coffee export strategy aligned with macroeconomic policy issues thereby create very competitive market for coffee industry in Ethiopia.

1.6 Scope and limitations of the study

The study mainly covered the macro-level determinants of export price of coffee in Ethiopia only for the period 2001-2020 in 40 Ethiopian coffee destinations. The study mainly comprised identifying macro level factors and measuring impact of these factors on export price of coffee. These factors included exchange rate, terms of trade, world coffee supply change, per capita income of coffee importing country, and inflation rate as independent variables and export prices of coffee as dependent variable. This research

work has attempted to enrich and substantiate with ample theoretical and empirical literature review more associated with primary agricultural commodities.

Limitedness of prior information that explains relationship of most macroeconomic factors and export price of a commodity was encountered as the limitation of the study. Factors which indirectly affecting coffee export price such as investment, infrastructure and policy reforms left uncovered in this study are recommended for potential study.

1.7 Organization of the paper

The rest of this thesis is organized as follows. Chapter two provides a detailed review of the theoretical and empirical literature focusing on coffee market and coffee price. A conceptual framework of the study is also discussed in chapter two. Chapter three discusses the research methodology including the data and empirical strategy. The fourth chapter presents and discusses the general view of coffee export and trend in Ethiopia as well as the main empirical results of the study. The fifth chapter concludes with policy recommendations based on the findings of the study.

CHAPTER TWO

REVIEW OF LITERATURE

2.1. Theoretical literature

2.1.1 Trade theory and export

The classical economic views try to explain why it is beneficial for a country to engage in international trade based on the assumption that countries differ in their production efficiency. The theoretical foundations for empirical studies of the determinants of export and export prices lie in the conventional trade theories based on David Ricardo, the Heckscher-Ohlin (H-O) framework, new trade theories and endogenous growth theories (Krugman, 1979).

For instance, in Keynesian theory, international trade states that first, more export generates more income growth through foreign exchange multiplier¹ in the short run. Second, export raises more foreign exchange which is used to purchase commodities such as machinery, electrical and transport equipment, fuel and food which is motivating factors for economic growth of a nation. Third, exports indirectly promote economic growth via increased competition economies of scale like more efficient management or reduction of organizational inefficiencies, better production techniques, positive learning from foreign rivals and technical expertise, about product design are accrued due to more exports, leading to economic growth.

The engagement of nations in the international trade depends upon nations' specialization in the production of goods and services in which advantages constructs room for improvement of welfare of society as a whole. This theory traces back to the last half of the 18th century, the time when Adam Smith realized the importance of specialization and trade in his wealth of nation. Subsequently, many economists advocated the contribution of international trade for welfare of nations (as engine of growth) in the overall process of economic development (Onafowora and owoye, 1998; Arndt, 1999).

¹Foreign trade multiplier also known as export multiplier may be defined as amount by which a national income of a nation will be raised by a unit increase in domestic investment on exports. As export increases there is an increase of income of all persons associated with export industries.

The classic economist, David Ricardo, by extending Adam Smith's absolute advantage, on his principle of comparative advantage states that a comparative advantage exists whenever countries with very different characteristics, such as a country with high agricultural productivity trading agricultural product for industrial products from the country with high industrial productivity with other things being equal. As in the Ricardian model, prices continued to be defined in real terms and not in units of money. Later, free trade based on labor and technology moved away from Ricardian comparative cost doctrine to endowment-based explanation of Heckscher-Ohlin (HO) for nation having similar access to technology. According to Heckscher-Ohlin (HO), the free trade doctrine played down the role of demand on market prices in order to bring resources endowment of nations to the center stage as the determining factor for mutually gainful trade.

Furthermore, Krugman's explanation of trade between similar countries was proposed in a 1979 the journal of international economics, and involves two key assumption: that consumers prefer a diverse choice of brands, and that production favors economies of scale this logic explains that each country may specialize in producing a few brands of any given type of product, instead of specializing in different types of product.

Accordingly, most Sub-Saharan African (SSA) countries engaged in exporting primary agriculture commodities in which they have comparative advantages in labor intensive and tropical agro-ecology. In these Sub Saharan African countries, a single product still accounts for over one-half to total exports in seventeen countries: three principal products account for over 75 percent of total exports (Todaro, 1998). In some of the small countries, anywhere from 25% to 40% of the monetary GNP is derived from the overseas sale of agricultural and other primary products, such as: coffee, cotton, cacao, sugar, palm oil and copper (Ingram, 1986).

However, world commodity price being notoriously volatile, driven by changes in global demand and supply; developing countries are particularly affected by shocks that can result in increased poverty and reduced public funding for health and education. Commodity price instability has a negative impact on the economic growth, countries' financial resources, and income distribution, and may lead poverty instead of poverty alleviation.

Julie Subervie (2008) noted that producers from agricultural commodity exporting countries are particularly vulnerable to the fluctuations of world market prices as they are widely exposed to price shocks and have little ability to cope with them. Influence of macroeconomic factors (infrastructure, inflation and financial deepening) on the price instability. Julie Subervie conducted study based on the sample 25 countries between 1961 and 2002 using panel model result revealed that a significant negative effect of the world price instability on supply, and further show that high inflation, weak infrastructure and a poorly developed financial system exacerbate the effect. Deaton Angus (1999) argued that African economies would be better off if commodity prices were higher, but there is surely little prospect the future cartels will be any more successful than those that have tried and failed in the past.

Based on the traditional theory of commodity market, prices are determined by demand and supply forces, recognizing the available privately held inventories in comparison to consumption requirement. This global shift in demand and supply of agricultural commodities arises from the different determining factors embedded on demand and supply side of a product. The considerable shifts of demand and supply could in return affect the price of the commodity. Macroeconomic and micro economic factors are assumed to be major factors for influencing the shift of the demand and supply curves of the coffee markets. Among others the exchange rates, general inflation rates, terms of trade, per capita incomes of importing countries world coffee supply change are found to be important coffee price affecting factors.

Nevertheless, agricultural exports continue to be the most important source of foreign exchange for the majority of Sub-Sahara African countries (Gilbert 2000). For a given level of access to international markets, countries with better supply conditions are expected to export more (Redding and Venables, 2004).

2.1.2 Theoretical overview of commodities export and price trend

According to Schmiege Evita (1993), the exports of many developing countries consist to a large degree of commodities; quite often only one or a few commodities form the basis of almost entire export earnings (e.g., Burundi: 68% coffee export, Mali: 74% cotton;

Rwanda: 81% coffee; Ethiopia: 30% coffee). This concentration of production and exports on a few commodities makes developing countries' economies especially vulnerable to external shocks. Price changes and general price decline that took place in recent decades in major export commodities influence not only the foreign exchanges directly influence farmers' incomes and living standards of rural families. During 2004–2008, global commodity prices rose to record levels. As a result, several low-income countries are still experiencing high price levels, trade deficits, and unstable macroeconomic environments. High commodity prices, particularly for food, also have adverse effects on poverty in countries with large fractions of net food-buyers (Wodon and Zaman, 2010). Several studies have attempted to address the underlying causes of the global price rise, typically identifying a combination of factors – ranging from long-term economic and demographic trends combined with short-term problems, such as bad weather, speculation, high oil prices, and export bans in a number of countries.

In accordance, Ethiopian coffee market is seriously affected due to long time price shocks and general price decline from year to year. Even at the time when world coffee supply and demand are more or less constant over time, the export price of Ethiopian coffee show continuous fluctuations. Obviously, Price plays a significant role in explaining the behavior of producers and suppliers of coffee.

Prebisch-Singer Hypothesis (PSH, 1950) suggested that the commodity terms of trade particularly primary products should decline in the long-run, as the income elasticity of demand for commodities is less than that of manufactured goods. Because they assert that in the long-term the prices of primary products in international markets decline thereby worsening the terms of trade for developing countries depending primary export. The PSH argues against the view of classical economists such as Ricardo, Malthus, Mill and Jevons in the nineteenth century, who emphasized that commodities are characterized by physical finitude: arable land is limited by earth surface and minerals, such as oil and metals, have a limited available stock in the ground. Due to this inexorable limitedness, commodity prices, that is, terms of trade of developing countries, should rise in the long-run, not decline (Hallam 2018). Ultimately, whether the long-term trend of relative commodity prices is ascending or declining is an empirical question. Hence more than any other developing regions, SSA remains heavily dependent on export of primary commodities

including coffee –some of whose price have been steadily decline (Cleaver and Donovan, 1995; Maunduna, 2005).

Over the period since 1970s, prices have averaged a 3 percent per year price decline for Arabica and a 5 percent decline for Robusta (Lewin et al., 2004). Over the period 1998 to 2001, real coffee prices fell by 50 percent. World coffee price has been dropped by 30% below the average of the last ten years (ICO, 2019). As a result, for a country such as Ethiopia, where coffee represents more than 35 percent of the value of exports in, and the decline in world coffee prices cost Ethiopia us \$300 million in export values, equivalent to 50 percent of its annual export earnings (Oxfam, 2001).

In general, agricultural produce are characterized with a combination of short periods of high and volatile prices and long periods of low prices and low volatility (Deaton & Laroque, 1992) which implies that price instabilities in agricultural commodities, coffee inclusive, are inevitable.

In theory of market economy, it is clear that demand and supply theory will allocate resources in the most efficient way possible. The laws of demand and supply demonstrate the quantities that will be sold at a certain price (Smith A., 1863). This means that the higher the price, the higher the quantity supplied. Producers supply more at a higher price because selling a higher quantity at higher price increases revenue. In competitive market structure, demand shift and supply shift assume a constant commodity price. But these variables (supply and demand) can increase or decrease in response to other factors other than commodity's own price.

Accordingly, there are many macroeconomic variables determining prices of export commodity indeed. Among several factors real exchange rate, world commodity supply, demand (consumption), interest rate, terms of trade, inflation rate (consumers price index CPI), GDP growth, real foreign income as explanatory variables are potentially affected export price of a given nation.

The effect of the exchange rate on exports depends on the price elasticity of export supply because the real exchange rate should incorporate the price effect on exports. The relative

price is, in part, determined by the level of the exchange rate. Under purchasing power parity (PPP²), relative prices should change in proportion to any exchange rate movement. As trade theory explains that real effective exchange rate movements are also negatively correlated with the growth in exports performance. Thus, an overvalued currency can undermine export competitiveness through a direct loss of price competitiveness for exporting firms; undervaluation of the currency can bolster export competitiveness (Biggs, 2007) which is means to enhance the incentives for export activities (Oyejide, 2007) and lead to diversification of exports (Sorsa, 1999; Mouna and Reza, 2001).

Nonetheless, response to price changes of demand for primary products of LDCs is low which implies that LDC exports respond imperfectly to changes in the real exchange rates, conversely, industrial products have a higher price elasticity, which causes industrial exports to respond perfectly to changes in the exchange rate. This leads to conclude that the effect of exchange rate on LDCs exports is ambiguous (Roshan, 2007). An increase in the world price may not pass to producer price due to the overvaluation of local currencies (Abdulai, 2000; Baffes& Gardner, 2003; GolettiandTsigas, 1995). Thus, the higher the price elasticity, the more competition face exports of a particular country on the world market.

In regard to economic growth, a sharp decline in economic activity occurred across the globe following the 2008 sub-prime financial crisis, a period often considered the largest recession since the Great Depression in 1930s. With consequent of this, the last decade has also witnessed periods of dramatic booms and busts in commodity prices. Some market analysts argue that the 2008 financial crisis along with soaring institutional trading may have affected world commodity pricing due to excess speculative activities in commodity markets (Masters, 2008; Gilbert, 2010; Tang and Xiong, 2012).

Economic theory suggests that an additional dollar of income provides a higher level of marginal utility to a lower-income person than it does to a higher-income one (Berry et al. 1995). Further, for a fixed market basket of goods, a price increase for a particular product within that basket, say coffee, is likely to have its greatest impact on lower-income

² PPP is the theory that changes in exchange rates are related to price levels between countries.

individuals. In essence, lower- and higher-income individuals are likely to show different purchase responses to both price and income changes.

As in the market of other agricultural commodities, long spells of declines in coffee prices are followed with short spells of increase in prices. This could also be attributed to several factors such as farmers' speculations /stimulated to grow more. Once excess supply is in the system and prices have fallen, these stocks act as a restraint on price increases coming from a short-run supply fluctuation because traders will hold stocks for both speculative reasons, expecting to sell them for a profit at a later date if price rise, and for precautionary reasons expecting to meet sales obligations to roasters during shorter periods of coffee unavailability (Lewin et al., 2004).

The price effect of withholding supply from the market is increase on some agricultural markets (e.g., grains, beef, and sugar), industrialized countries' agricultural policies and subsidized exports contributed to a large extent to worldwide over-supply and the long-term price decline. The rigidity of the quota system may also have had an additional effect on long-term price developments: as it reduced competition to a certain extent, it exerted a dampening effect on technical progress and therefore prices.

On the other hand, the falling trend in prices was characterized by among others the combination of increased productivity, rising production as new lower-cost producers enter the market, raising share of export prices, and a sequence of renewable planting and innovation that follows price spikes that occur occasionally, usually following a frost or drought in Brazil (Lewin et al., 2004).

In respect to Ethiopia, export of primary products (mainly coffee) is income and price inelastic implies that export supply of coffee is not directly influenced by foreign demand factors. According to Yishak (2009) unit price of exports, real effective exchange rate, taxes on trade and diversification index affect export volumes negatively and significantly while income per capita, and share of manufacturing in GDP & FDI inflows as a percentage of GDP affect export volumes positively & insignificantly during the period 1987–2006. Abay and Zewdu (1999) and Alemayehu (1999) also argue that the demand side of export characterized with a low-income elasticity for the type of commodities that

Ethiopia exports, declining prices for its exports, and limited destinations for Ethiopian exports.

2.1.3 Coffee as a Global Commodity

Trade:

Coffee is an important commodity in the world economy, accounting for trade worth approximately US\$ 16.5 billion in calendar year 2016, when some 97 million bags of 60 kg (5.8 million tons) were shipped (ITC, 2011). In 2019, an estimated 22 billion pounds of coffee were exported by coffee producing countries around the world, which is of great significance in world economy as the largest single commodity entering the international trade after petroleum and petroleum products thereby playing vital role in the balance of trade between developed and developing countries. In several coffee producing countries, coffee accounts for at least 20 percent of the total export earnings, where approximately 100 million people are affected directly by the coffee trade (Lewin et al., 2004).

Although exceptions can be found, it is now generally agreed that export prices, quantities, and total earnings are all more unstable for the average poor country than the average rich one (Ingram, 1986). Despite the overall growth in the sector, coffee prices have experienced a continued downward trend since 2016, dropping 30% below the average of the last ten years (ICO, 2019). Price volatility in coffee has been a common occurrence in the industry for a long time, as it is the case to most markets for agricultural commodities (Tomek & Robinson, 2003). This instability of export prices and earnings is believed to lead to serious internal economic instability through the familiar multiplier accelerator process (Salvatore, 1983). Thus, these primary product exports are subject to large fluctuations in price and volume, and that high degree of concentration in exports makes their economies vulnerable to external disturbance.

Production:

Coffee is mainly produced in Brazil, Columbia, Mexico, Ethiopia, Uganda, Honduras, Castalia, Peru, Vietnam, Indonesia and India. In world coffee production, Brazil is on top and Ethiopia stands at 5th position. The world coffee production estimated 10.25 million metric tons (ICO, 2019), while Ethiopia 467,000 metric tons (4.5% of the world). For example, Brazil, Colombia and Vietnam together accounted for about 61 percent of total

production in 2002. Coffee growing and trading have exceptional importance in the economies of many countries, which are large dependent upon this commodity for their export earnings and thus continuation of their development programme in the social and economic fields. The international coffee organization (ICO) has estimated that coffee growing provides direct full-time employment for 25 million people worldwide. Taking into account related industrial and service activities (processing, marketing, roasting, and transporting) the figure rises to 100 million people, including families (Joackim, 2000).

However, if a country is a small open price taker world market forces, generally determine the prices of its exports or a dominant supplier is also able de-stabilize markets and to increase prices within certain limits by withholding production or to enter into ruinous competition in order to gain market share (Evita, 1993). Thus, change in production pattern of coffee in top coffee producers; highly influence the international coffee prices.

For example, the expansion of Brazilian coffee plantations and Vietnam's entry into the market in 1994, when the United States trade embargo against it was lifted added supply pressures to growers. The market awarded the more affordable Vietnamese coffee suppliers with trade and cause less efficient coffee bean farmers in many countries such as Brazil, Nicaragua and Ethiopia not to able to live off of their product, which at many times were priced below the cost of production, forcing many to quit the coffee bean production and move into slums in the cities (Mai, 2006).

Consumption:

Coffee is an interesting consumption product since it has a widespread and rooted culture with multiple functions in people's lives (Linda and Menth 2014). European, African and South East Asian countries are the major coffee consuming countries. Regardless of reasons for consumption, it is consumed frequently and intensively and few would trade it for alternatives, which speak for its importance and necessity (Sigfridsson, 2005). From the view point of Coffee consumption, Consumer Culture Theory (CCT) has focused on understanding the social and cultural aspects of consumption (Elliot & Wattanasuwan, 1998; Arnould & Thompson, 2005). To mention the general trend in the drink sector in American, on average, 1.76 cups per day, Europeans 2.04 cups (calculation based on ICO's

2005 survey) in Sweden about six million people drink 3.2 cups of coffee per day on average (WWF, 2008).

According to ICO, in Africa the two biggest consumers in the region by far are Ethiopia (1.7 million) and Algeria (1.7 million). Ethiopia consumes its own about 50% of Arabica production and a small quantity of soluble. Algeria is one of the world's fastest growing markets and consumes primarily African Robusta and a much smaller proportion of Arabica. South Africa, Israel, and some of the more affluent Arabic countries represent small but potentially lucrative markets for better Arabica, though these are currently dominated by soluble consumption.

According to ICO (2015), of the numerous botanical varieties of coffee trees, only two are cultivated and utilized commercially to any large extent worldwide. These are Coffee Arabica and Coffee Robusta.

Coffee Arabica: Coffee Arabica is one accounting on average for 60% of world production. After the ripe cherries have been harvested, two methods are used to remove the envelope or husk from the beans so as to obtain the marketable green coffee: the wet processing and the natural sun-dried methods. The cherries are dried in the sun or in mechanical dryers and then milled to produce green beans. The two biggest producers of Natural Arabica are Brazil and Ethiopia (Lewin et al., 2004). The quality of natural Arabica is substantially high due absence of water contacts which would affect the produce during fermentation of water and the cherry.

The two big producers of unwashed (or natural) Arabica are Brazil and Ethiopia. This production process does not involve any water: The cherries are dried in the sun or in mechanical dryers and then milled to produce the green bean. Contact with water can negatively affect the quality, particularly if it starts fermentation within the cherry, so this production system depends on having a reliably dry harvesting season. Both Brazil and Ethiopia produce some washed and (in Brazil) semi-washed coffee. In Ethiopia, 10-15 percent of output is washed—in particular the Yergacheffe and similar coffees that are highly valued for their particular cup characteristics.

Robusta coffee: The Robusta coffee tree is derived from the *Coffea Canephora* species and usually known as Robusta which accounts on average for 40% of world production. Robusta is noted for its resistance to diseases hence suitable for growth in tropical environments of Africa which are most vulnerable to pests and diseases (Vander Vossen, 2009). Vietnam is by far the main producer after Brazil but Ivory Coast, Indonesia and Uganda are also major players (Ponte, 2002).

2.1.4 Coffee industry in Ethiopia

Ethiopia is motherland of coffee Arabica with enormous genetic sources. The high genetic diversity of Ethiopian coffee is considered to be of great value both nationally and internationally, as it represents a pool to develop improved breeds of coffee. There are currently hundreds of types of coffee under cultivation, each with varying aromas, tastes or colors, especially in the Southwestern part of the country. Ethiopian coffee ranks highly in intrinsic quality of the bean due to the diverse agro-ecological zones and immense genetic diversity aforementioned. Because of its diverse genetic makeup, climatic condition and organic nature production, Ethiopia's coffee Arabica is high valued coffee in the world market. This is secret why Ethiopia's coffees were widely favored by consumers long before countries like Vietnam, Colombia Brazil got into coffee scene.

Production: Total coffee production has been improving steadily during the past twenty years, with a 110 percent increase between 1993 and 2011, produces 50,000 to 450 000 metric tons annually, depending on weather and prices. Small private coffee plantation contributes about 90 % of the country's coffee, while large private owned commercial plantations account the rest. The land area under coffee cultivation is difficult to determine because plots are fragmented and interspersed with other crops. It is estimated, however, that Ethiopia has over 320,000 hectares of coffee trees. Coffee is produced mainly in 5 regions or 30 zones and 172 Woredas. Of these, 125 Woredas are considered the major producers for export. Small land holder farmers produce 95 percent of Ethiopia's coffee in varied environments, including forest, semi-forest, garden, and plantation coffee.

Figure 2.1: Ethiopia coffee production with respect to areas

	2015/16	2016/17	2017/18	2018/2019	2019/20
Production (1,000 MT)	6510	6943	7055	7250	7350
Area(1,000H)	528	529	532	535	538
Productivity (tons/ha)	0.74	0.79	0.80	0.81	0.82

Source: Official USDA PSD for MY2015/2016 and Post Estimates for MY2016/17-2019/20

Economic and social benefits of coffee: Ethiopia has a long story linked with social, economic and cultural functions. It is a major commercial commodity which plays vital role in country's economy- as sources of income and employment, as main source of foreign currency, source for local consumption. Country's 35-65% of total export earnings generated from the coffee export. About 25% of the total population is directly or indirectly dependent on coffee industry of which 15 million people directly engaged in production, processing, distribution and export of coffee.

Ethiopia is Africa's leading exporter of Arabica coffee, earning over \$310 million in 1997 which grew to \$881million in 2016/2017 from coffee export with America being its biggest market (ICO, 1997; 2017). The Ethiopia coffee has been exported to more than 50 countries; the major destinations are Germany, Saudi Arabia, Japan, Belgium, United States of America and France.

However, there is increase in coffee export in volume (quantity), the total revenue does not show proportional increment implies that there is price declining with in respect to the exported volume of coffee. Ethiopia's coffee has remained with a small market share in world coffee market for more than 50 years. According to New York's Times (1962) quote "Ethiopia's Superior Coffee is Widely Favored". During this time, Vietnam global market share was 0.1% after 30 years jumped to 20% which is world's second exporter whereas Ethiopia's coffee world market share could not jump beyond 4 % for several years. Besides to its dominant producer of Coffee Arabica in Africa, Ethiopia has along and well-established tradition of coffee drinking. About 48.82 percent of total production consumed locally (ICO, 2018/2019).

Ethiopia has more than 400 coffee exporters, 395 coffee farmers who directly export coffee, and over 30 import-export companies who export coffee and use the foreign

currency to import other materials like vehicles and construction inputs. Ethiopia exports coffee to over 50 countries. Based on the coffee export data in 2017/18, the principal export markets for Ethiopian coffee were: Germany (22 %), Saudi Arabia (16 %), United States of America (11%), Belgium (7 %), Sudan (6 %) and Italy (5 %).

Ethiopia Commodity Exchange (ECX): Since 2008, the establishment of Ethiopian Commodity Exchange (ECX), centralized coffee trading system has been undertaken between buyers and seller. The aim of ECX is creating an efficient, transparent and orderly marketing system to serve the needs of buyers, sellers and intermediaries, and promote increased market participation of Ethiopian small-scale producers. ECX increased access costs and disconnected exporters from producers, which increased market power for coffee suppliers, while setting up a grading system that has to be reinforced to avoid the sale of overpriced coffee at ECX.

However, consequently coffee market system via ECX faced the difficulty of obtaining the traceable coffee and product differentiation. In addition, the lack of traceability of the coffee purchased by exporters from specific growing areas (producers) and the decrease in the predictableness of particular coffee stocks and corresponding price movements (that allow exporters to mitigate price risks) could also be limiting the local-international price correlation, despite the higher aggregate (regional) price information. For example, higher price volatility transmission from international to local markets could make small-scale farmers and low-income consumers more vulnerable to international price shocks, particularly in the absence of efficient risk sharing mechanisms. Consequently, as response to this problem, coffee reforms were undertaken and encouraged the actors to obtain traceable and specialty coffee through vertical integration. This is the marketing reform that allowed farmers to export their own farm coffee, legally licensed coffee exports; roasters can access specialty coffee through vertical integration.

Quality: cup quality, often referred to as drinking quality or liquor quality, is an important attribute of coffee and acts as yardstick of microeconomic variable for price determination (Negussie et al., 2008). The coffee quality is a critical importance for the coffee industries. Despite popularity in Arabica and fine coffee production, the quality of coffee in Ethiopia is affected by the production and post-harvest system. This quality problem makes the

Ethiopian coffee unable to adequately compete in the international coffee market and earn reasonable price.

2.2 Empirical literature

A few studies have been conducted on identifying the macroeconomic variables that explains the commodity prices especially international commodity such as coffee, cotton and others. Jeffrey Frankel (1985) and (2006) developed an equation of econometric models namely “carry-trade model” and “overshooting model” that explain about some of the macroeconomic variables influencing international commodity prices. Those are economic activities (GDP), monetary policy (real interest rate), and real exchange rates and other determinants of net convenience yields (inventories and risk premium). The research result concluded that related real interest rate affects negatively, and convenience yields affect positively commodity price index. Thus, in general individual commodities are of course influenced by individual micro cause, the extent to which the prices of different commodities together move to striking is direct macroeconomic linkage, and the commodity prices are volatile and correlated.

Julie Subervie (2008) noted that producers from agricultural commodity exporting countries are particularly vulnerable to the fluctuations of world market prices as they are widely exposed to price shocks and have little ability to cope with them. Influence of macroeconomic factors (infrastructure, inflation and financial deepening) on the price instability. Julie Subervie conducted study based on the sample 25 countries between 1961 and 2002 using panel model result revealed that a significant negative effect of the world price instability on supply, and further show that high inflation, weak infrastructure and a poorly developed financial system exacerbate the effect.

Similarly, Jian et al (2016) examined linkage between commodity price bubbles and macroeconomic factors on agricultural commodity markets in China. A Zero-inflated Poisson Model used to analyze the factors contributing to price bubbles in which economic growth, money supply and inflation have positive effects on price bubble occurrences.

Mold and Morrissey (2006) argues that exports in SSA are determined by supply side variables, such as domestic prices (official or market determined), the growth of GDP,

index of variable cost and capacity utilization and fewer studies have focused on the demand side constraints of exports in SSA, such as income and prices in competitor countries. According to Goletti and Tsigas (1995), export price transmission is explained by accessibility of marketing infrastructure, transaction and transportation costs, action of traders, government policies on export taxes and exchange rates.

Belayneh Kassa (2012) explained that export performance, which is associated with export prices positively influenced by real effective exchange rate, openness, RGDP of home country, infrastructural development and private credit as a ratio of GDP (financial development in the long run).Assefa Muluget (2018) attempted to examine determinants of the export competitiveness of the coffee in Ethiopia in which the price is part of competitiveness. In this study, domestic consumption level, domestic production level, world price of coffee, exchange rate and export volume are found to be determining factors of export competitiveness.

Eugene Jones (2014) conducted research on prices sensitivity for different brands and coffee varieties confirmed that inner-city grouped as lower-income shoppers are more price-sensitive than suburban grouped as higher-income shoppers for many brands and varieties of coffee. The study result implies that in higher income class is less response than the low-income level for the price variability.

According to Zekarias Bassa and Degye Goshu (2019), Ethiopian coffee export has causality association in the long run with export price, world coffee export level, population and coffee production, trade openness using co-integration approach. The analysis pointed out that in the long run the extent of Ethiopia coffee export inversely related to coffee production in the country and world coffee supply in tone and directly related to export price and population size of active aged category.

Furthermore, Hussien and P. Nandeeswara (2015) attempted to explain the determinants of Ethiopia's Sidama coffee export applying panel dataset of Tobit random effect model. Accordingly, the result of the traditional gravity model shows that most of the exogenous variables have shown the already expected signs. However, only economic size of exporter nation, difference in per capita income and the resistance factor of distance have possessed

a significant effect on in trade with Sidama coffee. On contrast to this, Kebede Bekele (2011) examined both lagged and current real exchange rates are not in a position to exert significant effect on the bilateral exports of the country a dynamic panel data gravity model that takes into account the persistent nature of trade estimated using the system GMM estimator.

According to (Yishak, 2009), the supply side conditions are major factors for Ethiopian export. Other economic, social, political, and natural factors sometimes profoundly change the impact of fundamental factors on the determination of prices and their evolution (USDA, 1999).

Alemayehu (2002) specified export supply as a function of lagged and current price (which is relative price of south multiplied by exchange rate and divided by relative domestic price), supply of domestic credit, government investment and foreign capital inflow. He used error correction model to estimate the elasticity of the independent variables. His results indicate that long price elasticity is larger than the short-run one.

2.3 Conceptual framework

In-depth technical and practical understanding of coffee sector in general and export in particular pursued me to select the “Macroeconomic Factors that affect export prices of coffee in Ethiopia” as research agenda. To fine tune to more specific, the research topic, the objective of the problem, study questions, and the hypothesis needed to be developed based on adequate literature review of prior information. In literature reviewing, both theoretical and empirical literatures were importantly viewed and tailored to this specific study. During literature reviewing, particularly, explanatory variables related to this study, the research methodologies, specific tools or modeling approach and conclusions were given due emphasis. Subsequently, data collection, data encoding, data processing and analysis works were properly carried out.

For this study, regression model of panel data analysis was employed to estimate the model and determine the significance of independent variables on dependent (Export prices of coffee). As empirically panel data was found to be more efficient, it was helpful to determine the significance of relationship between macroeconomic variables as

independent variables and export prices of coffee as dependent variable. According to the literature reviews made for the study, the conceptual framework was developed considering exchange rate, inflation rate, GDP growth rate, terms of trade, per capita income of coffee importing countries and world coffee supply change as independent variables and export prices of coffee in Ethiopia as dependent variable.

This study is empirically to explore the relationship these independent variables and dependent variables linked together and to measure the significance of the impact by using the econometric model of panel data model. So that, it is important to explain and define each variable included under this study as follows.

Export Prices of coffee: this can be Prices offered to coffee per ton in USD by coffee importing country. The study has assumed different 40 country prices. Prices across destinations vary due to effect of supply and demand side factors. Export price of coffee is dependent variable used to measure empirical evidence representing export prices of coffee. According to international coffee organization, Coffee prices fall broadly in two categories; spot prices and future prices.

- **International spot market prices:** ICO3 group indicators for Colombia Mild, other Mild, Brazilian natural and Robusta (based on ex-dock quotation reported in main markets). The group indicator prices are combined in a single measure, the ICO composite indicator which represents ‘an average coffee price.
- **National spot market prices:** prices paid to growers refer to farm-gate prices reported in local currency by ICO member countries.
- **Future market price:** quotations from the New York (Arabica) and London (Robusta) exchange. The prices are the average of the 2nd and 3rd positions. According to the composite index of the London based coffee export country grouped international coffee organization the monthly coffee price averages in international trade had been well above 100 USD cent/lb during 1920s and 1980s but then declined the late 1990s reaching a minimum in September 2001 of just 417 USD cent per lb and stayed low until 2004. The reason for collapse of international

³The ICO is an intergovernmental organization established by the United Nations in 1962, including both producing and consuming Member countries. It exists specifically to address world coffee problems and issues in view of coffee’s exceptional economic importance and developmental implications.

coffee agreement of 1962-1989 with cold war pressures, which help minimum coffee price at 1.2 USD per pound.

Exchange Rate (XRAT): In an increasingly inter-linked global market, booms in the domestic market may be due to rising international trade. Exports and agricultural prices are found to be sensitive to movements in the exchange rate (Chambers and Just, 1982). According to David Romer, if the price of domestic currency (birr in our case) is lower in terms of foreign currency, this will encourage exporters and discourage importers. That is if national bank of Ethiopia deliberately devalues the birr then the price of export will be higher when it is measured in terms of birr. The real exchange rate, which reflects the underlying relative movement of prices at home and abroad, proves to have a significant effect on the export performance of the lowest performers.

GDP growth rate: Rapid economic growth can possibly trigger global and domestic commodity price booms (Caballero et al., 2008). A number of recent studies have highlighted the role of economic growth on the behavior of commodity prices (Kilian, 2009; Gilbert 2010; Baffes and Etienne 2016). Gilbert (2010) found that economic growth is an important determinant of changes in world agricultural prices over a 38-year period from 1970 to 2008. Baffes and Etienne (2016) show that in the short-run, economic expansion as represented by income growth can positively affect both the real and nominal commodity prices. Regarding to monetary policy, interest rate affects the cost of borrowing and is expected to influence the behavior of commodity market investors. Many existing studies found that interest rates contribute to the historical commodity price booms. For instance, Pindyck and Rotemberg (1990) showed that interest rates are negatively related to the commodity price booms in 1970's and 1980's. Similarly, Akram (2009) argues that a decline in real interest rate contributed to higher commodity prices in 2006-2008.

Inflation Rate (INFRAT): Commodity price boom-and-bust cycle is likely to be highly associated with domestic inflation. Many studies have found commodity price booms are more likely to occur when inflation rate is high, as high inflation puts upward pressure to commodity prices (Pindyck and Rotemberg, 1990; Kyrtsova and Labysb, 2006). In period of high inflation, there is high demand for export business which is the reflection of the quantity theory leading to relatively lower product price. Coffee is an export commodity

that given due emphasis from government for generating foreign currency in Ethiopia. In case of Ethiopia, majority of exporters start export business thinking it as means to pass the shortage of foreign currency highly desired for importing goods from abroad. So, the export business is often being operated not based on profits rather loss. Eventually, the losses incurred in export business are added on the price of imported goods, which can cause imported inflation.

Terms of trade (TOT): Terms of trade, defined as the ratio of export prices to import prices, have an impact on the macroeconomic performance of large exporters (Jean-François Carpentier, 2020). A rising terms of trade signals a gain from international trade for that country, as it can pay for more imports per export units, which can ultimately translate into a more vivid economic growth (Collier and Goderis 2012). For developing countries with commodities as main exports (energy, metals, agricultural), the terms of trade consist in a ratio of country specific commodity prices to import prices, which mainly consist in manufactured goods. Consequently, for these countries, the terms of trade are sometimes proxied by a commodity terms of trade, where the numerator reflects the evolution of the prices of the sole commodity exports.

Per capita income (PCI): - average income measures the average income earned per person in a given nation. The income elasticity of demand is defined as the percentage change in the quantity of demand for a good divided by the percentage change in real income. The income elasticity of demand for agricultural raw material is below 1, with the lowest elasticity. In developed countries (high GNP/capita), demand is less elastic than in developing countries (low GNP/capita).

World Coffee Supply change (WCSS): Change in coffee supplied to world coffee market by coffee producing countries. As earlier mentioned, coffee is mainly produced by world's developing countries especially in South America, Asia and Africa. Brazil, Colombia, Vietnam and Ethiopia are the major producers. In accordance to United States Department of Agriculture (USDA), it was estimated that world production has been rising by an average of 1.8 percent per year since 1965, which was a consistent increase despite the decrease in real prices (Lewin et al., 2004). The growth rate drops to 1.4 percent when

these three producing countries are removed from the picture implying that the most recent growth of the world supply came from the first two of these origins.

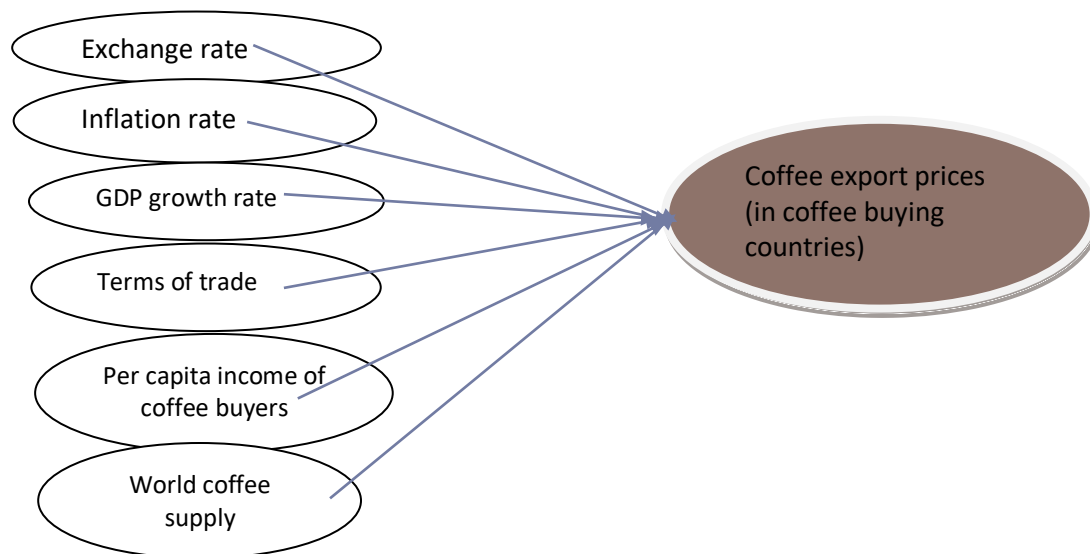


Figure 2.1: Conceptual Framework of the study

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Data

Data were collected from different sources. Coffee export prices from 40 buying countries spanning the period 2001 to 2020. The dataset was balanced form that means all 40 export

prices have measurement in all time periods. The total number of observations was 800. Hence, the panel data analysis has been employed aiming to enhance the efficient and consistent estimation of effect of macroeconomic factors on coffee export prices.

The quantitative data were collected from the National Bank of Ethiopia (NBE), World Bank, IMF, Ethiopian Coffee and Tea Authority (ECTA), International coffee organization (ICO) and Ethiopian Customs Commission. It should be noted that prices were given in US cents per pound for export; however, I converted all prices to US dollar per ton to be consistent with the units for both the production and import quantities.

3.2 Data analysis

Data analysis in this is carried out using panel data econometrics methods and descriptive statistics. The reason why the panel data were selected in this study was its importance in estimating specific relationship between the export prices of coffee and macroeconomic variables; this is because as Baltagi (2001) explained as “Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency” (p.6). Thus, panel data was found to be more appropriate to deal with heterogeneity.

In the Stata application, the least squares dummy variable (LSDV), regression, “with in” estimation, “between” estimation (group or time mean model), GLS, and FGLS/EGLS were main techniques used for purpose of data analysis. The fixed effects were tested by manipulating the F-test, while random effects were examined by the Breusch-Pagan Lagrange Multiplier (LM) test (Breusch and Pagan, 1980) and when the null hypotheses of both F-test and Breusch-pagan LM test were rejected, the Hausman test was employed for choosing either of the two based on the null hypothesis rejected or not rejected which one model is inconsistent. This is to prove that null hypothesis of individual effect is uncorrelated with other regressors is not rejected; the random effect model is favored over its fixed counterpart. So as to validate the study well, the analysis so included goodness-of-fit measures (e.g., F score and likelihood ratio SSE, and R^2) and parameter estimates with their standard errors, and test results (i.e., F-test, LM test and Hausman test).

3.3 Econometric model specification and selection

In general, the theoretical underpinnings of the model are outlined in Holtham (1988) and Deaton and Laroque (1992). The panel data model has had numerous empirical applications: Gilbert (1989) used it to look at the effect of developing countries' debt on commodity prices; Pindyck and Rotemberg (1990) examined movement among various commodity prices; Frankel and Rose (2010) analyzed the effects of a range of macroeconomic variables on agricultural and mineral commodities; and Baffes and Dennis (2015) and Baffes and Etienne (2016) examined the effect of income growth in emerging economies on real food prices.

With this regard, Panel data were analyzed to investigate individual (group) and/ or time effects using fixed effects and random effects models. When should a fixed or random effects model be utilized? The answer to this question is debatable. Some believe that it is dependent upon the underlying cause in the model. For example, if the individual effects are the result of a large number of non-observable stochastic variables, then the random effect interpretation is demanded. Others think the decision rests on the nature of sample - that is when sample is comprehensive or exhaustive, and then fixed effects models are the natural choice to enhance generalization.

3.3.1 Fixed effects model

Fixed effect model deals with heterogeneity from group and/or time effects individual intercepts⁴, The key difference between fixed and random effects models is that individual

⁴a fixed effect model examines if intercepts vary across group or time period, whereas a random effect model explores difference in error variance components across individual or time period is called error component model.

effect “ u_i ” in a random effect model should not be correlated with any regressor. Slopes are assumed unchanged in both fixed and random effect models.

Fixed effect (FE) model takes α_i to be a group specific constant in the regression equation

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \dots\dots\dots(1)$$

Or in matrix form $Y_{it} = \alpha_i + X'_{it}\beta + \varepsilon_{it} \dots\dots\dots(2)$

Where, $X_{it} = (X_{1it}, X_{2it}, \dots, X_{kit})$

$$\beta' = (\beta_1, \beta_2, \dots, \beta_k)$$

The individual effect, is regarding to be constant over time (t) and specific to the cross-sectional unit (i). The fundamental assumption of fixed effects model;

$$E[\varepsilon_{it}] = 0, \text{cov}(\varepsilon_{it}, \varepsilon_{jt}) = 0, \text{Var}(\varepsilon_{it}) = E(\varepsilon^2_{it}) = \sigma^2_\theta$$

$$E[\varepsilon_{it}, X_{1it}] = E[\varepsilon_{it}, X_{2it}] = \dots = E[\varepsilon_{it}, X_{kit}] = 0 \text{ and } X_{kit} \text{ no invariant}$$

These parameters can be estimated by OLS when N is small but not when that is large. If individual effect u_i (cross-sectional or time specific effect) does not exist ($u_i = 0$), ordinary least squares (OLS) produce efficient and consistent parameter estimates i.e.

$$Y' = \alpha + X' \beta + \varepsilon (\mu_i = 0)$$

OLS is run based on five assumptions. These include linearity, exogeneity (disturbance is not correlated with regressors), homoscedasticity & non autocorrelation, independent variables not stochastic, and no multicollinearity. If individual effect u_i is not zero in longitudinal data, heterogeneity may influence assumption of exogeneity and homoscedasticity. The violation of assumption exogeneity renders random effect estimators biased. Hence, the OLS estimator is no longer best unbiased linear estimator.

3.3.2 Random effects model

The random effects (RE) model also known as the error component model, includes a non-measurable stochastic variable, which differentiates individuals.

$$Y'_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \mu_i + \varepsilon_{it} \dots\dots\dots(3)$$

Random effects: $Y_{it} = \alpha + X' \beta + (\varepsilon_{it} + \mu_{it}) = 0 \dots\dots\dots(4)$

Where: $X'_{it} = (X_{1it}, X_{2it}, \dots, X_{kit})$

$$\beta' = (\beta_1, \beta_2, \dots, \beta_k)$$

$$E[\varepsilon_{it}] = E[\mu_{it}] = 0, \text{cov}(\varepsilon_{it}, \varepsilon_{jt}) = 0, \text{Var}(\mu_i) = E[\mu^2] = \sigma^2_\mu$$

$$E[\mu_i, X_{1it}] = E[\mu_i, X_{2it}] = \dots = E[\mu_i, X_{kit}] = 0$$

Assuming normality $\mu = N(0, \sigma^2_u), \varepsilon_{it} \sim N(0, \sigma^2_\theta)$ both u_i and ε_{it} are stochastic variables. Where; term “ u_i ” is a stochastic variable that embodies unobservable or non-measurable disturbances that accounts for individual differences. The study randomly sampled countries and assumed that effect was random distributed across individuals but constant through time periods. Fixed or random effect specific to individual (group) or time period that is not included in the regression, and errors are independent identically distributed $\varepsilon_{it} \sim \text{IID}(0, \sigma^2)$. A random effect model assumes that individual effect (heterogeneity) is not correlated with any regressor and then estimates error variance specific to groups (or times). The rationale⁵ behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model.

$$\text{EXPR} = f(\text{INFRAT}, \text{XRAT}, \text{GDPG}, \text{TOT}, \text{PCINC}, \text{WCSS}) \dots \dots \dots (5)$$

Following the same fashion in equation (1) and (3) the implicit function given in equation (5) might be written in explicit, econometric form as below:

$$\text{Fixed effect model: } \text{EXPR}_{it} = \alpha + \beta_1 \text{INFRAT}_{it} + \beta_2 \text{XRAT}_{it} + \beta_3 \text{GDPG}_{it} + \beta_4 \text{TOT}_{it} + \beta_5 \text{PCINC}_{it} + \beta_6 \text{WCSS}_{it} + \varepsilon_{it}$$

$$\text{Random effect model: } \text{EXPR}_{it} = \alpha + \beta_1 \text{INFRAT}_{it} + \beta_2 \text{XRAT}_{it} + \beta_3 \text{GDPG}_{it} + \beta_4 \text{TOT}_{it} + \beta_5 \text{PCINC}_{it} + \beta_6 \text{WCSS}_{it} + (\varepsilon_{it} + u_{it})$$

Where: EXPR_{it} = coffee export prices as dependent variable where i = (country) and t = time

Independent variables:

INFRAT_{it} = inflation rate

XRATE_{it} = exchange rate

GDPG_{it} = nominal GDP growth rate

TOT_{it} = terms of trade

PCINC_{it} = per capita income of coffee buying countries

WCSS_{it} = world coffee supply change

α = intercept allowed to vary from individual to individual

u_{it} = between entity error

⁵“...The crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not”(Green, 2008, p.183).

ε_{it} = with in entity error

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 = coefficients/slope parameters/

3.3.3 The research hypotheses description

$$EXPR_{it} = \alpha + \beta_1 INFRAT_{it} + \beta_2 XRAT_{it} + \beta_3 GDPG_{it} + \beta_4 TOT_{it} + \beta_5 PCINC_{it} + \beta_6 WCSS_{it} + \varepsilon_{it}$$

For the hypothesis testing, the following null and alternative hypotheses were designed.

Table 3. 2: Structure of panel data model

Null hypothesis	Alternative hypothesis
H₀ : The export price of coffee is not associated with inflation rate (H₀:$\beta_1=0$).	H_a : The export price of coffee in Ethiopia is affected by inflation rate (H_a: $\beta_1 \neq 0$).
H₀ : The export price of coffee is not affected by exchange rate (H₀:$\beta_2=0$).	H_a : The export price of coffee is affected by exchange rate (H_a: $\beta_2 \neq 0$).
H₀ : The export price of coffee is not affected by GDP growth rate (H₀:$\beta_3=0$).	H_a : The export price of coffee is affected by GDP growth rate (H_a: $\beta_3 \neq 0$).
H₀ : The export price of coffee is not affected by terms of trade (H₀:$\beta_4=0$).	H_a : The export price of coffee is affected by terms of trade (H_a: $\beta_4 \neq 0$).
H₀ : The export price of coffee is not affected by per capita income (H₀:$\beta_5=0$).	H_a : The export price of coffee is affected by per capita income importing countries (H_a: $\beta_5 \neq 0$).
H₀ : Ethiopia's coffee export price is positively associated with World coffee supply change (H₀:$\beta_6=0$).	H_a : Ethiopia's coffee export price is not positively associated with World coffee supply change (H_a:$\beta_6 < 0$).

Note: Overall significance testing $H_0: \beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=0$ at significance level of 95%

It could be noted that a random effect model was estimated by using generalized least square (GLS). In order to select⁶ the best model, among others, four possible outcomes of hypothesis were considered. These were;

1. If both null hypotheses of F-test and LM test are not rejected, the best model is the pooled OLS.
2. If the null hypothesis of an F-test in a fixed effect model is rejected and the null hypothesis of a Breusch-Pagan LM test in a random effect model is not, then a fixed effect model is preferred. If the null hypothesis of a Breusch-Pagan LM test in a random effect model is rejected and the null hypothesis of an F-test in a fixed effect model is not, then a random effect model is preferred.
3. If a random and fixed effect models are found to be significant test results, further need to run a Hausman test. In Hausman test result, if the null hypothesis of uncorrelated between individual effects and regressors is rejected, preferred model is random effect model; otherwise, fixed effect model fitted to the data.

⁶Kennedy (2008:286) suggest that first examine if individual specific intercept are equal; if yes, the panel data are pooled and OLS will do, if not conduct Hausman test, use random effect estimator if the group effect is not correlated with error term; otherwise, use fixed effect estimator.

4. If the data considered as not poolable and each entity has different slopes of regressors, needed to conduct a Chow test and then, if null hypothesis is rejected, attempted to fit random coefficient model or hierarchical linear model.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND DISCUSSIONS

4.1 Overview of Ethiopian coffee export and its economic contribution

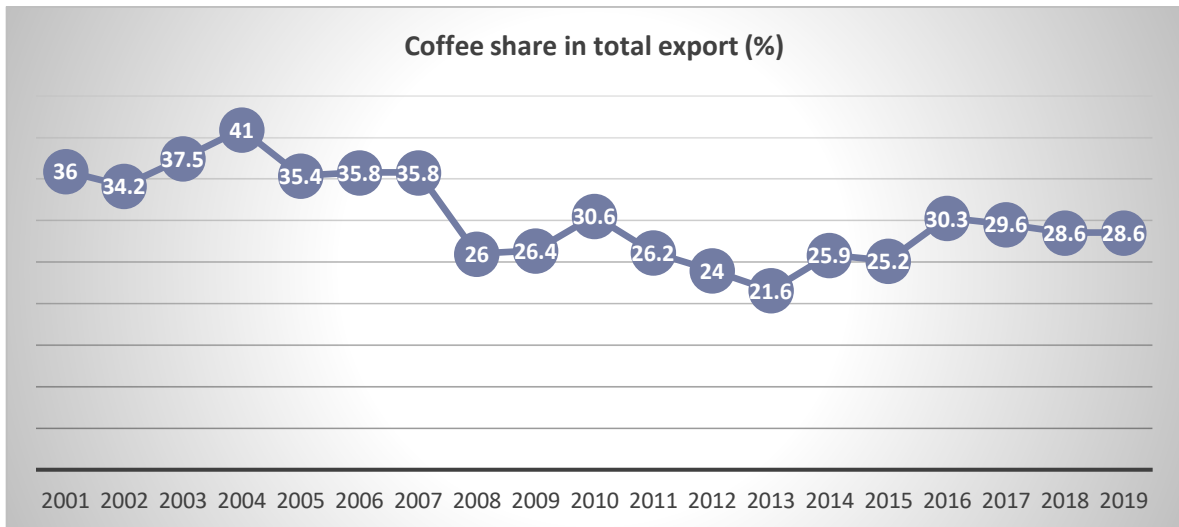
As much as this country is the homeland for the coffee plant, its people are also heavy consumers of coffee. Over 50% of the coffee produced is consumed within Ethiopia. Coffee accounts for 60% of exports, and 80% of total employment. It is estimated that more than 15 million people are directly or indirectly engaged in the production, processing

and trading of coffee. Ethiopia is Africa's leading exporter of Arabica coffee, earning over \$310 million in 1997 which grew to \$881million in 2016/2017 from coffee export with America being its biggest market (ICO, 1997; 2017). The Ethiopia coffee has been exported to more than 50 countries; the major destinations are Germany, Saudi Arabia, Japan, Belgium, United States of America and France.

4.1.1 Share of coffee export in total export earnings and GDP

Like other developing countries, Ethiopian economy is based on agriculture, which contributes about 45 percent to GDP and more than 80 percent of exports and employs 85 percent of the population. The structure of the export sector is dominated by a few primary products that account for a lion's share of the county's export earnings, while share of non-agricultural products in total exports is almost insignificant for the past five decades, primary agricultural products accounted to about 80%-90% of total export earnings. Among the major export products, coffee accounts more than 30 % of total export for the last 5 decades (see figure 4.1). Though decreasing from time to time due to increase in number and quantity of other export items, coffee, historically used to account for about 60% of the total export revenues (Petit, 2007).

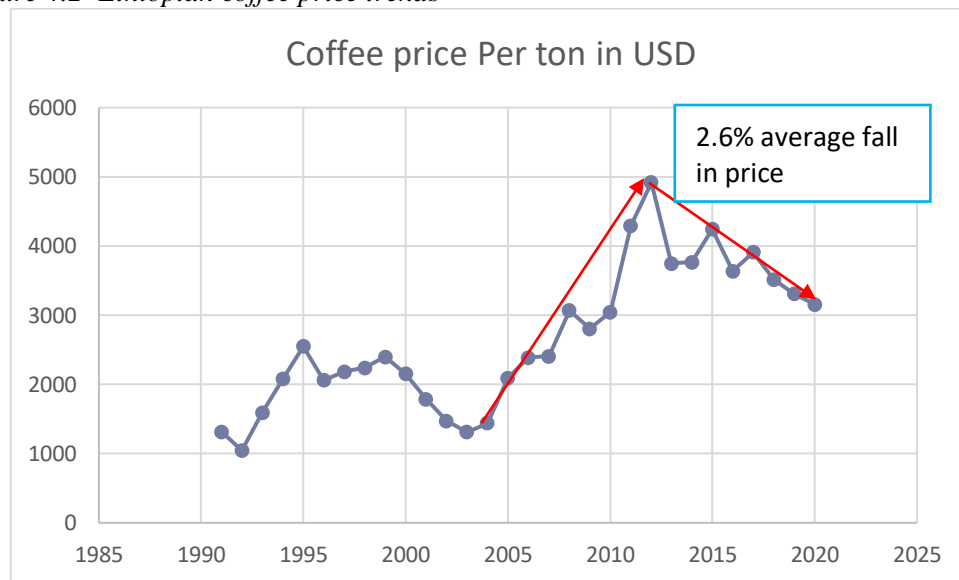
Figure 4. 1: the trend of share of coffee in total export



Source: Author’s own computation using data from NBE and ECTA

4.1.2 Trend of Ethiopian coffee prices

Figure 4.2: Ethiopian coffee price trends



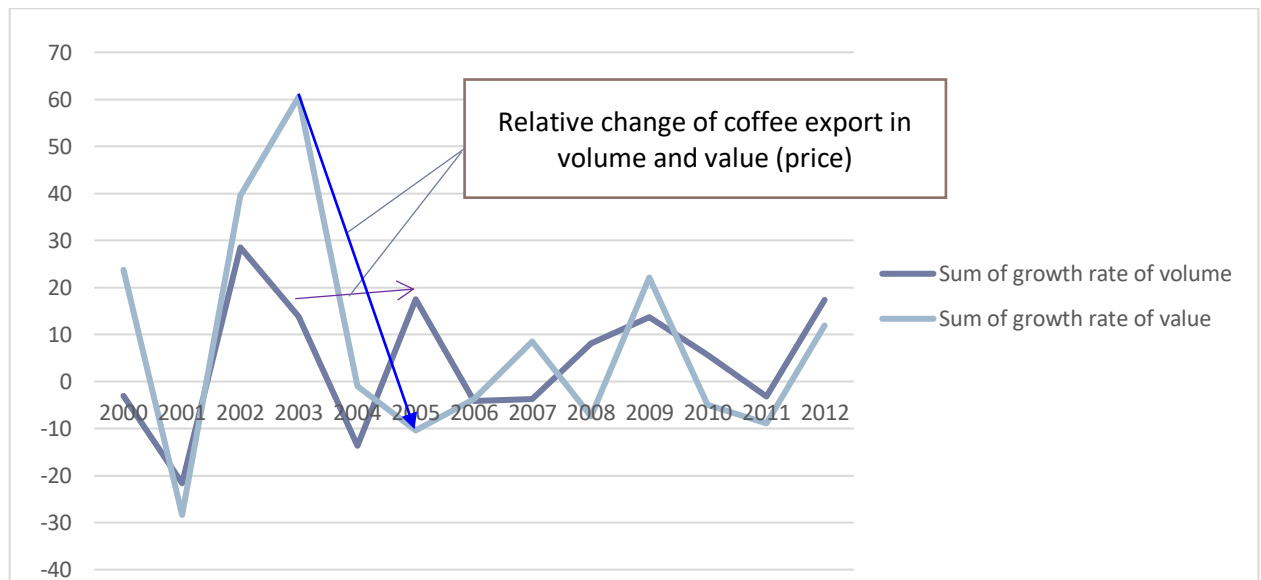
Source: ECTA and Ethiopia Custom Commission

As illustrated in figure 4.1, the maximum and minimum export price of coffee recorded 1,043 USD and 4919 USD per ton in 1992 and in 2012 respectively. The maximum price which was recorded in 2012 further declined to 3,154 USD by 35.8% in 2020 over 8 years. In general, from 2012 to 2020 export price of coffee in Ethiopia has been falling by 2.61 % in every fiscal year. The temporary export prices booms and busts would not assure future

predictable supply and production sustainability. Moreover, one-time price booms which could be a windfall precede with long term price slump greatly affects producers. On the other hand, increase in the world price may not pass to producer price due to the overvaluation of local currencies (Abdulai, 2000; Baffes & Gardner, 2003; GolettiandTsigas, 1995).

The figure 4.2exhibits that the trend relationship of total price (revenue) of coffee with total coffee supply widely dispersed that clearly indicates price elastic of supply is not consistently variable responsiveness of quantity supplied in response to higher change in price there is very small change in quantity supply or sometimes reverse of low of price and supply movement relationships.

Figure 4.3: The relative growth of coffee export in terms of volume and value



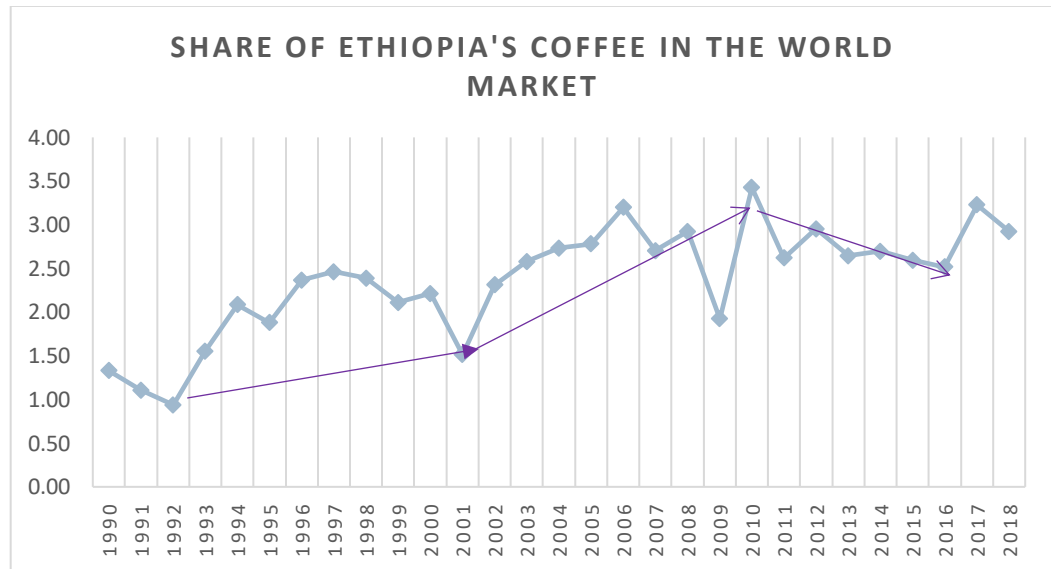
Source: Ethiopia Coffee and Tea Authority and Ethiopia Customs Commission

4.1.3 Ethiopia’s coffee market share in the international market

Over several years, Ethiopia has remained with small market share in the world coffee market. It has stayed with only world market share ranging from 0.94 % to 3.43 % as minimum and maximum share in 1992 and 2010 respectively over period of 1990-2018. The maximum share reached in 2010 was not maintained for extended time rather

declined until 2016 by 2.52% every year (see figure 4.4). This limited range of market share and inconsistent market seizure could shed light in economic development and foreign currency supply as the coffee sector is considered as the vital role-playing agricultural commodity. Recent years’ the declining Ethiopian share in world market may be due to the new emerging of new coffee producers, and production in other producing countries.

Figure 4.4: Trends of share of Ethiopia’s coffee in world market



Source: International coffee organization (ICO)

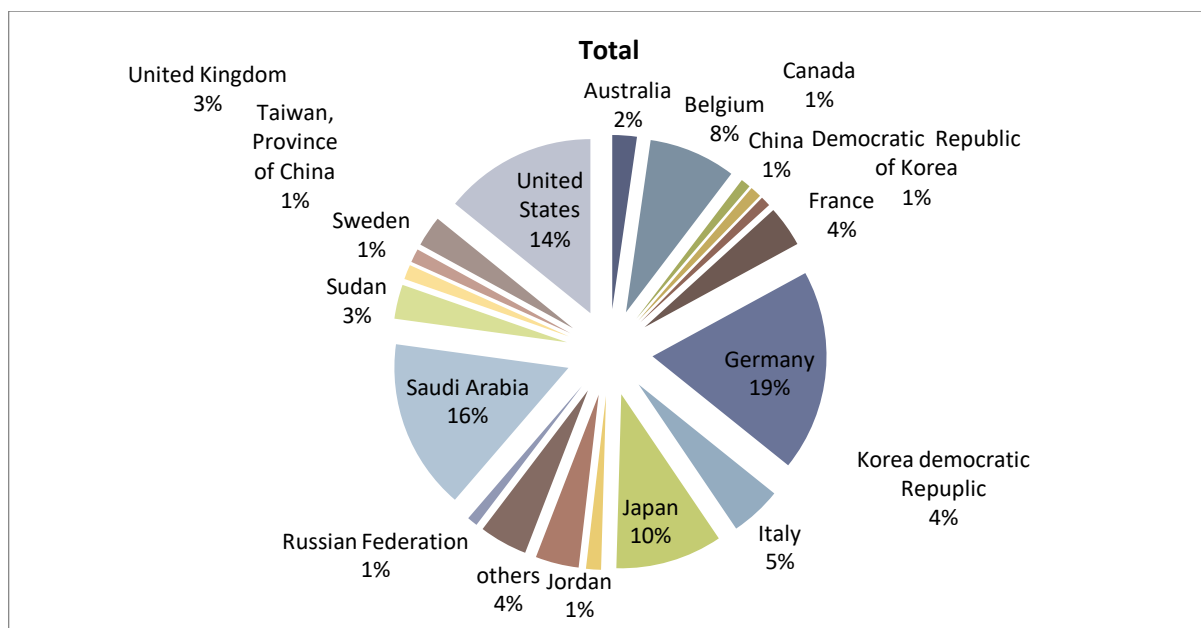
4.1.4 Major Ethiopian coffee destination countries

Ethiopia has about 50 destinations every year for coffee product. In the figure 2.4, listed 10 top Ethiopian coffee buying countries in period 2005-2020 named Germany (19%), Saudi Arabia (16%), United States of America (14%) and Japan (10%) are major Ethiopia coffee buyers. The structure of pricing is different from importing country to other. Over the years, across the destinations, Ethiopia coffee has no made significant market diversification and expansion.

Though Ethiopian Commodity Exchange (ECX), as a new modern commodity exchange was emerged in 2008, it has not showed significant change in market expansion. Meanwhile, in response to growing demand for the traceable and high-quality coffee within importing countries, recently Ethiopia has established and implementing coffee marketing

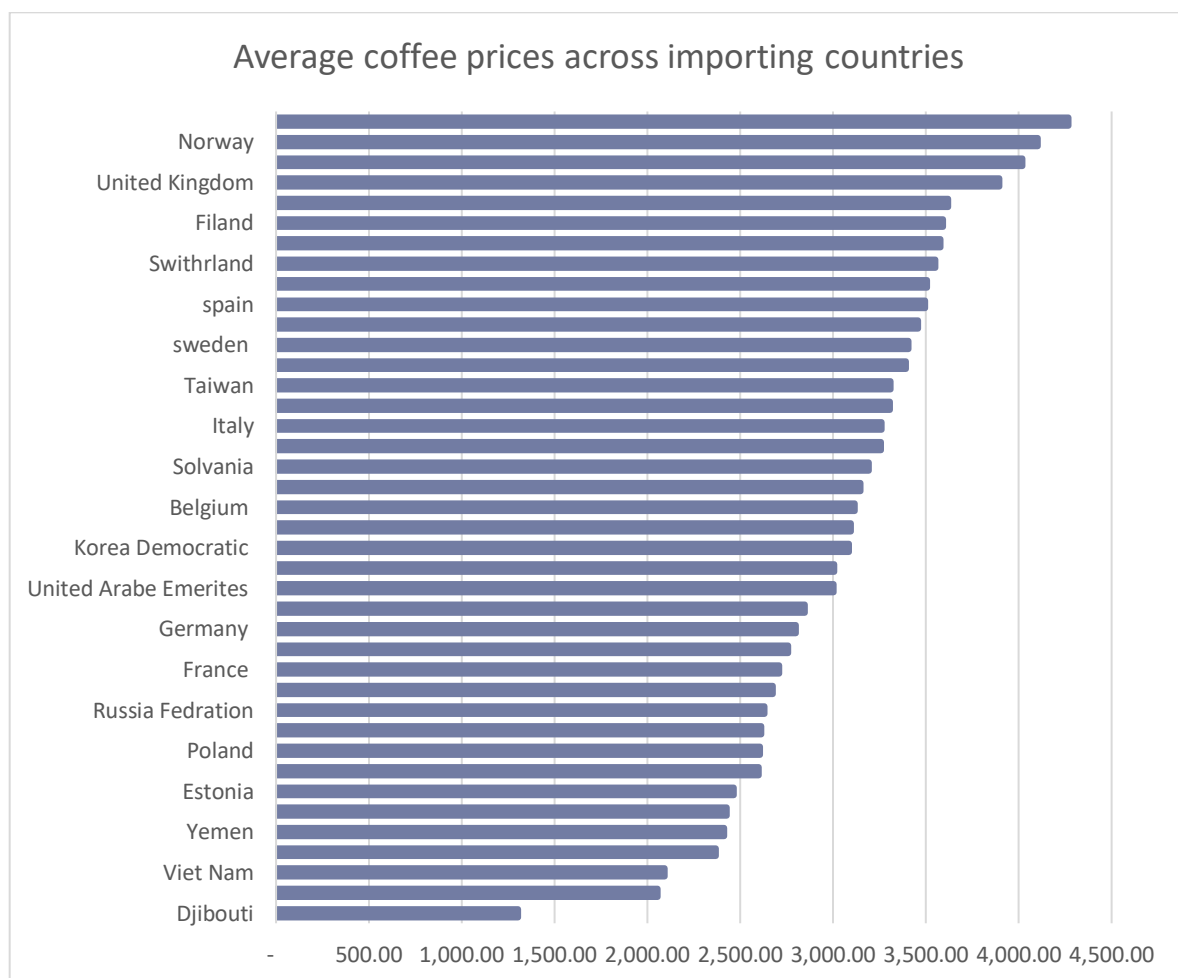
reform. The reform focuses on the marketing system in which small farmers, suppliers and commercial growers can supply quality and traceable coffee to world market upon the request of customer by their own export licenses. Another important part of market reform is establishment of marketing system that connects direct suppliers and coffee exporters through vertical integration (direct involvement of the coffee exporter and regional coffee suppliers and growers without intervention of ECX. Unlike the ECX trading floor, implementation of alternative marketing system of vertically integration assumed to ensure quality and traceable coffee upon the buyer requests. Nevertheless, more than 90% of exported coffee was green bean which indicates that like other agricultural commodities, the prices offered for row coffee is relatively very low.

Figure 4.5: Share of coffee export by destinations



Source: Ethiopia Coffee and Tea Authority and Ethiopia Custom Commission

Figure 4.7 Average price differences across importing countries



Source: ECTA and ECC average price for last 20 years across 40 destinations of Ethiopian coffee

Developed countries tend to buy higher-priced coffees. By contrast, LDC are inclined to buy lower-priced coffees (figure 4.6). In the last 20 years, from European countries, Norway has been buying Ethiopian coffee at higher price of 4,269.22 USD per ton on average in the last 20 years. In contrary, from LDCs Djibouti has been buying at the lowest price which was 1,302.39 USD on average in the last 20 years. In the above, prices differences across the destinations shows that there is indication of the fixed effects across the countries that could determine the prices heterogeneity. The key difference of the between the developed countries offering higher price and least developing countries the lower price may be due to per capita income differences. A price change in a particular importing country would lead to a similar change in the price of other country of coffee in the market.

4.2 Descriptive Statistics

Table 4.1: Summary statistics for main variables

Variables	Mean	Std. Dev.	Min	Max	Skew.	Kurt.
Export price	3050.996	1357.345	396.32	6991.125	.217	2.633
Inflation rate	13.235	13.663	-10.773	55.241	1.382	5.621
Exchange rate	16.256	7.672	8.457	33.25	.63	2.264
GDP growth rate	8.846	3.9	-2.099	13.534	-1.482	4.394
Terms of trade	57.34	10.732	44.053	83.882	.934	3.085
Per capita income	26940.842	21661.203	422.316	103000	.776	3.212
World coffee supply	2.377	4.257	-3.885	33.25	1.121	6.898

Source: Author's own calculation

As illustrated in Table 4.8, the descriptive statistics, measures of central tendency, measure of dispersion minimum and maximum and number of cases. In regards to descriptive statistics, export price of coffee from total sample size of 800 (n=40 countries as individual entity and T=20 years period of time) $N=nT=800$, is found to be average, minimum and maximum prices are 3050.9, 396.32 and 6991.125 USD respectively during sample period. The Standard deviation of export price, 1357.34 USD, indicates the average dispersion of every export price from the mean value. The standard deviation obtained descriptive statistics confirms that a big variability of export prices even much greater than minimum prices (396.32 USD).

Table 4.2 □ Matrix of Correlations

Variables	Export price	Inflation rate	Exchange rate	GDP growth rate	Terms of trade	Per capita income	World coffee supply
Export price	1						
Inflation rate	0.206	1					
Exchange rate	0.542	0.13	1				
GDP growth rate	0.196	0.145	-0.11	1			
Terms of trade	-0.231	-0.076	-0.365	0.129	1		
Per capita income	0.479	0.087	0.174	0.086	-0.069	1	

World coffee supply change	0.184	0.144	0.29	0.29	-0.045	0.041	1
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Source: Author's own calculation using Stata 14.12

In table, correlation matrix indicates that all paired or between two variables less than moderate correlation implies that there is no multicollinearity.

4.3 Empirical Results

In this study, the Stata application was used for carrying out analysis for parameter estimations, the model selection, and for testing heteroskedasticity, serial correlation and multicollinearity.

4.3.2 Results for estimation

So as to infer the parameters included in econometric models, the estimation based on sample data is essential empirical evidence. Thus parameter estimates found from the analysis are important for drawing discussions and conclusion subsequently.

Table 4.3: Fixed effects regression results

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Inflation rate	5.45	2.30	2.37	.018	.938	9.98	**
Exchange rate	71.16	5.23	13.59	0	60.87	81.44	***
GDP growth rate	63.06	8.94	7.05	0	45.51	80.62	***
Terms of trade	-5.51	3.04	-1.81	.07	-11.49	.459	*
Per capita income	.057	.005	10.69	0	.046	.067	***
World coffee supply	-22.93	8.18	-2.80	.005	-39.00	-6.86	***
Constant	104.89	235.44	0.45	.65	-357.31	567.09	
Mean dependent var		3050.99	SD dependent var			1357.34	
R-squared		0.54	Number of obs			800.000	
F-test		146.33	Prob > F			0.000	
Akaike crit. (AIC)		13034.71	Bayesian crit. (BIC)			13067.50	

*** p<.01, ** p<.05, * p<.1

Source: Author's own computation

Table 4.4: Comparison of estimates from fixed effect, pooled OLS and random effects

Variable	Fixed effects	Pooled OLS	Random effects
Inflation rate	5.45** (2.30)	7.99** (2.54)	7.48** (2.32)
Exchange rate	71.16*** (5.23)	86.54*** (5.14)	83.71*** (4.84)
GDP growth rate	63.06*** (8.94)	79.77*** (9.47)	77.27*** (8.75)
Terms of trade	-5.51 (3.04)	-6.67 (3.41)	-6.33* (3.105)
Per capita income	.056*** (0.005)	.022*** (0.002)	.030*** (0.003)
World coffee supply change	-22.93** (8.18)	-16.85 (8.88)	-22.30** (8.301)

constant	104.89 (235.44)	637.01* (250.56)	494.22* (239.2)
R-squared	0.538	0.505	0.49
F-test, Wald test	146.33	134.66	843.91
N	800	800	800

*** p<.01, ** p<.05, * p<.10 Source: Author's own estimation

In table 4.4, the three-model results set in one table depicts implies comparison of parameter estimates. From the above model's parameter estimation one can observed that there is slight difference in estimates. Also, it found out the same decisions on F statistics that reject the null hypothesis and lower P-value and individual variable t-test are statistically significant at the .01 level.

4.3.3 Tests results for panel data model selection

The model estimation does not, which model is more consistent and efficient one. So, it leads to conduct further important tests to select best model among these three models. Thus, the author called for proceeding-test for fixed effects, Breusch-Pagan Lagrangian multiplier for random effects and a Hausman test for choice of fixed or random effect model. Accordingly, the null of the Breusch Pagan LM for the random effects was rejected at the same time the null of F-test fixed effects was rejected (see table 4.5).

Table 4.5: Breusch and Pagan Lagrangian multiplier test for random effects

	Coef.
Chi-square test value	205.95
P-value	0.000

Source: Author's own estimation using Stata 14.2

Both the null hypotheses of F-test of fixed effects and Breusch-Pagan LM test of random effects were rejected. So it was needed to select either of the models, the Hausman test was conducted and as illustrated in table 4.8 $P < 0.05$ which implies that the null hypothesis was rejected suggesting a fixed effects model was favored over its random effects counterpart showing that individual effects are correlated with the other regressors.

Table 4.6: Hausman (1978) specification test

	Coef.
Chi-square test value	33.18
P-value	0.000

Source: Author's own estimation using Stata 14.2

According to Hausman test, as the null hypothesis is rejected and then preferred fixed effects over random effects; otherwise fits random effect model. Thus in this study ,

Hausman test of the P-value found small enough to reject the null hypothesis suggesting that unique errors (u_i s) are correlated with the regressors, so the fixed effects model is appropriate. Since the key difference between fixed and random effect models is that individual effect u_i in a random effect model should not correlated with any regressor (see table 4.6).

In order for the results to be econometrically credible and economically meaningful, diagnosis for presence of cross-sectional dependence (Pesaran CD), serial correlation and heteroskedasticity tests and treatments were importantly required. The tests results showed that the presence of serial correlation and heteroskedasticity problem which could make estimates inefficient. To control the heteroskedasticity, the clustered standard errors need to be used. Finally, through the clustered standard errors, the parameter estimates of fixed effects model were estimated (see table 4.7).

In addition, to see if time fixed effects are needed, a joint test was conducted to see if the dummies for all years are equal to zero. In this study, the $\text{prob}>F$ is <0.05 , so test rejected the null that the coefficients for all years are jointly equal to zero, therefore time-fixed effects are needed in this case(see appendix 13).

Table 4.7: Last estimates fixed effects regression

EXPR	Coef.	robust St.Err.	t- value	p-value	[95% Conf	Interval]	Sig
Inflation rate	5.45	1.46	3.74	.001	2.50	8.41	***
Exchange rate	71.16	9.26	7.68	0	52.41	89.90	***
GDP growth rate	63.06	10.51	6.00	0	41.80	84.33	***
Terms of trade	-5.51	1.83	-3.00	.005	-9.23	-1.79	***
Per capita income	.057	.009	6.61	0	.039	.07	***
World coffee supply change	-22.93	5.151	-4.45	0	-33.35	-12.51	***
Constant	104.8 93	207.34	0.51	.616	-314.50	524.28	
Mean dependent var		3050.99	SD dependent var			1357.34	
R-squared		0.53	Number of obs			800.000	
F-test		47.37	Prob > F			0.000	
Akaike crit. (AIC)		13032.71	Bayesian crit. (BIC)			13,060.82	

*** $p < .01$, ** $p < .05$, * $p < .1$

4.3.4 Discussions

Based on the analysis result produced in table 4.7, detail discussions and interpretation of parameter estimates are presented as follows. Accordingly, about 53 % export price coffee is explained by six variables (inflation rate, exchange rate, terms of trade, per capita income of coffee buying countries and world coffee supply change). The R-squared, F-test, and P- value all 53% goodness-of-fit reveals that fixed effects model fit well the data

Inflation rate (INFRAT): Inflation rate is found to be statistically significant ($t=3.74$, $p<.001$). As the inflation rate increases by one unit, the export price of coffee increases by 5.45USD. So, the null hypothesis of export price of coffee in Ethiopia is affected by inflation rate is rejected. Main cause for inflation, It is usually posited that this “external cost” of inflation can be quite sever to countries which heavily rely on foreign markets, this requires extra efforts on the parts of policy makers to contain inflationary pressure, whether they are cost-push, demand-pull or combination of both. As a nation faces shortage of currency supply to importing the goods from rest of the world, many traders seek to secure the desired currency through national bank law. But many exporters do not want to get competitive pricing market. They sell only in cheap priced markets. Theoretical and practical experiences show that inflation and lower exchange rates can be used as an important instrument for increasing export capacity. In return, devaluation causes cost inflation as well as an increase in general price levels. This increases general price level, will increase the production costs. the foreign debt amount and may have effect on increasing export capacity because most of the developing countries are dependent on the agricultural sector, and the demand capacity of agricultural products may not change by reducing prices. So, the study result confirmed that the significant effect of inflation rate on export price goes consistent with many studies. For example, commodity price booms are more likely to occur when inflation rate is high, as high inflation puts upward pressure to commodity prices (Pindyck and Rotemberg, 1990; Kyrtsova and Labysb, 2006).

Exchange rate (XRAT): The second variable, exchange rate is statistically significant ($t=7.68$ $p<.000$).As the exchange rate increases by one unit, the export price of coffee increases by 71.1 USD. In macroeconomic theory, as far as real exchange rate is depreciated the export will be encouraged. The assumption set in the null hypothesis was domestic currency that has depreciated steadily over the period in this study shows

significant responsiveness of prices or volume of most Ethiopian primary agricultural product exports. Thus, the coffee export price is significantly reacting on the exchange rate suggests that pattern of diversification and in general dependence of major export share on single agricultural product that is coffee in Ethiopia outweigh the hypothesis. A proactive real exchange rate policy is an important macroeconomic policy instrument that government can use to influence the specialization pattern of a country. By manipulating the real exchange rate, the government can alter the overall incentives structure of the economy and subsequently the trajectory of the country's production or specialization pattern. Such a policy can be implemented both to increase the supply of traditional exports (primary products) as well as to diversified production and export into new areas.

GDP growth rate (GDPG): The third variable, GDP growth rate is found to be statistically significant ($t=6.00$, $p<.001$). As the GDP growth rate increases by one unit, the export price of coffee increases by 63.06USD. The study result is consistent with Deaton Angus (1999) explanation that there is correlation between GDP growth and commodity prices growth moving with similar direction, mostly particularly over the long swings, but also over shorter period, with commodity price growth leading economic growth. Despite the focus on export diversification in the development plans of the country, the export pattern is still dominated by traditional produces whose world price has been fluctuating. Gilbert (2010) found that economic growth is an important determinant of changes in world agricultural prices over a 38-year period from 1970 to 2008. Baffes and Etienne (2016) show that in the short-run, economic expansion as represented by income growth can positively affect both the real and nominal commodity prices.

The result of this study is also consistent with Jian Lia, et al (2016) study that explore economic growth, money supply and inflation are macroeconomic factors that contribute to price bubbles on agricultural commodities. In addition, Julie Subervie (2008) examined that influence of macroeconomic factors (infrastructure, inflation and financial deepening) on the price instability using panel model where the result revealed a significant negative effect of the world price instability is another evidence to validate this study result.

Terms of trade: the fourth variable, terms of trade is statistically significant ($t=-3.00$, $p<.001$). As the terms of trade increases by one unit, export price of coffee decreases by - 5.516 USD, other variables remain constant. Price movements of internationally traded

goods, as well as changes in the volume and product composition of trade; affect the gains an individual country can reap from international trade. These gains are traditionally measured by the terms of trade (the evolution of a country's export prices relative to its import prices) and the purchasing power of its exports (defined as the total export value deflated by import prices). The impact of price movements on both these measures is determined, in the short term, by the composition of a country's imports and exports, and, in the medium term, by its flexibility in being able to adapt the composition of its exports and imports to changing international demand and supply conditions. Coping with commodity-price related balance-of-payments problems International measures may also be required to address adverse balance-of-payments effects of commodity price instability. A realistic option would be the improvement and scaling up of compensatory financing mechanisms. Any such scheme should avoid pro-cyclicality. Another option would be to include deferred repayment options in case of external shocks, including commodity price surges or collapses

Per capita income of coffee buyer: The fifth variable, per capita income of coffee importing countries is statistically significant ($t=6.61$, $p<.001$). For one dollar increase of per capita income of coffee buying country, the export price of Ethiopian coffee expected to increase by .057 holding all other variables constant. Regressing of the per capita income of importing countries on the export price of Ethiopia's coffee is inelastic which implies that the effect of per capita income of coffee buyer on the export price variability is very small. Export price of coffee is not less affected by the per capita income of buyers. Besides, the result also seems to confirm one of the two unanimously accepted arguments among scholars that "traditional export commodities of developing countries have low-income elasticity of demand". Economic theory suggests that an additional dollar of income provides a higher level of marginal utility to a lower-income person than it does to a higher-income one (Berry et al, 1995). Thus, we can argue that inelastic impact of trading partners' income on Ethiopia's coffee prices is due to the fact that the nature of Ethiopian exports which is characterized by export of primary products.

World coffee supply change: The sixth variable, world coffee supply change is not statistically significant ($t=-4.45$, $p<.115$). For a one-unit change increase in world coffee supply, the export price of coffee expected to decrease by 22.9 USD holding all other

variables constant. The null hypothesis of export price of coffee is not negatively associated with world coffee supply. The fact that when supply increase (positive shift in supply), it may create excess supply in case demand remained constant, hence forcing exporters to sell at lower prices to encourage buyers to take up their excess surplus in the market. Decrease in world coffee supply will create scarcity hence selling the competitive scarce commodity at higher prices.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary

International trade, theoretically, carried out based on comparative advantages and continued to become engine of economic growth for a nation. As result many LDCs have been engaged in trading primary products. Likely, Ethiopia has been exporting primary agricultural products, predominantly coffee, on average at least more than 30% of export earnings. Growing and exporting coffee business in Ethiopia has ample comparative advantages; to mention some, the high-quality valued coffee Arabic was originated and is grown in Ethiopia, the existence of multi coffee varieties, wide range of agroecology zones, and availability of excess labor.

However, for last 5 decades, economic gain generated from coffee industry in general and coffee export in specific has been limited and showed trend of relative decline. Market share of coffee in the international market has not been exceeded 4% and stayed swinging around 3% for long time. In addition, coffee market prices have been unstable and declined over time. In fact, many empirical studies reveal that in many SSA countries primary commodities have been experienced price fluctuation and long -term decline since the world economic great depression. So, it should be important to identify and measure macroeconomic factors which are cause for the occurrence of the recurrent export price of coffee fluctuation and long-term price decline.

Thus, this study has aimed to investigate the macroeconomic factors that affect the export prices of coffee in Ethiopia. The econometric approach used in this study was panel data. It included the data for export prices of Ethiopian coffee in 40 countries as cross-sectional and 2001 -2020 as time series. The total sample observation was 800. Inflation rate, Exchange rate, GDP growth rate, terms of trade, per capita income of coffee buyers and world coffee supply change were used as independent variables whereas the export price of Ethiopian coffee was dependent variable. For all variables, the quantitative data were collected from the ECTA, ECC, NBE, WB, IMF and ICO. The panel data held process of fixed effects and random effects model specification. In order for the model specification, the F-test for fixed effects, Breusch Pagan LM for random effects, and Hausman test to test

fixed effects or random effects model were employed to reach at the most consistent and appropriated model. Based on these tests results, the decision drawn that the fixed effects model is the best fit the data. To be economically reliable and consistent, heteroscedasticity, multicollinearity, and serial correlation test were conducted, and the null hypotheses were not rejected at conventional level of significance. So as to control the heteroscedasticity and serial correlation, robust standard error needed to be used.

Finally, the result of the analysis revealed that 53% variance was statically affected by five out of the seven factors at conventional level of significance. The export prices coffee affects export price of coffee across different destinations. The macroeconomic variables: exchange rate, inflation rate, GDP growth rate, terms of trade, per capita income of coffee importing countries and world coffee supply changes are found to be factors affecting the export price of coffee in Ethiopia.

5.2 Conclusions

Despite the existence of enormous comparative advantages and potentials for coffee industry in Ethiopia, the performance of export has been affected by many factors among other; export price-volatility and a long-term decline are the major ones. This study has been outlined for Ethiopian coffee export price over period of 2001-2020 for 800 observations in 40 Ethiopian coffee destinations using panel dataset. The study examined macroeconomic variables which are the cause for fluctuation and declining of export price of coffee. To this end, the data well fit the fixed effects model and addressed the objective of study, identifying mainly macroeconomic variables that determine the export price of coffee, which in turn has a significant effect on export performance of country.

In terms of the model selection stage, Breusch-Pagan Lagrange Multiplier (LM) test, Hausman test and F-tests were conducted thinking critically about potential problems if observed and unobserved heterogeneity (a set of missing relevant variables) is not taken into account.

In order for the results to be econometrically credible and economically meaningful, it was important to investigate the statistical properties of model. With this regard, the study analysis came with wide range of procedural tests for cross-sectional dependence, serial

correlation and heteroskedasticity. By conducting the heteroskedasticity and serial correlation tests faced the presence of the heteroskedasticity and serial correlation. To control heteroskedasticity, robust option of standard error needed to be used.

The result of study analysis evidenced that all variables were statistically significant at $p < .0001$ at alpha level accounting for 53% variance in export price of coffee in Ethiopia. The parameter estimates of variables- inflation rate, exchange rate, GDP growth rate, per capita income of coffee buyers have a positive impact on the movement of export price of coffee in Ethiopia, while the Terms of trade and world coffee supply change have negative impact on coffee export price. These study findings provide useful information on the nature and formation of price booms and bust behavior and shed light on the impacts of macroeconomic policy on commodity markets.

5.3 Policy recommendations

Is it possible to draw policy lesson from these argument and result? There are some obvious by now well-known points, value addition and export diversification work better when financing single commodity like coffee exports than by other means the basis of the findings of the research in general and the conclusion drawn above, the author recommends the following points which, he thinks, will contribute in minimizing the problems arise out of coffee price fluctuations and long-term declining.

- For foster diversification and industrialization, it is necessary to reassess the priorities of macroeconomic policies and to enlarge the range of policy instruments. Diversification and industrialization remain the best means in the long run for countries to reduce their vulnerability to the adverse growth effects of commodity price volatility. This can be achieved best by integrating commodity policies into a country's overall macroeconomic and development strategies.
- By manipulating the macroeconomic variables, the government can alter the overall incentives structure of the economy and subsequently the trajectory of the country's production or specialization pattern. Such a policy can be implemented both to increase the supply of traditional exports (coffee) as well as to diversified production and export into new areas.

- In general, under frame of GDP growth as overriding policy priority, export dominant commodity, which is coffee in this case, should gain special attention for change the production and productivity as well as the trade liberalizing to take a big move on the coffee industry.

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Appendices

Appendix1: mean values of variable

<i>Year</i>	<i>Average of EXPR</i>	<i>Average of INFRAT</i>	<i>Average of XRATE</i>	<i>Average of GDPG</i>	<i>Average of TOT</i>	<i>Average of PCINC</i>	<i>Average of WCSS</i>
2001	1,283.26	(10.77)	8.46	7.42	65.21	16,986.35	1.45
2002	1,357.61	(1.22)	8.57	1.63	78.22	17,010.90	(1.96)
2003	1,648.85	17.77	8.60	(2.10)	47.96	17,709.42	(2.49)
2004	1,482.51	2.38	8.64	11.73	61.26	20,186.89	5.48
2005	2,048.56	10.75	8.67	12.64	57.23	22,680.26	(3.57)
2006	2,284.93	10.82	8.70	11.54	51.98	24,011.56	4.78
2007	2,433.96	15.10	8.97	11.79	57.06	25,482.20	4.97
2008	2,977.45	55.24	9.60	11.19	50.23	28,477.15	1.35
2009	3,535.13	2.71	11.78	10.04	54.77	30,613.33	(1.06)
2010	3,129.49	7.32	14.41	10.57	70.30	27,639.49	0.84
2011	3,200.47	38.04	16.90	13.53	83.88	28,994.89	5.29
2012	4,899.21	20.81	17.70	8.70	62.99	32,061.65	6.12
2013	3,880.51	7.39	18.63	9.94	66.07	31,357.24	0.11
2014	3,738.88	8.46	19.59	10.30	55.34	32,050.45	6.43
2015	4,370.72	10.45	20.58	10.41	45.28	32,247.47	0.14
2016	3,765.53	7.50	21.73	7.96	44.05	28,663.95	3.57
2017	4,084.25	8.36	23.87	10.90	49.76	28,784.36	(1.32)
2018	3,884.37	16.77	27.43	7.80	45.86	30,257.26	5.02
2019	3,567.88	15.30	29.07	8.97	49.24	32,048.88	12.37
2020	3,446.36	21.50	33.25	1.95	50.10	31,553.13	0.02

Source: Author's own computation

Appendix 2: Coffee export data over period of 2001-2020

SN	Year	Volume in ton	Value in ('000') USD	Price Per ton in USD
1	2001	99,134.00	177,167.95	1,787.16
2	2002	110,347.00	162,448.60	1,472.16
3	2003	126,100.00	165,300.00	1,310.86
4	2004	144,629.00	208,313.00	1,440.33
5	2005	159,845.00	334,509.00	2,092.71
6	2006	153,155.00	365,834.00	2,388.65
7	2007	176,400.00	424,144.00	2,404.44
8	2008	171,000.00	524,744.00	3,068.68
9	2009	134,000.00	375,838.00	2,804.76
10	2010	172,210.21	524,331.74	3,044.72
11	2011	196,117.93	841,649.72	4,291.55
12	2012	169,387.04	832,909.47	4,917.20
13	2013	199,103.58	746,416.33	3,748.88
14	2014	190,876.00	718,792.00	3,765.75
15	2015	183,839.90	780,228.50	4,244.07
16	2016	198,621.65	722,430.00	3,637.22
17	2017	225,667.66	882,467.35	3,910.47
18	2018	238,465.55	838,154.00	3,514.78
19	2019	230,764.42	762,976.40	3,306.30
20	2020	270,835.13	854,211.29	3,153.99

Source: ECTA& Ethiopia Customs Commission

Appendix 3: Export value in USD in “000” by destination

Country	2013	2014	2015	2016	2017	2018	2019	2020
Germany	191,444.76	152,805.30	141,454.61	135,919.31	140,035.20	145,100.63	98,617.24	145,784.27
Saudi Arabia	108,980.59	118,054.12	131,959.86	111,825.68	132,932.15	120,993.43	117,959.02	133,055.74
Japan	81,374.92	62,966.53	87,639.40	52,236.07	87,479.51	69,191.58	89,494.75	80,078.64
Belgium	60,903.14	53,984.65	45,011.89	54,661.27	82,542.88	67,905.56	55,817.40	76,287.90
United States	70,538.96	86,608.95	109,362.46	99,519.92	116,731.24	140,900.22	123,300.70	125,239.12
France	32,386.97	35,287.75	32,655.86	34,312.31	32,159.11	26,642.38	16,288.42	25,013.12
Italy	35,234.23	37,665.51	32,177.29	34,271.67	47,126.69	39,838.53	35,704.73	31,131.00

Korea								
democratic	19,397.43	23,017.16	31,117.48	40,729.08	50,069.12	41,617.48	42,129.14	57,666.98
United								
Kingdom	19,312.10	21,620.12	22,841.93	24,408.71	33,467.86	23,211.42	18,536.56	11,916.37
Australia	13,559.75	17,566.93	18,562.26	19,367.46	20,347.47	16,531.88	20,062.89	13,833.47
Jordan	10,282.37	10,799.82	9,741.64	10,085.39	10,488.75	9,180.89	10,664.47	57,666.98
Russian	7,519.07	5,640.75	6,407.93	6,301.92	8,920.04	9,779.47	7,563.22	7,538.28
Spain	9,523.68	7,206.71	9,051.87	13,665.51	10,160.86	10,978.45	9,396.56	6,277.39
Canada	7,245.21	6,294.34	6,701.96	7,170.91	7,295.26	8,564.35	6,048.48	6,479.69
Israel	3,491.33	2,441.98	2,862.47	2,971.49	3,082.45	3,986.65	2,404.05	2,873.28
United Arab								
Emirates	3,182.51	4,048.08	1,725.10	1,973.33	4,358.82	2,530.12	3,856.05	5,966.70
Netherlands	4,036.81	4,888.08	6,067.04	4,874.64	8,002.58	6,596.17	9,055.51	5,758.02
Taiwan	2,107.21	3,275.38	4,909.57	6,285.38	13,766.37	10,824.88	14,990.39	21,937.96
China	1,667.69	2,991.23	2,805.92	5,336.49	8,228.81	11,746.16	15,387.22	16,551.25
Egypt	677.59	376.61	1,291.58	514.88	783.44	1,517.42	1,775.41	2,185.40

Appendix4: Skewness/Kurtosis tests for Normality

Variable	--- joint ---				
	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
EXPR	800	0.012	0.012	11.560	0.003
ACPR	800	0.108	0.000	27.750	0.000
INFRAT	800	0.000	0.000	.	0.000
XRATE	800	0.000	0.000	73.470	0.000
GDPG	800	0.000	0.000	.	0.000
TOT	800	0.000	0.546	69.580	0.000
PCINC	800	0.000	0.210	53.610	0.000
WCSS	800	0.000	0.000	.	0.000

Appendix 5: Variance inflation factor (VIF)

Variance inflation factor		
	VIF	1/VIF
XRATE	1.351	.74
WCSS	1.243	.804
GDPG	1.187	.843
TOTM100	1.169	.855
INFRAT	1.054	.949
PCINC	1.049	.953
Mean VIF	1.176	.

Appendix 6: Linear regression OLS with robust standard error

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	7.995	1.892	4.23	0	4.281	11.709	***
XRATE	86.544	4.962	17.44	0	76.803	96.285	***
GDPG	79.777	7.566	10.54	0	64.925	94.628	***
TOTM100	-6.672	2.825	-2.36	.018	-12.217	-1.126	**
PCINC	.023	.002	11.96	0	.019	.027	***
WCSS	-16.852	10.5	-1.61	.109	-37.463	3.758	
Constant	637.018	193.872	3.29	.001	256.455	1017.581	***
Mean dependent var		3050.996	SD dependent var			1357.345	
R-squared		0.505	Number of obs			800.000	
F-test		202.432	Prob > F			0.000	
Akaike crit. (AIC)		13262.514	Bayesian crit. (BIC)			13295.307	

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 7: Pooled linear regression

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	7.995	2.549	3.14	.002	2.991	12.999	***
XRATE	86.544	5.14	16.84	0	76.455	96.633	***
GDPG	79.777	9.475	8.42	0	61.177	98.376	***
TOTM100	-6.672	3.417	-1.95	.051	-13.38	.036	*
PCINC	.023	.002	14.31	0	.02	.026	***
WCSS	-16.852	8.887	-1.90	.058	-34.297	.593	*
Constant	637.018	250.568	2.54	.011	145.164	1128.873	**
Mean dependent var		3050.996	SD dependent var			1357.345	
R-squared		0.505	Number of obs			800.000	
F-test		134.665	Prob > F			0.000	
Akaike crit. (AIC)		13262.514	Bayesian crit. (BIC)			13295.307	

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 8: Fixed effect Regression results

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	5.459	2.303	2.37	.018	.938	9.981	**
XRATE	71.161	5.237	13.59	0	60.879	81.442	***
GDPG	63.068	8.941	7.05	0	45.515	80.621	***
TOTM100	-5.516	3.044	-1.81	.07	-11.491	.459	*
PCINC	.057	.005	10.69	0	.046	.067	***
WCSS	-22.934	8.186	-2.80	.005	-39.005	-6.863	***
Constant	104.893	235.444	0.45	.656	-357.311	567.098	
Mean dependent var		3050.996	SD dependent var			1357.345	

R-squared	0.538	Number of obs	800.000
F-test	146.333	Prob > F	0.000
Akaike crit. (AIC)	13034.715	Bayesian crit. (BIC)	13067.507

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 9: Estimation of fixed effects

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	5.459	2.303	2.37	.018	.938	9.981	**
XRATE	71.161	5.237	13.59	0	60.879	81.442	***
GDPG	63.068	8.941	7.05	0	45.515	80.621	***
TOTM100	-5.516	3.044	-1.81	.07	-11.491	.459	*
PCINC	.057	.005	10.69	0	.046	.067	***
WCSS	-22.934	8.186	-2.80	.005	-39.005	-6.863	***
Constant	104.893	235.444	0.45	.656	-357.311	567.098	

Mean dependent var	3050.996	SD dependent var	1357.345
R-squared	0.538	Number of obs	800.000
F-test	146.333	Prob > F	0.000
Akaike crit. (AIC)	13034.715	Bayesian crit. (BIC)	13067.507

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 10: Estimation of fixed effects (with robust standard errors)

EXPR	Coef.	robust St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	5.459	1.46	3.74	.001	2.506	8.413	***
XRATE	71.161	9.268	7.68	0	52.415	89.906	***
GDPG	63.068	10.513	6.00	0	41.804	84.332	***
TOT	-5.516	1.838	-3.00	.005	-9.234	-1.798	***
PCINC	.057	.009	6.61	0	.039	.074	***
WCSS	-22.934	5.151	-4.45	0	-33.352	-12.516	***
Constant	104.893	207.345	0.51	.616	-314.502	524.289	

Mean dependent var	3050.996	SD dependent var	1357.345
R-squared	0.538	Number of obs	800.000
F-test	47.373	Prob > F	0.000
Akaike crit. (AIC)	13032.715	Bayesian crit. (BIC)	13060.823

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 11: Linear regression, absorbing indicators

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	5.459	2.303	2.37	.018	.938	9.981	**
XRATE	71.161	5.237	13.59	0	60.879	81.442	***
GDPG	63.068	8.941	7.05	0	45.515	80.621	***
TOTM100	-5.516	3.044	-1.81	.07	-11.491	.459	*
PCINC	.057	.005	10.69	0	.046	.067	***
WCSS	-22.934	8.186	-2.80	.005	-39.005	-6.863	***
Constant	104.893	235.444	0.45	.656	-357.311	567.098	

Mean dependent var	3050.996	SD dependent var	1357.345
R-squared	0.627	Number of obs	800.000
F-test	146.333	Prob > F	0.000
Akaike crit. (AIC)	13034.715	Bayesian crit. (BIC)	13067.507

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 12: Regression results produced using xtreg EXPR i.YEAR, fevce(cluster CTRY)

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
------	-------	---------	---------	---------	-----------	-----------	-----

2001b.YEAR	0
2002.YEAR	74.354	19.042	3.90	0	35.839	112.869	***	
2003.YEAR	365.587	17.287	21.15	0	330.622	400.553	***	
2004.YEAR	199.252	30.751	6.48	0	137.053	261.451	***	
2005.YEAR	765.297	111.818	6.84	0	539.124	991.47	***	
2006.YEAR	1001.675	111.264	9.00	0	776.624	1226.727	***	
2007.YEAR	1150.705	113.271	10.16	0	921.592	1379.818	***	
2008.YEAR	1694.189	110.396	15.35	0	1470.892	1917.487	***	
2009.YEAR	2251.875	181.466	12.41	0	1884.826	2618.925	***	
2010.YEAR	1846.232	120.528	15.32	0	1602.441	2090.022	***	
2011.YEAR	1917.21	147.078	13.04	0	1619.717	2214.702	***	
2012.YEAR	3615.951	173.855	20.80	0	3264.297	3967.605	***	
2013.YEAR	2597.248	159.611	16.27	0	2274.404	2920.092	***	
2014.YEAR	2455.618	147.99	16.59	0	2156.28	2754.955	***	
2015.YEAR	3087.465	176.947	17.45	0	2729.555	3445.374	***	
2016.YEAR	2482.266	177.792	13.96	0	2122.647	2841.885	***	
2017.YEAR	2800.993	206.919	13.54	0	2382.459	3219.526	***	
2018.YEAR	2601.112	166.923	15.58	0	2263.478	2938.745	***	
2019.YEAR	2284.617	185.434	12.32	0	1909.54	2659.693	***	
2020.YEAR	2163.096	181.583	11.91	0	1795.81	2530.383	***	
Constant	1283.259	97.194	13.20	0	1086.665	1479.853	***	

Mean dependent var	3050.996	SD dependent var	1357.345
R-squared	0.730	Number of obs	800.000
F-test	1243.729	Prob > F	0.000
Akaike crit. (AIC)	12628.044	Bayesian crit. (BIC)	12717.051

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 13: Regression results produced using xtreg EXPR INFRAT XRATE GDPG TOTM100 PCINC WCSS i.YEAR, fe

EXPR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
INFRAT	-541.34	163.315	-3.31	.001	-861.956	-220.724	***
XRATE	429.836	118.571	3.63	0	197.059	662.612	***
GDPG	-283.182	120.658	-2.35	.019	-520.055	-46.309	**
TOTM100	-473.819	120.434	-3.93	0	-710.253	-237.385	***
PCINC	.02	.005	4.33	0	.011	.028	***
WCSS	10.841	14.657	0.74	.46	-17.934	39.615	
2001b.YEAR	0	.	.	.	.	.	.
2002.YEAR	9759.167	2463.176	3.96	0	4923.51	14594.824	***
2003.YEAR	4919.94	1692.092	2.91	.004	1598.06	8241.819	***
2004.YEAR	6487.667	2132.042	3.04	.002	2302.086	10673.249	***
2005.YEAR	9969.82	3234.845	3.08	.002	3619.239	16320.401	***
2006.YEAR	7313.558	2407.42	3.04	.002	2587.361	12039.754	***
2007.YEAR	12115.636	3689.879	3.28	.001	4871.742	19359.531	***
2008.YEAR	30685.755	9338.832	3.29	.001	12351.953	49019.556	***
2009.YEAR	3679.007	948.532	3.88	0	1816.868	5541.146	***
2010.YEAR	12183.07	3262.763	3.73	0	5777.68	18588.459	***
2011.YEAR	35018.285	9897.747	3.54	0	15587.233	54449.337	***
2012.YEAR	15705.688	3925.999	4.00	0	7998.248	23413.128	***
2013.YEAR	8915.294	2224.814	4.01	0	4547.585	13283.003	***
2014.YEAR	3878.364	977.37	3.97	0	1959.612	5797.116	***
2015.YEAR	482.184	232.729	2.07	.039	25.296	939.072	**
2016.YEAR	-3452.157	1044.406	-3.31	.001	-5502.514	-1401.8	***
2017o.YEAR	0	.	.	.	.	.	.
2018o.YEAR	0	.	.	.	.	.	.
2019o.YEAR	0	.	.	.	.	.	.
2020o.YEAR	0	.	.	.	.	.	.
Constant	24464.931	6115.08	4.00	0	12459.932	36469.93	***

Mean dependent var	3050.996	SD dependent var	1357.345
R-squared	0.737	Number of obs	800.000
F-test	98.722	Prob > F	0.000
Akaike crit. (AIC)	12613.323	Bayesian crit. (BIC)	12716.384
*** $p < .01$, ** $p < .05$, * $p < .1$			

testparmi.YEAR

(1) 2002.YEAR = 0

(2) 2003.YEAR = 0

(3) 2004.YEAR = 0

(4) 2005.YEAR = 0

(5) 2006.YEAR = 0

(6) 2007.YEAR = 0

(7) 2008.YEAR = 0

(8) 2009.YEAR = 0

(9) 2010.YEAR = 0

(10) 2011.YEAR = 0

(11) 2012.YEAR = 0

(12) 2013.YEAR = 0

(13) 2014.YEAR = 0

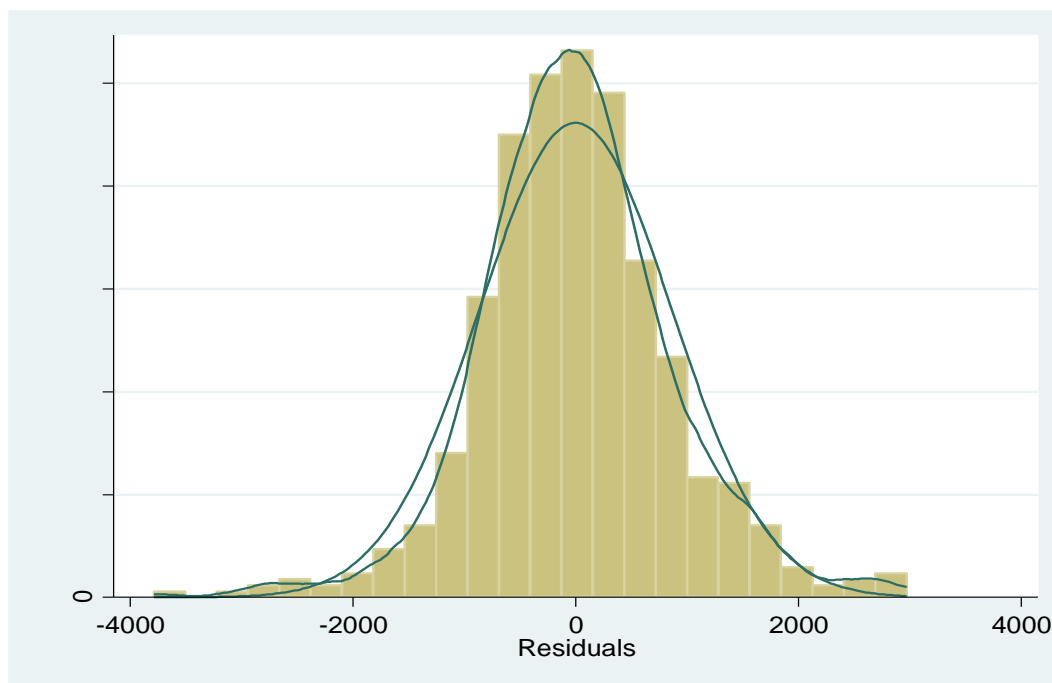
(14) 2015.YEAR = 0

(15) 2016.YEAR = 0

F(15, 739) = 37.35

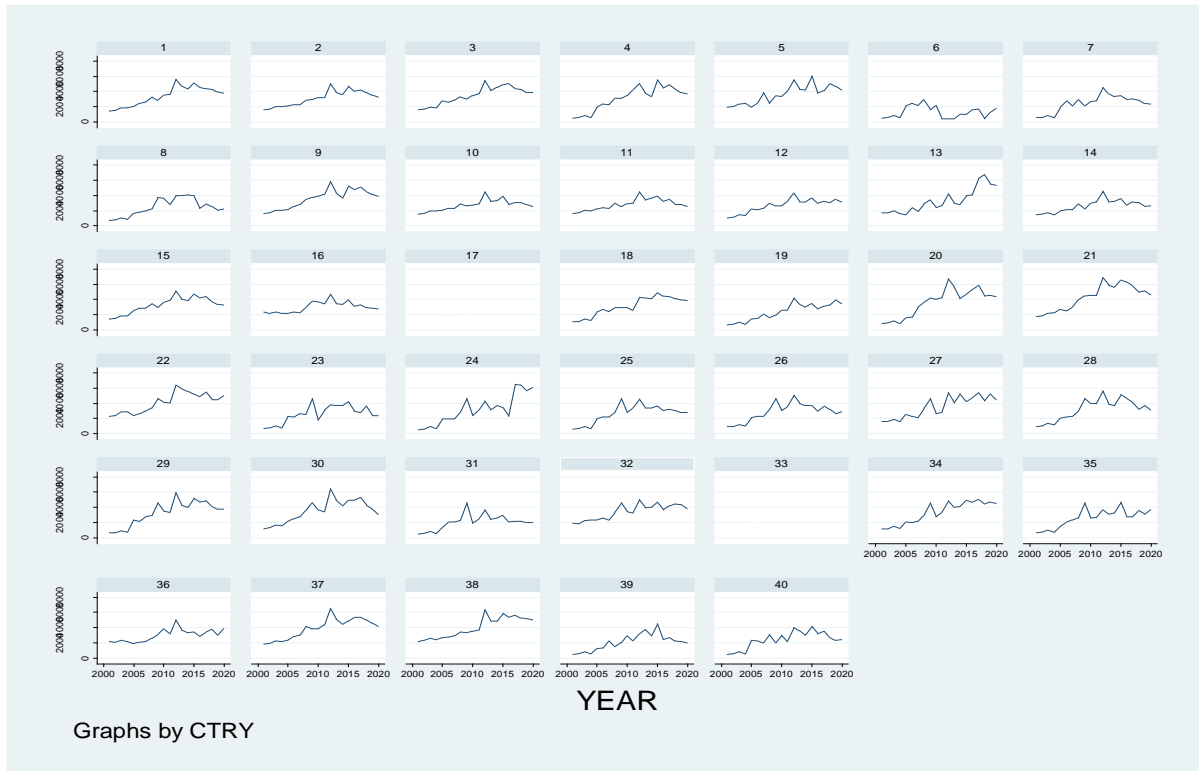
Prob > F = 0.0000

Appendix14: normality test



Estimation using Stata 14.12

Appendix15. Export prices graph in respects to each destinations



Source: Estimation using Stata 14.12

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