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DETERMINANTS OF AGRICULTURAL EXPORT IN ETHIOPIA

SAMUEL TEKESTE

ADDIS ABABA, ETHIOPIA

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DETERMINANTS OF AGRICULTURAL EXPORT PERFORMANCE IN ETHIOPIA

Samuel Tekeste

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This is to certify that the project paper Prepared by Samuel Tekeste, entitled: Determinants of Agricultural Export in Ethiopia and submitted in partial fulfillment of the requirements for the Degree of Masters of Arts (Applied Trade Policy Analysis) compiles with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Determinants of Agricultural Export in Ethiopia

Samuel Tekeste

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This paper identified some of the main determinants of agricultural export in Ethiopia for the period 1980-2010. To test empirically the relationship between agricultural export performance and its major selected determinants such as terms of trade, gross domestic product, domestic price, world price, kilometers paved roads and fertilizer input import over a period; cointegration and error correction approaches in the regression analysis were used.

The results from the cointegration and error correction models revealed that all the above listed explanatory variables significantly affected agricultural export performance in the long run except domestic price. In the short run, gross domestic product (GDP) became insignificant and negative in sign which was unexpected. Domestic price was also insignificant like in the case of long run. However, except these two variables other variables were found to significantly affect the agricultural export performance of the country. On the other hand, out of the variables significantly affected agricultural export both in the long run and short run; terms of trade, world price, fertilizer input import over a period and kilometers of paved roads affected agricultural export positively as expected. Especially when we look at the magnitude by which kilometers of paved road affected the dependent variable both in the long run and in the short run positively and significantly, it can be regarded as one of the key finding in this study.

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List of Acronyms and Abbreviations

ADB	African Development Bank
ADLI	Agricultural Development Led Industrialization
ADF	Augmented Dickey Fuller
CSA	Central Statistics Agency
DF	Dickey Fuller
ECM	Error Correction Model
FAO	Food Agency Organization
GDP	Gross Domestic Product
IMF	International Monetary Fund
LDC	Least Developed Countries
MDG	Millennium Development Goal
MOFA	Ministry of Foreign Affairs
NBE	National Bank of Ethiopia
NEER	Nominal Effective Exchange Rate
NEPAD	New partnership for African development
OLS	Ordinary Least Squares
REER	Real Effective Exchange Rate
SSA	Terms of Trade
USD	US Dollar
USA	United state of America
VAR	Vector Autoregressive
WTO	World Trade Organization

CHAPTER ONE

1. INTRODUCTION

1.1 Background

Agriculture is by far the single most important economic activity in SSA and it remains key to achieving the poverty targets of the MDGs in Africa. According to NEPAD (2003) for most countries in SSA, agriculture contributes an average of 30-60% of GDP and about 30% of the values of exports. However, trade liberalization and tariff barriers have been just some of the areas that have been detrimental to African farmers. Structural adjustment, policies and trade conditions have resulted in the collapse of agricultural support institutions, the elimination of subsidies and reduction in tariffs for most African countries. On the other hand if we look at the case of European and American farmers, it is completely different from that of African farmers. That means these farmers are highly subsidized by their governments. That is why these highly subsidized European and American farmers undermine the African farmers both in domestic and export markets-leaving African farmers unable to compete in the global market. Furthermore, these subsidized goods lead to over production, which then results in lowered prices. In terms of agricultural trade, statistics show that the share in world agricultural exports of SSA declined from 8% in early 1960s to 2% in the early 2000 and SSA has fallen from a net food exporter to a net food importer (Haggblade et al., 2004). Based on agricultural trade balance, there is an increasing dependence on agricultural imports, with imported food replacing traditional food. Agricultural imports are growing at faster rates than agricultural exports (M.Obwona and E.Chirwa). But, this trend is not good for these countries since export is indispensable for the growth of the economy especially in the case of small economies like Africa.

Furthermore, according to Charles D.Jebuni (2006), especially for African countries export is indispensable for the growth of economy and poverty reduction. Since the economies of most African countries are small, exports are the main engine of growth of these countries. In spite of its importance, Africa is increasingly being marginalized in world trade. And this is in spite of several years of economic reforms involving trade and

exchange rate liberalization. The study by Mouze (2005) also outlined that analysis of the external sector in least developed economies over the last three decades has showed a dismal outcome. Most of them were subject to vulnerable balance of payments deficit owing to external shocks, internal resource mismanagement and policy deficiencies. A close look over the factors aggravating the problem indicates that the relative price of imports has been increasing drastically while that of exports with the exception of oil was declining creating heavy burden on these economies in terms of debt servicing and repayment which in turn limits their pace on the development path.

Nevertheless, trade in agricultural commodities still dominates the export scene of African countries despite many challenges facing it. The agricultural sector constitutes a significant part of the whole economy and employees a considerable proportion of the labor force. Furthermore, increasing agricultural export is an indeterminate step towards restoring external balance of payment equilibrium which has been the central part of most economic structural adjustment programs initiated in 1980s and 1990s, (Gbadebo and Odwaro, 2007).

According to Alwang and Siegel (1994), the international trade of SSA countries is mainly based on exporting primary agricultural commodities in which they have comparative advantage due to cheap labor and tropical climate.

Even though trade in agricultural commodities dominated the export scene of most African countries as discussed above, there are also many challenges towards taking trade opportunities with these commodities. For instance, according to Tyler Biggs (2007), low-income countries appear to especially constrain in their ability to take advantage of trade opportunities. Export volumes are generally small and concentrated in a few products, frequently in natural resources into new export activities, as adjustment is hampered by primitive transportation systems, inadequate public institutions, under developed financial systems, low levels of human capital, and weak or nonexistent safety nets, which make people particularly vulnerable to shocks. Consequently, despite some success with trade reform, export supply response in many low-income countries has been disappointing, particularly in the area of non-traditional exports. This is also true for

the case of Ethiopia as she is one of the low-income countries highly depending on agricultural commodity exports for her foreign exchange earnings.

Obviously if we say agriculture is the main stay of the Ethiopian economy, it is not far from reality. For this looking at different data regarding the contribution of agricultural sector to country's economy either directly or indirectly is more than enough. For instance, according to data from central statistics agency (CSA), its share accounts for more than 40% of the total GDP, 50% of foreign currency earning and above 80% of employment creation. In addition, both industry and services are dependent on the performance of agriculture, which provides raw materials, generates foreign currency for the import of essential inputs and food for the fast growing population. But starting from recent years the share of service sector in the GDP of the country started to exceed that of agriculture. For instance, according to NBE Annual Report (2007/08), during this fiscal year, real GDP grew by 11.6%. This high growth rate was achieved for the fifth time in a row (i.e. 11.7% in 2003/04, 12.6 in 2004/05, 11.5 in 2005/06 and 11.5% in 2006/07), which places Ethiopia among the top performing economies in Sub-Saharan Africa. All sectors contributed to this relatively high economic growth with the service expanding by 17.0% and contributing about 62.8% to the overall GDP growth. The agriculture and industry sectors also grew by 7.5% and 10.4% respectively. Furthermore, real GDP is projected to grow by 11.2% in 2008/09. Even though the share of agriculture in the country's GDP has become less than that of service sector since starting from recent years, still agriculture is the back bone of Ethiopia's economy.

In spite of its importance in the national economy, agriculture is based on subsistence farm house holds whose modes of life and operation have remained unchanged for centuries (Hailegiorgis Biramo, 2010). Despite these importances, agricultural policy making in Ethiopia is facing important challenges. Two different perspectives for agricultural policy challenges can be distinguished: competitiveness of Ethiopian export-oriented agriculture on the world market on the one-side and food security through support of subsistence and local-market oriented agriculture on the other side of the spectrum. Both are important issues for Ethiopian agricultural Policy and both can be

empowered by dedicated policy supporting information, infrastructure and services (Dawit Alema et al).

Like Sub-Saharan African countries, Ethiopia's export is dominated by export of primary commodities which include agricultural products mainly coffee, oilseeds, chat, flower, pulses and live animals. For instance during the fiscal year (2009/10), according to the data from Customs Authority, the share of these commodities out of the total $2 billion export during the mentioned year is 26.4,17.9,10.5,8.5,6.5 and 4.5 percent respectively. In other words, these agricultural commodities account almost more than 70 percent of the total export of the country during this fiscal year. The other point here is that in terms of commodity composition although coffee continues to dominate, its relative share of total exports has been decreasing while that of other commodities is rapidly increasing on the other hand.

In general, despite Ethiopia's comparative advantage due to cheap labor and favorable climate relatively for these primary agricultural commodities export like other SSA countries as Alwang and Siegel (1994) identified, the country's export performance is not satisfactory though improvement is there. There are various factors affecting or determining export performance of the country in general and agricultural export in particular. For example, according to Mouze (2005), price policy instruments such as real exchange rate devaluation and institutional factors significantly affect agricultural export of the country. Obviously, there are also various factors affecting Ethiopia's agricultural export apart from the ones sited by Mouze. Hence a closer look at the major factors determining the agricultural export supply of the country theoretically and empirically is indispensable in order to help the country to experience or achieve a sustainable growth in exports.

1.2 Statement of the problem

In the last two decades the share of agricultural export from SSA countries in the world market has significantly declined both in its value and volume. This might be as a result of distorted agricultural market, developed countries provide protection to the agriculture sector both in terms of subsidies and tariff walls depresses primary commodity export

share of SSA. Despite the various constraints facing the agricultural export performance of SSA countries, these primary commodity exports have a significant importance for SSA economy. Therefore, in order to improve its performance a close look at these constraints and analyzing them is indispensable (Ibrahim, 2007).

When we look at the case of Ethiopia, according to access capital (2010) report, the country's exports reached a never-before-seen level of $2 billion in the just completed fiscal year, 2009/10.This export level is an impressive 38% increase from the $1.5% billion in exports registered in the previous year, and nearly three times the average annual export level of the prior decade (2000-2009). Even though there is improvement in exports since recent years, it is not as such satisfactory. For instance, Exports of goods in Ethiopia are only about 7% of GDP, compared to an average of near 30% of GDP in Sub-Saharan Africa. Export levels still fall short of what is registered by other African countries with much smaller populations (Uganda and Tanzania both export more than $3 billion per year), and exports per person remain very low: only $24 in Ethiopia compared to $200 in Sub-Saharan Africa and $580 in developing Asia. Growth rates are also very modest if one makes a comparison with Asian countries over a decades-long time frame. For example, Ethiopia's total exports were higher than that of Vietnam in the 1980s but are now just a tiny fraction: $2 billion in Ethiopia versus $65 billion in Vietnam.

In Ethiopia, agricultural products constitute a sizeable component of external trade generating a significant portion of export earnings. For instance, according to data from CSA during the fiscal year (2009/10), when we look at the composition of commodities: coffee, oilseeds, chat, flowers, pulses and live animals in that order have contributed an average about 26.4, 17.9, 10.5, 8.5, 6.5 and 4.5 percent of total export earnings which is almost 74.3 % together. From this we can see that the country's exports are highly concentrated in agricultural commodities.

Despite its huge contribution in the country's export, agricultural export performance of Ethiopia still did not reach to the desired stage may be due to several constraints. So identifying and addressing such factors determining the agricultural export performance of the country is a major task of this study.

1.3 Objective of the study

The overall objective of this paper is to assess theoretically and empirically the major determinants of agricultural export performance of Ethiopia since identifying and examining the factors that significantly affect Ethiopia's export in general and especially that of agricultural export in particular should facilitate the design of policies to improve the performance and ultimately overall economic growth.

The specific objectives of the study are:-

- Investigating the relative importance of major factors that determine agricultural export performance of the country.
- Establishing the relationship between agricultural export supply and its determinant factors.
- Addressing the respective impacts of price and non-price factors in the determination of exports levels.
- Finally to draw implications for agricultural export growth based on the empirical findings and to come up with plausible and sound policy recommendation that would improve export performance of the country.

1.4 Significance of the study

The study is significant in identifying the major factors that affect the agricultural export of the country by bringing empirical evidence using time serious data analysis. In addition, the study is also significant in that it incorporates additional important variables determining the agricultural export performance of the country which have not been incorporated in other previous or recent studies including the study by mouze(2005), Birhanu(2005), lemlem(2008) and others. Furthermore, the study uses very recent data for empirical analysis. In general, identifying the determinants of agricultural export performance will help to provide information to the policy makers to enable them come up with the appropriate policy regarding the growth of the sector and the economy as a

whole and will help broaden the understanding of determinants of agricultural export which will aid policy formulation.

1.5 Organization of the paper

The paper is organized in such a manner to have six chapters. Chapter one deals with a brief introduction of the study. The next chapter is regarding overview of the role and performance of agriculture sector in economy. Chapter three is concerned with review of existing theoretical and empirical literature regarding the subject. Chapter four is about data sources, methodology, and model specification. Chapter five discusses about the empirical analysis where as the last chapter consists of conclusions and policy implications of the study.

CHAPTER TWO

2. OVERVIEW OF THE ROLE AND PERFORMANCE OF AGRICULTURE SECTOR IN AN ECONOMY

2.1 The performance and contribution of agriculture sector to the country's economy

As it is obviously known Ethiopia's economy is highly dependent on agriculture, similar to that of SSA countries, where 80% of its population employed in this sector. That is why agriculture is widely regarded as the back bone of Ethiopian economy. It plays a key role both in the development of the nation as well as in the well being of its people. Its contribution to the national economy can be seen from different aspects. For instance, its contribution as a source of food and raw materials, its contribution to GDP, export earnings and so on. According to Wikipedia free.com, agriculture accounted for 46.3% of GDP, 83.9% of exports, and 80% of the labor force in 2006/2007, compared to 44.9%, 76.9% and 80% in 2002/2003, and agriculture remains the Ethiopian economy's most important sector. Ethiopia has great agricultural potential because of its vast areas of fertile land, diverse climate, generally adequate rainfall, and large labor pool. Despite this potential, however, Ethiopian agriculture has remained underdeveloped. Because of drought, which has repeatedly affected the country since the early 1970s, a poor economic base (low productivity, weak infrastructure, and low level of technology), and overpopulation, the agricultural sector has performed poorly. For instance, according to the World Bank between 1980 and 1987 agricultural production dropped at an annual rate of 2.1 percent, while the population grew at an annual rate of 2.4 percent. Consequently, the country faced a tragic famine that resulted in the death of nearly 1 million people from 1984 to 1986. Generally speaking despite its enormous benefits to the country's economy, agricultural sector has passed through many problems and challenges. For instance, during the imperial period, the development of the agricultural sector was retarded by a number of factors, including tenancy and land reform problems, the government's neglect of the agricultural sector (agriculture received less than 2 percent of

budget allocations even though the vast majority of the population depended on agriculture), low productivity, and lack of technological development.

Similar to that of imperial regime agricultural productivity also continued to decline during the Derg regime also. According to the World Bank, agricultural production increased at an average annual rate of 0.6 percent between 1973 and 1980 but then decreased at an average annual rate of 2.1 percent between 1980 and 1987. During the same period (1973–87), population increased at an average annual rate of 2.6 percent (2.4 percent for 1980-87). The poor performance of agriculture was related to several factors, including drought; a government policy of controlling prices and the free movement of agricultural products from surplus to deficit areas; the unstable political climate; the dislocation of the rural community caused by resettlement, villagization, and conscription of young farmers to meet military obligations; land tenure difficulties and the problem of land fragmentation; the lack of resources such as farm equipment, better seeds, and fertilizers; and the overall low level of technology. President Mengistu's 1990 decision to allow free movement of goods, to lift price controls, and to provide farmers with security of tenure was designed to reverse the decline in Ethiopia's agricultural sector. There was much debate as to whether or not these reforms were genuine and how effectively they could be implemented. Nonetheless, agricultural output rose by an estimated 3 percent in 1990-91, almost certainly in response to the relaxation of government regulation. This modest increase, however, was not enough to offset a general decrease in GDP.

On the other hand according to Economy@ethiopianembassy.org, since the new Ethiopian Government made agriculture its primary priority in 1991, Ethiopia has developed and implemented its Agricultural Development Led-Industrialization (ADLI) strategy and the key concept underlying ADLI is an export-led development strategy aimed at promoting economic growth in Ethiopia while coordinating agricultural and industrial development. In other words what the report tried to address is that following trade liberalization by the government and the government's strong commitment in creating conducive environment especially for private sector has benefited export sector and its growth in general. In addition to the above things, the new government of Ethiopia also facilitated the inflow of foreign investment by providing various incentives

following its recognition regarding the need of huge and large capital investments in order to exploit the countries resources and making agricultural sector the key contributor for the development of Ethiopia. Ethiopia has also a tremendous potential for investment in agro processing and many of her agricultural products can be exported without being processed, while others can be processed before they are brought to domestic and foreign markets. Finally, even though the government tries to encourage the export of agricultural products, the export of processed products has got a priority which involves and stimulates the growth and expansion of agro-processing sector.

2.2. Agricultural export performance and its trends

According to MOFA in its Trade Promotion Manual for Ethiopian Diplomatic Missions (2007), the Government of Ethiopia has been exerting at most effort to bolster the export sector which has resulted in turn in sustained and remarkable growth in the export sector. In addition to these the government of Ethiopia also tried to diversify the narrow range of export products through new investment in the sector. The multi-dimensional supportive interventions of the Government under the umbrella strategy of ADLI have led to encouraging results in most key export product categories; in particular, in products such as pulses and oil seeds. The report also underlined that the growth trend in the export sector is expected to continue at the current or at an improved rate in the near future. Using the raw data collected from Customs Authority, it also reported that the total value of exports has increased from 3.9 billion birr in 1997 to 8.9 billion birr in 2006 which is a two and half fold growth and also in the period between 1994 - 1999 E.C., export earnings grew on average by 22% with the earnings rising from USD 436 million in 1994 E. C. to USD 1.2 billion in 1999 E.C. according to the report. Following this consecutive growth in export sector, the government set the plan to earn 1.6-1.8 billion dollar in the year 2007 G.C.

According to Mekbib (2008), the volume of export has not shown what is sustainable and positive trend except a sharp rise in the second half of ninetieth. For instance, he outlined that there is a fluctuation in the volume of exports of major commodities like coffee, pulses and oilseeds, hides and skins and chat except that of fruit and vegetables and the structure of Ethiopian export is dominated by agricultural products which used to account

for more than over a long period except recent years when the export share of other products showed a relative increase. For instance, since 2001/2 to 2002/3 the country's export amount has shown slight increase of 5.2% in total value of export. However, Ethiopia's export performance from 2003/4 to 2005/6 has shown a great leap in foreign exchange revenue. In 2003/4 budget year the country earned 824 million USD, which show an increase of 27.2% (647.9 million USD) in revenue from the previous fiscal year. The 2005/6 Budget year revenue stood at 1354.7 million USD, exceeding by 172.3 million USD that of the 2004/5 Ethiopian budget year

He also tried to compare the export performance of 2005/6 budget year with that of the past five consecutive years and came up with an increase both in variety and quantity of export items. Similarly, export destinations are also on the rise. In the aforementioned budget year 1354.7million USD revenue is generated from exported products to more than 100 destinations. In general, the 2005/6 budget year export revenue is much higher than any of the previous years.

Among the exported items in 2005/6, 39 % of the export products were exported to Asia and Middle East, which exceeds 2001/2 export percentage by16.7%. Apart from Asia and Middle East other major destination of Ethiopia's export commodities for the 1998 Ethiopian budget year was Europe with more than 165 million USD which exceeds 2001/2 export value by 13.9 *%.(* yearly macroeconomic indicators – National Bank of Ethiopia)

In the last quarter of 2007, according to the report of national bank of Ethiopia coffee generates 127.8 million USD, which makes it again to lead the export market share. Coffee is followed by cereals, spices & oilseeds in total and then chat which generated 47.8 and 46.6 USD in the last three quarters of 2007 respectively.

According to access capital(2010) report, in the fiscal year 2009/10, Ethiopia has registered a never before seen two billion dollar which is 38% increase from the $1.5 billion in exports registered in the previous year of 2008/09 which is nearly three times the average annual export level of the prior decade (2000-2009). So there is a great improvements in the export value of the country recently as mentioned above compared to the previous time. But when it is compared to other Sub-Saharan African countries even it is to a greater extent unsatisfactory or almost the least. For instance, according to

the report of access capital, exports of goods in Ethiopia are only about 7 percent of GDP, compared to an average of near 30 percent of GDP in Sub-Saharan Africa and exports per person remain very low: only $24 in Ethiopia compared to $200 in Sub-Saharan Africa and $580 in developing Asia.

When we look at the structure of the export sector of Ethiopia it is characterized by high commodity concentration as is the case with least developed countries. That is, the sector is dominated by a few primary products that account for a lion's share of the country's export earnings. According to MOFA (2007),during the period 1994-1999 E.C., the leading export products of the country were coffee; oilseeds, pulses and spices; chat; hides and skins; and in very recent years flower and gold. For example, during the 1999 E.C. (2006/07), the share of the biggest contributors to the export earnings of the country was as follows: coffee (36%), pulses, oil seeds and spices (22.6%) of which the oilseeds were the most dominant (15.9%), gold (8.2), chat (7.8%), and hides, skins and leather products (7.6%). In absolute terms this means that coffee accounted for USD 424 million; pulses, oil seeds and spices' share was USD 267.6 million of which oilseeds accounted for USD 188 million; gold USD 97 million;; and hides and skins fetched USD 90 million; chat fetched USD 88.5 million and so on in the same year (i.e. 2006/2007).

It is therefore abundantly clear that export earnings from coffee still dominate and indeed exceed that of the second major export earners, namely pulses, oilseeds and spices by USD 157 million in that year. There has been, however, an interesting new development in the export composition of the country in recent years. That is, even though the sector is still dominated by a few primary products and coffee is still the biggest foreign exchange earner for the country, its percentage contribution to export earnings has gradually declined from 57% on average during the 1997/98-2000/01 period to 37% during 2000/01-2006/07 period. That is a decline from a share of more than half to about one third in a matter of few years. This is not because the absolute total (dollar) amount that coffee earns in a year has declined but because other sectors' contribution to export earnings has increased. That is, the contribution of product categories such as pulses and oilseeds and new comers such as flower has reduced the dominance of coffee in the export sector of Ethiopia - indicating a process of gradual horizontal export diversification. The ministry also identified that the earnings from flower export have

shown a dramatic growth such that it rose from a mere USD 159,000 in 1994 E.C. to USD 65 million in 1999 E.C. which is a four hundred fold growth, in a matter of six years. After eleven years this value became USD 170 million in 2009/10. It is almost more than twice. Let us look at the export performance of major commodities and their percentage share in 2009/10 from the table below.

Table 1: Major commodity exports, their value and percentage share (2009/10)

Exports by commodities(2009/10)			
Rank	Major commodities	USD value	Percentage share
1	Coffee	528,306,953	26.4%
2	Oil Seeds (sesame seeds, flaxseed, etc.)	358,515,300	17.9%
3	Gold	281,388,856	14.1%
4	Chat	209,525,313	10.5%
5	Flowers	170,195,147	8.5%
6	Pulses (beans, peas, lentils, etc)	130,100,321	6.5%
7	Live Animals	90,739,762	4.5%
8	Hide Skins	39,739,170	2.0%
9	Meat and Meat Products	33,999,375	1.7%
10	Vegetables	27,242,256	1.4%
11	Textile and Garments	22,860,780	1.1%
12	Spices	18,567,793	0.9%
13	Leather and Leather Products	15,760,381	0.8%
14	Mineral Products	13,363,246	0.7%
15	Natural Gum	12,681,896	0.6%
16	Others	11,777,487	0.6%
17	Cotton	10,611,606	0.5%
18	Cereals	4,800,538	0.2%
19	Animal Fodder	4,658,244	0.2%
20	Fruits	4,223,767	0.2%
21	Food	3,031,224	0.2%
22	Scrap Metal	2,450,816	0.1%
23	Natural Honey	1,889,305	0.1%
24	Beverage	1,685,393	0.1%
25	Bees Wax	1,598,914	0.1%
26	Animal Products	891,907	0.0%
27	Tea	881,699	0.0%
28	Hides	880,124	0.0%
29	Flour	762,013	0.0%
Total		2,003,129,585	100%

Source: Access capital (2010) based on data from Ethiopian revenue and customs authority

From the above table we infer that out of total export in the specified year, agricultural commodities accounted more than 70% share with coffee (26.4%).oil seeds (17.9%), chat (10.5), flowers (8.5), pulses (6.5) and others. Regarding export diversification or concentration of the country though Coffee continues to dominate the top spot among Ethiopia's exports but its relative significance is now at a historic low and the ranking of other key commodities is changing rapidly (table1). Notable among Ethiopia's non-coffee exports is the growing importance of five major products that each bring in more than $100 million per year: these include oil seeds ($358 million), gold ($281 million), chat ($210 million), flowers ($170 million), and pulses ($130 million).

In general when we look at the percentage share of major export items which are likely agricultural products by dividing into Imperial, Derg and EPRDF regimes; the percentage share of coffee became the highest during the Derg regime when it is compared to the Imperial and EPRDF regimes as it is depicted in table 2 below. In addition coffee constituted the highest share of total export value and not changed over the period under consideration. But the contribution of oilseeds and pulses declined during the Derg as well as the EPRDF regime. The contribution of chat from total export value has increased shapely to 10.15 percent as compared to its share during the imperial as well as the Derge regime with amount of 0.86 and 1.83 percent respectively.

Table 2: Percentage Share of Major Export items

Commodities	Imperial regime (1970/71-1973/74)	Derge regime (1974/75-1990/91)	EPRDF regime (1991/92-2006/07)	The whole period (1970/71-2006/07)
Coffee	43.23	63.57	53.73	57.12
Oil seeds	12.42	2.89	7.88	6.08
Hides and Skins	10.44	12.06	12.00	11.86
Pulses	11.08	3.86	3.38	4.43
Meat and Meat products	3.43	0.61	0.75	0.98
Fruits and Vegetables	9.66	1.09	1.41	2.15
Live animals	0.67	2.04	0.69	1.31
Chat	0.86	1.83	10.15	5.32

Source: National Bank of Ethiopia

2.3. Export promotion efforts in Ethiopia

2.3.1 Pre 1991/92

The previous governments of Ethiopia have tried to put their effort towards the promotion and diversification of the export commodities though export sector is their secondary activity and they were concentrating on import substitution strategy. The imperial government of Ethiopia in its three different five year plans tried to put its effort towards promoting export sector. The first five year plan which was from 1957-1962 focused on the buildings of different infrastructural facilities like road development and import substitution industrial promotion. Regardless of the above activities, it gave a minor attention to export promotion. On the other hand the second five year development plan stated the export sector to rely on traditional export products such as coffee, hides

and skins, oilseeds and pulses and others. When we look at the third five year development plan on the other hand, it gave a great deal of attention for foreign trade in general and for the export subsector development through diversifying varieties of export items in particular. (Debel G., 2002)

In general, the three development plans of the imperial government of Ethiopia didn't bring the anticipated export promotion and diversification though there were different attempts done.

The military government of Ethiopia under took a ten year perspective plan of 1985-1994 with the objective of orienting the country's export structure towards manufactured products from the already existing primary exports of agricultural products to expand the country's foreign exchange earnings and diversification of export items to come up with these objectives, the military government undertook different strategies. Such as promotion of exports through the provision of favorable tax, tariffs and foreign exchange rate measures, improving exports in terms of quality, quantity and variety and also others.

In general even though there were various measures taken by both the imperial and the derg regime to diversify and promote export sector, the country's export products remain undiversified and are still concentrated on very few products such as coffee, oilseeds, hides and skins, chat and pulses due to different factors.

2.3.2 Post 1991/92

The transitional government of Ethiopia has under taken different measures to boost the export performance of the country. For instance, this transitional government has undertaken liberalization and structural adjustment program together with the World Bank and International Monetary Fund to address the internal and external imbalances of the economy. In particular trade policy reform was undertaken which aimed at promoting exports through diversifying the country's commodity exports. Such as devaluation of the Ethiopian currency by more than 140 percent in terms of US dollar to make exports competitive and promote export trade; setting of a floor price for coffee, haricot bean and sesame seed; continuous revision of the tariff regime and reduction by of it from a maximum of 230 percent to50 percent; simplification of the import and export licensing system and making it more transparent so as to encourage new entrants in the export market; the range of goods and services covered by the auction has been progressively extended and finally fully liberalized; a duty draw back scheme was introduced where by exporters are re-funded the tax and duty they paid on the inputs and raw materials used in export production. This is to provide exporters a free trade status on their import of intermediate inputs and encourage non-traditional export products, especially that of manufactured goods. But the effectiveness of the scheme on export is constrained by lengthy administrative requirement to get re-funded, a foreign exchange retention scheme has been introduced which 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. But the scheme may not be beneficial in view of the usual control over the use of the retained 10 percent and for the fact that it ties up the working capital. In general following these trade policy reforms, a remarkable decrease in the anti-export-bias incentive structure and an increase in export volume and earning was realized (D.Gemechu, 2002).

CHAPTER THREE

3. LITERATURE REVIEW

3.1. The role of agricultural sector in Sub-Saharan Africa

Agriculture is an important sector for sustaining growth and reducing poverty in developing countries. Because the food and agriculture sector dominates most developing countries' economies in terms of contribution to GDP, employment and income, its growth and development are essential for overall process of socioeconomic development of developing countries (Wilfrid and Edwige, 2004). For instance, for the majority of the developing countries, the agricultural sector occupies a place of choice in the strategies and the development models; it represents a large part of gross domestic product GDP from 30% to 60% in two thirds of them approximately (FAO, 2001). According to Robert E.Clute, agricultural development in most countries is a necessary precondition for economic development unless they are fortunate enough to have other resources which can be exported to finance food imports.

Wilfrid and Edwige also underlined that the role of agriculture is to provide adequate output to assure global food security and enhance their economic development prospects. With a majority of the world's population living in rural areas in developing countries, agriculture remains a key economic activity to provide people with the capacity to feed themselves by producing their own food or as a source of employment and income to access food supplies.

Similarly, Jonson and Mellor (1961) in their integrative approach to the role of agriculture in economic development outlined five ways in which the development of agriculture supports the economic development of one nation. For instance, Economic development increases the demand for food and the failure of the agricultural sector to increase the food supply can impede development .The other way is in the case of peasant economies in the dominant sector of the economy, agriculture must provide the necessary capital for investments in social overhead and industry. There are also other ways in

which the development of agriculture supports economic development mentioned by the above researchers.

3.2. Export Performance and its Determinants in Low-Income Countries

‘‘Export performance is the relative success or failure of the efforts of a firm or nation to sell domestically produced goods and services in other nations and it can be described in objective terms such as sales, profits, or marketing measures or by objective measures such as distributor or customer satisfaction,’’ (Allaro, 2010). When we look at the export share of the African continent in the world trade, it has been experiencing a gradual decline since 1960. The share of the Africa’s export in the world export which stood at 5.52% in 1960 declined gradually to 2.87% in 2007 before increasing to 3.45% in 2008.This share in total world export is far below the share of the Asian continent in world trade has been enjoying an upward trend the share of the African continent and the developing America continent. Thus the trends showed that Africa has been losing market shares in exports in relative terms. Perhaps, this dismal trend can be linked to the composition of Africa’s merchandise trade. There is also dismal performance in terms of agricultural raw materials exports. Except for a country such as Benin that has over 50% of its exports in agricultural raw materials, a sizable number of the SSA countries share of the exports are below 20% (Adetunji and Busari, 2011).

Mold and Prizzon (2008) also tried to indicate that one of the most extensively cited stylized facts of African trade performance is that the continent’s share in world merchandise trade, measured in value terms, has declined steadily since 1980, from around 6 per cent to around 2 per cent in the late 1990s, with a subsequent mild recovery in the 2000s to around 3 percent. That decline in the world share of exports has been particularly marked for Western and Southern Africa. However, as Morrissey (2005) argues, this does not mean that trade is unimportant for Africa: compared to other developing country regions, Sub-Saharan Africa (SSA) tends to have high export/GDP

and import/GDP ratios. In simple terms, exports are very important to African countries even if African exports are not very important in the world market.

That is why based on the trade theory of Comparative advantage, Africa continues to produce and export its raw materials or primary goods, where it is said to have the comparative advantage as Amin et. al (2007) identified. But the comparative advantage theory has been disappointing as African countries have been forced in to the role of exporting raw material and other primary commodities with little or no development impact. Most of Sub-Saharan African countries depend almost on primary commodities for their foreign exchange earnings.

According to Ibrahim (2007), in developing countries, especially Sub-Saharan African (SSA) countries, pattern of exportable goods is dominated by primary agricultural products and for export of processed and semi processed agricultural products there is limited access to the international markets. Moreover the countries are facing decline in the prices of primary goods in the international market. However, LDCs basic focus was only to solve problems related to supply side bottleneck without paying much attention to the demand side problems or in some cases taking the demand side for granted. The export sector of SSA is highly affected not only by domestic policies but also by international policies including the performance of the world economy and other exogenous factors like institutions, governments' commitment, natural resource and intensity and prevalence of poverty.

On the other hand, according to study by Babatunde and Busari(2011), SSA countries have significantly liberalized their trade regimes over the past two decades or thereabout. Although, the pace and patterns of trade policy reform varies among countries, the general trend tends towards lower barriers to trade. This is evident in the significant reduction of tariffs and non-tariff barriers, removal of exchange rate control and elimination of export marketing boards among other trade reform measures. While the study was able to confirm the distortions caused by trade barriers on export performance, there is not much evidence that the adoption of trade policy reforms since, the mid-1980 have produced a significant agricultural export response. Declining infrastructure investment, particularly transport infrastructure (air/sea port, railways and roads) have

generated substantial transaction costs and dampened the response of agricultural exports to the more favorable trade environment being witnessed, since the mid 1980's. In addition, factors external to an individual country such as relative prices and income of trading partners appears to be more important determinants of exports than a country own structural adjustment policies. This however does not imply that, at the margin, structural adjustment policy reform is not beneficial. The simple point is that there are many factors other than structural policy that help explain the poor agricultural export performance of SSA countries. Domestic policies are necessary to reduce the various constraints on supply response increase transport and marketing efficiency and encouraging investment. To benefit from agricultural trade, SSA countries need to increase the flexibility and efficiency of resource use so that they can be competitive in global markets.

In addition Oyejide (2007) also identified that many African countries began the process of reforming their trade, investment and exchange rate regimes around the mid-1980s; this process gathered pace through the 1990s as the reforms both widened in terms of country coverage and deepened in several countries. These reforms constitute a reflection, in most cases, of a shift from an inward-looking and import-substituting industrialization strategy to an out ward-oriented and export-led development strategy. Correspondingly, the primary focus of policy gradually began to reflect increased concern for raising the profile of the export sector and more specifically for achieving the goal of significantly expanding and diversifying African exports. In this context, the emerging strategy appears to have at least two components, i.e., seeking improved external market access for a much wider range of African's export products, as well as seeking ways to eliminate the export supply response constraints which have hindered the growth and diversification of the regions export.

Ibrahim (2007) also identified that both domestic policies and international policies including the performance of the world economy and other exogenous factors like institutions, governments' commitment, natural resource and intensity and prevalence of poverty highly affect the export sector of SSA. Since the export sector is affected by multiplicity of causes, there has to be a rigorous analysis concerning this sector along

with agriculture, where agriculture is the base for the regions' export. Despite the significance of the sector, little work has been done in this area.

Various discussions on SSA's trade normally cover issues of unfair market access and problems concerning the market-distortive effects of developed subsidies. Yet one of the greatest challenges facing Sub-Saharan African countries today is overcoming supply-side constraints and building competitive capacity within the private sector. Over the past 30-40 years SSA's share in world exports has been declining and along with it the standard of living of most Africans. Yet during the same time, other developing countries, in particular in Asia, have experienced significant growth in their share of world exports (Calvin Manduna, 2005).

According to Allaro (2010), many researchers classify determinants of export performance into two broad components. These are internal and external components. According to him external components include market access/entry conditions and a country's location which include international markets while internal components are related to supply-side conditions. Foreign demand is influenced by various elements. Firstly it is strongly linked to geography (the structural components). Typically, countries at the center of fast growing region are more likely to benefit than countries situated outside that region. Second, it is likely to be related to competition and trade policy (the market access/entry component) which could have in principle a similar impact on trade than geography. Finally both quantity and quality of physical infrastructures (the development component) are expected to play important roles (Lages et al., 2004)

Fugazza(2004) also classified determinants of export performance into external and internal factors like Allaro (2010) where external factors are related to market access conditions and other factors affecting import demand. Apart from trade barriers and competition factors foreign market access is also determined by transportation costs, which include geography and physical infrastructures. On the other hand internal factors refer to supply side conditions. Supply capacity is also affected by location-related to elements, which may for example; affect access to raw materials and other resources. It also depends up on factor costs such as lab our and capital.

He also stated that, beside resource endowment, factor costs are essentially the outcome of economic policy and the institutional environment. Access to technology, which is likely to affect the productivity of the external sector, may be also an important determinant according to the above author.

On the other hand Charles D Jebuni (2006) outlined that the availability and quality of infrastructural services is critical to economic activity in terms of determining the costs, profitability and viability of different economic activities. They also influence the attractiveness of different countries/locations for investment, and the type of economic activities.

In general since the export sector is affected by multiplicity of causes in low income countries especially Sub-Saharan African countries there have to be a rigorous analysis concerning this sector.

3.3. Determinants of Export Performance in Ethiopia

Mekbib (2008) classified factors affecting export performance into two broad categories. These are domestic and external factors. According to Mekbib, ‘‘External factors are factors that are related with international/regional and individual country’s trade and related policies. For instance, the rules established by different international organizations such as world trade organization may probably promote external trade in the long run. Even though the rules established by international organizations such as the World Trade Organization (WTO) may in the long run promote external trade, in the short run, the degree to which globalization pressurizes developing economies to open-up without allowing enough time to prepare for the challenges, could have a serious impact on their export performance.’’ In addition to the above constraints the tendency of some regional organizations to protect their markets from external competition may minimize the developing countries access to the external market. Protective policies of countries (through tariff and non-tariff barriers), such as, for instance, the agriculture policies of some European countries, under pressure from internal industries, constrain exports of developing countries. The second one is domestic factors which Mekbib classified again in to two categories. Such as, factors internal and external to the firm.

When we look at specifically the factors affecting export performance of Ethiopia, different researchers have put their effort towards identifying and addressing these constraints. For instance, according to Abay and Zewdu (1999), the major constraints of the Ethiopian export sector could be seen from demand and supply sides. The demand side constraints include low level of demand for agricultural products due to very slow population growth rate in industrial countries, low income elasticity of demand for primary exports, production of synthetic products, and restrictive trade policies followed by importing countries. On the other hand; type and composition of products, concentration of export markets in few countries, natural factors like drought and diseases, and poor domestic policies are among the supply side challenges of the Ethiopian export trade according to the above named researchers.

The stage of development or level of industrialization is also an important determinant of external competitiveness and export performance through externalities. The level of development of infrastructure, the overall institutional framework for economic management, level of education of the workforce, the efficiency of transportation and communication system in the country, the availability and degree of domestic supply of inputs to exporting firms, the nature of home demand for export commodities, etc., influence the performance of a country's exports(Mekbib, 2008). He also underlined that the level of the economy, its resource endowments, policies and development strategies pursued are the some of the factors determining the export structure of the country.

World Bank (1987) report also indicated that exchange rate overvaluation, low level of investment, the coffee surtax, inadequate marketing infrastructure, high raw material import tariffs, unfavorable terms of trade and insufficient adjustment of producer prices are the major obstacles of Ethiopian export performance.

Mouze (2005) also tried to show the agricultural exports of Ethiopia as a function of real effective exchange rate, terms of trade, infrastructure variable measured by the percentage of paved road to total road, net value of world trade, agricultural input (fertilizer consumption) and a dummy to capture the impact of government change. As a result the Error correction model shows that only real effective exchange rate, terms of trade and fertilizer consumption are the significant short-run and long-run determinants of agricultural export supply of the country. On the other hand, Berhanu (2005) using

cointegration and Error Correction Model analyzed both short- and long-run relationships between the real exports of the country and various explanatory variables. The long-run model shows that when real exchange rate and real private sector credit affect real exports of the country positively, real private consumption affected negatively. Similarly, the short-run factors significantly affecting exports are real GDP, real private sector credit and real private consumption.

CHAPTER FOUR

4. DATA SOURCES, METHODOLOGY AND MODEL SPECIFICATION

4.1 Data Sources

The study uses secondary data collected from different sources. The main data sources are National Bank of Ethiopia, Ethiopian Revenue and Custom Authority, Ethiopian Roads Authority, Central Statistics Agency, World Development Indicator, IMF World Economic Outlook Website and UNCTADSTAT.

4.2 Methodology

4.2.1 Stationary and Non-Stationary Series

The standard classical methods of estimation which are used in the applied econometric work are based on a set of assumptions one of which is the stationarity of the variables. A variable is said to be covariance (weakly) stationary if the mean and the variances of the variable are constant over time and the covariance between two periods depends only on the gap between the periods, and not the actual time at which this covariance is considered whereas a non-stationary series has a different mean at different points in time and its variance increases with the sample size (Debel G., 2002).

According to Madala (1992), a time series is said to be strictly stationary if the joint distribution of any set of N observations Y_1, Y_2------Y_t is the same as the joint distribution of Y_{1+k}, Y_{2+k} …Y_{t+k} for all N and K. The distribution of Y_t is independent of time and thus it is not only the mean and the variance that is constant but also all higher values of t are independent of *t*.

In time series analysis, most encountered series are in fact non-stationary. Contrary to the situation of stationary process which fluctuates around their mean, the reversion to a fixed value rarely occurs for non-stationary process. If a non-stationary time series is regressed on one or more non-stationary time series, the results are prone to spurious regression problems. This is a situation where results obtained suggest there are statistically significant relationships between the variables in the regression model when

in fact all that is obtained is evidence of contemporary correlations rather than meaningful causal relations (J. Gudeta, 2010).

Therefore, it is necessary to check whether or not the variables included in the model are stationary or not before going to the next step which is regression analysis.

Testing for Unit-Roots

Unit-roots are important to detect the stationarity of time-series data. To test if the series, used have unit-roots we apply a test based on the work of Fuller (1976) and Dickey and Fuller (1979, 1981). The Augmented Dickey-Fuller test is a similar but modified version of the Dickey-Fuller test which is used when error term is not a white noise. While testing for stationarity, if a variable becomes stationary at level, then it is said to be integrated of order zero, I (0). And if the variable is stationary at its first difference, it is said to be integrated of order one I (1). Similarly, if a variable can be transformed to stationary series by differencing n times, then it is integrated of order *n*, I (*n*). (Verbeck, 2004)

4.2.2 Co-integration and the Error Correction Model

Once the order of integration of the non stationary variables has been determined and of variables is found to be non stationary the next step is Co-integration. The test for co-integration is to check for the existence of co-integrating relationships between non stationary explanatory variables, are co-integrated, if they have a liner combination of their data series that is stationary even though the individual series are non-stationary. In other words, we want to test for the stationary of the liner combinations of these variables.

The theory of cointegration addresses the issue of integrating short-run dynamics with long run equilibrium. Two I (1) series are said to be cointegrated if there exists a linear combination of the series which is stationary. Suppose that Y_t is I(1) and X_t is also I(1), then Y_t and X_t are said to be cointegrated if there exists a β such that $Yt - \beta Xt$ is I(0). In that case the regression equation $Yt = \beta Xt + Ut$ makes sense because Y_t and X_t don't drift too far apart from each other over time (Madala, 1992). In general, if X_t and Y_t are

cointegrated, that means there is a long-run relationship between them and Furthermore, the short-run dynamics can be described by the error correction model (ECM).

Regarding the test for the existence of cointegration, there are a number of methods for testing it. Among these the Engle Granger two step residual based procedures and the Johansen test are the major ones used by many researchers. Therefore, in this paper, the co-integration test carried out is Engle Granger two step procedures. This model first estimates the relationship between the variables by ordinary least square (OLS) and test for stationary of the error term. If the error term is found to be stationary then the variables are co-integrated. In economic terms, variables will be co-integrated if they have a long term equilibrium relationship between them(Maddala,1992).

4.3 Model Specification

Definition of Variables

Terms of trade

Terms of trade means terms or rates at which the products of one country are exchanged for the products of the other. It is known to us that every country has got its own money. The currency of one country is not legal tender in the other country. So, every country has to export commodities in order to import goods. In addition the rate of exchange or the term of exchange depends upon the elastic ties of the demand of each country for the products of the other. Terms of trade are measured by the ratio of export prices to import prices. The terms of trade will be favorable to a country when the export prices are high relatively to import prices. This is because the products of one unit of domestic resources will exchange against the product of more than one unit of foreign exchange. If on the other hand, the prices of its imports rise relatively to the prices of its exports, the terms of trade will be unfavorable to the country.

The terms of trade are of economic significance to a country. If they are favorable to a country, it will be gaining more from international trade and if they are unfavorable, the loss will be occurring to it. When the country's goods are in high demand from abroad, that is when its terms of trade are favorable, the level of money income increases.

Conversely, when the terms of trade are unfavorable, the level of money income falls. We therefore expect the coefficient of terms of trade to be positive.

Nominal effective exchange rate (NEER)

The price of one currency in terms of another is called exchange rate. Exchange rates play a central role in international trade because they allow the computation of the relative prices of goods and services produced in different countries thereby allowing the comparison of those prices across countries. Changes in exchange rates are described either as depreciations or appreciations.

There are two indicators to measure exchange rate changes. These are Nominal Effective Exchange Rate (NEER) and Real Effective Exchange Rate (REER). The NEER is a weighted average of major bilateral nominal exchange rates, with weights based on the trade shares reflecting the relative importance of each currency in the effective exchange rate basket.

According to Love and Turner, an increase in the index would represent an appreciation, by its nature of construction, since e is calculated in terms of US dollars per unit of local currency. An appreciation would be associated with a loss in competitiveness and most likely, a deterioration of trade balance, the extent of which is dependent upon the price elastic ties of demand for exports and for imports.

An increase in the NEER means appreciation and appreciation makes Ethiopia's agricultural export less competitiveness in the world market and thus decreases total agricultural exports of the country. On the other hand depreciation or the decrease in NEER increases agricultural exports of the country by making Ethiopia's agricultural exports more competitive in the world market in general. Finally, therefore, we expect the sign of the coefficient of NEER to be negative.

Infrastructure

Infrastructure is one of the major non-price factors which affects or constrains exports especially in least developing countries. Of the factors that boost production as well as export supply of commodities, infrastructural facilities come at the forefront. Its development is a key element of countries ability to produce and move goods. Weak infrastructure is a major impediment to trade, competitiveness and sustainable development in most African countries, particularly land-locked and small island countries. It reduces the return to trade and economic activity and hinders growth prospects of a given country.

According to Eyayu T. (2011), internal physical infrastructural facilities of a given country can be proxy by indexes such as percentage of paved roads out of the total road; number of fixed and mobile telephone subscribers (per 1000 people); number of internet subscribers (per 1000 people), freight of air transport (in mill ton-km) and so on. In this study the impact of infrastructure is captured by kilometers of total paved roads. Since the availability of road creates marketing opportunities in the international market and also the absence of such facilities does not bring the desired agricultural export performance of the country, therefore, we expect the sign of this variable to be positive.

Gross Domestic Product (GDP)

Higher GDP values in the exporting country imply increased capacities for export. It is expected to have to have a positive impact on exports. For instance, Kumar (1998) in his study on the determinants of export growth in developing countries confirmed that GDP has a significant positive impact export volumes. He also underlined that higher level of production is the main cause of export expansion. So, a higher GDP implies a higher production and hence larger volume of exports. Therefore, we expect a positive relationship between the dependent variable and GDP.

World Price

The price of exports on the international market is one of the major determinants of export growth and especially for countries which depend on exportation of agricultural products whose prices fluctuate from time to time (N.Agasha, 2006). When foreign price level increases, the domestic exporters will get incentive to maximize or increase their export. So, we expect positive relationship between the agricultural export and foreign price level.

Fertilizer input

Fertilizer is the ingredient which increases the productivity of agricultural products. When fertilizer import increases, its consumption will also increase which in turn increases the productivity and hence increases export supply of the country. Hence, we expect the sign of the coefficient of fertilizer input import to be positive.

Therefore, the model which will be estimated to capture the determinants of agricultural export in Ethiopia is thus given by:

$$Ln\ AGRX_t=\beta_0+\beta_1 ln\ TOT_t+\beta_2 ln\ GDP_t+\beta_3 ln\ DP_t+\beta_4 ln\ WP_t+\beta_5 ln\ NEER_t$$

$$+\beta_6 ln\ ROAD_t+\beta_7 ln\ FERT_t+\varepsilon_t$$

Where; $AGRX_t$= Agricultural export performance in million US dollars.

TOT = Terms of trade

GDP= Value of gross domestic product in million US dollars.

DP = Domestic price

WP = World price

NEER = Nominal effective exchange rate

ROAD = Kilometers of paved roads which is a proxy of transportation infrastructure.

FERT = Fertilizer import over a period in million US dollars

β's are unknown parameters to be estimated

t = time in years (1980-2010)

ε = random terms

To estimate the above equation, the time-serious approach was applied and the empirical results were tested using Eviews 7.

CHAPTER FIVE

5. EMPIRICAL ANALYSIS

5.1 Result of Unit Roots Tests

In time serious analysis the first task before any meaningful regression is to test the existence of unit roots in the variables and establishing their order of integration. Because the variables used in the analysis need to be stationary and/or should be co integrated in order to infer a meaningful relationship from the regression (D.Gemechu, 2002). All the variables used in the estimation process are tested using Augmented-Dickey Fuller test statistic and the results are presented in table 3 below.

Table 3: Results of unit root tests for order of integration of the variables

ADF test at level

Variable	ADF	p-value	Result
Lnagrx	0.2112	0.9688	Non-stationary
Lndp	0.2104	0.9686	Non-stationary
Lnfert	-3.0248	0.0439	Stationary
Lngdp	-1.2241	0.6501	Non-stationary
Lnneer	-1.1389	0.6863	Non-stationary
Lnroad	0.0995	0.9604	Non-stationary
Lntot	-4.6667	0.0008	Stationary
Lnwp	-0.2242	0.9248	Non-stationary

ADF test at First Difference

Variable	ADF	P-Value	Result
DLnagrx	-4.4128	0.0016	Stationary
DLndp	-3.6814	0.0099	Stationary
DLnfert	-7.0481	0.0000	Stationary
DLngdp	-3.5900	0.0223	Stationary
DLnneer	-3.3428	0.0124	Stationary
DLnroad	-5.2537	0.0002	Stationary
DLntot	-5.4096	0.0001	Stationary
DLnwp	-4.0874	0.0037	Stationary

As it is clearly shown in table 3, all the variables except terms of trade and fertilizer are not stationary at level or at zero difference. Fertilizer is a stationary at 5% and 10%. To get all the variables to be stationary, we will take the first difference of the variables and test for stationarity. Accordingly, all the variables in the above table are stationary at first difference. Hence, they are regarded as integrated of order one or I(1).Because, if a time serious is differentiated at once and the differentiated series is stationary, then the original serious is termed as integrated of order one (Gujarati, 1995).

5.2 Cointegration test

Table 4: Cointegration test using ADF

Residual		ADF Test	P-value
ECM		-5.1731	0.0002
Critical Values	1%	-3.6702	
	5%	-2.9639	
	10%	-2.6210	

For co- integration to exist the residual has to be integrated of order zero or stationary at first difference or at level as it was broadly discussed before. Accordingly, the table displays that the residual is found to be stationary at level with a p-value of 0.0002 which is almost zero.

5.3 Estimation of the long run and error correction models

After cointegration test has been conducted and its presence is confirmed, the next task is estimating the long run and error correction models.

Table 5: Result of the Estimated Long Run Model

Variables	Coefficient	Std error	P-value
Constant	-24.0371	4.3305	0.0000
Lndp	0.2713	0.4015	0.5059
Lnfert	0.1197	0.0281	0.0003
Lngdp	-0.5531	0.2361	0.0282
Lnneer	1.0505	0.2540	0.0004
Lnroad	1.8868	0.3826	0.0001
Lntot	0.6654	0.3233	0.0511
Lnwp	1.2414	0.2353	0.0000

Number of observation=31 R-squared=0.9330

F-statistic=45.7819 Prob (F-statistic) =0.0000

Adjusted R-squared=0.9127 Durbin-Watson (DW) =1.921

The results of various diagnostic tests such as Breush-Pagan-Godfrey test for heteroskedasticity (Annex 4), Breush-Godfrey LM Test for serial correlation (Annex 5), Jarque-Bera test for normality (Annex 6), and Ramsey's general test of model misspecification (Annex 7) are reported and all tests did not detect any problem of serial correlation, hetroskedasticity, non-normality and model misspecification.

In the above estimated long-run model when fertilizer, paved road, terms of trade and foreign price level have expected sign as anticipated; domestic price (insignificant), Gross domestic product and nominal effective exchange rate on the other hand revealed unexpected sign. For example, the coefficient of GDP is negative despite being significant. This negative relationship between GDP and agricultural export might be justified in such a way that when GDP of the country increases, domestic absorption will definitely increase. If domestic absorption increases, obviously agricultural export will decrease. In general as it can be seen from t-ratios and probabilities except domestic price all other variables significantly affected the agricultural export performance in the long-run.

Having already obtained the long-run model and estimated the coefficients, the next step will be estimation of coefficients of the short-run dynamics that have important policy implications. Hence, an error correction model will be estimated that incorporates the short term interactions and the speed of adjustment towards long run equilibrium. So, the error correction model has been estimated using the OLS technique and the results are summarized in table 6 below.

Table 6: Result of the Error Correction Model

Variable	Coefficient	Std error	P-value
C	-0.0821	0.0620	0.1997
Dlndp	0.0467	0.5022	0.9268
Dlnfert	0.0896	0.0293	0.0060
Dlngdp	-0.2385	0.3234	0.4675
Dlnneer	0.6809	0.3573	0.0705
Dlnroad	3.2089	1.1006	0.0083
Dlntot	0.6008	0.2795	0.0434
Dlnwp	1.2079	0.2951	0.0005
Decm	-0.8370	0.0620	0.0064

Number of observation=30 R-squared=0.6900

F-statistic=45.7819 Prob (F-statistic) =0.0005

Adjusted R-squared=0.572 Durbin-Watson (DW) =2.19

Similar to the case of long run model, the results of various diagnostic tests such as Breush-Pagan-Godfrey test for heteroskedasticity, Breush-Godfrey LM Test for serial correlation, Jarque-Bera test for normality, and Ramsey's general test of model misspecification which are listed and discussed in annex 9, 10, 11 and 12 respectively are reported and all tests did not detect any problem of serial correlation, hetroskedasticity, non-normality and model misspecification too.

On the other hand from the estimation results of the short run error correction model in table 6 above, the coefficient of the error correction term is significant with expected negative sign and relatively large magnitude (-0.8370). Its magnitude indicates that deviation from the long run equilibrium is adjusted fairly quickly where 83.7% of the disequilibrium is removed each period. The result of R^2 is also 0.69(69%). Which reveals that of Ethiopian agricultural export performance is caused by the explanatory variables included in the model, while 31% is by other variables which were not included in the model. Furthermore, F-statistic is significant with a probability of 0.005 which implies that the model fit.

Furthermore, coefficients of the short run model show that fertilizer input, nominal effective exchange rate, kilometers of paved road, terms of trade and world price are significant; indicating that the variables significantly affect the agricultural export performance of Ethiopia in the short run. However, despite nominal effective exchange rate significantly affected the agricultural export in the short run like in the case of long run, its sign is different from what already expected. That is the sign of the coefficient of nominal effective exchange rate became positive. The unexpected positive relationship registered from the result of the estimated model might be due to different reasons. For instance, if nominal effective exchange rate increases, domestic currency will appreciate. The appreciation of domestic currency has obviously negative impact on exports since it decreases the competitiveness of the country's export in the world market. On the hand, appreciation will also make imports cheap. Following the cheapness of import, domestic exporters may get incentive to import high quantities of different machineries, instruments, chemicals and others that will increase the productivity of agricultural exportable goods in general and the volume of agricultural export in particular. The other one is regarding the impact of agricultural input use which in this paper is captured by fertilizer import over a period. The result shows that a 1% increase in fertilizer import will lead to 0.09% increase in the agricultural export supply. That is an increase in the fertilizer import which means an increase in its consumption in other words increases the agricultural productivity and production of agricultural commodities in general which will also in turn increase the total agricultural export of the country. The coefficient of world price (WP) is also positive and significant as expected. That means an increase in

world price level by 1% will lead the agricultural export to increase by 1.2%. This is because of the fact that when foreign price level of agricultural products increases, domestic exporters will get incentive to increase the volume of their exports which will in turn leads to the increments of total agricultural export of the country. When we come to terms of trade, its coefficient is significant and positive in sign as expected. It shows that an improvement by 1% in the terms of trade will lead to 0.60% increase in the total agricultural export of the country. The other important explanatory variable is kilometers of paved roads which is a proxy of infrastructural facilities. The figure shows that an increase in the kilometers of paved roads by 1% will increase the agricultural export by a larger magnitude of 3.2%. As it was widely discussed under chapter four, infrastructural facility especially the expansion of paved roads is the key determinant of country's export performance.

On the other hand, as the estimated result obviously shows, the sign of the coefficient of domestic price (DP) is positive which does not match with what already expected and it is also statistically insignificant. This implies that domestic price has no impact on agricultural export performance of Ethiopia. This is likely because domestic exporters seriously look at foreign price of the exported good rather than its domestic price. Like domestic price, in the short run, the coefficient of gross domestic product is also insignificant and negative in sign. Therefore, the insignificance of the coefficients of the above two explanatory variables shows that in the short run neither domestic price nor gross domestic product has no impact on the country's agricultural export performance.

CHAPTER SIX

6. CONCLUSIONS AND POLICY IMPLICATIONS

6.1. Conclusion

Like many other Sub-Saharan African countries, Ethiopia has for long been dependent on primary commodities to partially meet its foreign exchange earnings. However, foreign exchange earnings attained from these traditional products which are mainly agricultural commodities could not match with the highly increasing demand. That is why this study has made an attempt to identify the factors that determine agricultural export performance of Ethiopia. In other words, the central question investigated in this paper is whether or not agricultural export is significantly affected by the major selected explanatory variables such as terms of trade, gross domestic product, domestic price, world price, nominal effective exchange rate, paved roads and fertilizer input. To address this question, time serious data ranging from the year 1980 up to 2010 was utilized. The study used secondary data collected from different sources. In this study agricultural export was used as dependent variable and the above mentioned variables expected to affect agricultural export performance of the country are used as explanatory variables.

Accordingly, the first task was estimation using OLS technique to test the relationship between agricultural export performance and explanatory variables. Pre-estimation tests of the statistical behavior of the variables using Augmented Dickey Fuller test for the presence of unit root showed that all the variables except terms of trade and fertilizer input were non-stationary at level. However, all the variables were stationary at first difference. Thus, they are regarded as integrated of order one. The next step was cointegration test which helps us to know the presence of long run relationship between the dependent variable and the explanatory variables. After cointegration test was conducted using Engle Granger procedure and its presence was confirmed, since the error correction term is significant and negative in sign as expected, the long run equation was estimated and according to the result all the variables except domestic price were found to significantly affect the agricultural export performance of the country. But, the sign of variables like gross domestic product and nominal effective exchange rate was found to

be different from what already expected. For instance, the sign of gross domestic product was negative. This might be due to the fact that when gross domestic product increases, domestic absorption will increase which in turn diminishes exports.

Next, the Error Correction Model (ECM) was estimated to show the short run relationship between the dependent and explanatory variables. Accordingly, the regression result shows that domestic price was insignificant in the short run. In addition to domestic price, gross domestic product also became insignificant. That means in the short run these variables have no impact on the agricultural export performance of Ethiopia. On the other hand except these two explanatory variables all other variables such as terms of trade, world price, kilometers of paved roads, and fertilizer input import over a period were found to affect the dependent variable significantly and positively as already anticipated. The coefficient of nominal effective exchange rate was negative despite its significance.

6.2. Policy implications

It is obviously clear that there is a strong relationship between export performance and economic growth. To strengthen this view if we look at the Asian countries which are commonly referred as Asian tigers; their economy is too much dependent on exports. Accordingly, due to that they registered a fast economic growth which stood them among middle income or high income level countries from the bottom. Therefore, countries should identify and go through the factors affecting either directly or indirectly their export performance. The study tried to list out the major factors affecting the agricultural export performance of Ethiopia by looking at both domestically related factors and foreign related market access conditions and/or including price and non-price factors affecting the agricultural sector performance.

The findings pinpoint that even though the government's policy makers should have to give a due emphasis for all factors either price and non-price factors that significantly affected the agricultural export performance of country, the emphasis that should be given for especially non-price factors such as the provision paved roads facilities has to take the lions share. For instance, if we look at the output of the estimated model both in the long run and short run, the coefficient of kilometers of paved road is very large

compared to that of other variables. This implies that road network is a major factor affecting the sector and its improvement is indispensible for the promotion of agricultural export in Ethiopia.

In general according to the findings, there is a room for improvement by considering the economic situation prevailing in the country. For instance, if we take the case of paved road network again, improving it would enable producers to sell their product in the nearby markets. This will in turn make them to shift from subsistence production to commercial production. This will lead to again a higher proportion of gross domestic product constituting export volumes. Not only road network but also other facilities including sufficient supply of fertilizer input either by importing or producing in the country and price related factors such as favorable terms of trade and higher foreign price level will lead to improvement in the agricultural export as the findings of the study depict.

Bibliography

Abay Asfaw and Zewdu Belete (1999), "Export Earnings Instability and Export Structure: the Case of Ethiopia".

Access Capital Investing in Ethiopia (2009) report.

Ackah, C. and Morrissey,O (2005), "Trade Policy and Performance in Sub-Saharan Africa Since the 1980s",*Credit Research Paper* Vol.05, *No.13,*University of Nottingham, England.

Amin,A., Amunda,N., and Diop,B.(2007), "Can Africa Develop Through Trade in the Current Global Economy with Large Trading Blocks?",Paper presented with in the Conference on Sector-Led Growth in Africa and Implication for Development, Dakar, Senegal.

Andrew Mold and Annalisa Prizzon (2008), ''Explaining Africa's recent export performance and the limited gains from the commodity boom''.

Berhanu A.(2005), ''Coffee prices and export growth opportunities: The case of Ethiopia

Berhanu Nega et al., (2002), ''Sources and uses of export support services in Ethiopia'' EEA/Ethiopian economic policy research institute working paper.

Biggs,T.(2007), "Assessing Export Supply Constraints: Methodology, Data, and Measurement" AERC Working Paper, African Economic Research Consortium, June, Nairobi

Biramo Hailegiorgis (2011), ''Export performance of oilseeds and its determinants in Ethiopia'', Journal of Cereals and Oilseeds Vol. 2(1), pp. 1-15

Calvin Manduna (2005), ''Assessing the causes of Sub-Saharan Africa's Declining exports and addressing supply side constraints'' Tralac working paper No 2/2005

Charles D. Jebuni (2006), ''Challenges and prospects of relaxing export supply constraints in Africa '' centre for policy analysis Accra, Ghana.

Dawit Alema et al, ''Agriculture policy support in Ethiopia''

Debel Gemechu (2002), ''Exports and Economic growth in Ethiopia: An Empirical Investigation''

Engle, R.F., and C.W.J. Granger (1987), ''Cointegration and Error Correction: Representation, Estimation and Testing'', Econometrica 55, 251-276. Harriies, R.

(1995), using Cointegration analysis in econometric modeling, New York, Prentice Hall.

Eyayu Tesfaye (2011), ‘‘Determinants of Agricultural Export in Sub-Saharan Africa’’

Fugazza,M.(2004), “Export Performance and Its Determinants: Supply and Demand Constraints”, Policy Issues In International Trade and Commodities Study Series Vol.1,No.26, Geneva, Swaziland.

Gbadebo, and Olusegun Odularu (2007), **“**Modeling Africa’s Agricultural Export to the United States”, PhD Thesis, Covenant University.

Getachew Yirga (2009), ‘‘Determinants of cut-flower export supply of Ethiopia’’.

G.S. Madala (1992)” Introduction to Econometrics” Second Edition, Macmillan publishing company, New York.

Gujarati, Damodar (2004) “Basic Econometrics”, 4th edition,The MacGraw – Hill Companies.

Ibrahim Worku (2007), ‘‘Determinants of primary commodity export in Sub-Saharan Africa’’

J.Love and E.Turner (2001), “Exports, Domestic Policy and World Markets: A Panel Study’’, Journal of International Development 13, 615-627.

Johansen, S. (1988), ‘‘Statistics Analysis of Cointegration Vectors’’, Journal Economic Dynamics and Control 12, 231-254.

Kumar.J., and Siddharthan, N.S.(1997), ‘‘Technology, market structure and Internationalisation’’ Issues and policies for developing countries, Routledge, Newyork

Love J. And E. Turner (2001) “Exports Domestic Policy and World Market: A Panel Study”, Journal of international development, Dev 13. 661-627.

L.Wilfrid and K.Edwige (2004), ‘‘Role of agriculture in economic development of developing countries: Case study of China and Sub-Saharan Africa’’ Journal of agriculture and social research vol.4, No.2, 2004.

Marios Obwona and EphraimChirwa, ‘‘Impact of Asian Drivers on SSA agriculture and food security: Issues and challenges’’.

Mekbib Negash (2008), ‘‘Pre Shipment loan utilization in exporting agricultural products in Ethiopia’’.

Ministry of Foreign Affairs (2007), ‘‘Trade Promotion Manual for Ethiopian Diplomatic Missions ’’

Mouz Mulugeta (2005), ‘‘Determinants of agricultural export in Ethiopia’’

M.Adetunji and Dipo T.Busari (2011), ‘‘Adjustment Reforms and agricultural export trade in SSA: A case of strange bedfellows ’’ volume:6 issue :2 page No:96-113.

NBE (National Bank of Ethiopia). Annual Reports, Various Issues

Oyejide, T. (2007), ‘‘Framework Paper for the AERC Collaborative Research Project on Export Supply Response Capacity Constraints in Africa”

Rao, B.B. (1994), ‘‘Cointegration for the Applied Economist, University of New South Wales, Australia, Macmillan’’

UNCOMTRADE, United Nations Commodity Trade Statistics, www.comtrade.statistics.

Verbeek (2004),”A guide to modern econometrics, Second Edition, John Wiley and Sons, Ltd, Rotterdam

World Bank (1987) Ethiopia: An Export Action Program, Eastern and Southern Africa Regional Office, Report No. 6432-ET.

Annexes

Annex 1: Unit Root test

ADF test at level

Null Hypothesis: LNAGRX has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.211182	0.9688
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.210415	0.9686
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNFERT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.024855	0.0439
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.224073	0.6501
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNNEER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.138984	0.6863
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

Null Hypothesis: LNROAD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.099469	0.9604
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNTOT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.666705	0.0008
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNWP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.224229	0.9248
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

ADF test at first difference

Null Hypothesis: D(LNAGRX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.412822	0.0016
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.681441	0.0099
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNFERT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.048138	0.0000
Test critical values:	1% level	-3.679322	

	5% level	-2.967767
	10% level	-2.622989

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.342884	0.0223
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Null Hypothesis: D(LNNEER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic
Augmented Dickey-Fuller test statistic		-3.590044
Test critical values:	1% level	-3.679322
	5% level	-2.967767
	10% level	-2.622989

*MacKinnon (1996) one-sided p-values = 0.0124

Null Hypothesis: D(LNROAD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic
Augmented Dickey-Fuller test statistic		-5.253701
Test critical values:	1% level	-3.679322
	5% level	-2.967767
	10% level	-2.622989

*MacKinnon (1996) one-sided p-values = 0.0002

Null Hypothesis: D(LNTOT) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic
Augmented Dickey-Fuller test statistic		-5.409633
Test critical values:	1% level	-3.689194
	5% level	-2.971853
	10% level	-2.625121

*MacKinnon (1996) one-sided p-values = 0.0001

Null Hypothesis: D(LNWP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.087432	0.0037
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values = 0.0037

Annex 2: Long run estimated equation

Dependent Variable: LNAGRX
Method: Least Squares
Date: 05/23/12 Time: 10:53
Sample: 1980 2010
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDP	0.271304	0.401459	0.675794	0.5059
LNFERT	0.119693	0.028070	4.264049	0.0003
LNGDP	-0.553085	0.236152	-2.342068	0.0282
LNNEER	1.050499	0.254017	4.135547	0.0004
LNROAD	1.886851	0.382678	4.930646	0.0001
LNTOT	0.665446	0.323381	2.057776	0.0511
LNWP	1.241452	0.235258	5.276971	0.0000
C	-24.03708	4.330551	-5.550581	0.0000

R-squared	0.933037	Mean dependent var	6.076678
Adjusted R-squared	0.912657	S.D. dependent var	0.576120
S.E. of regression	0.170266	Akaike info criterion	-0.485278
Sum squared resid	0.666779	Schwarz criterion	-0.115217
Log likelihood	15.52181	Hannan-Quinn criter.	-0.364647
F-statistic	45.78192	Durbin-Watson stat	1.920951
Prob(F-statistic)	0.000000		

Annex 3: Cointegration test

Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.173064	0.0002
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Diagnostic tests for estimated long run equation

Annex 4: Test for heteroskedasticty

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.638033	Prob. F(7,23)	0.7200
Obs*R-squared	5.040851	Prob. Chi-Square(7)	0.6550
Scaled explained SS	5.029045	Prob. Chi-Square(7)	0.6564

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/06/12 Time: 09:41
Sample: 1980 2010
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.602415	1.106515	-0.544425	0.5914
LNDP	-0.011878	0.102578	-0.115797	0.9088
LNFERT	0.005980	0.007172	0.833779	0.4130
LNGDP	0.043897	0.060340	0.727498	0.4743
LNNEER	0.014392	0.064905	0.221733	0.8265
LNROAD	0.027955	0.097780	0.285899	0.7775
LNTOT	0.078451	0.082628	0.949439	0.3523
LNWP	-0.100300	0.060112	-1.668567	0.1088

R-squared	0.162608	Mean dependent var	0.021509
Adjusted R-squared	-0.092250	S.D. dependent var	0.041627
S.E. of regression	0.043505	Akaike info criterion	-3.214237
Sum squared resid	0.043532	Schwarz criterion	-2.844176
Log likelihood	57.82067	Hannan-Quinn criter.	-3.093606
F-statistic	0.638033	Durbin-Watson stat	2.511526
Prob(F-statistic)	0.720035		

Ho: Homoskedasticity

H1: Heteroskedasticity

Thus, we accept the null hypothesis of constant variance or homoskedastic.

Annex 5: Test for serial correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.668666	Prob. F(2,21)	0.5230
Obs*R-squared	1.855965	Prob. Chi-Square(2)	0.3954

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/06/12 Time: 09:48
Sample: 1980 2010
Included observations: 31
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDP	-0.016130	0.409047	-0.039433	0.9689
LNFERT	0.009819	0.032682	0.300441	0.7668
LNGDP	-0.070914	0.247828	-0.286143	0.7776
LNNEER	0.078753	0.266788	0.295191	0.7707
LNROAD	0.104210	0.398751	0.261342	0.7964
LNTOT	-0.030194	0.329312	-0.091688	0.9278
LNWP	0.100896	0.258732	0.389963	0.7005
C	-1.119391	4.500940	-0.248702	0.8060
RESID(-1)	-0.036370	0.254204	-0.143076	0.8876
RESID(-2)	-0.305698	0.267281	-1.143732	0.2656

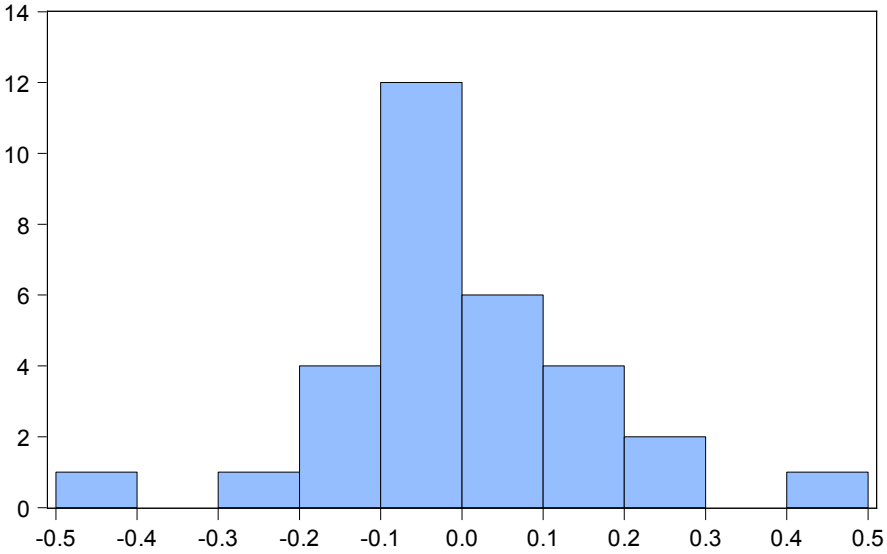
R-squared	0.059870	Mean dependent var	-4.59E-15
Adjusted R-squared	-0.343043	S.D. dependent var	0.149084
S.E. of regression	0.172773	Akaike info criterion	-0.417983
Sum squared resid	0.626859	Schwarz criterion	0.044594
Log likelihood	16.47873	Hannan-Quinn criter.	-0.267194
F-statistic	0.148592	Durbin-Watson stat	2.041266
Prob(F-statistic)	0.997122		

Ho: No serial correlation

H1: Serial correlation

Therefore, we fail to reject the null hypothesis.

Annex 6: Normality test



Series: Residuals	
Sample 1980 2010	
Observations 31	
Mean	-4.59e-15
Median	-0.023195
Maximum	0.410098
Minimum	-0.406886
Std. Dev.	0.149084
Skewness	0.140226
Kurtosis	4.624761
Jarque-Bera	3.511398
Probability	0.172786

From the above chart of normality test, Jarque-Bera tells us that the distribution is normal.

Annex 7: Ramsey test for model specification

Ramsey RESET Test
Equation: LONG2
Specification: LNAGRX LNDP LNFERT LNGDP LNNEER LNROAD LNTOT LNWP C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.144328	22	0.8866
F-statistic	0.020831	(1, 22)	0.8866
Likelihood ratio	0.029338	1	0.8640

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.000631	1	0.000631
Restricted SSR	0.666779	23	0.028990
Unrestricted SSR	0.666148	22	0.030279
Unrestricted SSR	0.666148	22	0.030279

LR test summary:

	Value	df
Restricted LogL	15.52181	23

Unrestricted LogL	15.53648	22

Unrestricted Test Equation:
Dependent Variable: LNAGRX
Method: Least Squares
Date: 05/06/12 Time: 09:52
Sample: 1980 2010
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDP	0.170944	0.807376	0.211728	0.8343
LNFERT	0.087530	0.224684	0.389571	0.7006
LNGDP	-0.412559	1.003115	-0.411278	0.6848
LNNEER	0.752666	2.079839	0.361887	0.7209
LNROAD	1.379284	3.538426	0.389802	0.7004
LNTOT	0.487310	1.277723	0.381390	0.7066
LNWP	0.885998	2.474519	0.358049	0.7237
C	-16.43140	52.88253	-0.310715	0.7589
FITTED^2	0.023055	0.159742	0.144328	0.8866

R-squared	0.933100	Mean dependent var	6.076678
Adjusted R-squared	0.908773	S.D. dependent var	0.576120
S.E. of regression	0.174010	Akaike info criterion	-0.421708
Sum squared resid	0.666148	Schwarz criterion	-0.005389
Log likelihood	15.53648	Hannan-Quinn criter.	-0.285999
F-statistic	38.35636	Durbin-Watson stat	1.940405
Prob(F-statistic)	0.000000		

Ho: Model specified correctly

H1: Model specified incorrectly

We fail to reject the null hypothesis since the probability of F-statistic is 0.8866 which is greater than 0.1.

Annex 8: Short Run Estimated Equation

Dependent Variable: DLNAGRX
Method: Least Squares
Date: 05/23/12 Time: 11:05
Sample (adjusted): 1981 2010
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNDP	0.046698	0.502239	0.092980	0.9268
DLNFERT	0.089610	0.029336	3.054595	0.0060
DLNGDP	-0.238525	0.322366	-0.739920	0.4675
DLNNEER	0.680917	0.357322	1.905613	0.0705
DLNROAD	3.208974	1.100647	2.915534	0.0083
DLNTOT	0.600803	0.279536	2.149288	0.0434
DLNWP	1.207932	0.295134	4.092823	0.0005

DECM	-0.837023	0.276711	-3.024900	0.0064
C	-0.082123	0.062028	-1.323970	0.1997

R-squared	0.690069	Mean dependent var	0.051127
Adjusted R-squared	0.572000	S.D. dependent var	0.249103
S.E. of regression	0.162967	Akaike info criterion	-0.547207
Sum squared resid	0.557726	Schwarz criterion	-0.126848
Log likelihood	17.20811	Hannan-Quinn criter.	-0.412731
F-statistic	5.844621	Durbin-Watson stat	2.196574
Prob(F-statistic)	0.000545		

Diagnostic tests for estimated short run equation

Annex 9: Test for heteroskedasticty

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.189501	Prob. F(8,21)	0.9896
Obs*R-squared	2.019908	Prob. Chi-Square(8)	0.9804
Scaled explained SS	1.433293	Prob. Chi-Square(8)	0.9938

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/06/12 Time: 12:00
Sample: 1981 2010
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.020194	0.013900	1.452787	0.1611
DLNDP	-0.024656	0.112549	-0.219067	0.8287
DLNFERT	-0.001940	0.006574	-0.295116	0.7708
DLNGDP	0.020928	0.072241	0.289704	0.7749
DLNNEER	-0.015629	0.080074	-0.195180	0.8471
DLNROAD	-0.016883	0.246650	-0.068449	0.9461
DLNTOT	-0.001230	0.062643	-0.019631	0.9845
DLNWP	-0.046714	0.066138	-0.706314	0.4878
DECM	-0.024078	0.062010	-0.388299	0.7017

R-squared	0.067330	Mean dependent var	0.018591
Adjusted R-squared	-0.287973	S.D. dependent var	0.032180
S.E. of regression	0.036520	Akaike info criterion	-3.538575
Sum squared resid	0.028008	Schwarz criterion	-3.118216
Log likelihood	62.07863	Hannan-Quinn criter.	-3.404099
F-statistic	0.189501	Durbin-Watson stat	2.370842
Prob(F-statistic)	0.989631		

Ho: Homoskedastic

Annex 10: Test for serial correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.487219	Prob. F(2,19)	0.2512
Obs*R-squared	4.060770	Prob. Chi-Square(2)	0.1313

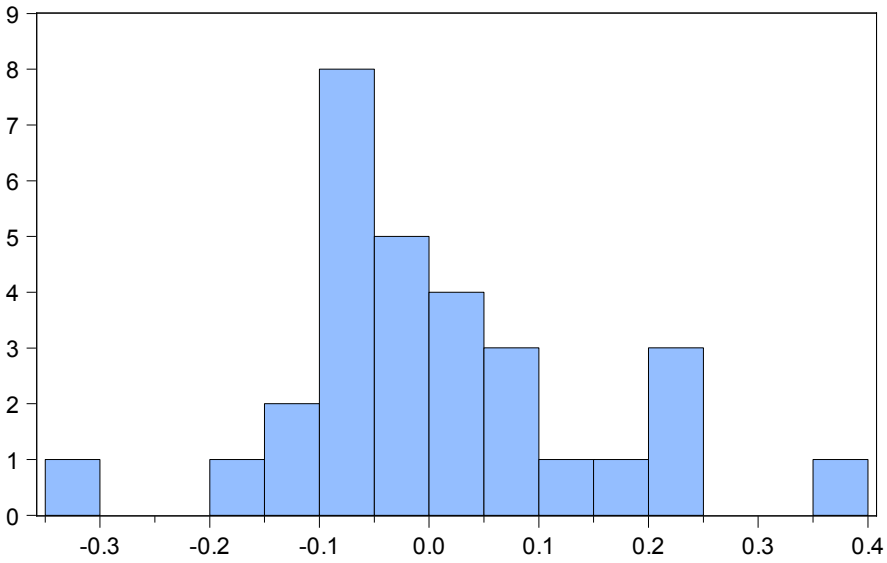
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/06/12 Time: 12:01
Sample: 1981 2010
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNDP	-0.259924	0.513939	-0.505749	0.6188
DLNFERT	-0.011182	0.031020	-0.360475	0.7225
DLNGDP	0.002703	0.329003	0.008215	0.9935
DLNNEER	-0.030136	0.411470	-0.073240	0.9424
DLNROAD	-0.009894	1.182568	-0.008367	0.9934
DLNTOT	0.113530	0.292985	0.387494	0.7027
DLNWP	-0.007322	0.314656	-0.023270	0.9817
DECM	0.832857	0.595409	1.398797	0.1780
C	0.020592	0.069764	0.295159	0.7711
RESID(-1)	-1.019159	0.602229	-1.692310	0.1069
RESID(-2)	-0.153907	0.297826	-0.516768	0.6113

R-squared	0.135359	Mean dependent var	-1.50E-17
Adjusted R-squared	-0.319715	S.D. dependent var	0.138679
S.E. of regression	0.159313	Akaike info criterion	-0.559315
Sum squared resid	0.482233	Schwarz criterion	-0.045542
Log likelihood	19.38972	Hannan-Quinn criter.	-0.394955
F-statistic	0.297444	Durbin-Watson stat	1.878251
Prob(F-statistic)	0.973083		

Ho: No serial correlation

Annex 11: Normality test



Series: Residuals	
Sample 1981 2010	
Observations 30	
Mean	-1.50e-17
Median	-0.031515
Maximum	0.373428
Minimum	-0.334074
Std. Dev.	0.138679
Skewness	0.467958
Kurtosis	3.896260
Jarque-Bera	2.099026
Probability	0.350108

Since the probability of Jacque-Bera is equal to 0.35 which is greater than 0.1, the distribution is normal distribution.

Annex 12: Ramsey test for model specification

Ramsey RESET Test
Equation: SHORT2
Specification: DLNAGRX DLNDP DLNFERT DLNGDP DLNNEER DLNROAD DLNTOT DLNWP DECM C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.419238	20	0.6795
F-statistic	0.175761	(1, 20)	0.6795
Likelihood ratio	0.262489	1	0.6084

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.004859	1	0.004859
Restricted SSR	0.557726	21	0.026558
Unrestricted SSR	0.552868	20	0.027643
Unrestricted SSR	0.552868	20	0.027643

LR test summary:

	Value	df
Restricted LogL	17.20811	21
Unrestricted LogL	17.33935	20

Unrestricted Test Equation:

Dependent Variable: DLNAGRX
Method: Least Squares
Date: 05/06/12 Time: 12:04
Sample: 1981 2010
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLNDP	0.020750	0.516120	0.040204	0.9683
DLNFERT	0.091824	0.030392	3.021353	0.0067
DLNGDP	-0.201659	0.340438	-0.592352	0.5603
DLNNEER	0.685644	0.364722	1.879909	0.0748
DLNROAD	3.060722	1.177270	2.599848	0.0171
DLNTOT	0.571803	0.293458	1.948500	0.0655
DLNWP	1.153096	0.328285	3.512484	0.0022
DECM	-0.826641	0.283390	-2.916968	0.0085
C	-0.087954	0.064793	-1.357473	0.1898
FITTED^2	0.299355	0.714045	0.419238	0.6795

R-squared	0.692769	Mean dependent var	0.051127
Adjusted R-squared	0.554515	S.D. dependent var	0.249103
S.E. of regression	0.166263	Akaike info criterion	-0.489290
Sum squared resid	0.552868	Schwarz criterion	-0.022224
Log likelihood	17.33935	Hannan-Quinn criter.	-0.339872
F-statistic	5.010838	Durbin-Watson stat	2.190300
Prob(F-statistic)	0.001310		

Ho: Model specified correctly
We fail to reject the null hypothesis.

Declaration

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

Declared by:

Name_____

Signature_____

Date_____