

ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES

Does Real Exchange Rate Matter for Ethiopia's Exports?  
A Gravity Model Analysis

By

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A thesis submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Masters of Science in Economics

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## Table of Contents

Contents	Page
Acknowledgments.....	i
Table of contents.....	ii
List of Tables.....	iv
List of Figures.....	iv
Abbreviations and Acronyms.....	v
Abstract.....	vi
<b>CHAPTER I: INTRODUCTION</b>	
1.1 Background of the study.....	1
1.2 Statement of the problem.....	3
1.3 Objective of the study.....	4
1.4 Significance of the study.....	4
1.5 Scope and Limitation of the study.....	5
1.6 Organization of the paper.....	6
<b>CHAPTER II: OVERVIEW OF ETHIOPIA’S EXPORT</b>	
2.1 Share of Exports in GDP.....	7
2.2 Major Export Commodities of Ethiopia.....	9
2.3 Major Destinations of Ethiopia’s Exports .....	13
<b>CHAPTER III: REVIEW OF LITERATURE</b>	
3.1 Theoretical Literature.....	16
3.1.1 Gravity Model.....	16

3.1.2	Measuring Real Exchange Rate.....	20
3.2	Empirical Literature.....	23
3.2.1	The Effects of Changes in Real Exchange Rate on Aggregate Export.....	24
3.2.2	The Effects of Real Exchange Rate on Sectoral/Commodity Specific Exports.....	29
 CHAPTER IV: METHODOLOGY AND DATA		
4.1	Specification of the Model.....	37
4.2	Hypotheses on the Expected Signs of the Coefficients.....	42
4.3	Estimation Issues.....	43
4.4	The Data.....	46
 CHAPTER V: RESULTS AND DISCUSSIONS		
5.1	Results for Aggregate Exports.....	47
5.2	Results for Coffee and Oilseeds.....	50
 CHAPTER VI: CONCLUSIONS AND POLICY IMPLICATIONS		
6.1	Conclusions.....	54
6.2	Policy Implications .....	55
REFERENCES.....		57
APPENDICES.....		66

## **List of Tables**

Tables	page
Table 2.1: Volumes of Major Export Products (in thousands of metric tons).....	10
Table 2.2: Value Share of Major Export Products (as percentage of total export values)...	11
Table 2.3: Unit Value of Exports (Birr per kilogram).....	12
Table 2.4: Major Export Destination Countries (2005/06-2009/10).....	13
Table 2.5: Export Destination by Major Continents (2005/06-2009/10).....	14
Table 5.1: Estimation Results for Aggregate Export.....	47
Table 5.2: Estimation Results for Coffee and Oilseeds.....	51

## **List of Figures**

Figure	page
Figure 2.1: Exports of Goods and Services as Percentage of GDP.....	8

## **Abbreviations and Acronyms**

CPI	Consumer Price Index
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
LDCs	Least Developed Countries
MEDaC	Ministry of Economic Development and Cooperation
NER	Nominal Exchange Rate
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
PPI	Producer Price Index
RER	Real Exchange Rate
SSA	Sub-Saharan Africa
US	United States
WPI	Wholesale Price Index

## **Abstract**

*Real exchange rate is usually used as a measure of export competitiveness of a country. Despite mixed results in empirical works, its depreciation (appreciation) is supposed to stimulate (depress) exports from a particular country. This study mainly focuses on examining whether Ethiopia's exports are determined by movements in real exchange rate. To examine this issue, the aggregate export and the exports of two main subsectors; namely, Coffee and Oilseeds are taken into consideration using bilateral exports to seventeen major trading partners over the period 2000-2009. Accordingly, a dynamic panel data gravity model that takes into account the persistent nature of trade is estimated using the system GMM estimator. Following recent approach in empirical studies, both the current and one year lagged real exchanges rates are included, where the latter is intended to account for the sluggish adjustment of trade to changes in relative prices.*

*The results of the study show that both lagged and current real exchange rates are not in a position to exert significant effect on the bilateral exports of the country, in all the three export categories under consideration. The implication is that complementary measures are required to gain competitiveness in international market. Diversifying exports from traditional primary commodities to nontraditional price elastic export items, expanding exports destinations and giving due attention to the quality of exports are reasonable options*

## **CHAPTER I: INTRODUCTION**

### **1.1 Background of the Study**

Export- led growth has been given special attention in many countries. This is so because exports generate scarce foreign exchange reserves that are necessary to finance essential imports required for domestic production and capital formation. The increase in export earning can also improve the balance of payment of a country. Moreover, the re-investment of proceeds from export could play a prominent role in creating employment opportunities for those unemployed (Jordaan and Eita, 2007). Giles and Williams (1999) also added that an expansion in exports may promote specialization in the production of export products, which in turn may boost the productivity level of the export sector accompanied with reallocation of resources away from the relatively less productive nontrade sector to the this more productive tradable sector. Then, the improvement in productivity may lead to output growth.

The period of 1970s marked the shift in economic thinking from import substitution to export promotion strategy, because it was the time when many developing countries which had been following the former strategy, experienced slower growth and rapid inflation. The miracle growth of Japan only within twenty five years after World War II, and the subsequent growth success of the four East Asian “tigers” (South Korea, Taiwan, Hong Kong and Singapore), have also witnessed the importance of the export sector for economic growth. All of these economies relied on increased exports and achieved rapid growth rates (Palley, 2002).

Like most of the Sub-Saharan African and other developing countries, the Ethiopian economy is characterized by shortage of foreign exchange as a result of declining exports, particularly from primary commodity exports, which constitute significant part of the total export earnings of the

country (Gebru, 2004). According to Alemayehu (2002), a decline in prices faced by exporters („terms of trade“), instability of export earnings, and an absolute decline in levels of demand and supply are the main reflections of the adverse impact of dependence on exports of primary commodities.

Overall, the performance of Ethiopia’s export may not be satisfactory enough as can be observed from two main angles. Firstly, the export items of the country have been constrained to only few commodities, with coffee accounting for the lion’s share of the export earnings. Secondly, the share of export in GDP has been low when compared to those of other Sub-Saharan Africa and least developed countries as a whole<sup>1</sup>. In spite of its poor performance, still due emphasis has been given to the promotion of exports.

As parts of the trade liberalization, the transitional government of Ethiopia has taken some trade policy reforms which aimed at promoting exports through diversification of the country’s export items. Devaluation of domestic currency, reduction of tariff rates, simplification of import and export licensing procedures, creation of conducive environment for private exporters through giving state exporting enterprises managerial autonomy but no monopoly power, introduction of duty draw back scheme (whereby exporters are re-funded the tax and duty they paid on the inputs and raw materials used in export production), foreign exchange retention scheme (entitles exporters to retain 10 percent of their earning to hold in their account and to sell the 40 percent at a competitive rate, while submitting the remaining 50 percent directly to the National Bank ) and preferential interest rate scheme for exporters (lower as compared to the rates on non-export activity loans) are the prominent measures ( MEDaC 1999, cited in Teshale 2005). Moreover,

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<sup>1</sup> More detail is given in chapter two.

the Ethiopian Export Promotion Agency was established by proclamation no. 132/1998. The basic objective of the agency is to promote the country's exports.

Taking into account the focus given to the export sector, it is rational to investigate factors affecting export flows between Ethiopia and its trading partners. This study will investigate whether changes in the bilateral real exchange rate of Ethiopia affects the exports of the country in a framework which includes the aggregate export as well as two major export categories: coffee and oil seeds. The choice of these sub-sectors is based on their importance in total exports of the country and the availability of data.

## **1.2 Statement of the Problem**

Real exchange rate is frequently used as a good indicator of competitiveness of a country's exportable as it shows the relative prices of a country's goods and services as compared to those of other countries. Depreciation of real exchange rate implies that the country's products become relatively cheaper as compared to those of other countries and hence the demand for the country's export may increase. It can also affect exporters' return positively making export more profitable thereby encouraging firms to increase the volume of their exports (Alam, 2010).

Before the liberalization policy of 1990s, the exchange rate in Ethiopia had been fixed at 2.07 Birr against US Dollar for almost two decades. The rate was devalued by 140 percent to 5 Birr per 1 US Dollar in October 1992. Recently, in September 2010, the rate was devalued by 20 percent from 13.63 Birr/US Dollar to 16.35 Birr/US Dollar. Apart from these two massive devaluations, there have been changes in the nominal exchange rate of Birr since the abandonment of fixed exchange rate in 1991. Specifically, Ethiopia's currency has been

depreciating from year to year when valued in terms of US Dollar. Of course, this change in nominal exchange rate should be translated into exchange rate in real terms to indicate export competitiveness.

Some empirical studies have shown that depreciation of real exchange rate improves the exports of a particular country through increasing their competitiveness while others reveal that this is may not be realistically achieved. Therefore, the importance of this paper lies in examining the role of real exchange rate in the export performance of Ethiopia.

### **1.3 Objective of the Study**

The primary objective of the study is to examine whether real exchange rate matters for exports of Ethiopia.

Specifically, the study intends:

- i) to investigate the role of real exchange rate in the aggregate exports of Ethiopia,
- ii) to examine the extent to which the real exchange rate shapes the commodity specific exports of the country, and
- iii) to draw policy implications for improving export performance of the country based on the findings of the study.

### **1.4 Significance of the Study**

There is an increasing interest among economists regarding the effects changes in real exchange rate on the export performance of a country. If depreciation of real exchange rate really increases the competitiveness of a country's exports, then it is possible to increase production and boost the export earnings. If such relationship does not exist, then depreciating the exchange

rate may not be a reasonable way of improving the country's competitiveness. In this case, other forms of incentive schemes may be implemented. Hence, the study tries to examine whether exports of Ethiopia during the recent years are influenced by the position of bilateral real exchange rate of the country against its trading partners.

This study scrutinizes not only the overall export over time but also extends its analysis to commodity level with particular reference to coffee and oilseeds. Since different sub-sectors are likely to respond differently to price incentives, using a single aggregated export data may not be a sensible approach to understand the reactions at the sectoral or commodity level. In connection to this, the application of gravity model to sectoral/commodity level analysis is made following recent attempts in some countries. Moreover, the dynamic panel data gravity model and the corresponding system GMM estimation used in this study extends the traditional approach of the static model.

Therefore, the outcome of this study may enable policy makers to make adjustments in the formulation of policies/strategies aim at improving the performance of the export sector. The study is also expected to contribute its own for further studies on the area.

### **1.5 Scope and Limitations of the Study**

The scope of this study is confined to analyzing the effect of real exchange rate on the bilateral exports of Ethiopia to seventeen major trading partners for the period 2000-2009. The data problem on bilateral exports at a commodity level and the intention of the study to examine the role of real exchange in the recent export performance of the country, are two main reasons behind this short period consideration.

The definition of real exchange rate is fraught with some form of disagreement especially on the selection of price indices. However, an attempt has been made to overcome this problem by using the wholesale price index as a proxy for foreign price index and the consumer price index as a proxy for domestic price index, the usually recommended approach. Moreover, taking aggregate and commodity specific export data from two separate sources may make the comparison of their results little odd. However, this option is used to get the complete data for the required export categories.

## **1.6 Organization of the Paper**

This paper is organized in six chapters. The next chapter provides an overview of Ethiopia's exports mainly focusing on the importance of exports in the GDP of the country as well as major export commodities and their destinations. The third chapter reviews the available theoretical and empirical literature on the gravity model as well as measurement of real exchange rate and its effects on export both at an aggregate level and commodity level. Chapter four explains the methodology and data. The econometric results of the study are discussed in chapter five. In chapter six conclusion and policy implications are given.

## **CHAPTER II: OVERVIEW OF ETHIOPIA’S EXPORTS**

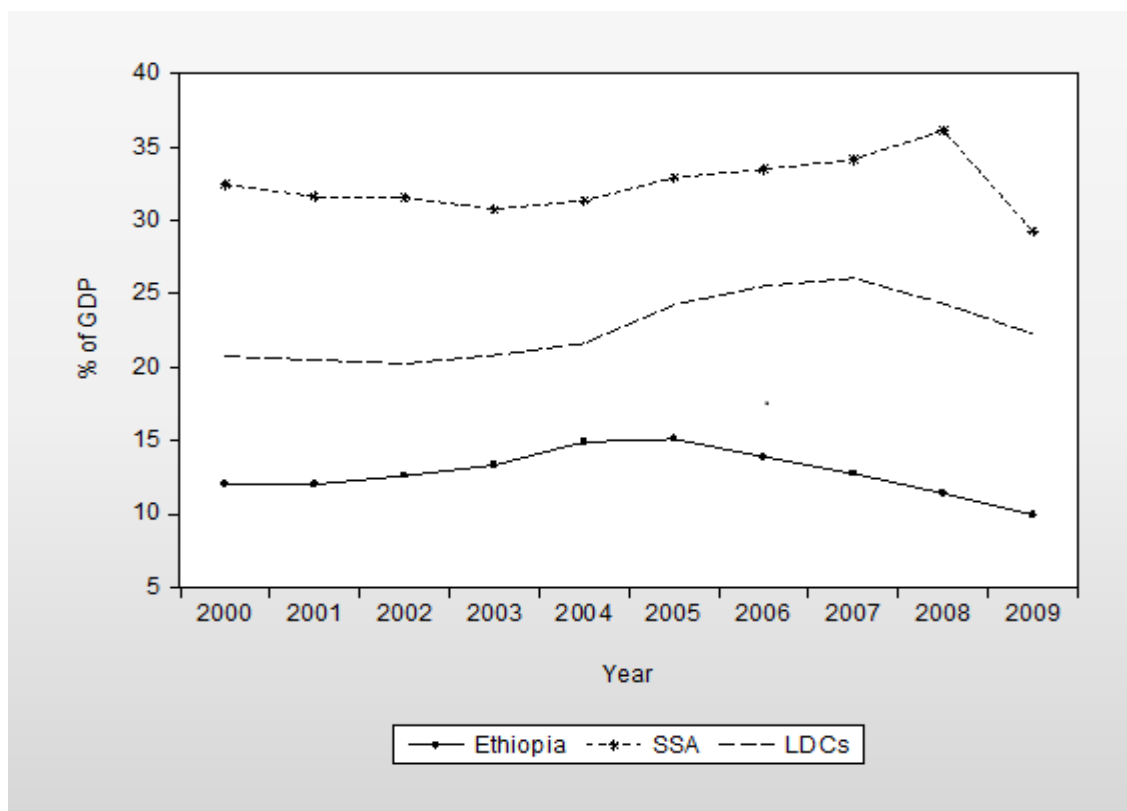
As a part of alleviating the problem of trade balance of Ethiopia, it is rational to improve the earnings from the export sector. However, it may not be an easy task mainly due to the nature of the export items of the country. Being largely an agrarian economy, its exports are mainly composed of primarily commodities. Moreover, the export of the country is also confined to few categories of commodities. This is against the case of East Asian countries which have diversified their exports to larger extents. In the following sub sections, an overview of Ethiopia’s export is given mainly focusing on the share of exports in GDP, major export products and major export destinations.

### **2.1 Share of Exports in GDP**

One of the main considerations in assessing the export performance of a country may relate to its importance in the overall GDP. If the share is high, it can be said that the country is largely engaging in export trade and is benefiting a lot from it. If it is low, this may mean that the country is less involved in the export or it does not earn sufficient revenue from what it exports. The figure below shows the percentage share of earnings from exports in the total GDP of Ethiopia comparing with respective values in Sub-Saharan Africa (SSA) and least developed countries<sup>2</sup> (LDCs) as a whole.

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<sup>2</sup> It is based on United Nations classification



**Figure 2.1: Exports of Goods and Services as Percentage of GDP**

Source: Own computation based on the data from World Development Indicators database (2010)

As shown above, Ethiopia's exports of goods and services as a percentage of GDP, during 2000-2009 period has almost been stagnant with slight increase and decrease during the first five years and the last five years of the period under consideration, respectively. That is, it exhibited petty increment from 12% in 2001 to 15% in 2005; however, it gradually declined to around 10% in the year 2009. Moreover, this value has been substantially lower when compared to the respective values for SSA and LDCs. For example, in the last two years of the period under consideration, the average values of exports (% of GDP) in SSA have nearly been triple of the corresponding value in Ethiopia. Similarly, the average share of export earnings in the overall value of GDP for LDCs has been almost twice that of Ethiopia, during these two years. Hence, it can be said that the size of exports in the country's overall GDP is relatively low.

## **2.2 Major Export Commodities of Ethiopia**

For a long time, coffee has been the largest export item of Ethiopia, both in terms export volume (quantity) and export earnings. However, its share has tended to fall during recent years accompanied with slight diversification towards other export products. Oilseeds, pulses, hides and skins, chat, meat and meat products, live animals, fruits and vegetables, flower, sugar, gold and bees wax constitute the other major export products of the country.

Ethiopia is known for its Arabica coffee in the international markets. Its export takes different forms: not roasted or decaffeinated, not roasted but decaffeinated, roasted but not decaffeinated, as well as roasted and decaffeinated coffee. The unroasted and not decaffeinated coffee accounts for the largest share of total coffee export. Sesame seeds, niger seeds, peanut, linseeds, sunflower, safflower, castor seed, mustard seed and soy bean are the main types of oilseeds exported to foreign markets.<sup>3</sup>

The importance of the export products in the country's overall export can be observed from their contribution in terms of volume (quantity) of export and their share in the total export revenue. The following two consecutive tables show these figures for a period of 10 years. Table 2.1 shows the magnitude (volume) of major export items for the period under consideration. Table 2.2 indicates the respective share of these export commodities in the total export earnings of the country.

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<sup>3</sup> Based on the raw data from the Revenue and Customs Authority of Ethiopia

**Table 2.1: Volumes of Major Export Products (in thousands of metric tons)**

COMMODITY	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Coffee	116.6	99.1	110.3	126.1	156.4	161.1	147.7	175.7	170.7	134
Oilseeds	43.1	55.1	76.6	82.8	105.9	170.8	265.6	230.8	152.1	287
Pulses	23.5	26.9	109.2	66.2	73.3	121.7	110.4	156.7	233	138
Hides and skins	8.6	12.4	10.3	10.5	9.4	15.6	15.4	15.6	12.3	7.3
Fruits and vegetables	20.7	17	29.7	25.3	36.8	3.8	3.5	39.7	39.9	38.5
Chat	15.7	11.9	9.4	6.1	43.7	19.4	22.3	22.7	22.4	25.4
Sugar	17.2	57	58	77	16	15	0.00	0.00	63.4	47.6
Live animals	1.8	0.2	0.2	0.6	3.1	21.2	33.3	43.7	40	36.7
Meat products	2	0.9	0.7	1.7	4	7.3	8	5.9	6.5	7.5
Flower	0.00	0.00	0.00	0.00	0.00	0.00	6.3	13.6	22.4	29.2
Others	0.2	0.3	0.3	0.2	0.4	0.4	201.1	129.7	75.5	67.1
Grand Total	249.4	280.8	404.7	396.6	449.2	570.3	844.9	834	838.3	818.6

Source: National Bank of Ethiopia, annual reports (various issues)

The above table reveals that there are some fluctuations in the volume of exports supplied to foreign markets. Despite the variations from year to year, the exported quantities of most commodities are relatively higher during the latter periods. From example, the export volume of oilseeds has increased from 43 thousand metric tons in 1999/2000 to 287 thousand metric tons in 2008/09. Similarly, the respective volume of pulses has increased from 23.5 thousand metric tons in 1999/2000 to 233 in the year 2007/08. In addition, the decline in the exports of chat during the first four years of the period under consideration has been reversed in the latter years with moderate improvements from year to year. The other notable figure from table 2.1 is that flower has also become one of the major export products of the country since 2005/06.

**Table 2.2: Value Share of Major Export Products (as percentage of total export values)**

COMMODITY	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Coffee	53.91	38.90	36.07	34.24	37.22	39.57	35.42	35.78	35.90	25.85
Oilseeds	6.45	6.90	7.21	9.55	13.77	14.76	21.13	15.82	14.93	25.11
Pulses	2.02	1.86	7.28	4.13	3.76	4.18	3.70	5.92	9.77	6.23
Hides and skins	7.24	16.22	12.28	10.82	7.26	7.98	7.50	7.55	6.73	5.02
Chat	15.63	13.06	10.83	12.02	14.66	11.82	8.90	7.81	7.34	9.52
Gold	6.57	6.01	7.78	8.72	8.11	7.00	6.47	8.26	5.39	6.80
Fruits and vegetables	1.12	1.17	2.07	1.98	2.12	1.90	1.32	1.36	0.87	0.82
Sugar	0.61	1.75	2.20	3.71	1.71	0.07	0.00	0.00	0.13	1.17
Live animals	0.36	0.04	0.18	0.10	0.32	1.51	2.75	3.09	2.76	3.55
Meat products	0.83	0.37	0.24	0.50	1.29	1.72	1.85	1.30	1.42	1.80
Flower	0.00	0.00	0.00	0.00	0.38	0.92	2.18	5.37	7.61	9.04
Bee's wax	0.14	0.19	0.16	0.10	0.16	0.13	0.14	0.15	0.13	0.11
Others	5.13	13.53	13.68	14.13	9.24	8.42	8.63	7.59	7.04	4.98
Grand total	100	100	100	100	100	100	100	100	100	100

Source: Own computation based on data from National Bank of Ethiopia, annual reports (various issues).

As it can be observed from the above table, the values of coffee export have assumed the lion's share in the overall earnings from exports for most of the years under consideration. In 1999/2000, its percentage share in the total values of export has been quite higher than those of other export items. During the eight years that followed (2000/01-2007/08), its relative contribution has been moderate lying between 34.24% in 2002/03 and 39.57 in 2004/05. However, during the year 2008/09, its share has significantly declined and the gap has been filled by proportionate increased share of oilseeds.

Moreover, for most of these periods, the export earnings of the country has largely been dominated by the earnings from the first six export items, namely, coffee, oilseeds, pulses, hides and skins, chat and gold. The combined share of these commodities, in the total values of

export, ranges from 78.5% in 2008/09 to 91.82% in 1999/2000. In the latter years, flower has also obtained an important place in the export earnings of the country.

The other consideration relates to the unit value of exports. This might show the importance of a unit of an export item. In addition, it may indicate the changes in the unit prices of these commodities over time. Table 2.3 below gives this figure for selected export categories.

**Table 2.3: Unit Value of Exports (Birr per kilogram)**

COMMODITY	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09
Coffee	18.31	15.33	12.63	11.25	12.32	18.01	20.83	21.21	28.68	29.34
Oilseeds	5.92	4.90	3.64	4.78	6.73	6.34	6.91	7.04	13.39	13.31
Pulses	3.40	2.71	2.58	2.59	2.66	2.52	2.91	3.90	5.72	6.86
Hides and skins	33.29	51.07	45.91	42.49	39.98	37.41	42.30	50.03	74.60	104.71
Chat	39.45	42.80	44.65	81.54	40.99	44.70	34.74	36.04	44.67	57.01
Fruits and vegetables	2.13	2.68	2.70	3.25	2.98	3.67	3.29	3.48	2.97	3.22
Sugar	1.39	1.20	1.47	2.00	5.53	0.35	-	-	0.28	3.75
Live animals	8.00	7.03	43.05	6.80	5.24	5.22	7.19	7.40	9.42	14.70
Meat products	16.55	16.52	14.22	12.07	16.64	17.34	20.22	23.17	29.91	36.58
Flower	-	-	-	-	-	-	30.20	41.27	46.33	47.12
Bee's wax	25.58	23.31	21.07	21.91	19.12	25.06	37.48	38.79	71.40	77.17

Source: National Bank of Ethiopia, annual reports (various issues).

As it can be observed from the above table, hides and skins, chat, coffee, meat products, flower and bee's wax have relatively higher unit values than others. Notwithstanding their considerable share in the total volume of export, the per kilogram export values of oilseeds and pulses have mostly been low. On the other hand, there have been some fluctuations in the unit values of most export items especially in the first four/five years.

## 2.3 Major Destinations of Ethiopia's Exports

The analysis of the major export markets of the country can be seen in terms of the major export destination countries and major destination continents. As it can be clearly observed from the two consecutive tables below, the exports of Ethiopia are highly confined to particular markets from year to year.

**Table 2.4: Major Export Destination countries (2005/06-2009/10)**

COUNTRY	2005/06	2006/07	2007/08	2008/09	2009/10
Germany	9.82	11.77	9.52	9.17	9.81
China	13.34	5.04	4.98	12.76	11.65
Netherlands	3.78	4.75	6.88	8.39	7.38
Italy	5.48	6.34	5.21	4.19	2.35
Saudi Arabia	5.43	6.18	7.93	7.70	6.12
Switzerland	6.62	4.99	5.49	7.45	6.10
Japan	7.83	6.12	6.15	0.47	1.19
United States of America	4.72	4.99	7.18	4.85	3.89
Sudan	2.42	4.37	3.85	4.86	5.76
Djibouti	5.65	4.15	3.66	3.13	2.51
Belgium	2.64	3.72	3.37	2.44	2.24
Turkey	1.43	3.16	2.73	1.58	1.67
United Kingdom	2.59	2.82	2.16	4.09	2.18
United Arab Emirates	2.15	2.62	3.82	4.09	3.88
Yemen	2.33	2.36	1.89	4.06	0.82
Somalia	3.81	2.22	4.91	2.05	8.61
Israel	1.99	2.11	3.24	6.80	2.61
France	2.02	2.03	1.38	2.76	1.20
India	0.75	1.17	1.01	1.03	1.22
Egypt	1.45	0.66	0.60	1.03	1.56
Others	15.20	18.46	14.05	7.11	17.26
Grand Total	100.00	100.00	100.00	100.00	100.00

Source: Ministry of Trade of Ethiopia

The above table shows the major export destination of Ethiopia at a country level. The values given in the table indicate the percentage share of the earnings from exports to each respective country out of the total export earnings of Ethiopia in specific year. The importance of these countries has been fluctuating over the years, with either Germany or China taking the top rank in all cases. For example, during the year 2005/06, China had been the most important export destination for Ethiopia followed by Germany and Japan. During the year 2006/07, Italy and Saudi Arabia were the second and third major export markets of Ethiopia following Germany. In the year that followed, Saudi Arabia was the second followed by United States of America. Finally, in the latter two years of the period under consideration, China and Germany were the first and the second most important sources of revenue for Ethiopia's exports. Netherlands and Somalia were the third major export destinations for the 2008/09 and 2009/10, respectively.

On the other hand, it can be inferred from the above table that African countries such as Sudan, Djibouti, Somalia and Egypt are also becoming important export markets for Ethiopia's products. This may show an encouraging effort towards utilization of regional and neighboring opportunities.

**Table 2.5: Export Destination by Major Continents (2005/06-2009/10)**

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

Source: Ministry of Trade of Ethiopia

As it can be observed from the above table, the highest share of export earnings of the country have been obtained from exports to Europe, except in the year 2005/06, when Asia was the top export destination continent. On average, the two continents absorb more than 70% of export of the country. Export to Africa takes the third rank, with slight improvement in its share in the year 2009/10. America (both North America and South America) and Oceania are the fourth and fifth important markets, where the share of the latter lies below 0.5% in all these years. The increased role of African and Asian countries in contrast to those of European and America (of which North America is the dominant) may mean the gradually increasing importance of the so called „south- south“ trade.

## CHAPTER III: REVIEW OF LITERATURE

### 3.1 Theoretical Literature

#### 3.1.1 Gravity Model

Although it can be applied to other fields of study like human migration and investment flows across countries, gravity model is one of the most important empirical approaches in international trade. Accordingly, an extensive amount of literature has been published on this model. Its origin goes back to the Newton's law in physics, in which the gravitational attraction between two objects is equated to the product of their masses divided by the distance between them (Rahman, 2006).

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

After the initiative works by Tinbergen (1962) and Pöyhönen (1963), the gravity models have been widely used in empirical studies of international trade. Nevertheless, the models have been subjected to criticism for their lack of clear theoretical foundation. In other words, they have been considered as simple intuition derived from the physical forces of attraction and repulsion. As a result, gradual improvements have been made overtime to fill the theoretical gap and thus to improve the explanatory power of the model (Alemayehu and Atnafu, 2008).

The first important consideration in the improvement of the gravity model is the addition of relevant variables which may explain trade across countries or regions. Explanatory variables like population size, GDP per capita and real exchange rate have been used to the gravity models by different researchers at different time (for example, Frankel *et al*, 1995; Matyas *et al*, 2000; and Elliott and Ikemoto, 2004). In addition, some dummy variables have been incorporated to capture geographical, cultural, institutional and related factors that may influence bilateral trade flows (for example, Aitken, 1973 and Endoh, 1999).

The other development in overcoming the lack of theoretical underpinnings of gravity model involves its derivation from relevant theories of international trade. Linnemann (1966) was the first researcher who tried to provide some theoretical foundation for the model. His main contribution relates to derivation of gravity equation as a reduced form of partial equilibrium model of export supply and import demand, where price variables ignored. However, this early effort appeared to be inconsistent with the multiplicative form of the partial equilibrium model (Aguilar, 2006).

Anderson (1979) leads the formal attempt of deriving the gravity equation. He derived it from the properties of the expenditure system under a hypothesis of identical homothetic preferences across regions. That is to say, if consumers with different income levels in different regions face the same prices, then their demand for goods will be in the same proportions. Apart from the Cobb-Douglas assumption stressed in the analysis, he also gave an account of constant elasticity of substitution (CES) preferences. The concept of product differentiation was a quite important consideration in both cases. It builds upon an Armington assumption which dictates that

products are differentiated by country-of-origin whereby each country producing a single specialized product.

Helpman (1987) and Bergstrand (1985; 1989) also extended the use of gravity equation based on monopolistic competition model. However, the product differentiation among the producing firms is assumed instead of product differentiation by country of origin. Monopolistic competition was intended to explain the argument that different countries specialize in production of differentiated products because of the economies of scale at the firm level.

Moreover, Deardorff (1995) derived the gravity model of bilateral trade from two extreme cases of the Heckscher-Ohlin (H-O) model. The first is the frictionless trade, the case in which absence of all barriers to trade in homogeneous products causes producers and consumers to be indifferent among the trading partners, as long as they buy or sell the desired goods. Based on this conjecture, he obtained expected trade flows that correspond to simple gravity equation whenever preferences are identical and homothetic. In the second case, assuming countries producing differentiated goods, he derived the gravity equation with Cobb-Douglas preferences and then with Constant Elasticity of Substitution (CES) preferences. Anderson and Wincoop (2003) also successfully derived an operational gravity model from the CES system. Their analysis critically advocates the desirability of basing the estimation of gravity equation on relevant theories.

Similarly, Evenett and Keller (1998) tried to assess the empirical success of the gravity model based on two important theories of trade, the H-O theory and the increasing returns theory. An imperfect specialization model with differences in factor endowments as sources of trade, best explain the pattern of international trade while a model of imperfect specialization that includes

both increasing returns and factor endowments predicts only production of more differentiated goods when the level of intra industry trade is higher. However, the perfect specialization models of the two theories fail to give sound explanation for the empirical success of the gravity equation.

In a nutshell, although a number of trade models have contributed to the empirical the success of the gravity equation, two of them are worth mentioning. First, the importance of the H-O theory lies in explaining bilateral trade flows among countries with large factor proportion differences and high shares of inter-industry trade (so-called „North-South“ trade). Second, the differentiated product model would be responsible for explaining bilateral trade flows among countries with high shares of intra-industry trade (so called „North-North“ trade) in increasing returns with monopolistic competition (Sohn, 2001).

The final consideration relates to the ways of analyzing trade flows using the gravity model. According to Harris and Matyas (1998), the major drawbacks of earlier studies emanate from the nature of the data used and model restrictions. That is, much of the studies have been undertaken based on cross-section of country data in one time period, or upon single time series data in a country-by-country approach. However, in order to account for heterogeneity across countries in trade flows, recently gravity models have been modified to a panel data setting, in which case several time series of cross-section data sets would be considered (Harris and Matyas, 1998).

### 3.1.2 Measuring Real Exchange Rate

The real exchange rate (RER) can either be bilateral or multilateral exchange rate (also called real effective exchange rate). The latter is calculated as a weighted average of the most important bilateral rates, with the weights commonly determined by each foreign country's share in total trade. In other words, the bilateral real exchange rate measures competitiveness between two trading partners but the multilateral real exchange rate indicates a country's competitiveness relative to a group of its trading partners (Motlaleng, 2004).

There are some controversies in constructing real exchange rate index. Although this variation is not per se serious, it can sometimes provide contrasting results. Basically, we have two main categories of real exchange rate; those based on purchasing power parity (PPP) on one hand and those based on the tradable and non tradable distinction on the other. According to the first definition, the real exchange rate will be defined as the nominal exchange rate adjusted by the ratio of the foreign price level to the domestic price level (Edwards, 1989). That is,

$$\text{RER} = \text{NER} \frac{p^f}{p},$$

where, RER is the real exchange rate, NER is the nominal exchange rate,  $p^f$  is foreign price level and  $p$  is the domestic price level.

Alternatively, according to the second version, real exchange rate is defined as the ratio of domestic prices of the tradable goods to prices non-tradable goods. This second definition provides the incentives for resource reallocation between the tradable and non tradable sector; an increase in RER makes the production of tradable goods relatively more profitable thereby inducing resources to move out of the non-tradable sector and into the tradable sector (Ibid).

The real exchange rate calculated on the basis of the distinction between the tradable and the non-tradable commodities is constrained on the ground that the prices for such commodity groups are not widely available (Kipici and Kesriyeli, 1997). In other words, the idea of price relation between tradable and non-tradable goods breaks down in situations where no clear distinction exists between tradable and non-tradable goods (Snape, 1988). Hence, this theoretically appealing approach of measuring real exchange rate would not be easy in real application.

The other problem in calculating real exchange rate is the choice of price/cost indices to be used. Wholesale price index (WPI) and/or producer price index (PPI), consumer price index (CPI), GDP deflator, export unit values and unit labour costs are the main indices used in the construction of real exchange rate. However, each index has its pros and cons.

Consumer price indices, wholesale price indices, and GDP deflators are all criticized on the ground that they include both traded goods and non-traded goods. Since the prices of the two categories of goods may diverge over time due to differential sectoral productivity growth, the aggregate price indices may not properly represent the prices of tradable goods. Relatively, whole sale price index covers more of the tradable goods sectors, but the commodities included in this index are composed of similar tradable goods whose prices don't differ significantly when measured in a common currency unit. Thus, the movements in a real exchange rate index constructed using this index may not explain the actual changes in a country's competitiveness level sufficiently. That notwithstanding, it is usually used as a proxy for foreign currency deflator because it is a good representative of the prices of internationally traded goods (Lafrance *et al.*, 1998).

GDP deflator-based measures are basically comparable across countries; however, they are not available on the monthly basis which makes them less important for studies requiring monthly or less than a year analysis. In this regard, consumer price indices are frequently used in constructing real exchange rates, not only because they are similarly constructed across countries but also they are available for a wide range of countries over a period of time (Ellis, 2001).

Export unit values are crucial in capturing export costs and prices. Despite their advantage in excluding non-traded goods, there are certain cases that limit their applications. The first important caveat is that the basket of goods differs across countries to a greater extent for export unit value than for the other indices. As long as export pattern differs significantly across countries, the composition of the export unit values also tends to vary (Terra and Vacia, 2008). Second, real exchange rate based on total export unit value may not be a good measure of competitiveness in countries where a single or only few products account for the largest share of their exports since it is measured as a weighted average of exported goods prices. Third, unit value data are not available on a timely basis for many countries (Ceglowski and Golub, 2002).

Cost indices, mainly unit labour costs, are also sometimes used as measure of external competitiveness. They are commonly measured as labour cost per unit of output or equivalently labour cost divided by output per worker (Motlang, 2004). The basic problem associated with these indices is that they are quite sensitive to cyclical changes in labour productivity. For example, a shift towards a more capital-intensive production may lead to a lower total production cost per unit, and thus a gain in competitiveness. However, the associated fall in the unit labour cost will overstate this gain in competitiveness since unit labour costs fall relatively

more than total costs do per unit. This is to mean that changes in unit labour cost-based real exchange rate index may arise not only from changes in competitiveness, but also from the capital to labour ratio that is not related to competitiveness (Nilsson, 1999).

The other trouble is the doubt on the reliability and the availability of data on labour productivity and labour compensation used in computing unit labour costs. Unit labour costs also do not take in to account other costs of production such as costs of intermediate goods, capital costs and non-labour taxes (Ceglowski and Golub, 2002).

### **3.2 Empirical Literature**

In empirical studies, the question whether or not the real exchange rate matters for exports of countries is fraught with some forms of disagreement. There are a lot of results in favor of the conventional view which expects positive effect of real exchange rate depreciation on exports. In contrast, it is also evident to get findings with an adverse effect. Still other researches indicate that exports are almost insensitive to changes in competitiveness. According to Alam (2010), the prevailing literature on whether real exchange rate depreciation promotes export or not, provides different results which may vary mainly due to the economy concerned, technique used, and extent considered.

The studies of the export performance by many researchers focus either on aggregate export or industry (product-specific) analysis. Of course, there are also efforts by others to consider both cases. The following are few of substantial studies on exports in which the role of real exchange rate has been examined.

### 3.2.1 The Effects of Changes Real Exchange Rate on Aggregate Exports

Previous studies indicate that real depreciation of exchange rate played vital role for improvements in the export performance of some countries by increasing the competitiveness of their products in international markets. For example, Arslan and Wijnbergen (1993) tried to find the driving forces behind the Turkish miraculous export growth during the 1980-87 periods. The result of the study showed that the export boom was largely triggered by macroeconomic policies and trade reform that allowed a steady real depreciation of its Lira.

Damijan *et al* (2008) also examined the reasons behind the remarkable growth of export performance of transition economies of the former socialist countries of Central and Eastern Europe (CEEC). They decomposed factors determining export performance into the foreign market access and supply capacity. Further, the importance of individual factors determining the supply capacity was also assessed. Supply capacity is formulated as a function of GDP, GDP per capita, real exchange rate, foreign direct investment, productivity level, institutional changes, and technological development. The first two explanatory variables approximate the economic potential of the exporting country while the remaining are meant to represent factors which affect the country's ability to adjust to the changing global demand patterns. The result showed a negative impact of real exchange rate appreciation on exports.

Moreover, Babatunde (2009) made an attempt to inspect the response of merchandise exports to real exchange rate-based trade liberalization in Sub-Saharan Africa (SSA), between 1980 and 2005. It builds up on the claim that trade liberalization would likely depreciate real exchange rate where the latter is used as a proxy for relative price of exports. The study covers the period when a significant reduction in trade barriers was put into action across many SSA countries to boost exports and foster economic growth. The panel least squares estimation reveals that a

more competitive and stable real effective exchange rate depreciation can enhance the export performance of the region. A more detail heterogeneous panel analysis shows that the results vary across the four sub-regions (West, East, Central, and Southern Africa) of SSA.

Gravity models are usually augmented with the real exchange rate variable to capture the effect that changes in competitiveness of a country's export items may have on its export performance. In most cases, the affirmative role of real exchange rate depreciation on exports is confirmed. For example, in assessing the trade between the Mercosur member countries (Argentina, Brazil, Uruguay and Paraguay) plus Chile and fifteen European Union member countries, Martinez-Zarzoso and Nowak-Lehmann (2003) supplemented the standard gravity model with real exchange rate. Their result demonstrates that real depreciation of exchange rate leads to significant rise in export.

Guided by the basic goal of analyzing the determinants of tradable flows between developed and developing countries, Ricchiuti (2004) also used a gravity model augmented with technological distance and bilateral real exchange rate. Estimating a fixed effects model for different groups of countries, he obtained a result showing a positive effect of real depreciation of exchange rate on export.

In addition, Rahman *et al* (2006) augment the traditional gravity model with bilateral real exchange rate and other important variables, in order to investigate the trade creation and trade diversion effects of a number of Regional Trading Agreements ( RTAs), with special focus on the South Asian Free Trade Area (SAFTA). Unlike the usual case of considering the exporting country exchange rate, their model incorporated real exchange rate of dollar in terms of domestic currency, both for exporting as well as importing countries. The coefficient of exporter

real exchange rate was expected to be positive while that of importer was expected to be negative. The result verifies the expectation; however, the effects are very low in both cases.

Aristotelous (2008) applied a generalized gravity model with a panel data of export between Greece and twenty-one developed countries for the period 1981-2005. The result illustrates that a real appreciation in the value of Greece's currency leads to a significant decrease in Greek exports. In the same way, Oh and Tumurbaatar (2011) used bilateral trade data to analyze trade between Mongolia and its fifty-nine main trading partners from 1995 to 2008. The study adopts the pooled OLS instead of fixed or random effect to analyze the panel data. Their result shows that the real appreciation of exchange is associated with decline in exports. Following a slightly different approach, Nguye (2010) estimated both static and dynamic gravity models to Vietnamese export flows and obtained positive effect of real exchange rate depreciation on bilateral trade between Vietnam and a foreign partner. However, the estimated effect is small.

Younes and Taleb (2006) using similar gravity model approach came up with a result that contrasts the findings of the above studies. The standard gravity model is augmented with a number of variables to test their relevance in explaining trade bilateral trade flows between European Union and Arab Mediterranean countries for the period 2001 to 2004. These variables are real exchange rates, infrastructure endowments and squared differences in per capita incomes. Real exchange rate is defined as the local currency value of one unit of foreign currency, multiplied by the ratio of foreign country GDP deflator to domestic country GDP deflator, so that an increase in the value of real exchange rate would imply depreciation. Unexpectedly, real exchange rate elasticity of export is found to be negative.

It is also not surprising to get results with insignificant coefficients for real exchange rate. For example, Fang and Miller (2004) revisited the weak relationship between exchange rate depreciation and exports of Singapore. The evidence shows that depreciation does not significantly improve exports but exchange rate risk (generated by fluctuation) impedes export. They suggested that Singaporean policy makers should promote export growth by stabilizing the exchange rate rather than generating its depreciation.

The gravity model analysis by Srinivasan and Archana (2009) also reveals insignificant role of real exchange rate variable in the aggregate exports of India. In Ethiopia, similar study by Yishak (2009) indicates that real exchange does not have significant effect on Ethiopian export performance. However, this study focuses merely on the aggregate export of the country.

All the studies considered above give mixed results for the responsiveness of exports to changes real exchange rate. Though not much comprehensive, attempts have also been made to account for some factors affecting the real exchange rate elasticities of exports. To assess whether or not the effect of real exchange on export considerably varies because of the employed methodology, Wang and Ji (2006) applied both time series and panel data estimation to bilateral trade flows between China and its top trading partners. The analysis of the generalized gravity model indicates largely consistent results in both cases, showing the robustness of the findings of the study under different methodologies.

On his side, Campa (2002) examined the reactions of export behavior to changes in bilateral exchange rate both in nominal and real terms with reference to eight countries in Latin America that experienced extreme nominal exchange rate depreciation. The results reveal that higher bilateral depreciations lead to larger increases in exports from the devaluating country. The

effect is more imperative for the real than for nominal exchange rate movements. The other notable point from the results is that the sensitivity of bilateral export flows to changes in real exchange rate is quite higher for export flows to industrialized countries than to other countries. This may give a little clue to suggest that the nature of the export destination matters for the real exchange rate elasticity of exports.

To examine the variation in responsiveness of exports due to the nature of the destination economy, Cheung (2007) compared the performance of Hong Kong's exports particularly to the USA and Japan as well as aggregate exports to the rest of the world, using a monthly data from 1991 to 2001. The quantity of the country's export demand is postulated as a function of foreign country's real income and relative price of exports as represented by Hong Kong's real exchange rate. The cointegration framework was employed to scrutinize the long-run and short-run interactions between these variables. The short-run price effect is weak. The coefficient is significant only for exports to Japan. On the other hand, exports have empirical long-run relationship with real exchange rate, in all three cases. However, estimated aggregate price elasticity is smaller than the destination country-specific elasticity estimates.

This was further extended by Berthou (2008), who intended to examine whether the reaction of exports to real exchange rate movements can differ due to the characteristics of the destination country under consideration. As a result, he derived and estimated a gravity equation for twenty OECD exporting countries along with fifty two developed and developing importing countries. The result shows that the real exchange elasticity of export is reduced when the destination country is located at more distance and has a low quality of institutions. The low efficiency of

customs in both the importing and exporting countries were also found to make export response to real exchange rate less elastic.

### **3.2.2 The Effects of Changes in Real Exchange Rate on Sectoral/Commodity-Specific Exports**

The responsiveness of aggregate exports to changes in real exchange rate and to changes in other explanatory variables may not explain the behavior of exports at more disaggregated level. Hence, apart from the aggregate export analysis, there have been other empirical studies with detailed sector, sub-sector or product specific focus. Like the results in the overall export analysis, there are mixed results for the effects of real exchange rate on exports. Some of these studies are discussed below.

Kim *et al* (2004) examine the effects of the Canada–US exchange rate on bilateral trade of agricultural goods between the two countries. The study utilizes two time series models: the vector error correction model (VECM) and the vector moving average model (VMA) with quarterly time series data from 1983 to 2000. The result shows that U.S. exports to Canada are significantly affected in the short run by the real exchange rate between the two countries. In the long run, however, the impact of the real exchange rate on US exports is reduced. Unfortunately, the reverse effect, the response of the Canadian agricultural exports to the real exchange rate shock is not examined.

Another agricultural sector analysis has been undertaken by Hatab *et al* (2010) who employed a gravity model to analyze the main factors influencing Egypt's agricultural exports to its 50 major trading partners for the period 1994 to 2008. The fixed effects result indicates that real

depreciation of Egyptian Pound against the currencies of its trading partners stimulates agricultural exports of the country.

Thorbecke and Zhang (2008) used a panel data set including China's labor-intensive manufacturing exports to 30 countries. These goods include carpets, clothing, fabrics and yarns, furniture, knitwear, and leather. The exports are estimated as the functions of bilateral real exchange rates and incomes of the importing countries. The results indicate that an appreciation of real exchange rate would substantially reduce China's labor-intensive exports. The elasticities are relatively higher for knitwear and furniture but smaller for yarns and fabrics, with those of others in between the two.

A relatively more comprehensive study was carried out by Nowak-Lehmann *et al* (2005) who applied an extended version of the gravity model to estimate a panel data of exports from sixteen Turkey's most important sectors to European Union (EU) for the period 1988 to 2002. Despite moderate differences in elasticities, an improvement in Turkish price competitiveness (expressed as an increase in the Turkish real effective exchange rate) led to a significant enhancement in Turkish exports in almost all sectors.

Single product assessment has also been considered in many studies. For example, augmenting the usual gravity model with real exchange rate, Jordaan and Eita (2007) analyzed the determinants of South African leather product exports to thirty -two trading partners using annual data for the period 1997 to 2004. The result gives the expected negative effect of appreciation of the real exchange rate on leather exports, but the coefficient is not statistically significant.

In other studies, distinct industry (product-specific) export supply functions are estimated based on a proposition that adjustments in exports are largely supply driven. Accordingly, the export supply functions would be formulated with real exchange rate as one of the independent variables. For example, Cameron and Uz- zaman (2005) estimated export supply function of the Pakistan carpet industry (which represents an important source of revenue for the country) over the period 1970-2003 using an error correction model. According to the result, exchange rate in real term has the expected sign and is statistically significant showing an adverse effect of its appreciation on export.

Similarly, Pollen (2008) attempted to model Zambian copper export supply by specifying it as a function of real exchange and other explanatory variables. The cointegration and error correction model analysis indicates that real depreciation of exchange rate affects the copper export supply only in the long run.

In the Ethiopian case, the study by Asmerom (1999) takes into consideration sales (production) as well as net new planting for a panel of 276 small-scale coffee farmers during the period 1992-1994. In addition to the fixed and random effects models, he also estimated the short run and the long run panel data. Accordingly, it is obtained that the sales and new planting of coffee are significantly (positively) affected by depreciation/devaluation of real exchange rate both in the long run and in the short run.

Moreover, the study by Gebrelibanos (2005) shows that export supply of oilseeds is positively affected by real exchange rate both in the long run and in the short run. That is to mean depreciation of real exchange rate enhances the export supply of oilseeds. Getachew (2009) also contributed his own to the analysis of the export supply, focusing on the recently flourishing cut

–flower export of Ethiopia. Estimating a panel data of 33 exporting firms from 2005 through 2008, he shows that both real exchange rate and its lag value have significant influence on cut-flower export. However, the coefficient of current real exchange rate unexpectedly is negative, dictating an adverse effect of real depreciation of exchange rate on export.

However, Edwards and Alves (2005) investigated the determinants of South African manufacturing export performance estimating both the export supply and demand functions. Their analysis reveals that the country's manufacturers are on average price-takers in the international markets. This implies that foreign export demand in terms of market access is not a predominant constraint to export growth. In other words, exports from this sector are essentially supply driven. It was then shown that the real depreciation of South Africa's rand in 1990s has played an important role for the growth in manufacturing exports during the period under consideration. They also added that the volatility of exchange rate has restricted new entrants and resulted in a slow response of export supply to real depreciation of exchange rate than otherwise would have been the case.

Existing literatures also witness circumstances in which the real exchange matters for some product categories but turns out to be insignificant for others. The study by Fosu (1992) in Ghana verified this variation in the commodity specific response of agricultural export to real exchange rate. He focused on three major export commodities of the country- cocoa, coffee and sheanuts. Accordingly, the OLS estimation result reveals that real exchange rate significantly affects the export of the first two whereas that of sheanuts is shown to be irresponsive to changes in real exchange rate. The real exchange rate elasticities of both cocoa and coffee export are themselves less than unity, implying the inelastic response of these exports to a change in the real exchange rate. Specifically, the result shows 10 percent depreciation

(appreciation) of the real exchange rate leads to a 1.82 percent and 4.42 percent increase (decrease) in cocoa and coffee export volumes, respectively.

In a similar fashion, Ndung'u *et al* (2002) examined the role played by real exchange rate in Kenya's export performance, by disaggregating total exports of goods and services into three categories including the traditional agricultural exports of tea and coffee, and „other exports of goods and services“. Their analysis shows that real exchange rate has a remarkable positive effect on the volume of export supply for coffee and „other goods and services“ in the long-run. In the short run, the export responses to price incentives are weaker than the long run effects. However, no cointegrating long run relationship is established between tea exports and real exchange rate.

On the other hand, Kiptui (2007) investigated the impact of the real exchange rate on the demand for exports in an export demand framework for Kenya's major export categories: tea, coffee, horticulture and manufactured goods. A bounds testing result indicates the existence of positive long-run effect of real exchange rate depreciation on exports of only coffee, tea and horticulture. The result also demonstrates that the real exchange rate has positive effect in the short-run but the effects are insignificant. The implication is that the effects of the real exchange rate are more likely to be long-run in nature rather than short-term for Kenya.

Moreover, Trang *et al* (2008) analyzed the role of real exchange rate in the export of different product groups with particular reference to Vietnam for the period 2004 to 2008. They categorized the export products into two main and eight small sub groups. The two broad categories are primary and manufactured products. Further, the two sectors are equally disaggregated into four sub-groups each. An augmented gravity model is estimated using Tobit

estimation method to account for the censored data. The overall result shows that the impact is stronger in the case of manufactured product group than the case of primary product group. Further analysis of respective sub- groups demonstrates a significantly affirmative impact of real exchange rate depreciation on export of all product groups except for the sub group comprising essential products like mineral fuels, lubricants, and related materials whose demand is highly inelastic.

There have not been clear-cut reasons why the elasticities differ across the sub-groups. Few empirical studies have been carried out to scrutinize whether the degree of responsiveness of exports to changes in competitiveness could be influenced by such circumstances like the price indices used in constructing real exchange rate, the methodology employed and the nature of the commodity itself.

Ceglowski and Golub (2002) tried to investigate the effect of South African real exchange rate on manufacturing export competitiveness for the period 1970 to 1998. They calculated the real effective exchange rate of the rand, alternatively using consumer Prices, GDP deflator, wholesale Prices, manufacturing value added deflator, and unit labour costs. Their analysis confirms the premise that depreciation of real effective exchange rate leads to improvement in the manufacturing exports from the country, with the magnitude of the elasticity varying based on a way the real exchange rate is calculated, and on the specification of the regression equation.

With regards to the nature of the products, the real exchange rate elasticities of the exports are supposed to be weaker for „parts and components“ than those of other manufacturing products. Among others, the studies by Athukorala(2004) and Jongwanich (2007) confirm this hypothesis.

The former investigates the role of the real exchange rate in Thailand's export performance over 1995–2003. In the study, export volume is estimated as a function of real exchange rate, capacity utilization, world trade volume and a dummy representing crisis periods for total manufactured exports and four sub-categories including chemicals, machinery and transport equipment, basic (resource-based) manufacturing, and miscellaneous manufacturing. The results display significant differences in the magnitude of real exchange rate elasticities across the sub-groups, with the smallest coefficient for machinery and transport equipment.

Jongwanich (2007) conducted a similar study for nine economies in East and Southeast Asia comprising People's Republic of China, Hong Kong, Taipei-China, India, Indonesia, Korea, Malaysia, Singapore and Thailand, during the period 1990–2006. She estimated the export function with real exchange rate, domestic production capacity and importing countries' real income as explanatory variables. To investigate whether trade in parts and components really behaves differently to changes in real exchange rate, export equations are estimated for three different export categories. These are total merchandise exports, manufacturing exports, and machinery and transport equipments. The cointegration analysis shows evident variation in the long-run real exchange rate elasticities across the three export categories in all economies under consideration. As expected, the long-run real exchange rate coefficients of machinery and transport equipment exports are the lowest. With those of manufacturing exports coming in between, the coefficients of total merchandise exports are the highest.

Based on the result, she suggested that exports of manufactured final products, especially those that are labor-intensive, tend to be more responsive to changes in the real exchange rate than exports of those of machinery and transport equipments products, which have to rely to a greater

extent on imported parts and components. In other words, expanding product fragmentation and intermediate goods trade weakens the influence of the real exchange rate on export performance.

Moreover, relatively higher responsiveness of exports of labor intensive products to real exchange rate has been observed in the study by Fugazza (2004) who grouped the exporters into different quantiles for a sample of 149 countries covering the period 1988-1999. The results indicate that real exchange rate has significant effect on export performance of firms in the lowest quantile that exports mainly labour intensive commodities and manufactured products.

The justification then is that as good export performers are more likely to have a strong position in more capital-intensive products markets and may face fewer competitors than exporters in more labour intensive product markets, they suffer less than the latter from export competitiveness, measured by the real exchange rate. In other words, their competitiveness would be principally influenced by the technological content of their products rather than by the real exchange rate, whereas exports of those producing highly substitutable and low skill products would be more sensitive to price incentives.

## CHAPTER IV: METHODOLOGY AND DATA

### 4.1 Specification of the Model

As explained in the theoretical literature sub-section, gradual improvements have been made to the gravity model so that it would be more suitable for analyzing bilateral trade flows between a pair of countries. Leaving aside other adjustments, the focus here is simply on advancements made through incorporation of additional explanatory variables into the model based on which the model of this study is specified.

The standard gravity model states that the trade between two countries is determined positively by each country's GDP, and negatively by the distance between them ( Hatab *et al*, 2010). Thus, the simplest gravity equation can be stated as follows:

$$X_{ij} = \alpha_0 (GDP_i)^{\alpha_1} (GDP_j)^{\alpha_2} (DIS_{ij})^{\alpha_3} \dots\dots\dots (4.1)$$

where,

$X_{ij}$  = bilateral trade which may be exports, imports, or exports plus import between country i and country j

$GDP_i$  = GDP of country i

$GDP_j$  = GDP of country j

$DIS_{ij}$  = Distance between the two countries' capital cities or between their economic centers.

Usually, the gravity models are estimated in log linear form, in which case the estimated coefficients would be interpreted as elasticities. Accordingly, equation (4.1) would take the following form:

$$\ln X_{ij} = \alpha_0 + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \alpha_3 \ln DIS_{ij} + \varepsilon_{ij} \dots \dots \dots (4.2)$$

where,  $\varepsilon_{ij}$  is the error term.

Furthermore, the generalized gravity model augments the basic model with other variables which are thought to explain the flow of trade among countries. It states that the volume of bilateral trade between a pair countries does not depend only on their incomes(GDPs) and geographical distance, but also on their populations and a set of dummy variables either facilitating or hindering trade between pairs of countries(Martinez-Zarzoso and Nowak-Lehmann, 2003). That is,

$$X_{ij} = \beta_0 (GDP_i)^{\beta_1} (GDP_j)^{\beta_2} (POP_i)^{\beta_3} (POP_j)^{\beta_4} (DIS_{ij})^{\beta_5} (A_{ij})^{\beta_6} \dots \dots \dots (4.3)$$

where,  $POP_i$  and  $POP_j$  are the sizes of population of country i and country j, respectively.  $A_{ij}$  denotes other factors affecting the trade between the two countries. Other variables are as explained earlier.

Similarly, the log-linear representation of equation (4.3) turns out to be:

$$\ln X_{ij} = \beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln POP_i + \beta_4 \ln POP_j + \beta_5 \ln DIS_{ij} + \beta_6 \ln A_{ij} + \varepsilon_{ij} \dots \dots \dots (4.4)$$

Consequently, the operational model for this study would be derived based on the above augmented model with some modifications, mainly by including additional variables of interest and selecting appropriate formulation of the model. Apart from the usual variables of the gravity model, this study introduces real exchange rate, internal transport infrastructure and the trade policy of importing countries as additional determinants of exports.

In contrast to the cross section and time series cases, this study adopts the panel data approach. The advantage of the latter is that time series and cross-section observations are combined to offer more variability, more degree of freedom, and reduce the multicollinearity among explanatory variables (Nguyen, 2010).

Moreover, there are many arguments in favour of the dynamic panel data formulation of gravity model instead of the static model, where only contemporaneous effects of regressors on trade are taken into consideration. The most important explanation is that the entrance and exit barriers due to sunk costs may lead to the so called “persistence effect” where past trade linkage plays an important role for current trade between countries. This is to mean that for countries that have long trade history with each other, the developed distribution and service networks make entry and exit quite difficult (De Nardis and Vicarelli, 2003).

The other reason is that consumers in the importing country might have got accustomed to the products of particular exporter country (Eichengreen and Irwin, 1997). On the other hand, estimating a static model for which the underlying process is actually dynamic, may involve a misspecification that could bias the estimated coefficients and their standard errors. Under this condition, even if the coefficient of the lagged dependent variable is of no interest, it is advisable to incorporate dynamics in order to get consistent estimates of the other parameters (Fernandes, 2006).

Therefore, the dynamic panel data gravity model used for analyzing both aggregate and commodity group exports of Ethiopia to its major trading partners may take the following form:

$$\ln X_{ij,t} = \beta_0 + \beta_1 \ln X_{ij,t-1} + \beta_2 \ln GDP_{it} + \beta_3 \ln GDP_{jt} + \beta_4 \ln POP_{it} + \beta_5 \ln POP_{jt} + \beta_6 \ln DIS_{ij} + \beta_7 \ln RER_{ij,t} + \beta_8 \ln ITF_{it} + \beta_9 \ln TP_{jt} + \varepsilon_{ij,t} \dots\dots\dots(4.5)$$

Following Martinez-Zarzoso and Nowak-Lehmann (2003) and Fernandes (2006), the one year lagged real exchange rate is introduced to account for the sluggish adjustment exports to real depreciation/appreciation.

Hence, the final model of this study becomes:

$$\ln X_{ij,t} = \beta_0 + \beta_1 \ln X_{ij,t-1} + \beta_2 \ln GDP_{it} + \beta_3 \ln GDP_{jt} + \beta_4 \ln POP_{it} + \beta_5 \ln POP_{jt} + \beta_6 \ln DIS_{ij} + \beta_7 \ln RER_{ij,t} + \beta_8 \ln RER_{ij,t-1} + \beta_9 \ln ITF_{it} + \beta_{10} \ln TP_{jt} + \varepsilon_{ij,t} \dots\dots\dots (4.6)$$

where,

$X_{ij,t}$  = Value of bilateral exports of Ethiopia to importing country j in year t,

$X_{ij,t-1}$  = Value of bilateral exports of Ethiopia to importing country j in year t-1,

$GDP_{it}$  = GDP of Ethiopia in year t,

$GDP_{jt}$  = GDP of importing country j in year t,

$POP_{it}$  = Population of Ethiopia in year t,

$POP_{jt}$  = Population of importing country j in year t,

$DIS_{ij}$  = Distance between Addis Ababa and the capital city of importing country j,

$RER_{ij,t}$  = Bilateral real exchange rate between Ethiopia and importing country j in year t,

$RER_{ij,t-1}$  = Bilateral real exchange rate between Ethiopia and importing country j in year t-1,

$ITF_{it}$  = Ethiopia's internal transport infrastructure (proxied by the percentage of paved road in the total road network of the country) in year t, and

TP<sub>jt</sub> = Trade policy of importing country j (represented by its trade freedom index) in year t.

Finally,  $\varepsilon_{ij,t}$  denotes the composite error term which constitute a country pair individual effect(

$\mu_{ij}$ ) and idiosyncratic error term ( $v_{ij,t}$ ). That is,

$$\varepsilon_{ij,t} = \mu_{ij} + v_{ij,t} \dots\dots\dots(4.7)$$

In equations (4.5) and (4.6) above, the bilateral real exchange rate (RER) is derived as follows:

$$RER = NER \cdot \frac{P^f}{P} \dots\dots\dots(4.8)$$

where, NER is nominal exchange rate,  $P^f$  is the index of foreign prices proxied by the wholesale price index(WPI)<sup>4</sup> of the trading partner country, and  $P$  is the domestic price index, represented by the domestic consumer price index(CPI).

Since the bilateral nominal exchange rate between Ethiopia and its major trading partners are not directly available, it is calculated through US Dollar as:

$$NER = \frac{\text{Domestic currency}}{\text{US Dollar}} \cdot \frac{\text{US Dollar}}{\text{Foreign currency}} \dots\dots\dots(4.9)$$

Therefore, an increase (a decrease) in the value of NER shows depreciation (appreciation) of nominal currency of Ethiopia against the currency of the trading partner country. Similarly, an increase (a decrease) in RER indicates depreciation (appreciation) of bilateral real exchange rate of Ethiopia.

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<sup>4</sup> For China, Djibouti and Yemen, CPI is used due to lack of data on WPI

## 4.2 Hypotheses on the Expected Sign of Coefficients

Taking the role of trade history into consideration, it is rational to expect positive effect of lagged export on current period export. The economic growth in either Ethiopia or partner country is expected to increase the supply of or demand for Ethiopia's exports, respectively. Therefore, the coefficients of both are expected to have positive sign. Export is also expected to be affected positively by internal transport infrastructure which is proxied by the percentage of paved road out of the total road network in the country. Better infrastructure eases the difficulties associated with moving the commodities to the departure place.

Distance is used as a proxy for transportation costs. It is based on an assumption that the farther the countries are from Ethiopia, the higher the costs of transportation and vice versa. Therefore, distance is expected to negatively influence the bilateral exports of Ethiopia.

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

The coefficient of bilateral real exchange rate is expected to have a positive sign under the assumption that a real depreciation of the exchange rate promotes exports of the country by

increasing their competitiveness. In other words, depreciation of Ethiopia's bilateral real exchange rate makes its exports cheaper in the market of destination country and increases exports to that country.

Finally, trade policy of trading partners is assumed to be an important determinant of trade between pair of countries. The trade freedom index calculated by Heritage Foundation based on tariff and non-tariff barriers is used. The index ranges from 0 to 100, where a score of 100 implies perfectly free trade. Hence, the coefficient of this index is expected to be positive as higher trade freedom leads to more involvement in trade (Oh and Tumurbaatar, 2011).

### **4.3 Estimation Issues**

The formulation of the model in a dynamic panel data framework requires corresponding appropriate method of estimation. This is because estimators most commonly used in panel data will be biased and inconsistent when the lagged value of the dependent variable is included as one of the explanatory variables (Harris and Matyas, 2004).

With regards to this study, applying OLS estimator to the model specified in (4.6) leads to inconsistent estimates of the parameters since the lagged dependent variable is correlated with the individual effect ( $\mu_{ij}$ ) and thus correlated also with the composite error term ( $\mu_{ij} + v_{ij,t}$ ). The within groups estimator may reduce this inconsistency by transforming the equation which eliminates the individual effect. The transformation enables us to express the original equation as deviation from individual means. Nevertheless, there could be considerable correlation between the transformed lagged dependent variable and the transformed error term, when the time dimension is not large enough (Bond, 2002). Accordingly, the OLS estimator provides

estimates of the parameters that are biased upwards in the presence of individual-specific effects while the within groups estimator gives estimates that are seriously biased downwards in panel with short time dimension. Hence, consistent estimates of these parameters seem to lie in between the OLS levels and within groups estimate (Bond et al., 2001).

To reduce the problems associated with the estimators mentioned above, the usually recommended approaches are Instrumental Variables (IV) and Generalized Method of Moments (GMM) estimators. The former estimation leads to consistent but not necessarily efficient estimates of the parameters as it does not make use of all available moment conditions and it does not take into account the differenced structure on the residual disturbances (Baltagi, 2001).

Recently, two main versions of the generalized method of moments (GMM) estimators are becoming popular methods of estimating dynamic panel data models. These are the „difference“ and „system“ GMM estimators (Arellano and Bover 1995; Blundell and Bond 1998). The conventional approach in difference GMM estimator is to first difference in order to eliminate unobserved individual effect and to use lagged levels as instruments for the differenced equation. The system GMM estimator simultaneously estimates set of equations in first-differences with suitably lagged levels as instruments and set of equations in levels with suitably lagged first-differences as instruments (Bond et al., 2001).

However, the difference-GMM estimator is poorly behaved in terms of precision and finite sample performance if it is employed to estimate autoregressive models for moderately persistent series from moderately short panels (time dimension). This is because lagged levels of the variables are only weak instruments for subsequent first-differences. These biases can be reduced by exploiting reasonable stationarity restrictions on the initial conditions process under

the extended system GMM estimator (Blundell and Bond, 1998). Moreover, it is possible to include time invariant regressors in the system GMM estimator, which are eliminated in difference GMM. Doing this does not affect the coefficient estimates of other regressors because all instruments for the levels equation are assumed to be orthogonal to the individual specific effects, indeed to all time-invariant variables (Roodman,2006).

As explained earlier, trade relationships are persistent in their nature mainly due to sunk costs associated with entry and exit and because of the developed habit of consumption in the importing country for the products of the exporter one. Therefore, the system GMM estimator is more appropriate than the difference GMM estimator for the model used in this study.

To check the consistency of GMM estimators two tests are commonly applied. These are the Sargan tests and autocorrelation tests developed by Arellano and Bond (1991). The validity of instruments is tested using Sargan tests of over-identifying restrictions. In addition, tests of first-order, AR(1) and second-order, AR(2) autocorrelation are also available for first differenced residuals. Given the transformation made to remove the individual effects, first-order serial correlation is expected but it is uninformative. Hence, the test for first order serial correlation in levels can equivalently be done by testing for second-order autocorrelation in the transformed residuals. Serial correlation in the differenced residuals at an order 2 implies that the moment conditions used are invalid, which means that there is misspecification of the model.

#### **4.4 The Data**

The study covers the period from 2000 to 2009. The values of bilateral exports of Ethiopia for coffee, oilseeds and aggregate exports to seventeen major trading partners are considered (the list of the countries included in the sample is given in appendix).

The data used in the study have been collected from different sources. The values of aggregate bilateral exports of Ethiopia to the trading partners have been taken from the International Monetary Fund's Direction of Trade Statistics (DOTS) database and the corresponding value for the selected product groups have been obtained from the Revenue and Customs Authority of Ethiopia.

The data for most of the variables including GDP (in billions of US Dollar), consumer price index (constant 2005), wholesale price index (constant 2005), nominal exchange rate (national currency per US Dollar), population size (in millions) and internal transport infrastructure (the percentage of paved road out of total road network of the country) have been obtained from the World Development Indicator database.

The distance in kilometers between Addis Ababa and the capital cities of major trading partner countries has been obtained from [www.indo.com/distance](http://www.indo.com/distance). The trade freedom index is obtained from the Index of Economic Freedom created by the Heritage Foundation and it is available at [www.heritage.org/research/features/index/downloads/academicuserGuide.pdf](http://www.heritage.org/research/features/index/downloads/academicuserGuide.pdf).

## CHAPTER V: RESULTS AND DISCUSSIONS

This chapter is devoted to the presentation and discussion of findings from the system GMM estimator. In line with the objective of the study, due emphasis is given to the effects of movements in real exchange rate on the bilateral exports of Ethiopia to its major trading partners. The estimations are made independently for coffee, oilseeds and aggregate export. This approach helps gauge if there are substantial variations in responsiveness across sectors. Section 5.1 gives the results for aggregate export and section 5.2 deals with those of the remaining two.

### 5.1 Results for Aggregate Export

The result for the aggregate exports is given in table 5.1. This shows the responsiveness of overall bilateral exports of Ethiopia to changes in the main explanatory variables of the model.

**Table 5.1: Estimation Results for Aggregate Export**

Dependent variable:  $\ln X_{ij,t}$

Independent variables	Coefficients
$\ln X_{ij,t-1}$	0.1196** (0.0437)
$\ln GDP_{it}$	2.5713** (1.2953)
$\ln GDP_{jt}$	0.5603* (0.2883)
$\ln POP_{it}$	-18.7209* (9.7008)
$\ln POP_{jt}$	0.3725*** (0.1446)
$\ln DIS_{ij}$	-1.6771** (0.7731)
$\ln RER_{ij,t}$	-0.1629 (0.6487)
$\ln RER_{ij,t-1}$	0.1873 (0.6405)
$\ln ITF_{it}$	3.2413* (1.7554)
$\ln TP_{jt}$	1.3056 (0.8787)
Constant	67.4336** (34.3960)
Sargan test, p-value	0.1210
AR(1), p-value	0.0062
AR(2), p-value	0.1973

Note:  $\ln$  shows the natural logarithm of the variables, whereas, \*\*\*, \*\* and \* indicate the significance of the coefficients at 1%, 5% and 10% levels of significance, respectively. Standard errors are in parentheses.

From the above table, it can be observed that most of the usual variables of the gravity model are significant with their expected signs. Current exports are positively related to exports of previous year. This is theoretically appealing since previously established trade relationship is expected to pave the way for exports to a particular destination in the subsequent year. It also confirms the validity of the dynamic specification of the model.

The estimated positive coefficient of Ethiopia's GDP shows that domestic economic growth leads to more export supply. On the other hand, the positive coefficient of the trading partner's GDP which is significant at 10% level of significance implies that the more affluent the importing country is, the higher its import demand. Hence, Ethiopia's export to this country increases.

The population of Ethiopia has a negative coefficient which is significant at 10% level. This may indicate the dominance of absorption effect of increased population due to large home market for domestic production. A highly significant positive coefficient of the importing country's population shows that the more populous the country is, the higher its imports to satisfy large domestic demand. As expected the estimated coefficient of distance is negative. This implies that the farther the destination countries are from Ethiopia, the smaller the exports to these countries. This is because transportation costs are expected to increase with increase in geographical distance between two countries. The internal transport infrastructure, proxied by the percentage of paved road out of the total road network in the country, has also expected positive coefficient which is significant at 10% level.

Finally, it is worth noting to look at the role of real exchange rate, which is the main variable interest in this study. Since the formulation of real exchange rate has been in terms of domestic

currency per foreign currency multiplied by the ratio of foreign price to domestic price, its increase implies real depreciation while the decline indicates real appreciation. The estimation result demonstrates that neither its contemporaneous value nor its lagged value exerts considerable effect on the aggregate bilateral exports of Ethiopia. In particular, current real exchange rate has unexpected negative coefficient; however, one year lagged value has a positive coefficient.

In empirical studies it is not odd to get results with similar findings where exports are insensitive to changes in real exchange rates. However, the theoretical justifications are demanding in some cases. The most commonly given explanation relates to the condition when exports are highly dependent on imported intermediate goods and raw materials. In this case, the gain in competitiveness from real depreciation might be offset by the corresponding increase in import prices (Stucka, 2004). In the Ethiopian context, this explanation may not actually hold provided that the exports of the country are the highly confined to primary products which are hardly dependent on the imported goods.

Observed from the structuralist view of trade, such insignificant results are expected given the nature of exports of developing countries. It is based on “export supply pessimism” and “import demand pessimism” theories. The former theory states that exports of these countries depend on few primary commodities with a very low domestic supply response. Thus, changes in relative prices will not induce a tangible change in domestic production. On the other hand, the latter theory dictates that the traditional exports of developing countries have low world price elasticities of demand (D.B. Nidlela and T. Nidlela, 2002). Thus, the lack responsiveness of Ethiopia’s exports to changes in real exchange rate may be attributed to price inelastic domestic

export supply and/or low price elasticity of demand for primary commodities in the foreign markets.

In table 5.1, the Sargan test and autocorrelation test are also reported. The Sargan test with a p-value of 0.12 fails to reject the null hypothesis that the over-identifying restrictions are valid. This implies that the instruments used are valid. Moreover, the autocorrelation test based the second order autocorrelation test with a p-value of 0.1973 fails to reject the null hypothesis of no second order autocorrelation.

## **5.2 Results for Exports of Coffee and Oilseeds**

Export at sectoral/commodity level may behave differently from the export behavior at an aggregate level. This variation in responsiveness to changes in the explanatory variables could mainly be due to some characteristics that are unique to a particular sector. Hence, the responses of exports of coffee and oilseeds to changes in real exchange rates and to changes in other regressors are given in table 5.2 below.

**Table 5.2: Estimation Results for Coffee and Oilseeds**Dependent variable:  $\ln X_{ij,t}$ 

Independent variables	COFFEE	OILSEEDS
	Coefficients	Coefficients
$\ln X_{ij,t-1}$	0.6450*** (0.0890)	0.4529*** (0.1015)
$\ln GDP_{it}$	6.6505** (2.9485)	2.1367** (1.0095)
$\ln GDP_{jt}$	1.9853** (0.9921)	-0.2294 (0.3316)
$\ln POP_{it}$	-54.9922** (23.6308)	-11.744* (7.1082)
$\ln POP_{jt}$	0.2972 (0.2711)	0.4439 (0.2813)
$\ln DIS_{ij}$	-0.4080 (0.7934)	-0.7865 (1.1597)
$\ln RER_{ij,t}$	0.1904 (1.0696)	0.9894 (0.9485)
$\ln RER_{ij,t-1}$	-0.2768 (1.0462)	-1.0581 (0.9733)
$\ln ITF_{it}$	5.5445** (2.6581)	10.3820*** (3.1247)
$\ln TP_{jt}$	0.4961 (0.7528)	2.2427** (1.0349)
Constant	182.4642** (87.5206)	15.9686 (28.7867)
Sargan test, p-value	0.2516	0.1849
AR(1), p-value	0.0053	0.0048
AR(2), p-value	0.6688	0.7230

Note: *ln* shows the natural logarithm of the variables, whereas, \*\*\*, \*\* and \* indicate the significance of the coefficients at 1%, 5% and 10% levels of significance, respectively. Standard errors are in parentheses.

As it can be inferred from table 5.2, some variables have significant effects with the directions of their influence consistent to those under the overall export. In addition to lagged exports, it is also evident that domestic factors comprising GDP, population size and infrastructure have similar effects on the exports of the two subsectors. This implies that supply side factors greatly determine Ethiopia's export performance even at the commodity level.

The estimated coefficients of one year lagged exports are significant for both commodity groups. In addition to entrance and exit barriers due to sunk costs, this may indicate that the consumers in the importing countries have got accustomed to the quality and variety of Ethiopia's oilseeds and coffee.

Moreover, the significant positive coefficients of internal transport infrastructure have the implication that this variable is an important supply side factor for the two commodities under consideration. It is obvious that agricultural commodities are largely grown and harvested in the rural areas of the country considerably far from their place of departure. Thus, underdeveloped infrastructural facilities constrain the supply of these commodities while their improvements have expansionary effects on export.

Similar to that of the overall exports, the effect of the size of Ethiopia's population on exports of coffee and oilseeds is significantly negative. These two commodities are consumption goods which may be utilized directly or through further processing. Hence, more domestic demand may reduce the quantities of their export. For example, as coffee is the chief traditional drinking item in the country, higher home demand driven by increased number of population may restrain its amount that is supplied to foreign market.

Further, the results reveal that a trade policy of the importing country has a lot to do with the exports of oilseeds from Ethiopia. This indicates that the reduction of tariff and non tariff barriers by a trading partner on its imports encourages the exports of these commodities to that country. The GDP of the major trading partners has significant effect only on the exports of coffee with the expected positive sign. This may mean that coffee is more luxurious than oilseeds.

Like the case under the aggregate export, the estimated coefficients of both current and lagged real exchange rates are insignificant for the two commodities. The only difference is that the coefficients are positive for the current and negative for the lagged value of this variable. The irresponsiveness of exports from these two subsectors to the movements in real exchange rates can also be explained by the justifications given for the aggregate export. That is, both price inelastic export demand and/or export supply conditions can be applicable to these traditional export items.

To deal with the consistency of the underlying system GMM estimator, the Sargan and the autocorrelation tests are also given. The Sargan test with p-values of 0.25 and 0.18 for coffee and oilseeds equations, respectively, shows that the instruments used in the system-GMM estimator are valid. The autocorrelation test with p-values of 0.67 for coffee and 0.72 for oilseeds also display that the residuals are not second-order correlated.

## CHAPTER VI: CONCLUSIONS AND POLICY IMPLICATIONS

### 6.1 Conclusions

It is usually assumed that real depreciation of exchange rate promotes exports from a country by increasing their competitiveness. However, existing empirical studies provide findings both in favour of and against this expectation.

In this study, an attempt has been made to examine whether bilateral real exchange rate determines the exports of Ethiopia to its major trading partners. Accordingly, bilateral exports to seventeen main trading partners are considered for the period 2000-2009. The study covers the exports of Coffee and Oilseeds in addition to the aggregate export. An augmented dynamic panel data gravity model is specified taking into account the role of trade history for the contemporaneous trade. The estimation of the model is made using the System GMM estimator as it allows for the persistent nature of trade and because it is also more efficient than other estimators with similar purposes.

The estimation results show considerable similarities in the effects of some explanatory variables on exports at aggregate level and for the two subsectors. The lagged export has positive effect on the current export in all three cases. In addition, supply side factors consisting of domestic GDP, internal transport infrastructure and size of population are important determinants of export, in all three cases. The first two have positive effects on the exports of the country where the size of domestic population has the opposite effect. The others have somewhat mixed effects. GDP of trading partners have significant positive effect on aggregate export and on that of coffee. The sizes of population of importing countries and distance are significant only for the overall export with positive and negative effects, respectively. The trade

policy of importing countries represented by their trade freedom index has significant positive effect only on exports of oilseeds.

On the other hand, the real exchange rate does not have significant effect on export for all three categories of exports under consideration. In addition to the current value this variable, its one year lagged value has also been included to capture sluggish adjustment of trade to appreciation/depreciation of real exchange rate. However, the coefficients of both are statistically insignificant. This irresponsiveness of Ethiopia's exports to real exchange rate may be attributed to low price elasticities of domestic export supply and/or low price elasticities of demand for primary commodities in the markets of the trading partners.

## **6.2. Policy Implications**

Based on the findings of this study, the following policy implications can be drawn.

- It is obvious that huge portions of the country's exports including the two subsectors considered in this study are primary products with presumably price inelastic domestic supply and foreign demand. Hence, the country should diversify its exports to other nontraditional exports. In particular, a step towards labour-intensive manufactured products is highly recommended. Apart from utilizing the relatively abundant and cheap labour force of the country, these products may not be seriously influenced by costly import of capital goods.
- In addition to diversification in the type of export products, the country should also expand its export destinations. Capturing new export markets may reduce the competition that comes from countries exporting similar products. The recent expansion of exports to some African and the Middle East countries gives a clue that the country may benefit significantly if it manages to exploit these increasingly growing markets.

- In this study it has been found that supply side factors, particularly economic growth and domestic infrastructure are important determinants of the country's exports. This may mean that the country could benefit a lot through improving its export supply capacity. In this case, competitiveness may be attained by giving due emphasis to the quality of export products.

It should be stressed that this study has used the bilateral real exchange rate as a measure of relative prices due to the bilateral nature of the gravity model. On the other hand, exports of only two subsectors and the aggregate export have been considered. Hence, future studies can apply other approaches mainly by using real effective exchange rate that shows a country's competitiveness against a group of its trading partners and also by incorporating more export subsectors.

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## APPENDICES

### Appendix A: Descriptive statistics of variables

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
$X_{ij}^a$	170	36.656	37.463	0.0471	194.982
$X_{ij}^b$	170	15.670	26.158	0.0003	138.044
$X_{ij}^c$	170	5.971	16.414	0.0313	175.321
$GDP_i$	170	14.383	7.330	7.79	28.537
$GDP_j$	170	1761.057	2927.661	0.551	14369.4
$POP_i$	170	73.895	5.537	65.515	82.825
$POP_j$	170	127.661	301.63	0.73	1331.46
$DIS_{ij}$	170	5342	3287.38	547	11538
$RER_{ij}$	170	6.008	4.631	0.0346	17.328
$ITF_i$	170	12.474	0.468	12	13.4
$TP_j$	170	74.765	12.925	28.2	88.2

Note: *a*, *b* and *c* indicates aggregate, coffee and oilseeds export, respectively.

## Appendix B: Correlation Matrix of explanatory variables

	lnGDPi	lnGDPj	lnPOPi	lnPOPj	lnDISij	lnRERij	lnITFi	lnTPj
lnGDPi	1.0000							
lnGDPj	0.1113	1.0000						
lnPOPi	0.7583	0.1141	1.0000					
lnPOPj	0.0181	0.6947	0.0190	1.0000				
lnDISij	-0.0000	0.6141	-0.0000	0.6457	1.0000			
lnRERij	-0.0503	0.5708	-0.0425	0.1768	0.5781	1.0000		
lnITFi	0.0162	0.0288	0.2249	0.0042	-0.0000	0.0126	1.0000	
lnTPj	0.1258	0.6571	0.1297	0.1828	0.6106	0.5909	0.0050	1.0000

## **Appendix C: List of samples of trading partners**

1. Belgium
2. Canada
3. China
4. Djibouti
5. Egypt
6. Germany
7. Greece
8. Israel
9. Italy
10. Japan
11. Netherlands
12. Saudi Arabia
13. Spain
14. Switzerland
15. United kingdom
16. United states of America
17. Yemen

**Declaration**

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the thesis have been duly acknowledged.

The examiners' comments have been duly incorporated.

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Place and date of submission \_\_\_\_\_