

DETERMINANTS OF AGRICULTURAL EXPORTS IN ETHIOPIA

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Determinants of Agricultural Exports in Ethiopia

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Abstract: In addressing the dismal performance of the export sector in Ethiopia, it is important to look at the percentage contribution of each sector and also the factors that affect the growth of the respective sector. Analysis of sectoral contribution to international trade confirms that in Ethiopia agriculture is found to be the single most important sector in terms of revenue generation contributing over 80% of foreign exchange earnings. Thus, in trying to disentangle the effect of each policy instrument, we have used secondary time series data for 30 years where analysis of factors behind growth of the sectoral contribution suggests that output has been responsive both to price and structural factors emphasizing the importance of both factors as a tempo for growth in the agricultural sector. Results from the study indicate that price policy instruments such as real exchange rate devaluation and institutional factors such as fertilizer consumption do have a significant and positive impact on aggregate agricultural exports. Results from individual export product (chat) are also in conformity with the above result suggesting that policy makers should use both to expand export from the sector.

Key Words: Agricultural Exports, Supply Response, Price Factors, Structural Factors, Stationarity

CHAPTER ONE

1. INTRODUCTION

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 payment's 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.

With a view to curbing the dismal environment, policy prescriptions were put forward by Breton Woods institutions ranging from liberalizing the market such as exchange rate devaluation with the effect of directing resources from the non-tradable sector to tradable sector to restraining active government role in the economy to decrease excess domestic demand. Yet the effects of such policies are not certain as Smith (1989) puts the causes for such trade imbalance to be exogenous such as fall in commodity prices which these countries export, a decline in availability of international finance, increasing interest rate, etc and thus such policy prescriptions could have further depressed such economies. Supportive views were also provided by Yoseph (1994) using Cornia's (1988) results which argues that over 60% of export earnings of sub-Saharan Africa countries comes from commodities whose price elasticity of demand is such that an expansion in volume of exports results in contraction in export earnings. This necessitates the effect of devaluation to be reviewed with regard to its impact on exports and

flow of trade. Additional work using different analysis has also come from Rao (1989). As reported in Sadoulet and de Janvry (1995), a reduction of taxation on agricultural products in spite of the high fiscal role they play, will reduce government capacity to invest and the reduction in government investment even hampers the growth in the sector owing to an adverse change in domestic terms of trade.

Considering the Ethiopian case like many LDC's agriculture is a bed rock to the economy which is relied upon both for subsistence and cash. The sector constitutes around 85% of total employment, 40% of total output and more than 73% of the country's foreign exchange earnings (Ethiopian Economic Association, 2003/04). Though its contribution to foreign exchange is high, the sector's export is highly dependent on a single crop, coffee, which is used to make two third of the county's total export until recent times. Of course such mono-crop exporting exposes an economy to higher degrees of risk, for which Ethiopia could be cited as a good example. Entry of Vietnam in the coffee market as a major exporter has dramatically raised the supply and has resulted in a significant slump in the price of coffee since 1997/98 which went down from USD 3.5/kg in 1997/98 to USD 1.46/kg in 2001/02. This in turn has resulted in a decline in receipt of total export earnings of the country by about 16% between 1999/00 and 2001/02. (National Bank of Ethiopia, 2002)

1.2 STATEMENT OF THE PROBLEM

The importance of trade in agricultural products is of prime importance in the context of economic growth especially in less developed countries like Ethiopia as they have competitive advantage in the production of agricultural products. Yet agricultural markets are the most heavily distorted in the world market according to

Suresh (1992) resulting in instability in export earnings and thus have undesired consequence on growth prospect of these economies.

In Ethiopia, agricultural products constitute a sizeable component of external trade generating a significant portion of export earnings. However in earlier period the growth of the sector was limited owing to high tariff structure and strict import and export licensing in view of industrial protection producing a cost structure which was out of world prices.

To redress the situation and to step up the rate of growth of exports, which is crucial for medium term recovery of the economy, the present government introduced a number of new trade policies. One major step taken in the trade policy was adjustment in exchange rate to improve the country's international competitiveness in the short and medium term, thus boosting growth of exports. The exchange rate policy was also followed by major structural reforms in trade policy aimed at substantial liberalization of control and licenses, abolition of export taxes and other measures to encourage competitiveness in the economy. However having taken all these measures the growth in the export earning was not significant and sometimes negative. This would in turn have important implication for the country, whose future economic growth and debt servicing depends on export earnings.

1.3 OBJECTIVES OF THE STUDY

In view of the role agricultural exports have in developing economies, this study attempts to examine the trends in agricultural trade overtime, with specific objectives of addressing:

- The rate of substitution between export crops and the influence that price exerts on relative production of these crops

1.5 DATA SOURCE

The study is based on time series secondary data where by the annual data utilized for this modeling purpose is extracted both from domestic and international sources. The internal sources are mainly National Bank of Ethiopia and Ethiopian Economic Association databases. As to the international sources FAO trade yearbook, World Bank report and International Financial Statistical books are used. Other sources for the data analysis include Ministry of Finance and Economic Development, Central Statistical Authority , Coffee and Tea Authority and Ethiopian roads authority data base.

CHAPTER TWO

Brief Review of Chat Production in Ethiopia

2.1 Historical Review of Chat Production In Ethiopia

The history of chat can be traced according to Ezekial (1997) as far back as the medieval age where it served as medical input and also was used in religious and cultural celebrations. According to the same author, documents on chat production however seem to appear after 19th century. Among these, famous one in the article by Beke (1843) (cited in Ezekial (1997)) titled 'The countries south of Abyssinia', published in the journal of Royal geographical society which indicated that coffee and chat were growing wild in southern Abyssinia. Yet, its first use in the form of tea was described by William Cornwallis (1844) during his visit to the court of Sahle Sellassie of Shewa. The use of chat was further discussed by Barton in the book titled "First foot step in East Africa" in 1894 which he indicated the commodity as being consumed by the elite group in the community.

The history of export of chat can be traced only as far back as 1902 when the Addis Ababa-Djibouti rail road was constructed. However it's importance has increased during the late 1920's and early 30's where official publication was made by the French colony of Somaliland. Accordingly, in 1929 the total amount of chat exported to Djibouti was around 7000kgs earning 209,774 francs and this figure rose in 1931 to 9830 kgs generating over 392,000 francs. Though chat has become a growing crop in the Eastern part of the country, the volume of its export was only showing a slight increment owing to external factors such as high cost of transportation in terms of taxation and also due to negative attitude of existing officials and land lords.

2.2 Implication of Chat Production on Agrarian System

Review of trends over the agrarian system during the 1950's according to Ezekial (1997) indicates that the acreage used for chat production increased by more than double reaching 17, 300 acres just from 7400 acres.

The reasons for a shift in farmers' attitude to use of chat according to the same author, using Derek W.A Peters', explanation include the nature of the crop, that is the tendency to give output for longer periods. Besides this, the crop needs only little care taking thus requiring only a small labor time. Such effects for care taking even is needed during months where farmers are idle and will not affect cultivation during normal crop calendar making the crop a suitable choice for the farmers.

The third reason might relate to product characteristic to serve as classic cash crop; meaning it is easily sold, and after often high profit through out the year. When compared with coffee, the alternative cash crop, chat had a competitive advantage as coffee prices were fluctuating since 1950's and also because of the tendency that chat could be cultivated twice a year without irrigation and upto five times if irrigation is used. In case of coffee, a good harvest year is followed by a year with no output.

The other reason for the product to be a first choice to farmers relates to the fact that the crop is easily adaptable to a wide range of soil and agro-ecological conditions. According to Peters (1952) as reported in Ezekial (1997) the crop could be cultivated on terraced hill sides,

interspersed with coffee trees. Besides this, it will be also intercropped with sorghum in sloppy areas, thus making it suitable for farmers as it will not compete for land with food crops as it could be cultivated on marginal lands where other groups could not grow. Last but not least, the crop does also have an added advantage with regard to its capability to resist diseases and drought.'

CHAPTER THREE

LITERATURE REVIEW

3.1 Supply Response Analysis: Theoretical Literature

Review of literature on supply response in most cases focuses on how producers react to change in product and factor prices, in technology, and in access to certain constraining factors of production. Such responses of course would help a lot in policy analysis as it would give policy makers and scholars an overview on how producers react to a bunch of policy packages implemented and to external shock they experience. The common way of analysis used by many scholars is either to view the impact on individual product or at sectoral level. In most of these cases, the elasticities of supply response will be much higher for individual products as compared to the sectoral aggregate especially in the short run. The reason is, as Binswanger (1990) argues, resources could be reallocated across individual activities while for sectoral aggregates, a change or an increment in size or amount of fixed factors, technological change is a must which in most cases takes long period of time to achieve as compared to resource reallocation. A good example for this could be the agricultural sector where by the fixed factors such as land, labour and capital investment constitute a large part of it which in turn makes it difficult to get large response from the sector in the short run as these inputs require time to adjust. An addition to this argument was provided by Mundalk (1987) as cited in Sadoulet and de Janvry (1995) which indicates that elasticities of supply response become more responsive as time passes as resource allocation becomes optimal and also the tendency that factors which are fixed in the short run can change overtime. This will

in turn increase responsiveness of production decisions depending on variability of factors.

Similar views were also provided by Akiyama & Trivendi (1987) arguing the need for distinction between short run and long-term producer decision as the short run dimension only focuses on the extent of the resource available at present while long term analysis includes changes in technology, the level of new planting and replanting.

In addition to the above views on supply response of producers decision in the short run or long run; a continuing debate still exists on whether producers are highly responsive to price or non price factors, public service provisions such as infrastructure, R&D and credit disbursements. This is especially true for African agriculture (Osith & Mathurin, 1990). As Delgado and Mellor (1984) justify the price incentive mechanism will result in transfer of income from small urban non-tradable services sector and consumers of importables to a relatively large number of rural producers of exportables in the application of policy packages such as devaluation, tariff changes and direct policy reforms. This in turn will result in a shift in the internal terms of trade towards agriculture. In addition to this, application of this policy option favors small government involvement in the economy both to avoid the high taxation imposed on agriculture and to reduce the level of market imperfections as a result of parastatals which work against the positive terms of trade for agriculture.

The other view forwarded by structuralists argues the principal problem in most of sub-Saharan agriculture relates to high production costs especially in terms of opportunity cost of labour which is pushed upward by factors outside the agricultural sector.

This in turn led this school of thought to consider technological innovation in terms of labour per unit cost reduction and solution to the problem. These include better input delivery, rural infrastructure,

agricultural resources and extension systems (Delgado and Mellor 1984). Having put the above theoretical arguments, analysis applied in estimating supply response with a view to verifying whether the theoretical explanation is in confrontation with empirical results takes various methods. Yet the common method used in most empirical studies is a model developed by Nerlove (1958). This model has minimal theoretical and data demands but it focuses on the need for expectation formation on expected prices and adjustment lags for desired quantities as farmer respond to expected as opposed to actual prices and also as it takes several times for farmers to achieve their desired production pattern at new prices. However partial adjustment models are highly criticized for their unrealistic assumption of fixed target supply based on stationary expectations which makes it restrictive and is unlikely to consider the full dynamics of supply and thus biasing elasticity estimates downwards. (Abdulahi and Peter 1995). The most straightforward way to overcome the restrictive dynamics of Nerlove's method is to use a co-integration analysis which according to Alemayehu (1997) will have added features such as a technique to capture short run and long run variations, an adjustment mechanism and a technique to identify long run relationship.

3.2 Empirical Evidence on Agricultural Response

Empirical evidence on agricultural supply response especially in Sub-Saharan Africa fall either in support of price or non-price factor as main determinants explaining farmers reaction. There is conflicting evidence ranging from high elasticity to lack of responsiveness depending on the country, crop and level of aggregation. Yet the crucial point to be considered is that the elasticity estimates must be taken from models that at least base their starting point on the

realities of the economies under review if the elasticities are to be used for policy purpose.

Argument in favor of high price elasticity such as Peterson (1988) as cited in Osith and Mathurin (1990) attributes the low elasticities to price in SSA to time series estimates which have a greater tendency of minimizing the true effect of expected price changes as much of price variation that prevails is a temporary one causing actual prices to vary more than expected prices and as a solution he suggests cross sectional analysis which reflect the response to differences in average level of expected prices whereby using such methods he found aggregate supply response elasticities more than 1.

Still further support for high price in agriculture comes from Berg report (1981) as reported in Smith (1989) which put the crisis to be a consequence of agricultural taxation in the form of low producer price regulated by parastatal marketing agencies, over valued exchange rate that reduces the value of agricultural exports in terms of domestic currency. Using the same study for 9 export crops in 13 major exporting SSA countries, the tax burden is on average around 40 to 45 percent implying an average Net Protection Coefficient (NPC) of 0.55 to 0.60. The institution has made further studies over 30 countries in SSA in 1986 where the ratio of farm gate price to border prices for selected commodities were found to be less than 1 in the 1970's and 1980's. The impacts even become more severe according to this study if one considers exchange rate as the real exchange rate has shown a rise in 14 SSA countries on average by 31% between 1969-1983. As a result, Lipton (1987) as was put in Smith argues small farm households to be highly responsive to prices if given the opportunity to face liberalized market.

Supporting results were also provided by Bapna et al. (1984) and Fulginiti and Perrin (1990) which were reported in Sadoulet and

de Janvry (1995). Their analysis shows farmers to be price responsive with elasticity ranging between 0.23-0.77 for own price of different crops in the study by Bapna over semi-arid zones of India and 0.7-1.5 in the study by Fulginiti & Perrin over Argentina agriculture. The analysis by Fulginiti and Perrin has further investigated factors responsible for rise in input price and lower producer price of most products. Their result indicate elimination of export taxes alone would contribute production increase of 15% for beef and 96% for soybeans and thus an average increase of 27% for aggregate production.

As to studies on agricultural export crops, studies by Malcom et al. (1981) also suggest that price policies in African countries are undervalued which in turn result in full potentials in terms of allocation, production and consumption not to be realized. In his analysis, these policies have an impact on export reduction in most African countries as their NPCs are less than 1. Further confirmation to this was also made by Bateman (1965) in his study of Ghana cocoa to own and competing prices (coffee) where he found large lags to be significant indicating the importance of cocoa and coffee prices in motivating farmers to plant.

Literature on aggregate agricultural export supply tries to estimate the effect of price changes with a view that favorable price can increase production at the expense of non-tradables, even if aggregate output does not increase. The findings show that net agricultural exports tend to be higher than agricultural imports because as the exchange rate rises, agricultural export rises and agricultural imports become more expensive and fall. A study by Balassa (1986) as was put in Binswanger (1989) run a regression of the ratio of exports to outputs for changes in real exchange rates and foreign income with the result that agricultural export elasticities are higher than export of all goods and almost as high as merchandise goods (in SSA the value is around 1.35 when agricultural export to

agricultural output is put as dependent variable while net agricultural output to agricultural output is put the value goes to 11.45). Similar studies incorporating all developing countries shows the value to be small falling around 0.68 for agricultural export to agricultural output and 4.96 for net agricultural output to agricultural output. Also a study by Clever (1988) which was reported in Binswanger (1989) compared agricultural growth rates of Sub-Saharan African countries under adjustment with those not under adjustment. His analysis indicates that the annual agricultural growth in countries with adjustment is 2.6% higher than those without adjustment. And the striking difference between the two groups clearly started to be observed overtime, showing responsiveness of African agriculture to price changes. All in all, impacts of structural adjustment programmes according to Binswanger (1990) seems to be observed on aggregate agricultural sector after several years and in the short run contribute much to structural adjustment mainly by increasing net exports.

Factors affecting agriculture according to the structuralists was summarized by Delgado and Mellor (1984) which attribute the main factor hindering growth of African agriculture to lack of technological innovation which is central for growth in production which in turn results in a decline in per unit cost of production. For them use of price policy without having provisions of better input delivery system, rural infrastructure and agricultural extension and research system would be a futile effort and thus consider non-price factor to be determinant in explaining agricultural response behavior in poor economies.

Evidence in support of this view was put forward by several empirical studies including a study by Ranade et al (1988) as cited in Benyon(1988) on Burkina Faso coffee production who found technological change to be a prime factor of increasing profitability of

the sector in spite of fall in real price of coffee in terms of food grain. Further studies include the research by Krishna (1982) as cited in Binswanger (1990) in Indian state of Punjab on 11 crops where he showed an irrigation impact which as a result found the elasticity to lie above 1. Another study on the issue was put forward by Stone (1980) on Chinese agriculture as reported in Benyon(1988) indicates that the role of price was insignificant and large importance was given to substantial infrastructure investment (particularly in chemical fertilizer and water and soil conservation of the 1960s). Based on the same article World Bank study in the 1980's also put supporting evidence for productivity enhancing effect of investment on human capital where by estimated percentage increases in annual farm output due to four years primary education were 8.1% in seven studies without complementary input and 13.2% in eight studies with complementary input (improved seeds, irrigation and transport cost.

Supporting views on this policy option was also forwarded by Binswanger (1989) which was put in Sadoulet and de Janvry (1995) with an outcome indicating public investment and services which includes irrigation, rural road density, paved road, electrification, government canal irrigation etc to have a strong effect of agricultural output.

In addition to the supporting view above, arguments criticizing the analysis of low price elasticity was forwarded by Schiff (1981) as indicated in Binswanger(1989) who argues that the effect of prices could also be transferred to long run aggregate supply curve where the impacts could be observed on privately owned inputs and thus rejects the supporting empirical evidence for low aggregate price elasticity made available by Bond (1983) on African agriculture owing to various problems in her estimation which he puts the major ones to be the use of current price as opposed to expected price and also the

use of output per-capita as dependent variable rather than aggregate output.

Considering the Ethiopian case, most of the studies concentrate on the impact of the reform in individual crop with output of the studies differing in terms of identifying the needed incentive to boost the agriculture sector of the economy. Their analysis could be put into the two schools of thought. The first school suggests price reform for boosting agriculture while the second justifies non price factors as a major bottleneck for growth in Ethiopian agriculture.

Studies in support of price policy reform include a work by World Bank (1976) using Nerlovian method as cited in Dejene (1994). The short run aggregate supply elasticities according to this study was found to be 0.24 while the long run is 0.56 which are higher even as compared to sub-Sahara African countries. Further support to this work is provided by Teshome (1979) in his study of share of coffee producers in the value of coffee export whereby he indicates their share to be limited to 40% of the fob export price in 1975. In addition to this, analysis on total taxes in exportable coffee by Dercon and Lulseged (1994) shows the rate to be high which according to their calculation was a quarter of the total value between 1970/76 rising to 44% after the revolution in the latter half of 1970's and 40% between 1981/82-1985/86. But with declining world price the value dropped to about 25% between 1986/87 -1989/90. They further calculated the total effect of export taxes and exchange rate overvaluation where by between 1976-1980 prices could have increased by more than 130% and between 1980-1985 this went to 173% with increasing implicit taxation through over valuation of the birr. But since then owing to a reduction in world price level the possibilities for further increment declined though more than 70% higher prices could have been paid between 1986-1991. They have also made a regression analysis on the

responsiveness of coffee production as a result of which they found farmers to be responsive to prices relative to other crop prices.

According to their estimates the elasticity of official supplies was around 0.17% in the short run and 0.27% in the long run during the late 1960's and about 10% of long run supply response between 1973-1993 periods. Further studies were also made by Asmerom (1999) on effects of the reform programme on agricultural export. Using his survey result which are gathered from small scale farmers, positive response for both short run and long run was identified with farmers increasing yield through increased use of labor, fertilizer, and insecticide on existing stock of trees for the short run and uprooting of old trees and replanting them by new ones. This is in addition to use of extra acreage at the expense of other perennial and annual crops for the long run. The number of coffee trees owned by small scale farmers over the study area increased by 2% while fertilizer and insecticide usage increased by 6% and 13.7% respectively after two years of devaluation. As to the use of labor, most use family labor however the number of small scale farmers who use hired labor show a slight increase of 5% over the two years indicating the increased sales has been the result of intensive picking, use of modern input, and hired labor which seem to be of short run nature. Questions regarding the number of trees they expect to uproot and the number of trees they expect to plant with a view of indicating the long term direction towards increasing coffee yield was also raised with the result showing a substantial difference between planting new trees and uprooting old ones. On average, farmers are expected to plant 360 new coffee seedlings compared with 63 they expect to uproot suggesting that overall small scale farmers intended to plant more trees. In general his analyses of primary sources statistics shows that devaluation followed by increase in the price of tradables tend to give the desired result even in Ethiopia.

Besides his econometric finding showed a positive and significant relationship between real exchange rate and net new planting suggesting the high domestic price of coffee to stay and a long run response of around 0.592 indicating that peasant farmers do respond to prices and other incentives in rational and predictable manner.

A criticism on this view was forwarded by Dejene (1994) arguing non price factors to be more binding in Ethiopian agriculture than price ones. As a result he attributes the high elasticities of price response of agriculture by World Bank study owing to the inappropriate methodology they adopt. According to Dejene (1994), the major factor that constrains agricultural growth in Africa especially in Ethiopia are structural which constitutes limited proven innovation as evidenced by limited use of chemical fertilizers in the country (only about 14% of the farmers during the study), inadequate institutions such as shortage of credit facilities, low levels of human capital as most of the farm family is too malnourished and unhealthy to work harder or longer in response to high price incentives. Also as was put by Mulat and Bekele (2003) land constraint is a major bottleneck to increased production as population pressure overland has given rise to shortening of the fallow period, progressive elimination of the size of operational holding, deterioration in the quality of land. Besides, factors such as labor constrains as household labor supply is highly constrained by peak periods of labor activity, participation in social and cultural obligations, and imperfect nature of markets which will limit effectiveness of price mechanism. Still the author considers unavailability and high price of consumer goods, inadequate rural infrastructure such as feeder roads and storage facilities, as limits imposed on the size of marketed surplus by the need to increase own account consumption and effect of nature

over agriculture where the author used the case of coffee berry diseases which claim around 20% of the potential output.

3.3 Model Specification

3.3.1 Theoretical Framework on Supply Response

As was put in Sadoulet and DeJanvry (1995), two factors are identified to be detrimental in producers' response. One relates to technology of production which could be represented through production function. The other relates to profitability of output, meaning difference between revenue and cost of production.

Given technology at his disposal which is given by the form below, the producer is assumed to choose combinations of inputs and outputs that will maximize profit in a competitive market.

$$\text{Max}_{x,q} p'q - w'x \quad \text{S.t.} \quad h(q,x) = 0 \quad \text{-----(1)}$$

The solution to this problem is thus relates to set of input demand and outputs supply function where here in we focus on output supply function for exports which is given as

$$q = \text{fn} (p_q, w_q, u_q) \quad \text{----- (2)} \quad \text{where } q \text{ reflects volume of exports}$$

X relates to inputs used in production

W relates to relative production cost

p explains relative price of outputs

And u- is used to capture in error term

If we still define the above model in terms of external and domestic factors, we will have

$$q = \text{fn} (p_q^f, w_q^f, p_q^d, w_q^d, u) \quad \text{-----(3)} \quad \text{where in variables with F as superscript refers foreign while those variables with D as superscript refers to domestic factors.}$$

As a result in the structural model that we put in costs and prices that relates to foreign factors will be captured through terms of trade (TOT), where an increase in TOT will result in a positive response as

this would mean exporters would enjoy less cost of imported capital and intermediate products.

Effects of domestic price and cost factors could be represented through real effective exchange rate (REER) as real devaluations through shows price incentives in terms of domestic currency which encourage resource shift towards the external sector. Beside this as Fosu (2003) puts domestic component of production cost should include political system that operates as for example an interventionist political system would lead to an increase in economic cost and reducing competitiveness. Thus in our model effects of political system are captured through Dummy for government change.

However in addition to the variables that we use to explain price and cost in Export supply function, there exist certain factors such as technological change, which in the above analysis were assumed to be constant, that will contribute to large production capacity as through reduction in production cost and thus positively influencing exports. In our model, effects of technological change were proxied by input delivery system while rural infrastructure development will improve farmers' access to out put markets and use of inputs. At last but not least, we have also incorporated in our model trade position of the country under review as it will have implication for export supply. For example, under negative net value of world trade, most economies work on increasing export so as to off-set negative trade balance.

Incase of individual product modeling as with aggregate export supply function, its supply function is governed by profitability of the product under consideration.

Here, effects of domestic price and cost factors are taken care of by real exchange rate

(REER), relative price of the product to its substitute while impact of changes in productivity are proxied by fertilizer imports and gross domestic product(GDP).Value of world trade (VWT) and DDR

(Government change) are used as in the aggregate export model to see impacts of trade position of a country in world trade and changes in political system respectively.

3.3.2 Theoretical Justification for explanatory and dependent Variables.

Real Exchange rate (REERI): the use of exchange rate as explanatory variable is justified on the grounds of creating incentive for exporters. The nature of exchange rate management will either result an over-valued or depreciated exchange rate with the effect of determining a country's product competitiveness in the international market. Thus, a depreciating real exchange rate would lead to increase in exports while an appreciating real exchange rate would make it less competitive. We therefore expect the coefficient of REER to be negative.

Terms of trade (TOT) - increase in terms of trade would imply an increase in profit of exporters other things constant and thus an incentive to produce more goods for export which is mainly agricultural in the Ethiopian case.

Value of World trade (VWT) - represent net exports of the country over a given period and this is crucial in determining foreign exchange position of a country. Net value of world trade could be positive or negative depending on whether export revenue exceeds expenditure on imports. A negative net value implies an unfavorable balance of trade position which in turn forces the country under review to increase the exportable surplus so as to offset the deficit trade balance. An inverse relationship is therefore expected between the two variables.

Gross Domestic Product (GDP) - A direct relationship is expected between quantities of a particular commodity and gross domestic product; a reflection of strength of the economy.

Agricultural Exports as Share of GDP (Agr. Exp) - The need to use value rather than quantity of agricultural exports stems from the fact that the unit of measurement for various products which are exported differs and thus is difficult to quantify them using the same measurement scale. However using value of agricultural exports is also not free from problem as it might result in spurious output owing to price fluctuation and thus it has been scaled by GDP over the period to have consistent estimates.

Infrastructure (INFRA) - Is one of the major non-price factors which constrain exports in least developing economies. According to the structuralists, in the absence of such facilities, incentives through price will not bring the desired effect in African agriculture. Thus, we expect a direct relationship with exports.

3.3.2.1 Aggregate Agricultural Export Modeling

As was described in the literature survey, the main factors constraining growth in agricultural sector in general and its export in particular are related either to competitiveness of the economy which is measured by real exchange rate and terms of trade or non price factors which can be indicated through land size and humidity, information access, infrastructure distribution and external market access constraint, etc. Considering this fact, the functional form for aggregate agricultural export can be specified as

$$\text{Agr. Exp} = \alpha_0 \text{REER}^{\beta_1} \text{ToT}^{\beta_2} \text{INFRA}^{\beta_3} \text{VWT}^{\beta_4} \text{INPUT}^{\beta_5} e^{\beta_6 \text{DDG}}.$$

The agricultural export supply function describes the relative importance of price and non price factors with value of aggregate agricultural exports put in as dependent variable. Here REER is the real effective exchange rate measured as the reciprocal of nominal effective exchange rate index multiplied by consumer price index of the major trading partners to the CPI of Ethiopia, TOT is the terms of trade defined as ratio of price of exports to price of imports, INFRA is

infrastructure variable measured by the percentage of paved road to total road in a country, VWT represents the net value of world trade, that is Ethiopia's export value; GDP is the country's gross domestic product measured at factor cost. The dummy DDG are meant to capture the impact of government change; Input is agriculture input proxied here by fertilizer import over a period.

The hypothesis is that REER and VWT will have an inverse relation while all the remaining will exert positive impact on agricultural exports.

3.3.2.2 Individual Agricultural Product Modeling

The general form of the export supply function of the particular commodity is specified in double log form as

$$\ln QE_{it} = \beta_0 + \beta_1 \ln REER + \beta_3 \ln (P_{it-3} / P_{jt-3}) + \beta_4 \ln VWT_t + \beta_5 \ln GDP_t + \beta_6 \ln INF_t + \beta_8 \ln DDG + \beta_9 \ln INPUT_t$$

Where QE_{it} refers to the quantity of i^{th} commodity exported over specific period t .

P_{it-3}/P_{jt-3} refers to the ratio of price of the commodity to its substitute. It is used to measure the relative profitability of the product as compared to its substitute. Thus an increase in price of the commodity relative to its substitute will result uprooting of the substitute and replacing it with the other product as it becomes more profitable to produce for farmer and vice versa.

CHAPTER FOUR

DISCUSSION AND ANALYSIS

4.1 Profile of Ethiopian Agricultural Trade

Analysis on the performance of agricultural trade over the past twenty years indicates that there was a tendency for growth in absolute value both in export and import sector. However if we look at the proportional share in each sector, as in much of developing economies agriculture does contribute much of the export while it constitutes only a small portion of the country's import. This in turn has resulted in a positive net agricultural trade having a tendency for growth especially after 1990/91 as export has shown much growth as compared to imports with regard to agriculture.

Table 4.1: Performance of Ethiopian Agricultural Trade, 1980/81-2000/01(in thousands of birr)

Item	1980/81	1985/86	1990/91	1998/96	000/01
Total Agricultural Exports	706.95 (84.21)	788.72 (85.38)	469.9 (82.13)	2348.24 (90.07)	469.52 (67.12)
Total Agricultural Imports	107.23 (7.75)	538.4 (24.35)	283.08 (13.29)	603.71 (7.83)	703.35 (5.42)
Net Agricultural Exports Over All Trade Balance	599.72 -	250.32 -	186.02 -	1744.53 -	1766.17 -
	-	1287.12	-1558.2	-6255.5	-9287.87

Source: National Bank Annual Publications and own Calculations

* Figures in Parentheses are percentages to the respective total

Detailed analysis in agricultural trade would further indicate that the share of agriculture in imports has increased in periods of famine (1985/86) where grain imports alone constitute a quarter of the country's import expenditure. Though great share of grain imports is observed in famine periods, further look into the structure of agricultural import confirms the fact that food and live animal subgroup have consumed heavy amount of foreign exchange. According to data described below this commodity group consumed over 90% of the country's expense on agricultural imports. On the other hand, review of the export sector indicted that much of the growth in earnings was observed after 1990/91 reform with agriculture generating on average 75% of the country's export revenue.

Table 4.2: Contributions of Various Commodities to Agricultural Imports (in thousands of birr)

Commodity	1980/81	1985/86	1990/91	1998/96	2000/01
Food and Live animals	88901 (82.90)	530599 (98.55)	263350 (93.03)	575263 (95.29)	641597 (91.22)
Tobacco	15860 (14.79)	2835 (0.53)	3564 (1.26)	7241 (1.2)	27129 (3.86)
Beverages	2470 (2.3)	4962 (0.92)	16163 (5.71)	21210 (3.51)	34628 (4.92)
Grain	44374 (41.38)	382447 (71.03)	202106 (71.4)	506124 (83.84)	461335 (65.59)
Total Agricultural Imports	107231	538396	283077	603714	703354

Source: National Bank Annual Publications and own Calculations

- Figures in Parentheses are Percentages to the respective total

Table4.3: Contributions of Agricultural Commodity Exports to Total Value of Agricultural Exports (In Thousands of Birr)

Commodity	1980/81	1985/86	1990/91	1998/99	2000/01
Coffee	524325 (74.17)	631065 (80.01)	268451 (57.13)	1724008 (73.42)	1453254 (58.85)
Oil Seeds	28371 (4.01)	7686 (0.97)	3633 (0.77)	41938 (1.79)	256398 (10.38)
Hides& skins	92705 (13.11)	110862 (14.06)	92206 (19.62)	309701 (13.19)	616638 (24.97)
Pulses	23693 (3.335)	8897 (1.13)	15716 (3.34)	77224 (3.29)	68561 (2.78)
Meat Products	631 (0.09)	3866 (0.49)	10151 (2.16)	12169 (0.52)	14065 (0.57)
Fruits and vegetables	5075 (0.72)	6027 (0.76)	12001 (2.55)	21029 (0.9)	44015 (1.78)
Live animals	9800 (1.39)	16470 (2.09)	1322 (0.28)	770 (0.03)	2360 (0.096)
Chat	22349 (3.16)	3844 (0.49)	65727 (13.99)	174444 (7.43)	50952 (2.06)
Bee wax			689 (0.15)	7987 (0.34)	7247 (0.29)
Total Agricultural exports	706949	788717	469896	2348241	2469523

Source: National Bank Annual Publications and own Calculations

* Figures in Parentheses are Percentages to the respective total

In addition to this, a break up of imports and exports into various commodities indicates that growth in net agricultural exports is largely attributed to an increment in export of coffee, hides and skins, and oil seeds in recent years though growth in agricultural imports specially grain have affected it negatively. This would confirm the fact that growth in trade surplus in agricultural sector is the effect of

newly implemented export oriented policies as opposed to import substitution strategies.

Even though expansion of the export sector would contribute a lot to the development process, one should also put into consideration the fact that it should not be at the cost of food self sufficiency goals. A study by Alemayehu (1999) indicates that with a volatile coffee market, resource shift from production of food crops towards coffee production is questionable which could further result in unwanted repercussions such as external pressures that come along with food assistance extending even to the extent of sovereignty of the country and the people. Thus, one can conclude that our agricultural policy should be framed, besides working on expansion of exportable commodities on those lines which will enable in achieving domestic needs.

4.2 Price policy instruments and Their Implication on Agricultural Exports

Since greater share of Ethiopian export are agricultural, any policy change with respect to external sector will tend to have huge consequence on agricultural specially in terms of creating incentives and disincentive for the farmers. Among such policy instruments, real exchange rate and terms of trade are important when it comes to affecting export supply from agriculture. As can be seen on the figure 3.1, Ethiopia has been experiencing a fluctuating terms of trade with much of the years under review facing a declining trend. However, the trend seems to change after the change in government in 1992 having a tendency of stabilizing itself. The declining trend could be result of various factors such as a decline in price of agricultural products and an increase at the same time price of manufactured goods over the period. From the figure of courses one could deduct that much remains to be done in terms of expanding export sector in the country

4.3 Export Instability in agricultural sector

The table beneath depicts that instability was much higher in export revenue than the quantity exported except for pulses and live animals . As shown, such variation in exports earnings were alarmingly high for chat, oilseed, coffee and fruit & vegetables with a coefficient of variation 178,146,96 & 93% respectively .The instability in the quantum of export was high for oil seed, live animal and chat export with CV of 101,103 & 96%. The high instability in export earnings as compared to quantum of export would imply that variability in unit cost were more important except for pulses and live animals where changes in quantity of export were more important in destabilizing export earnings. All in all, however if one could see the figures in the table; there tend to be big variations both in amount of export earnings and quantity exported for each product. Such cases could have unwanted consequences in affecting growth objectives according to Yohannes (1992) as it will have high investment risk and also possibility of disrupting imports.

Beside these, big fluctuation in export earnings as compared to quantity exported according to the same another could imply vulnerability of the economy to external shocks (such as price falls and world economic recession) than domestic supply problems (due to natural disasters, drought, etc) which is the case in Ethiopia.

Table 4.4: Instability in Export of Major Agricultural products 1970-2001
(Percent)

Instability measure	Product						
	Coffee	Chat	Oilseed	Pulses	Fruits & Vegetables	Live Animals	Leather
Quantity Coefficient of Variation	29.66	96.32	101.40	88.45	47.86	103.52	47.86
Export Earnings Coefficient of Variation	5.52	177.79	146.15	82.45	93.27	75.67	74.85

Source: National Bank Ethiopia Publications and Own Calculations

4.4 Analysis on Diagnostic Test Results

In modeling time series variables one needs to put great care over the variables under study as the regression result might be spurious in the sense that it will have high R^2 values and significant t-statistics but in reality does not have any relationship. Such result could occur of course when variables under regression are non-stationary random process. (Pindyck and Rubinfeld: 1998).

Most economic variables are found to be non stationary and thus regression outcomes could be misleading. A non stationary variable is one whose behavior is dependent on time and thus their analysis is only limited to the time period under consideration. This in turn makes it difficult for forecasting purpose. However such variables could be made stationary by simple differencing. The number of times the series is differenced before a stationary result is achieved is termed as order of integration.

$$\Delta Y_t = Y_t - Y_{t-1}$$

Thus the first step involves identifying statistical behavior of the variables under study. As a result, a test statistic for stationarity has been developed using Dickey and Fuller (DF) and augmented Dickey fuller statistic (ADF) where in our models, i.e. in both models, the test statistic indicated that all variables were found to be insignificant at level forms. However, when these variables are again tested for stationarity at first difference the t-statistic provide evidence for a rejection of the null hypothesis, which assumes the variables as non-stationary at their difference. As was put in Gujarati (2003), the test-statistic is based on Engle and Granger critical significance values established for stationary tests.

Mathematical representation for test statistic can be put in as

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + e_t$$

$$\Delta Y_t = (\rho - 1)Y_{t-1} + e_t$$

$$\Delta Y_t = \delta Y_{t-1} + e_t \dots \dots \dots 1 \text{ (for DF test)}$$

$$\Delta Y_t = \alpha + \delta Y_{t-1} + \sum_{i=1}^p \phi \Delta Y_{t-i} + e_t \dots \dots \dots 2 \text{ (for ADF test)}$$

Here H_0 assumes Y is $I(1)$ against H_1 which assumes Y as $I(0)$
 e_t is a white noise term and P is used to take in the number of lags which is assumed to include enough terms so that the error terms are serially uncorrelated.

The table beneath portrays DF and ADF test for each series under study where in all variables except value of world trade do exhibit stationarity in their first difference as their ADF statistic values are above the 1% critical value of 2.645 while that of value of world trade was found to be stationary in first difference as its ADF value is above the 5% critical value which in turn enables rejection of the null hypothesis.

Table 4.5: Statistical Behavior of Individual Series

Variable	ADF	Variable	ADF
LroAtg	-0.4308	Δ LroAtG	-5.291
LtoT	-1.076	Δ LToT	-6.354
LREERI	-0.7072	Δ LREERT	-3.918
LVWT	-1.202	Δ LVWT	-2.078*
Ltcofertcon	0.7045	Δ Ltcofetcon	-15.51
Lpaved	-2.153	Δ Lrpaved	-3.804
Lpit -3/pit-3	-1.386	Δ L pit-3/pit-3	-6.969
Lvolchatex	-0.004	Δ Lvolchat ex	-7.209
LrGdp	-1.873	Δ LrGDP	-4.17
Lfertcon	-2.978*		

Where LroAtG- is ratio of agriculture to GDP

LToT- is Terms of Trade

LREERT- Real effective exchange rate

LVWT- Value of World Trade, meaning Ethiopian Trade balance

LtoCofertcon- value of fertilizer consumed

Lrpaved- ratio of paved road

Lpit-3/pit-3- ratio of own rice to price of substitute product

Lvlochatx- volume of chat exported

LrGDP- Real Gross Domestic Product

Lfetcon- Total amount of fertilizer consumed

ADF- Augmented Dickey-Fuller statistic with critical values

Having identified the variables of the same order, meaning those which exhibit stationarity in difference, the next step involves a test

for co-integration which needs examination of their linear combination for stationarity. In our case, as was depicted in the table below in both models, the residuals were found to be stationary; meaning the trends in both explanatory and dependent variables will cancel out

Test for stationarity of residuals is based on

$$e_t=Y_t-\alpha-\beta X_t.....3$$

Where here H_0 relates the residuals to be $I(1)$ while in H_1 the residuals are assumed to be stationary. Estimates for residuals could be approximated by least squares residuals for co-integrating regression

$$e_t= \rho e_{t-1}+U_t.....4$$

And in examining stationarity for residuals one could use DF or ADF test statistic which could be put in as

$$\Delta e_t = \psi e_{t-1} + u_t 5 \text{ where } \psi =(\rho-1)$$

$$\Delta e_t=\psi e_{t-1}+\sum_{i=1}^p \beta \Delta e_{t-i}$$

Table 3.6: Univariate Stationarity Property for Residuals

Regression model	μ_{t-1}	5%	1%
Agg.Agricultural export model	-2.799	-1.953	-2.642
Chat export	-4.616	-1.953	-2.642

Since in both models under study the residuals ADF statistic values are above the critical values of 2.642, one could assume the dependent and the regressors obey a stable, long run relationship and co-integrating parameters provide in large samples excellent estimates of the long run, steady-state equilibrium relationship among the regressand and explanatory variables.

4.5 Interpretation of Results and Outputs

A view of co-integration results from table 3.6 on aggregate agricultural exports indicates that an improvement in TOT will have a positive impact leading to an increase in exports from the agricultural sector, which would suggest more profitability of the sector. Similar results have been also obtained for real exchange rate, and fertilizer consumption which is consistent with prior expectations. The estimate with value of world trade is however perverse to the expectation but the figures are found to be insignificant. If we make a more detailed explanation of the results appreciation of real exchange rate would cause a fall in agricultural exports as agricultural exports from the country would be non-competitive in the world market thus losing in even the existing market share. Using table 3.3, would imply thus for every percent depreciation, we could get an increase in exports of 1.17 percent on average indicating exchange rate mechanism as one policy option for affecting exports in agriculture.

Still our estimate for terms of trade would further confirm that price policy instruments do have a positive and significant impact on aggregate agricultural exports. Estimates from our regression imply that improvement in terms of trade for the country would contribute positively to exports in agriculture as a 10% improvement in TOT will have an increment of 6.2% in agriculture exports in the long run. On the other hand, impacts of institutional factors which in this paper was captured by agricultural inputs, i.e. fertilizer consumption, do also have a role to play in expanding agricultural exports as every 10 percentage increase on fertilizer consumption would boost agricultural exports by 1.2 percent.

Table 4.7: Co- integration outputs of aggregated and individual product model

Regressor	Dependent variable			
	lnroAtG	t-values	InVolchat ex	t-values
Intercept	-2.34	(-1.30)	-52.50 (-2.04)	(-2.04)
LToT	0.62	(4.14)	-	
LREERI	-1.17	(-5.92)	-1.18	(-1.97)
LVUVT	0.049	(1.44)	0.138	(1.24)
Ltocofercons	0.123	(2.95)	-	
Lpit-3/pit-3	-		-0.0239	(-0.0781)
Lrpaved	-0.090	(-0.20)	3.19	(1.55)
LrGDP	-		7.88	(2.68)
DDR	0.250	(0.046)	-0.27	(-0.842)
R ² =	0.78		0.59	
F(6,24)	13.9**		5.874**	

Turning to individual product modeling, estimation results have expected sign in the chat export model. The relative price and value of world trade indicators do not have the expected sign which however are not significant, thus it is possible to ignore them. Price policy variables such as REERI are influencing chat exports positively. For example, an attempt to depreciate local currency by one percent could enable a boost of around 2 percent in chat export indicating its significant role in chat export. The same applies to an improvement in institutional factor such as infrastructure development which is captured by ratio of paved roads in the country. Accordingly a percentage increment in amount of paved roads will approximately result in an increment of three percent in chat exports.

4.6 Estimation Using Error Correction Models

Error correction coefficient is used to link the short run behavior of the regressand to its long run value. In attaining this objective, the model incorporates first difference of the dependant variable as a function of the change in given explanatory variables in the same period and lagged correcting error term for adjusting the difference between the regressand and its equilibrium value in previous period. Since here both the difference terms and the error correcting term are stationary, it will be valid to use OLS for estimation purpose. Thus, turning to estimated values of the aggregate export supply function, the model converges with a moderate rate to its long run equilibrium, with about 36 percent of the discrepancy being corrected in each period. In case of individual product modeling, meaning chat export model, since price and input variables are all statistically insignificant they were omitted from the final model. The adjustment mechanism with chat export model is relatively high, an indication of a fact that a large part of previous period errors are taken care of in current period.

If we further view the results from the error correction models, the coefficient of exchange rates suggests that for every unit of depreciation of real exchange rate, we could have on average an approximately identical change in aggregate export and around 12 percent increment in chat export for over 10 percent depreciation of the real exchange rate. This is of course in line with the theory which states elasticities of supply for individual products are higher as compared to sectoral aggregates in the short run as response for crops can be attained through resource reallocation. In addition to the above assertions, the above results are good indicator of the fact that prices do also matter in developing country. Thus, effects of indirect taxation through over valued currencies beside the direct tax polices

are significant and removal of such taxation will contribute a lot in expanding agricultural exports as the evidence from both the aggregate and individual product models are in support of this argument.

If we further look into non-price or institutional factors their impact is somewhat smaller as compared to price variables but significant. In case of aggregate export model, for every 10 percentage increment in fertilizer consumption we could have an almost 0.20 percent increment in export supply in the short run. But when we look at results for the individual product export model infrastructure development seems to have a large effect on changes in chat export as a unit percentage change in asphalted road tends to increase export supply by more than three percent.

The results shown above could be a good indicator of the factors behind agricultural growth in general and its export sector in particular. As was shown above both price and non-price factors do influence growth in agricultural export and do seem complementary thus suggesting governments and also various concerned parties to work on both sides to achieve the desired results.

Table4.8: Error Correction Model Results for Agricultural Exports

Regressor	Dependent Variable	
	ΔLroAtG	$\Delta \text{Lnvchat ex}$
ΔLToT	0.50 (2.65)	-
ΔLREERI	-1.12 (-4.47)	-1.16 (-1.4)
ΔLVWT	0.043 (1.13)	0.112 (0.884)
$\Delta \text{Ltocofercon}$	0.019 (3.29)	-
ΔLrgdp	-	9.15 (3.50)
$\Delta \text{Lrpaved}$	-	3.19 (1.10)
Intercept	-0.043 (-0.705)	-0.077 (-0.483)
DDR	0.024 (0.320)	-
μ_{t-1}	-0.36 (-2.09)	-0.80 (-3.71)
R^2	0.73	0.58
F (6,23)	10.16	-
F (5,24)	-	6.904

CHAPTER FIVE

Conclusion and Recommendation

In an attempt to boost growth of the export sector of most developing countries, whose economy is highly dependent on primary commodities especially on agriculture, two policy prescriptions were put forward by scholars. The first policy recommendation focuses on liberalizing the market such as exchange rate devaluation with the effect of directing resources from non-tradable sector to tradable one as there will be transfer of income from small urban non-tradable service sector and consumers of importables to a relatively large number of rural producers of exportables. Thus, according to them such policy instrument will result in a change in internal terms of trade in favour of agriculture. The second school attributes the problem to structural factors and suggest that policy makers should work more on improving input delivery system, rural infrastructure, agricultural research and extension system. According to them, improvement in such arena would contribute a lot in reducing the high opportunity cost of labour which is pushed upward by factors outside agriculture.

In this study we have tried to see the impact of these policy instruments both at an aggregate and individual crop level. In doing so, price policy instrument were modeled through real exchange rate, terms of trade, and relative price of the individual product to its competitor while institutional factors were captured by infrastructure development and amount of fertilizer consumed. As a result:

- A strong and positive impact of price policy instrument were observed both in the short and long run where by a 10% improvement in terms of trade will have 6.2% growth in agricultural export and a 1% depreciation of the real exchange rate will have a 1.17% increment in aggregate

export. For individual product, depreciation of local currency will enable an increment of 2% in chat export.

- The same also applies for the institutional factors where a 10% increment in fertilizer consumption results in a 1.2% growth in agriculture exports in the long run and 0.20% increment in the short run. In the case of the individual product, chat, improvement of infrastructure access by 1% will result in an increment of 3% in chat export in the long run and more than 3% in the short run.

Thus, viewing such impacts, both price and non-price factors do have a roll to play in expanding agricultural exports suggesting concerned parties to work on both factors to achieve the desired goal.

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DECLARATION

I, the undersigned, declare that this thesis is my original work, has never been presented for a degree in any other university and that all source of materials used for this thesis have been dully acknowledged.

Declared by:

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Signature 

Date: June 28, 2005

Confirmed by:

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Date: June 28, 2005

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