THE DETERMINANT OF AGGREGATE IMPORT DEMAND IN ETHIOPIA: CO INTEGRATION ANALYSIS.

BY:

WUBSHET OTORO LUTE

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WUBSHET OTORO LUTE

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BY
Wubshe Otoro

APPROVED BY:

ADVISOR	**SIGNITURE**

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ABSTRACT

In this paper, the determinant of Ethiopia aggregate demand is studies using yearly data in the period 1971/2 to 2006/7. The main objective of the paper is to identify the main determinant of Ethiopia import and the relative elasticity of explanatory variables. The augmented dickey fuller and Phillips Peron test is used to test the unit root test. Johansen co integration and error correction model is employed on yearly data in order to approve the existence of long run relationship and to identify the long run and short run relationship.

The main finding is that, in the long run Ethiopia import is mainly affected by real effective exchange rate, real gross domestic product and relative price. It shows elastic import demand with respect to explanatory variables except relative price. The sign of real effective exchange rate is unexpected in the long run. The short run adjustment coefficient is identified and has a correct negative sign; however, most of the coefficients of short run variables are statistically insignificant. The implication of the finding is that, ineffectiveness exchange rate policy in the long run, effectiveness of pricing policy and difficulty of substituting imported goods by domestic product.

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

International trade is widely acknowledged as an essential element in broadening the prospects for economy expansion. To this extent, international trade has been described as an engine for economic growth. It promotes domestic efficiency, international specialization and international competitiveness, ultimately leading to greater levels of global output. Undoubtedly, the process of global expansion critically depends on foreign trade activities.(**Caesar cheelo**)

In addition, the process of economic expansion or growth sets in motion a growing demand for capital and consumer goods as well as raw materials to sustain the expansion. **Harrod and Hague (1963**) have stressed the need to sustain increasing levels of consumption, investment and production as growth progresses. Clearly, economic growth necessitates the provision of additional resources as it occurs. However, the provision of these extra resources cannot be sustained out of domestic supply alone, implying that imports of foreign resources are necessary to fill the gap between a growing domestic aggregate demand and a limited supply. Imports are therefore introduced as a vital component in international trade and economic development.

The vital role played by imports in foreign trade and development is perhaps what generated the current widespread interest in explaining the determinant of imports in developed and less developed countries alike. In order to analyze the import determinant of Ethiopia, it is worth to review the trade profiles of the country.

Ethiopia's import constitutes such an essential commodities as capital goods, intermediate goods and consumer goods, which are crucial for production as well as consumption purposes. As Ethiopia is price taker in world market, the value (quantity) of imports should have been declined as result of devaluation. However, even after adjustment for price, the value of import is not declining after the reform (Tura Kebede, 2001) .Past growth in imports combined with sluggish growth in export resulted in persistent trade deficit. Except for the year 1973 surplus, due to the substantial increase in the export of oil seeds and pulses, the trade balance has been in deficit and it is widening. It widened from 0.1% of GDP in 1961 to 20.7% of GDP in 2003.

In Imperial regime (1960/1-1973/4) trade deficit was 1.6% of GDP. This period has been characterized relatively by the absence of quantitative and exchange restriction. The policy focused on quality control of imports and exports, and the imports of capital and raw material was encouraged. The performance of exports was in a better position in contrast with the Africa standards during that period and, particularly, export revenue covered the import requirement of the country.

During the Derg regime (1974/5-1990/1) trade deficit was 7.2% of GDP. The former relatively free trade policy was abandoned and substituted by central planning policy. The country foreign trade regime was then turned into more restricted policy. Import substitution strategy was promoted with restrict import licensing, tariff and quantity restriction. The discriminatory allocation of foreign exchange and other policies such as licensing procedure were against the private sector participation in foreign trade.

Deficit to GDP ratio during the past reform period 1991/2-2002/3 was 14.2%. As result of trade reform policies the previous restrictive trade policies have been relaxed. Various trade reform measures have been taken.

From 1970 to 2006, the average import growth rate was 15.65% per annum, and its ratio to GDP was 9.01% for the same period. Capital goods and intermediate goods take the higher share of import goods.

The above analysis shows that external trade is a key determinant of economic growth and development in Ethiopia as well. Following the recent research approach (Tang, 2003; Ho, 2004; Narayan and Narayan, 2005; Frimpong etal, 2006) the use of disaggregate component of total domestic income to estimate aggregate import demand is common. This paper uses aggregate approach to estimate the imports determinant. The reason for this is first the limitation of organized and qualified data; and second due to limited research works in the area (to the best of researcher's knowledge, there is to little or no qualified works in the area). Due to these reasons this paper focused on aggregate approach and the future works in the area may follow the disaggregate approach.

1.2 Statement of the problem

In spite of the vital role played by imports in foreign trade and economic development, it is unfortunate that in Ethiopia only scanty empirical evidence exist to explain import behavior. To the best of researcher's knowledge, there is no published works which explain the determinant of import demand of Ethiopia. From the literature surveyed, Tura(2001), and Muluneh(1982) are the only unpublished MSC thesis which consider import behavior of Ethiopia.

Ethiopia is running trade deficit for the last four decades except in year 1972/73. From 1970 to 2006 the average import growth rate is 15.65% per annual. Import as proportion of GDP was (on average) 9.01% from 1970 to 2006, and it has an important policy implications. With out adequate prediction of the response of imports to external and domestic shocks, the import strategies have not achieved their desired goals.

Thus the importance of trade policies in one hand and the absence of plenty of studies on behavior of import in other hand imply the wide information gap in the area and the importance of the study to fill this gap. On other hand there are plenty of empirical studies in aggregate import determinate both in developed and developing country. This implies the possibility or applicability of determining the determinant of import demand of Ethiopia.

This study therefore aims to adequately explain the determinant of import demand in Ethiopia in order to fill the information or knowledge gap in the area.

The main research questions are

- What determines aggregate import demand of Ethiopia?
- In what extent the import determinant affect the import demand?

1.3 Objective of the study

The main objective of the study is to examine the main determinant of Aggregate import demand of Ethiopia using a time serious analysis. The specific objectives are;

- To identify the major determinate of import demand of Ethiopia and

- To find out to what extent the import determinants affect the import demand of Ethiopia by estimating the respective elasticity of demand for imports.

1.4 Research Hypothesis

The study has the following hypothesis to be tested.

- *Relative price has a significant impact on import demand.*
- *Foreign exchange reserves (real effective exchange rate is used as proxy) have a crucial role in import demand of Ethi*opia.

1.5 Significance of the study /Policy relevance

There is a wide spread agreement that imports generally react more swiftly than exports to substantive trade liberalization resulting short run current account imbalances and need for temporary financing. Being able to predict import flows more accurately, can help policy makers to assess the overall sustainability of an adjustment program and to determine the speed of the trade liberalization process, more confidentially(Racado Faini, etal ,1998).

The availability of import demand elasticity is needed for the implementation and monitoring of trade-related policies and the study of international linkages. For developing countries in particular, estimates of secular elasticities are of practical importance for examining the effects of trade on employment and for any debt rescheduling and terms of trade gains from tariff as well as for analyzing the welfare implication of the cross-sectional structure of trade protection.

Thus, it will have an important economic implication, in that understanding of how import reacts to changing economic condition is a base for policy makers to counteract for trade imbalances in particular and maintaining macro-economic sustainability in general.

From an academic point of view, the study is important because it employ econometric techniques that have gained considerable currency in recent times, utilizing stationary tests, co integration analysis and an error correction model. The findings of this study are therefore significant because they add to the econometrics literature with respect to the case of Ethiopia.

1.6 Organization of the paper

The layout of the paper is as follows: The first of the five chapters is the previous introduction parts, which mainly contain background of the study, statement of problem, objective of the study, significance and the overview of methodology. The literature is reviewed in the second chapter, taking into account both theoretical and empirical issues. The third chapter is devoted for model specification and methodological issues. The empirical result (regression, presentation and discussion of result) will be presented in the forth chapter and the last chapter is for the summery of the research finding and recommendations (concluding statement).

CHAPTER TWO

LITERATURE REVIEW

In economics literature, imports have continually given a considerable amount of attention, both in relation to macroeconomic adjustment and within the broader context of international trade. This paper reviewed both theoretical and empirical literatures briefly. This is because the theoretical basis of import demand function is generally agreed upon and the empirical finding is almost in the same direction.

2.1 THEORETICAL LITERATURE

There is a large volume of theoretical economics on import behavior, most of which concerns the economic implications of trade policies on imports and the associated influence of imports on international trade and economic growth.

Economists have long been concerned with estimation of trade elastic ties. All the three elasticity (price elasticity of import demand, cross-price elasticity of import demand and income elasticity of import demand) are important in import demand estimation. The theoretical postulate for the above statement is quoted from Chellos as:

> "Following the assertion of the traditional theory of imports demand determinants (i.e. the Keynesian general theory of employment), scholars maintain that national income is an important determinant of imports in any open economy. Furthermore, a positive relationship between imports and national income is often postulated. However, the traditional import demand postulate has a microeconomic foundation, as it is based on the consumer theory of demand, which states that the aim of the consumer is to

> maximize satisfaction. This argument is extended to the demand for imports such that the demand for imports by a consumer is influenced by income, import prices and prices of other commodities…."

Price elasticity of import demand shows the sensitivity of import demand to changes in import prices (which are assumed exogenous for a small country). A change in import price affects the real income of the trading country. Cave and Jones, (1994) postulate that if the price of imports rises, three ingredients contributes to a decline of import demand:(a) a substitution effect in consumption (less is demanded); (b) an income effect (the rise in the price of imports lowers real income and therefore lowers imports); and (c) a production effect (the rise in import price serves to attract resource from other industries to the import-competing industry, so that importable decrease). An important demand elasticity relating the relative extent of import reduction to the initial price rise can be derived.

Ceteris paribus, if import demand is price elastic, then arise in the import price will lead to a decrease in the import bill and vice versa. On the other, if import demand is price in elastic, then an increase in the import price will increase the import bill and vice versa. Thus, if the import demand is inelastic then arise in the import price will make the current account deficit for the country worse. It is clear that price elasticity of import demand is expected to be negative. The explanation for values of price elasticity of import demand is quoted from D. Thomakos, etal (2002)

> "The economic intuition predicts that if the number of product Varieties in an economy is high, which may be due to liberal trade regime or developed industrial structure, the (absolute value of) import demand elasticities will be high as well. This is due to the fact that should the consumer be faced with

> higher import prices for a certain product, they can easily be switch to other commodity types, whether imported or domestic. The extent of the rise in the substitution possibility between many product categories due to increased ant outward-orientation of the economy, for example, can easily be seen through these elastic ties".

The cross-price elasticity of import demand is equally important. It shows the responsive of import demand to a change in the domestic price. To some extent, domestic goods and imported goods are substitutable. Thus an increase in the domestic price is expected to increase the demand for imported goods and vice versa. The magnitude of this change in import demand has a significant impact on the current account balance.

Income elasticity of import demand measures the responsiveness of import demand to change in income. An increase in real income signifies growth. However, generally expect a higher import bill with such economic growth. Ceteris paribus, this is likely to increase the current account deficit. Again, the magnitude is very important. If the income elasticity of import demand is highly elastic (and positive), then it is likely to increase the trade deficit substantially. In this case there is a trade off between economic growth and the current account deficit. On the other hand, if import demand is income inelastic and small in magnitude, then an increase in income may not have a very significant effect on import demand. While income elasticity of import demand is generally expected to be positive, it may not necessarily be so. If economic growth leads to an increase in the production of goods, which would have been imported otherwise, then it is possible to have a negative income elasticity of import demand. For example, Sinha (1997) finds income elasticity of import demand to be negative for Pakistan.

Caesar Cheelo, given the theoretical explanation for the negative income elasticities of demand for imports as:

> "Theoretically, it is possible to have negative income elasticities of demand for imports, through evidence of this is hard to come by. Since imports are the excess domestic consumption over domestic supply, the income elasticity of imports could be negative if domestic supply is more income elastic than domestic consumption".

The estimation of price elasticity of import demand is also important in the context of the Marshall-learner-Robinson condition (see Kenen, (1989, pp 294-302)). This condition states that a devaluation of a country's currency will improve the current account balance if the sum of the absolute values of the price elasticity's of import and export demand of a country are greater than 1. This implies that relatively high (close to 1) price elasticity of import demand will indicate that the marshal – Learner – Robinson condition is likely to be satisfied. In summery in the words of Houthakker and Magee (1969, P.111) "The practical and theoretical importance of price elasticities is beyond question."

According to Pilbeam (1998), and Collier and Gunning (1994), the domestic price of importable can be related to the exchange rate and foreign prices assuming a purchasing power parity(PPP) exist. Thus for instance, an overvalued domestic currency would artificially cheapen imports in relation to domestic substitutes, with increased imports as a direct consequence. This argument therefore highlights the idea that in influencing imports, there is a significant role for the exchange rate to play. In addition, there is room for using exchange rate policy in influencing imports (Caesar cheelo).

Several economic observers and scholars argue that imports demand can be influenced directly through trade policies such as tariffs and non-tariff barriers (quotas, import licensing, bans etc). For instance, the operation of import controls creates a wedge between the import (suppliers') price and domestic price of imports. On the other hand, it has been argued (Kindleberger, 1973) that a BOP effect may occur, causing import controls to ultimately lead to an increase in imports. Tariffs for instance, cut spending abroad and presumably imply increased spending at home (i.e. assuming funds not spent abroad are not saved). The increase in domestic spending due to cutting down on imports expenditure raises domestic income until it spills over into additional imports sufficient to restore the BOP. With accelerators therefore, one can have a decline in imports through a tariff ultimately lead to an import surplus. The foregoing therefore suggests that the effect of trade policies cannot be determined a priori (Cheelo).

Considering that trade liberalization issues have gained considerable currency among economic observers and international agencies in recent times; it would be useful to briefly discuss a potential effect of liberalization on imports. Dornbush (1992) argues that the domestic price of importable is related to the exchange rate and trade policy (or restrictions) through the following expression $P_d = E.P_w (1+ t)$[1]. Hence, it is quite possible to coordinate trade liberalization policy and exchange policy such that the domestic price of importable is unaltered. In this case, it would be expected that liberalization will gradually increase real income and so the BOP should not deteriorate. Underlying this argument is the fact that imports would not necessarily increase. Often however, least developed country government are resistant to exchange rate depreciation

[1] Where, t= nominal rate of protection, P_d = domestic price level, P_w = price level in the rest of the world, and E = exchange rate defined as the price of domestic currency of one unit of foreign currency.

and therefore cause imports to be artificially cheapened. Therefore, liberalization often causes unprecedented increase in import levels (Cheelo).

2.2 EMPIRICAL LITERATURE

There are a plenty of empirical literatures on the determinant of imports demand. The review on this paper is limited to the literatures which are directly relevant to the study. Empirical evidence on Ethiopia is considered first.

From the empirical literatures, the researcher surveyed, there is no published study was found that specifically estimates the determinant of aggregate import demand in Ethiopia. However, Tura Kebede, (2001) in his unpublished MSC thesis, examined the determinant of international trade flows in the case of Ethiopia.

Other reviewed literatures are those relevant to this study with regard to used methodology. Following the development of econometric techniques for impact assessment (measurement) there is a plenty of studies which estimates the determinant of aggregate import demand, by using *co integration analysis*, in both developed and developing country**.**

Two approaches are followed by empirical literatures to estimate import determinant in both developed and developing countries, aggregate and disaggregate expenditure approach. Disaggregate approach uses disaggregate components of total domestic income to estimate aggregate import demand, and it is common with recent research approach.

Abbott and Seddighi (1996) used the co integration approach of (Johansen and Juselius, 1990) and the error correction models of (Engel and Granger, 1987) to estimate an import demand model for UK. From their results consumption expenditure had the largest impact on import

demand (1.3) followed by investment expenditure (0.3) and export expenditure (0.1). The relative price variables (the ratio of import price to domestic price) had a coefficient of 20.1.

Mohammad et al. (2001) examine the long-run relationship between imports and expenditure component of five ASEAN countries (Malaysia, Indonesia, the Philippines, Singapore and Thailand) through Johansen multivariate co integration analysis (Johansen 1988; Johansen et al. 1991). Annual data for the period 1968-1998 are used for the countries (except Singapore, with a shorter period 1974-1998) the disaggregate model, in which the final demand expenditure is split up into three major components, is used. The result reveals that import demand is co integrated with its determinants for all five countries.

Narayan and Narayan (2005) applied the bounds testing approach to co integration to estimate the long-run disaggregate import demand model for Fiji using relative prices, total consumption, investment expenditure, and export expenditure variables over the period 1970 to 2000. Their results indicated a long run co integration relationship among the variables when import demand is the dependent variable; and import demand to be inelastic and statically significant at the 1 percent level with respect to all the explanatory variables in both the long-run and the short-run. The result revealed long run elastic ties of 0.69 for both export expenditure and total consumption expenditure respectively, followed by relative prices (0.38) and investment expenditure (0.17).

Joseph Magnus and Eric Fosu (2006) also used the newly developed bounds testing approach to co integration and error correction model to estimate aggregate import demand for Ghana by disaggregate expenditure component over the period 1970 -2002 (33 years date). They stressed that using disaggregate component of income, is superior to using aggregate income as explanatory variable for accurate estimation. They found a co integration relation among the

variables and used to estimate both long and short run disaggregate import model for Ghana. The study finds an inelastic and positive relationship between the three expenditure components (consumption, investment and expenditure on total export of goods and services) and aggregate import demand. Relative price is also inelastic but negatively affect aggregate demand.

CHAPTER THREE

METHODOLOGY

3.1 MODEL SPECIFICATION

Based on econometric theory we postulate that the demand for real imports in the long run, (M), is a positive function of real income or GDP, (Y). The assumption is that imports are normal in consumption, and that it is a negative function of relative import prices (P_m/P_d), where (P_m/P_d) is measured by the ratio of import prices (Pm) to domestic prices (P_d).

The standard import demand model with income and relative price as the explanatory variables has been the work horse in the literature in both developed and developing countries. Goldstein and Khan (1985) presented two trade models: the imperfect substitute's model and the perfect substitute's model. Whilst the perfect substitute is mainly for the trade of homogeneous goods, the imperfect substitutes is the one mostly used in studying imports of manufactured goods and aggregate imports[2].

In modeling an aggregate import demand function for Ethiopia, this paper follows the imperfect substation model. The key assumption is that (neither) imports (nor exports) are not perfect substitute for domestic goods of the country under consideration [**Gold stein khan, 1985 {cited in Dilip Duta, (2006)}],** this theory ensures that the market is neither filled completely by domestic nor foreign goods when each good is produced under constant (or decreasing) costs. That is each country is both an importer and exporter of a traded good. In addition, the imperfect

[2] Surveys of research on imperfect substitutes modeling include Goldstein and Khan, 1985; Knetter, 1992; Marquez, 1993; Hooper and Marquez, 1995; Senhadji, 1998; Tambi, 1998; Sinha, 1999; Dutta and Ahmed, 2001; Annie, 2004; and Agbola and Damoense, 2005.[cited in Frimpong, etal, (2006)]

substitution model assumes no importation of substandard goods or goods that are complement domestic goods.

Since small country imports only relatively small fraction of total world imports, it may be quite realistic to assume that the world supply of imports to small country is perfectly elastic. This assumption seems to be realistic in the case of Ethiopia because the rest of the world may be able to increase its supply of exports to this country even without an increase on prices. This assumption (infinite import supply elasticity) reduces our model to a single equation model of an import demand function.

In developing country, the relationship between income and relative price is unstable, strongly suggests that there are other factors influencing import determination in such countries. Availability of foreign exchange can be singled out as one of these factors. Thus, for example, a decrease in foreign exchange receipts may lead the government to tighten import controls and reduce import flows. The government in most developing countries largely controls the foreign exchange and the supply of import relies on the supply of foreign exchange made available to purchase imports (Riccardo Faini, etal, [1988 p. 10-11]).

The relationship relating the domestic price of importable to the exchange rate, foreign prices and trade restrictions may be expressed following Dornbush (1992), as

$P_d = E.P_w^*(1+t)$[3]

$P_d = E\ (P_w^* + P_w^* t) = E.P_w$, where $P_w = (P_w^* + P_w^* t)$ and P_w^* = foreign suppliers prices.

[3] Cited in Caesar cheelo , Determinant Of Import Demand In Zambia

This leads to $E = P_d/P_w$, where E is the price in domestic currency of one unit of foreign currency, therefore E=Pw/Pd is the real exchange rate measured as the price in foreign currency of one unit of domestic currency. This shows that theoretically real exchange rate and relative prices can be used interchangeably.[4]

An economic theory states that the quantity of imports demanded by a country depends on the relative prices (the ratio of import price to domestic prices) and the level of real income in that country. This is the traditional demand model within the imperfect substitute's framework, which relates imports to relative prices and real income and expressed as:

$$M_t = \beta_0 + \beta_1 Y_t + \beta_2 P_t^m + \beta_3 P_t^d \quad \text{.....(3.1)}$$

Where M_t demand for real imports is a function of domestic income (Y_t), prices of domestic goods and services or cross prices (P_t^d), and prices of imports or own prices (P_t^m). Under the assumption of homogeneity[5], the demand for imports can be expressed in terms of real domestic income Y_t and relative prices P_t^m / P_t^d as

$$M_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 (P_t^m / P_t^d) \quad \text{.....(3.2)}$$

This specification has a micro-foundation since it is based on the consumer demand theory, which states the consumer has the objective of maximizing satisfaction and hence income is allocated among competing goods. This argument can be extended to the demand for imports,

[4] According to Dornbush (1992) explanation exchange rate and relative price can be used interchangeably, but this is true only in fully liberalized economy where exchange rate fully floats. In least developed country like Ethiopia, where financial market is not fully liberalized, this theory doesn't work.

[5] Economic theory regards demand functions to be homogenous of degree zero in prices and money income (**Deaton and Muellbauer, 1980).** This proposition is commonly referred to as "absence of money illusion". This implies that if one multiplies all prices and money income by a positive number, the quantity demand will remain unchanged. This involves dividing the right hand side of the equation by domestic prices (Pt^d**)** (see Goldstein and Khan, 1985). [cited in Frimpong, etal, (2006)]

that is, demand for imports by a consumer is affected by income, import prices and prices of other commodities (domestic goods). Adding the individual demand for imports one can obtain the aggregate imports for the country as specified above (Egwaikhide, 1999, cited in Tura (2001))

The single relative price variable explains why economic agents switch their demand between imports and domestic goods (**Carone, 1996**). This equation is the framework most commonly used in empirical studies of import behavior because it provides an important advantage in the estimation stage. Specifically, it eliminates the multicollinearity problems that could exist in equation (2) due to the correlation between the domestic and import prices especially in small open economies such as Ethiopia.

Many authors have acknowledged the traditional models which relate import demand with import prices and income in explaining import behavior in developed countries, these modes had little relevance in the context of least developed countries, like Ethiopia. They point out the prominence of internal rigidities (such as foreign exchange constraints, policy interference and failure, borrowing constraints, and so on) and external shocks (such as commodity price fluctuations, weather shocks, world recessions, and the like) in affecting the capacity of Least developed countries to import.

Contemporary import models have been proposed which are more relevant to least developed countries, cases. For instance, **Moran (1989)** developed and estimated import models under foreign exchange constraints and arguing that such models are more appropriable representations of import behavior in least developed countries.

Moran (1989) model is specified as:

$$M_t = \gamma_0 + \gamma_1 F_t + \gamma_2 R_{t-1} + \gamma_3 M_{\tau-1} + \gamma_4 (P_t^m / P_t^d) + \gamma_5 Y_t \ldots\ldots\ldots (3.3)$$

Where F_t =current level of foreign exchange receipts, R_{t-1} = lagged international reserves and the other variables are as defined before.

Moran (1989) model import model combines traditional model and Hemphill (1974) model. Equating $\gamma_1 = \gamma_2 = 0$ in Moran model gives traditional import model and $\gamma_4 = \gamma_5 = 0$ gives Hemphill model. Hemphill (1974) model defines imports as the function of current foreign exchange receipts and lagged international reserves.

This paper follows Moran (1989) general import model in analyzing the import demand of Ethiopia, the slight difference is on exchange rate variables. This paper uses REER (real effective exchange rate) in instead of foreign exchange receipts and reserves.

Import liberalization, through easing access to import, is likely to result in a larger aggregate import demand by the economy. A dummy variable has to be included in the model to capture the effect of the import policy on import demand. Thus, the dummy variable is used for market structure (command economy from 1974-1991 and "market oriented economy" since 1991), to capture the effect of policy variation.

The most commonly used functional form are either linear or log linear formulation. Logarithmic formulation is preferred because it gives direct estimation of import elasticity and allows imports to react proportionally to rise and fall in the explanatory variables (Aruna Kumer Dash, 2005).

Studies by Khan and Ross (1977) and Salas (1982) suggest that in modeling an aggregate import demand function, the log-linear specification is preferable to the linear formulation.

Accordingly, the long-run import demand function for Ethiopia is specified as follows:

$$\mathbf{LRIM_t = \beta_0 + \beta_1 LRGDP_t + \beta_2 LRP_t + \beta_3 LREER_t + \beta_4 DM_t + \mu_t \ldots\ldots (3.4)}$$

Where, L = natural logarithm

RIM = real import (nominal import deflated by import price index)

RP= is the relative prices (the ratio of import price index to domestic price index)

RGDP = real gross domestic product

REER = real effective exchange rate

D = a dummy variable for trade liberalization and

μ = the i.i.*d* error term, at period *t*.

3.2 DATA SOURCES AND VARIABLE DEFINIT

The data source for the study includes: Ethiopia custom authority, National bank of Ethiopia, MOFED, Publication of IMF particularly (IFS) and its data set, Publication of Ethiopia Economic Research and Policy Institutes (EERPI) and its data set, Ministry of economic development (MEDaC), etc. Annual data from 1971/2 to 2006/07 is used for dependent and all independent variables.

Dependent variable

Real imports (M) are defined as nominal imports (NM) deflated by the import price index.

Explanatory variable

Relative import prices (RP) are defined as the import price index deflated by CPI.

Real income(Y) is proxy by real GDP and defined as nominal GDP (NGDP) deflated by the GDPD.

Real effective exchange rates (REER) are used to proxy foreign exchange protection. The assumption here is real effective exchange rate is affected by foreign reserve and foreign exchange receipts, therefore it is reasonable to take REER as proxy for foreign exchange protection. The data for REER is found from national bank of Ethiopia and based on IMF definition of exchange rate description (foreign currency to domestic currency/USD to ETB). Decrease in REER is depreciation and increase is appreciation.

Dummy variable (DM) is used to proxy policy differences between Derg and the current EPRDF policy on international trade. For policy dummy the year from 1971/2 to 1990/1 the value of the dummy is set at 0 and 1 otherwise.

Expected sign of the coefficient

All variables except dummy are explained in logarithm form and logarithmic formulation of the variable enables direct estimation of import elasticity and allows imports to react proportionally to rise and fall in the explanatory variables.

Coefficients of LGDP (β_1), LREER (β_3) and D (policy dummy) (β_4) are expected to be positive. β_1 measures income elasticity of demand and in economics, the income elasticity of demand measures the responsiveness of the quantity demanded of a good to the change in the income of the people demanding the good. A positive income elasticity of demand is associated with normal

goods and the aggregate import is expected to be dominated by normal goods. β_4 measure the effect of trade policy of current regime on import demand. Relative to the previous trade policy the current policy is more liberalized, and then the effect of this policy is expected to be positive on import demand. The coefficient of LREER (β_3) is expected to be positive, since an increase in REER is appreciation of domestic currency and appreciation of domestic currency will increase the demand for import by decreasing import price.

The coefficient of LRP (β_2) is expected to be negative. β_2 measures price elasticity of demand. In economics and business studies, the price elasticity of demand (PED) is an elasticity that measures the nature and percentage of the relationship between changes in quantity demanded of a good and changes in its price. The demand law states that, all other factors being equal, as the price of a good or service increases, consumer demand for the good or service will decrease and vice versa.

3.3 ESTIMATION PROCEDURE

The estimation procedure adopted in this study involves three stages

I. Determine the order of integration of the variables by employing Dickey Fuller (DF), Augmented Dickey – fuller (ADF) and Phillips Perron (1988) unit –root tests;

II. If the variables are integrated, we apply the Johanson-Juselius (1990, 1992, 1994) maximum likely hood method of co integration to obtain the number of co integrating vectors, and

III. If the variables are co integrated, we can specify an error correction model and estimate it with standard methods and diagnostic test

3.3.1 TIME SERIES ANALYSIS

Time series econometric study is not complete without performing time series analysis. A major problem associated with time-series data is that they often exhibit time characteristic (i.e. non stationary of variables/series) that may lead to spurious regression results and therefore, make statistical inference invalid. Spurious results imply obtaining a spurious or 'nonsense' correlation among series. Simply put, a spurious correlation involves observing from a regression, a large correlation coefficient that exists merely because the variables share a common trend-like movement over time (i.e. variables are non-stationary). That is, the variables do not lend support to any theory that tie them together (i.e. variables are not co integrated) (see, Enders, 1995; Johnton and DiNardo, 1997). Non-stationarity of series, given that these series are not co integrated implies that any regression involving them would yields spurious results.

Spurious results suggest that the mean and variance computed from non-stationary variables (in levels) would be biased estimates of the unknown population mean and variance. This is because: there is no long run mean to which non-stationary series revert; and the variance is time-dependent and goes to infinity as time approaches infinity.

Therefore, there is no long-run economic relationship among variables. Hence, the argument is upheld that using one or more non-stationary series in a regression produces biased estimates (spurious results), thereby leading to invalid statistical inference when the series are estimated in levels, except in the case of a co integrating relationship. Thus, if series are co integrated, it is most appropriate to apply an error correction model because it encompasses other models (Mwega, 1993).

To determine and take in to account the time-series properties of model variables, thereby avoiding the problem of spurious results, it is necessary to explore time-series analysis. Eviews and Stata econometric packages are used to test for stationarity of series and the existence of co integration among series as well as to estimate an error correction model.

3.3.2 UNIT ROOT TEST

The study performs two widely used unit root tests: the Dickey-Fuller (DF) and augmented Dickey-Fuller (ADF) tests, and the Phillips-Perron (PP) test. In this section we provide some theoretical background for these two tests.

The Augmented Dickey-Fuller (ADF) Test

To illustrate the use of Dickey-Fuller tests, consider first an AR (1) process:

$$y_t = \mu + \rho y_{t-1} + \varepsilon_t \quad \text{.....(3.5)}$$

Where μ and ρ are parameters and ε_t is assumed to be white noise is a stationary series if $-1<\rho<1$. If $\rho = 1$, y is a non-stationary series (a random walk with drift); if the process is started at some point, the variance of y increases steadily with time and goes to infinity. If the absolute value of ρ is greater than one, the series is explosive. Therefore, the hypothesis of a stationary series can be evaluated by testing whether the absolute value of ρ is strictly less than one. Both the DF and the PP tests take the unit root as the null hypothesis λ_0: $\rho = 1$. Since explosive series do not make much economic sense, this null hypothesis is tested against the one-sided alternative λ_1: $\rho<1$.

The test is carried out by estimating an equation with y_{t-1} subtracted from both sides of the equation:

$$\Delta y_t = \mu + \gamma y_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

Where $\gamma = \rho - 1$ and the null and alternative hypotheses are

$\lambda_{0:} \gamma = 0$, $\lambda_{1:} \gamma < 0$.

While it may appear that the test can be carried out by performing a t-test on the estimated γ, the t-statistic under the null hypothesis of a unit root does not have the conventional t-distribution. Dickey and Fuller (1979) showed that the distribution under the null hypothesis is nonstandard, and simulated the critical values for selected sample sizes. More recently, MacKinnon (1991) has implemented a much larger set of simulations than those tabulated by Dickey and Fuller. In addition, MacKinnon estimates the response surface using the simulation results, permitting the calculation of Dickey-Fuller critical values for any sample size and for any number of right-hand variables. EViews reports these MacKinnon critical values for unit root tests.

The simple unit root test described above is valid only if the series is an AR (1) process. If the series is correlated at higher order lags, the assumption of white noise disturbances is violated. The ADF and PP tests use different methods to control for higher-order serial correlation in the series. The ADF test makes a parametric correction for higher-order correlation by assuming that the y series follows an AR (p) process and adjusting the test methodology. The PP approach is described below.

The ADF approach controls for higher-order correlation by adding lagged difference terms of the dependent variable y to the right-hand side of the regression:

$$\Delta y_{t=} \mu + \gamma y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta y_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (3.7)$$

This augmented specification is then used to test:

$\lambda_{0:}\ \gamma = 0,\ \lambda_{1:}\ \gamma < 0$ in this regression. An important result obtained by Fuller is that the asymptotic distribution of the t-statistic on γ is independent of the number of lagged first differences included in the ADF regression. Moreover, while the parametric assumption that y follows an autoregressive (AR) process may seem restrictive, Said and Dickey (1984) demonstrate that the ADF test remains valid even when the series has a moving average (MA) component, provided that enough lagged difference terms are augmented to the regression.

There are two practical issues in performing the ADF test. First, you will have to specify the number of lagged first difference terms to add to the test regression. The usual (though not particularly useful) advice is to include lags sufficient to remove any serial correlation in the residuals.

Second issue is whether to include other exogenous variables in the test regression. You have the choice of including a constant, a constant and a linear time trend, or neither in the test regression. Your choice here is important since the asymptotic distribution of the t-statistic under the null hypothesis depends on your assumptions regarding these deterministic terms.

2 If you include a constant in the test regression, the t-statistic has a nonstandard distribution if the underlying process contains a unit root with a zero constant.

3 If you include a constant and linear trend in the test regression, the t-statistic has a nonstandard distribution if the underlying process contains a unit root with a zero linear trend.

The asymptotic distribution changes when these assumptions are not satisfied. For example, if you include a constant in the test regression and if the underlying process contains a unit root with a nonzero constant, then the t-statistic has an asymptotic standard normal distribution under the null hypothesis of a unit root.

Although this result complicates the testing procedure by increasing the number of cases to consider, Hylleberg and Mizon (1989) have shown that the standard normal critical values are likely to lead to too frequent rejection of the null hypothesis even in large samples, unless the constant is very large. They present critical values for selected sample sizes and various positive values of the constant parameter μ . Their critical values lie between the Dickey-Fuller values and those from the standard normal distribution; as the value of μ becomes smaller, the critical values become closer to the Dickey-Fuller values. Their recommendation is to use the Dickey-Fuller values rather than those from the standard normal distribution for moderate sample sizes.

There still remains the problem of whether to include a constant, a constant and a linear trend, or neither in the test regression. One approach would be to run the test with both a constant and a linear trend since the other two cases are just special cases of this more general specification. However, including irrelevant regressors in the regression reduces the power of the test, possibly concluding that there is a unit root when, in fact, there is none. The general principle is to choose a specification that is a plausible description of the data under both the null and alternative hypotheses (Hamilton 1994a, p.501). If the series seems to contain a trend, you should include both a constant and trend in the test regression. If the series does not exhibit any trend and has a nonzero mean, you should only include a constant in the regression, while if the series seems to

be fluctuating around a zero mean, you should include neither a constant nor a trend in the test regression.

Phillips-Perron (PP) Test

The Phillips-Perron(PP) (1988) test is well suited for analyzing time series whose differences may follow mixed autoregressive moving average(p,q) processes of serial correlation and hetroskedacity in testing the regression. Consider the following equation:

$$y_{t=} \mu_0 + \mu_1 y_{t-1} + \mu_2(t-T/2) + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.8)$$

Where T is the number of observation and εt is the error term. The null hypothesis of a unit root is $\mu_1 = 1$.

Most macroeconomic variables are found to be non-stationary and show trending over time (Johanson, 1992). One can, however, difference or de trend the variables in order make them stationary. If variables become stationary through differencing, they are in the class of difference stationary process. On the other hand, if they are de trended, they are trend stationary.

In the case where the variables are difference stationary, it is possible to estimate the model by first difference. However, this gives only the short run dynamics in which case valuable information concerning the long equilibrium properties of the data could be lost (Kennedy, 1992). In order to obtain both the short run dynamics and the long run relationship one can appeal to what is known as co integration.

If any variable is found to be non-stationary, the paper will test whether such a variable is stationary in its first-difference form. Any variable that achieves stationarity after first-

differencing is said to be integrated of order 1, denoted by I (1). If each variable is non-stationary but achieves stationarity after differencing, we will proceed with the co integration tests.

3.3.3 CO INTEGRATION ANALYSIS

The analysis of co integration starts with the determination of the univariate properties of the time series. Most macroeconomic variables are found to be non-stationary and show trending over time (Johanson, 1992). One can however, difference or de trend the variables in order to make them stationary. If variables become stationary through differencing, they are in the class of difference stationary process. On the other hand, if they are de trended, they are trend stationary.

In the case where the variables are difference stationary, it is possible to estimate the model by first difference. However, this gives only the short run dynamics in which case valuable information concerning the long run equilibrium properties of the data could be lost (Kennedy, 1992). In order to obtain both the short run dynamics and the long run relationship one can appeal to what is known as co integration.

Two or more I (1) variables are said to be co integrated if there exist a linear combination of them that is stationary (See Engel and Granger (1987)). If it is found that the variables are I (1), proceed with co integration tests (see Pesaran and Smith (1998). A test for co integration analysis means looking for stable long-run equilibrium relationships among non-stationary economic variables. If the results indicate that the absence of co integrating vectors between the variables, it means that there does not exist a long run stable relationship between them. If co integration exists, then it can be presumed that a one-way or two-way Granger causality exists in at least the

stationary series. However the implementation of co integration method necessitates the prior check for non-stationarity of data.

There are two main approaches to test for co integration. They are Engel and Granger (1987) two step procedure and the Johansen (1988), Johansen and Juselius (1990) procedure.

Engel-granger two stage procedure

Given two variables, let say Y_t and X_t are believed to integrated of order (1) and we want to determine whether there exist an equilibrium relationship between them. Engel and Granger (1987) propose a straightforward test whether two I (1) variables are co integrated of order CI(1,1).

The first step of Engel and Granger analysis is to pretest each variables to determine their order of integration. For co integration to exist the variable should be integrated of the same order. If the variables are integrated of different order, it is possible to conclude that they are not co integrated.

The next step, if all variables are co integrated of the same order, is to estimate the long-run equilibrium relationship in the form:

$$Y_t = \beta_0 + \beta_1 X_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.9)$$

To determine if the variables are actually co integrated, residual sequence (e_t) can be used for analysis. Thus, if the series of the residual of the long run equilibrium are found to be stationary, then Y_t and X_t sequences are co integrated of the order (1, 1)

The last step is to estimate the error correction model. If the variables are co integrated, the residuals from the equilibrium regression can be used to estimate the error correction model. Although, this method is easy to implement, it does have several problems.

Johansen's Co integration Test

Given a group of non-stationary series, we may be interested in determining whether the series are co integrated, and if they are, in identifying the co-integrating (long-run equilibrium) relationships. EViews implements VAR-based co integration tests using the methodology developed by Johansen (1991, 1995). In Johansen's method co integration analysis is tested using VECM and it avoids arbitrary selection of dependent and independent variables. It is a multivariate generalization of DF test for the unrestricted VAR model with K lags (Harris and Johansen).

Consider a VAR of order p:

$$\mathbf{y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + B x_t + \varepsilon_t,} \quad \ldots\ldots\ldots\ldots (3.10)$$

Where $\mathbf{y_t}$ is a k-vector of non-stationary I (1) variables, $\mathbf{x_t}$ is a d vector of deterministic variables, and $\boldsymbol{\varepsilon_t}$, is a vector of innovations. We can rewrite the VAR as:

$$\Delta \mathbf{y_t} = \boldsymbol{\pi} \mathbf{y_{t-1}} + \sum_{i=1}^{p-1} \boldsymbol{\gamma_i} \Delta \mathbf{y_{t-i}} + \boldsymbol{\beta} \mathbf{x_t} + \boldsymbol{\varepsilon_t}, \quad \ldots\ldots\ldots\ldots\ldots (3.11)$$

Where $\boldsymbol{\pi} = \sum_{i=1}^{p} \mathbf{A_i - I}$, $\qquad \boldsymbol{\gamma_i} = -\sum_{j=i+1}^{p} A_j$

Granger's representation theorem asserts that if the coefficient matrix π has reduced rank r<k, then there exist k*r matrices α and β each with rank r such that $\pi = \alpha\beta'$ and $\beta' y_t$ is stationary.

Where r is the number of co integrating relations (the co integrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the vector error correction model. Johansen's method is to estimate the π matrix in an unrestricted form, then test whether we can reject the restrictions implied by $\boldsymbol{\pi}$ the reduced rank of π.

In the Johanson procedure there are two tests that help to identify the number of co integrating vectors, called the trace (λ_{trace}) and the maximal (λ_{max}) statistics given as follows(Johansen, 1995; Harris, 1995):

$$\lambda_{Trace(}\mathbf{r)} = -T \sum_{i=1+r}^{n} \ln (1-\hat{\lambda}_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.12)$$

$$\lambda_{Max(}\mathbf{r, r+1)} = -T \ln (I-\hat{\lambda}_{r+1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.13)$$

Where $\hat{\lambda}_i$ =the estimated value of the characteristic roots (also called Eigenvalue) obtained from the estimated π matrix, T = number of observations

To determine the number of cointegrating relations r, subject to the assumptions made about the trends in the series, we can proceed sequentially from r = 0 to r = k-1(where k is the number of variables in the regression) until we fail to reject the null hypothesis. The first row in the upper table tests the hypothesis of no co integration, the second row tests the hypothesis of one cointegrating relation, the third row tests the hypothesis of two cointegrating relations, and so on, all against the alternative hypothesis of full rank, i.e. all series in the VAR are stationary.

Note that EViews displays the critical values for the trace statistic reported by Osterwald-Lenum (1992), not those tabulated in Johansen and Juselius (1990). Johansen also proposes an

alternative LR test statistic, known as the maximum Eigenvalue statistic, which tests (r) against (r +1). According to Johansen and Juselius (1992), the power of the trace test is lower than the maximum Eigenvalue test.

Comparison between JJ (Johansen- Juselius) and Engel-Granger procedure

To test for co integration among macro economic variables, we adopt the procedure developed by Johansen (1988) and Johansen and Juselius (1990) since this particular method is claimed to be superior to the regression based on Engel Granger procedure due to the following reasons. First, in case of Engel Granger procedure, the estimation of the long-run equilibrium regression requires that the researcher place one variable on the left hand side and use the others as regressors. But in practice, it is possible to find that one regression indicates the variables are co integrated, where as reversing the order indicates no co integration. This is a very undesirable feature of the procedure since the test for co integration should be invariant to the choice of the variable selected for normalization. On the other hand, the Johansen Juselius method does not rely on an arbitrary normalization. Secondly, the Engel-Granger procedure does not account for the possibility of multiple co integrating relationships and hence all the possible dynamic interactions that could exists between two or more time series. If a multiple co integration vectors exist, the use of Engel-Granger method may simply produce a complex linear combination of all the distinct co integrating vectors that can not be sensibly interpreted. In contrast, Johansen Juselius method provides a unified framework for the estimation and testing of co integrating relations in the context VAR error correction models. Johansen Juselius (1990) procedure allows for tracing more than one co integrating vector in the date by calculating the maximum likelihood estimates. The Johansen Juselius procedure fully captures the underlying time series properties of

the data and provides estimates of all the co integrating vectors that exist within a set of variables. It clearly shows whether the system consists of a unique co integrating vector or a linear combination of several co integrating vectors. It has also been argued in the econometric literature that the Johansen technique is more discerning in its ability to reject a false null hypothesis (Ericsson (1991)). There are concerns about the small sample bias in estimates from the Engel Granger procedure. Finally, the Johansen Juselius procedure allows for testing certain restrictions suggested by econometric theory, such as sign and size of the elasticity estimates. Unlike Johansen procedure, the Engel Granger two step procedures do not easily accommodate dynamics in the co integration analysis.[6]

3.3.4 ERROR CORRECTION MODEL

The existence of co integration among variables suggests that there is a long-run economic relationship among variables, implying that it is most efficient to apply an ECM. The ECM is superior to other model specifications because: It provides a more general and less restrictive lag structure, allowing for (partial or full) adjustment as a special case; and it captures both the long-run equilibrium and short-run dynamic relationships associated with a model, making it encompassing.

If variables are co integrated, then tests involving differenced variables will be misspecified and some important information lost unless a lagged error correction term is included. Therefore, we estimate the error correction model in which the error correction terms (ECT), derived from long-run co integrating vectors, are included as independent explanatory variables in the estimation

[6] Aruna Kumer Dash(2005)

process in order to recover all the long run information that was lost in the original estimation process (Eshete Amsalu, 2007).

The EC term lagged one period (i.e.EC_{t-1}) integrates short run dynamics in the long run import demand function. This leads us to the specification of a general error correction model (ECM).

$$\Delta \mathbf{LRImp_t} = \alpha_0 + \sum \alpha_{1i} \Delta \mathbf{LRImp_{t-i}} + \sum \alpha_{2i} \Delta \mathbf{LRP_{t-i}} + \sum \alpha_{3i} \Delta \mathbf{LRGDP_{t-i}} + \sum \alpha_{4i} \Delta \mathbf{LREER_{t-i}} + \sum \alpha_5 \mathbf{EC_{t-1}} + \alpha_6 \mathbf{D_t} + \varepsilon_t \ldots\ldots\ldots\ldots \mathbf{(3.14)}$$

Where EC_{t-1} is Error correction term lagged one period, and all other variables are remained as defined before.

The application of the Johansen method produces two types of relationship; short run dynamics and long run causal relationship between the trade balance and the specified set of independent variables. The long run causal relationship is captured by the coefficients of the lagged value of the error correction term, $EC_{t-1,}$ while the short run causal effects are implied by the coefficients of the lagged explanatory variables (in first difference). If only the vector error-correction term (ECT) is statically significant, this implies that the variable is weakly endogenous with respect to the long run parameters. Similarly, if only the coefficients of the lagged explanatory variables (in first difference) are statically significant, this implies that the variable is weakly endogenous with respect to the short run parameters. Finally, if the lagged explanatory variables and error correction terms are not statically significant, then the dependent variable is economically strongly exogenous (Eshete Amsalu, 2007).

The parameters of the error terms are called impact multipliers and they measure the instantaneous response of a given variable to one unit change in a shock. When the impact

multipliers are considered over time, they are called impulse response functions and when plotted against time the behavior of the variables in the dynamic system is represented in response to various shocks.

CHAPTER FOUR
EMPIRICAL RESULTS AND INTERPRETATION

4.1 EMPIRICAL RESULT

4.1.1 Summary

Table 4.1 summery statistics of the data

Variable	Count	Mean	Std. Dev.	Std. Err. of Mean	Min	Max
Time(year)	36				1971	2006
LRIMP	36	9.571082	0.923639	0.153940	8.108705	11.3755
LRGDP	36	10.69094	0.281668	0.046945	10.3305	11.35257
LRP	36	0.703775	0.637381	0.106230	-.0308272	1.869423
LREER	36	4.984724	0.286997	0.047833	4.511958	5.594711
All	144	6.487630	4.022382	0.335198		

Computed by EViews 5

4.1.2 UNIT ROOT TEST

In order to test stationarity of the variables included in our models, the augmented Dickey Fuller and Phillips Peron test using Eviews 5.0 are employed, and all the tests were runs on both 1% and 5% level of significance.

4.1.2.1 Augmented Dickey Fuller (ADF) Tests

The ADF test run and reported on 1 lag base. ADF test on level and first difference is reported on the following table.

Table 4.2 Augmented Dickey Fuller (ADF) Tests on Level and First Difference

variables	specification	ADF Test Statistic	** 1% Critical Value*	** 5% Critical Value
Lrimp	WI	0.190555173187	-3.63534389565	-2.94986112885
	WTI	-1.73140041417	-4.25051447594	-3.54681803446
Lrgdp	WI	0.340348647419	-3.63534389565	-2.94986112885
	WTI	-1.93451149034	-4.25051447594	-3.54681803446
Lreer	WI	-1.28699260835	-3.63534389565	-2.94986112885
	WTI	-2.36974486251	-4.25051447594	-3.54681803446
lrp	WI	-1.27831456062	-3.63534389565	-2.94986112885
	WTI	-4.40990850362	-4.25051447594	-3.54681803446
△Lrimp	WI	-3.34944595159	-3.642247334	-2.95274634773
	WTI	-3.61099884683	-4.26048405659	-3.5513667999
D^2(LRIMP)	WI	-5.26180027688	-3.64963315427	-2.95582644548
	WTI	-5.15884504549	-4.27115931734	-3.55623090081
△Lrgdp	WI	-7.44134560157	-3.642247334	-2.95274634773
	WTI	-5.60690114154	-4.27115931734	-3.55623090081
△Lreer	WI	-7.56995646202	-3.642247334	-2.95274634773
	WTI	-7.42911347001	-4.26048405659	-3.5513667999
△lrp	WI	-6.95725291606	-3.642247334	-2.95274634773
	WTI	**-6.83667045378**	-4.26048405659	-3.5513667999

*MacKinnon critical values for rejection of hypothesis of a unit root.

Note: WI refers to "With Constant"

WTI refers to "With Trend and Constant", $\triangle$ for difference

The ADF unit root test result of all variables on import equation is reported on table 4.2. The test result at level indicates that the null hypothesis of unit root could not be rejected both at 1% and 5% level of significance for all variables except LRP. The null hypothesis of unit root in level is rejected by ADF test for the variable LRP (with trend and intercept specification). The test result on first difference indicates that all the null hypothesis of unit root could be rejected for all variables except for LRIMP with both WI and WIT specification. From these ADF test we concluded that all variables except LRIMP are integrated of order one. The variable LRIMP boarders on the margin of a unit root, after running the test with variables in their first differences (both with constant and with constant and trend) and LRIMP are integrated of order two. To conclude the order of integration in the following section we have Phillips Peron unit root test result.

4.1.2.2 **Phillip Peron unit root Test**

The PP test was run on three truncation lags as suggested by Newey-west (1998). See the following table for test result.

Table 4.3 Phillips Perron (PP) Tests on Level and First Difference

variables	specification	PP Test Statistic	**1% Critical Value*	** 5% Critical Value
Lrimp	WI	-0.467731838186	-3.62887750197	-2.94715294449
	WTI	-1.90313150498	-4.24118361687	-3.5425551434
Lrgdp	WI	2.16811329813	-3.62887750197	-2.94715294449
	WTI	-0.781965754151	-4.24118361687	-3.5425551434
Lreer	WI	-1.78710110576	-3.62887750197	-2.94715294449
	WTI	-2.81429951502	-4.24118361687	-3.5425551434
lrp	WI	-1.59214540273	-3.62887750197	-2.94715294449
	WTI	-0.890000864245	-4.24118361687	-3.5425551434
△Lrimp	WI	-6.1908613606	-3.63534389565	-2.94986112885
	WTI	-6.21612351442	-4.25051447594	-3.54681803446
△Lrgdp	WI	-5.31208316214	-3.63534389565	-2.94986112885
	WTI	-6.00787479003	-4.25051447594	-3.54681803446
△Lreer	WI	-8.44598375446	-3.63534389565	-2.94986112885
	WTI	-8.41902696138	-4.25051447594	-3.54681803446
△lrp	WI	-3.94888973693	-3.63534389565	-2.94986112885
	WTI	-4.36736074326	-4.25051447594	-3.54681803446

**The critical values were obtained from the EVIEWS Econometric package and are equivalent to the critical t-values given in the Dickey-Fuller distribution table in Enders (1995).

Note: WI refers to "With Constant"

WTI refers to "With Trend and Constant", △ for difference

It is evident from the PP test results that all the variables are unambiguously found to be integrated of order one {i.e. I (1)}. The DF[7] and PP tests unambiguously call for us to reject the null- hypothesis of a unit root for all the variables. Since none of the lags of the ADF test were found to be significant, adding augmentations to the test perhaps weakened it.

To avoid over-differencing the variables therefore, we ignore the suggestion by the ADF test that some of the variables are integrated of orders higher than one. Instead, based on the more reliable results of the DF and PP tests, we assume that all the variables are I (1). This assumption is consistent with econometric theory, which postulates that most macroeconomic variables would exhibit unit roots, becoming stationary after first differencing. Otherwise macroeconomic variables would likely be stationary (Enders, 1995).

Note that, including a random walk with out drift and trend in a unit root test does not alter the final conclusion, i.e. all the variables are integrated of order one[I(1)].

4.1.3 CO INTEGRATION ANALYSIS

Choosing the Lag Order of a VAR

The lag order of the VAR is often selected somewhat arbitrarily, with standard recommendations suggesting that you set it long enough to ensure that the residuals are white noise. However, if you choose the lag length too large, the estimates become imprecise. For annual data, Pesaran and Shin (1999) suggest a maximum of 2lags. Based on Schwarz Bayesian Criterion (SBC),

[7] The DF test rejects the existence of unit root after first difference in 5% level of significance.

Akaike Information Criterion (AIC) and likelihood ratio (LR) test the optimum lag length was set to 2 lags.

Number of co integrate equation

After determining the order of integration and set optimal lag length, we can now move to test for the existence of co integration among the variables in our model. The Johansen procedure is applied to test for co integration of the variables and both the trace statistics and maximal statistics are given below.

Table 4.4 Testing For Co Integration Using the Johansen and Juselius Method

Null hypothesis	Alternative hypothesis	statistic	5 Percent Critical Value	1 Percent Critical Value
Maximum Eigenvalue test				
r=0	r=1	40.0726*(**)	27.07	32.24
r<=1	r=2	**16.6983**	20.97	25.52
r<=2	r=3	2.6969	14.07	18.63
r<=3	r=4	0.1155	3.76	6.65
Trace test(LR)				
r=0	r>0	53.67169*	53.12	60.16
r<=1	r>1	26.80995	34.91	41.07
r<=2	r>2	12.48554	19.96	24.60
r<=3	r>3	2.484293	9.24	12.97

Note ‘r’ refers to the number of co integrating vectors.

Restricted variables: constant, DM (policy dummy)

*(**) denotes rejection of the hypothesis at 5 %(1%) significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

The results of both maximal Eigenvalue and trace tests are reported in table 4.4.

Starting with the null hypothesis of no co integration (r = 0) among the four variables of LRIMP, LRGDP, LRP and LREER both the maximal Eigenvalue and the trace statistics reject the null hypothesis. But, both test statistics fail to reject the null hypothesis of one cointegrating vectors, suggest that r =1. Therefore, we conclude that there is only one cointegrating relation among the variables.

The Co integrating Equations (Vector)

The cointegrating vector is not identified unless we impose some arbitrary normalization. EViews adopts normalization such that the first r series in the LRIMP vector are normalized to an identity matrix. The normalized cointegrating relation assuming one cointegrating relation r = 1 is given by

Table 4.5 Beta and Alpha Coefficients of Co Integration Analysis

**Normalized co integrating coefficients (standard error in parentheses): 1 Co integrating Equation(s):					
LRIMP	LRGDP	LRP	LREER	DM	C
1.0000	-1.423147	0.298495	1.626620	0.0062499	-2.6806
ST.ERROR	(0.38988)	(0.09988)	(0.16102)		
Log likelihood		140.7867			
Adjustment coefficients (standard error in parentheses					
D(LRIMP)	-0.662950				
ST.ERROR	(0.38445)				
D(LRGDP)	0.132554				
ST.ERROR	(0.05472)				
D(LRP)	0.118890				
ST.ERROR	(0.08836)				
D(LREER)	-0.388169				
ST.ERROR	(0.27650)				

**Computed with Eviews 5 software packages

Normalized co integration equation can be written as:-

LRIMP-2.68059-1.423147*LRGDP+0.298495*LRP+1.626620*LREER+ 0.0062499*DM
…… (5.1)

The numbers in parentheses under the estimated coefficients are the asymptotic standard errors. Some of the normalized coefficients will be shown without standard errors. This will be the case for coefficients that are normalized to 1.0 and for coefficients that are not identified. In the latter case, the coefficient (usually 0) is the result of an arbitrary identifying assumption.

The existence of one co integrating relationship in the model suggests the existence of long run relationships. This means, the model that seeks to explain the long run behavior of the import demand should include at least real GDP, relative price and real effective exchange rate.

In order to improve the statistical specification of the model test of exclusion from the cointegrating space and tests of weak exogenity should be carried out. The zero restriction is imposed on each long run coefficient (beta) and the vectors for likelihood ratio tests are conducted. This test helps to identify unique cointegrating vector (it helps to determine which variable uniquely constitutes the cointegrating vector). The result of the test is given in table 4.6 below.

Table 4.6 Tests for Zero Restrictions on the Long Run Parameters (β)

coefficients	LRIMP	LRGDP	LRP	LREER
β	1.0000	-1.423147	0.298495	1.626620
T-VALUE		3.6502	2.98846	10.1018

The test result indicates that all explanatory variables are statically significant in explaining the long run real aggregate demand of Ethiopia.

To identify which entries of the column of α-matrix is statically different from zero; we impose a zero restriction on α-coefficients. The test of zero restriction on α-coefficient is sometimes

referred to as the test for weak exogenity[8] and it helps us to write the endogenous variables Conditioned on other variables in the vector.

Weak exogenity rejected for aggregate import. After testing weak exogenity condition, we can write the co integration vector in equation format by classifying the variables in to endogenous and exogenous. Thus, the long run equation can be written as:

LRIMP= 2.68059 +1.423147*LRGDP -0.298495*LRP -1.626620*LREER-0.0062499*D… (5.2)

4.1.4 VECTOR ERROR CORRECCTION MODELS

After confirming the existence of long run relationship among the relevant variables, the next task is to set up the vector correction model (VECM) in which vector error correction terms are included. This helps us to understand how short run adjustment of macroeconomic variables took place. From the long run relationship we can derive the error correction terms lagged one period in order to analyze the short run dynamics, as:

ECT1=LRIMP-2.68059-1.423147*LRGDP+0.298495*LRP+1.626620*LREER+ 0.0062499*DM …….. (5.3)

The error correction model with two lag length is reported in table 4.7 below.

Table4.7 Results of Error Correction Model with Log real Import Demand (LRIMP) as Dependent Variable

VARIABLE	COEFFICIENT	STD. ERROR	T-STATISTIC	PROB.
D(LRIMP(-1))	0.296399	0.318684	0.930071	0.3549
D(LRIMP(-2))	0.404797	0.231066	1.751869	0.0833*
D(LRGDP(-1))	-0.550285	1.118394	-0.492031	0.6239
D(LRGDP(-2))	0.315198	1.052598	0.299447	0.7653
D(LRP(-1))	-0.613563	0.955492	-0.642143	0.5224

[8] The weak exogenity of $Z_t(y_t, z_t)$ entails that the precise specification of the latter density is irrelevant to the analysis, and , in particular that all parameters which appear in this marginal density are nuisance parameters(Engel, Hendry and Richard, 1983)

D(LRP(-2))	-0.444963	0.838427	-0.530712	0.5970
D(LREER(-1))	0.789222	0.501087	1.575019	0.1188
D(LREER(-2))	0.693453	0.355650	1.949822	0.0544*
CONSTANT	-0.023770	0.125295	-0.189716	0.8500
DM	0.019666	0.156903	0.125341	0.9005
ECT-1	-0.662950	0.384447	-1.724423	0.0881*

*The null hypothesis of zero coefficients is rejected at 10% significance level

The regression result of table 4.7 is reported in the following equation:

$\triangle$LRIMP = -0.02 +0.30$\triangle$(LRIMP (-1)) +0.41$\triangle$(LRIMP (-2)) -0.55$\triangle$(LRGDP (-1)) +0.31$\triangle$(LRGDP (-2)) -0.61$\triangle$ (LRP (-1)) -0.44$\triangle$(LRP (-2)) + 0.79$\triangle$(LREER (-1)) +0.69$\triangle$(LREER (-2)) +0.02DM - 0.66ECT-1 …… (5.4)

Diagnostic tests for vector autocorrelation, vector normality and Heteroskedasticity are performed and there is no diagnostic problem. See annex II, III and IV at the back side of the paper.

4.2 INTERPRETATION OF THE RESULTS

In the above analysis long run and short run elasticity are estimated. Regarding the long run elasticity, all the variables, except real effective exchange rate and dummy variable, have their expected sign. The policy dummy (trade liberalization) coefficient carries unexpected sign, and is insignificant. This implies that the policy of trade liberalization has an inverse impact on aggregate demand of the country. The long run impact of real effective exchange rate on import is unexpectedly negative. This means depreciation (appreciation) of the domestic currency increase (decrease) aggregate import demand, which contradicts with theory. This has an implication of non achievement of marshal learner condition.

All estimated variables, except the coefficient of LRP are elastic. The coefficient of LRP is inelastic. The elasticity estimate indicate that in the long run aggregate import of Ethiopia is mostly affected by real effective exchange rate and followed by real GDP and relative price with elasticity of -1.63, 1.42 and -0.30 respectively. Real aggregate import will increase by 1.42% and decrease by 1.63% and 0.30% respectively in response to 1% increase in real GDP, real effective exchange rate and relative price. Relative price and import demand have inverse relationship implies that, citreous paribus, an increase in import price (decreases in domestic price) decreases aggregate import. The long run result approve the hypothesis of this paper, that is aggregate import of Ethiopia is mostly affected by exchange rate and price.

Regarding the short run result, the adjustment coefficient is negative and the value -0.66 indicates that 66% of the short run adjustment made within a year. Most of the short run coefficients are insignificant. Lagged real aggregate imports have positive impact on real aggregate import with lagged two periods has more impact than one period lagged import demand. The coefficient of lagged real GDP is mixed; negative with one period lag and positive with two period lags. As in the case of long run relationship the coefficient of relative price is negative and contrary to the long run relationship the coefficient of real effective exchange rate is positive. This implies that in the short run exchange rate policy is effective, that is devaluation (depreciation) of domestic currency decrease the aggregate import demand and revaluation (appreciation) of domestic currency increases aggregate import demand of the country in the short run.

CHAPTER FIVE
CONCLUSION AND POLICY IMPLICATIONS

5.1 CONCLUSIONS

The main objectives of this paper is to identify the major determinant of import demand any their respective elasticity of Ethiopia. To this end the paper estimated the short run and long run relationship of real GDP, relative price, real effective exchange rate and aggregate import demand of Ethiopia. All the relevant dependent and independent variables are specified in log-linear form and the estimated coefficients are elasticity of the dependent variable with respect to changes in corresponding explanatory variables. Johansen co integration and error correction model is employed on yearly data in the period 1971/2 to 2006/2007.

The augmented dickey fuller and Phillips Peron test is used to test the unit root test. The test approved the existence of unit root in level and all the variables are stationary in first difference. This indicates the existence of long run relationship among the variables. The Johansen co integration test proposes the existence of one co integration relationship between dependent and independent variables.

After carrying out the required test all short run and long run relationships are identified. Regarding the long run relationship; all estimated variables, except the coefficient of LRP are elastic. The coefficient of LRP is inelastic. Real effective exchange rate and the policy dummy have unexpected sign. The elasticity estimate indicate that in the long run aggregate import of Ethiopia is mostly affected by real effective exchange rate and followed by real GDP and relative price with elasticity of -1.63, 1.42 and -0.30 respectively. Real aggregate import will increase by

1.42% and decrease by 1.63% and 0.30% respectively in response to 1% increase in real GDP, real effective exchange rate and relative price. Relative price and import demand have inverse relationship implies that, citreous paribus, an increase in import price (decreases in domestic price) decreases aggregate import. The long run result approve the hypothesis of this paper, that is aggregate import of Ethiopia is mostly affected by exchange rate and price.

The short run adjustment coefficient is estimated using Error correction model, the adjustment coefficient is identified and have a correct sign. The adjustment coefficient of -0.66 indicates that 66% of the short run adjustment made within a year. Most of the short run coefficients are insignificant. Lagged real aggregate imports have positive impact on real aggregate import with lagged two periods has more impact than one period lagged import demand. The coefficient of lagged real GDP is mixed; negative with one period lag and positive with two period lags. As in the case of long run relationship the coefficient of relative price is negative and contrary to the long run relationship the coefficient of real effective exchange rate is positive. This implies that in the short run exchange rate policy is effective, that is devaluation (depreciation) of domestic currency decrease the aggregate import demand and revaluation (appreciation) of domestic currency increases aggregate import demand of the country in the short run.

5.2 POLICY IMPLICATIONS

Regarding the long run estimation, it is found that import demand is mainly affected by real GDP, real effective exchange rate and relative prices. Although, the sign of real effective exchange rate is unexpected, its magnitude is high. The estimated result implies that depreciation of local currency increases import demand and further deteriorates balance of payment. Therefore policy makers should care when using exchange rate policy for trade balance adjustment purpose.

The negative sign of price coefficient implies the effectiveness of pricing policy, that is according to the demand law increase in import price reduces the aggregate import demand of the countries, this is a good opportunity to substitute imported good by domestic products. In other hand the positive sign of real GDP is expected and it shows, as income increase the demand is not shifted to domestic consumption, and then there is a need to support domestic industries to substitute imported goods.

To overcome the persistent trade deficit of the country for the last four decades, the foreign currency shortage and the impact of current world inflation rate the only choice is to diversify and further process export goods and to substitute import goods by domestic product by supporting local industries. Exchange rate policy is ineffective in the long run.

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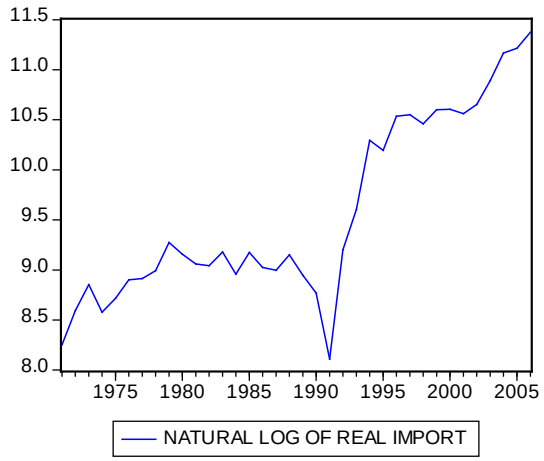
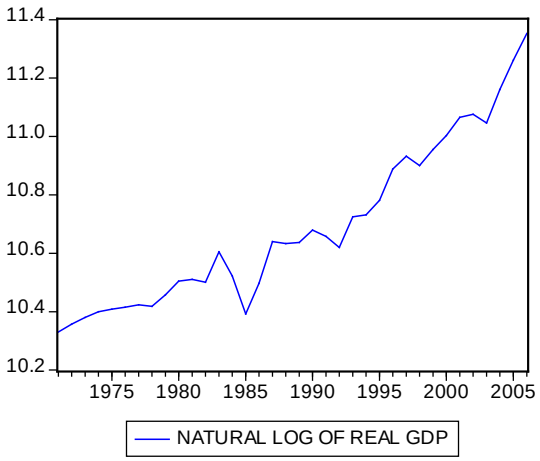
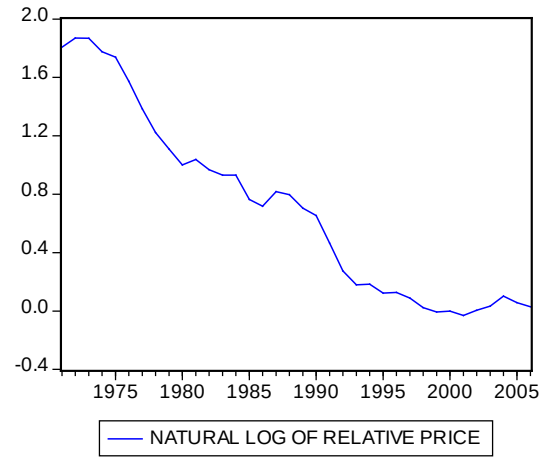
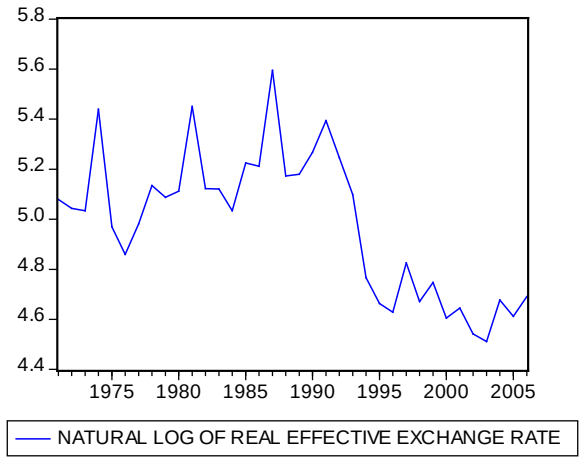
Annex I
Endogenous Group Graph









Annex II
VEC Residual Normality Test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
H0: residuals are multivariate normal
Sample: 1971 2006
Included observations: 33

Component	Skewness	Chi-sq	df	Prob.
1	-0.611627	2.057479	1	0.1515
2	-0.179926	0.178054	1	0.6731
3	0.175850	0.170077	1	0.6800
4	0.209339	0.241026	1	0.6235
Joint		2.646637	4	0.6186

Component	Kurtosis	Chi-sq	df	Prob.
1	2.913100	0.010383	1	0.9188
2	1.244604	4.236946	1	0.0396
3	1.361884	3.689708	1	0.0547
4	1.168486	4.612362	1	0.0317
Joint		12.54940	4	0.0137

Component	Jarque-Bera	df	Prob.	
1	2.067863	2	0.3556	
2	4.415001	2	0.1100	
3	3.859786	2	0.1452	
4	4.853389	2	0.0883	
Joint	15.19604	8	0.0554	

Computed by EViews 5

Annex III
Autocorrelation Test

VEC Residual Portmanteau Tests for Autocorrelations
H0: no residual autocorrelations up to lag h
Sample: 1971 2006
Included observations: 33

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	4.827705	NA*	4.978571	NA*	NA*
2	11.57112	NA*	12.15704	NA*	NA*
3	27.20633	0.0392	29.35578	0.0216	16
4	39.90552	0.1590	43.80658	0.0798	32
5	50.76545	0.3651	56.60578	0.1846	48
6	65.57235	0.4220	74.70310	0.1695	64
7	87.51700	0.2647	102.5559	0.0455	80
8	98.24334	0.4173	116.7147	0.0740	96
9	108.9202	0.5648	131.3953	0.1017	112
10	121.3610	0.6482	149.2452	0.0965	128
11	129.2753	0.8050	161.1167	0.1562	144
12	141.2929	0.8536	180.0015	0.1332	160

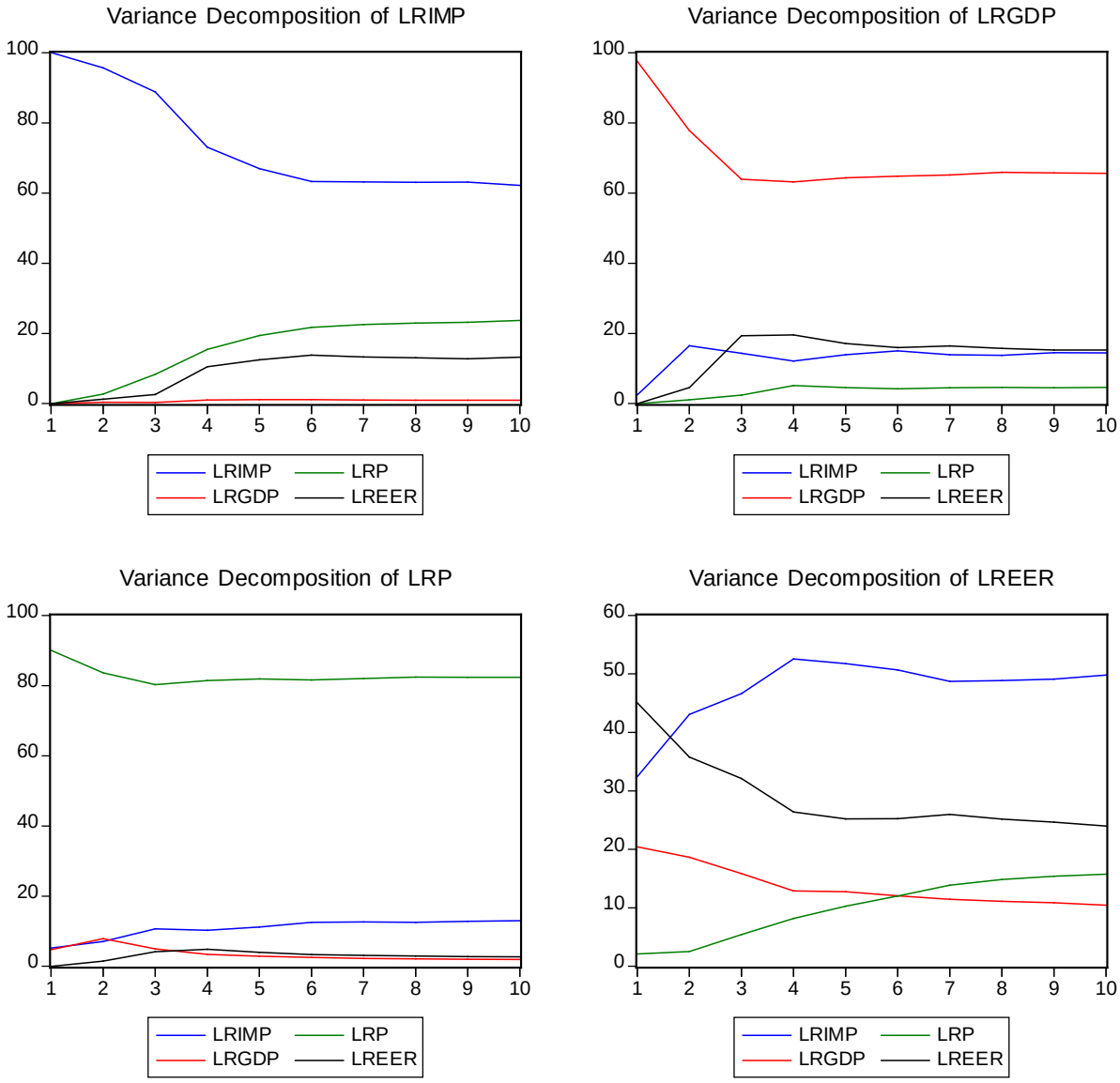
***The test is valid only for lags larger than the VAR lag order.**
df is degrees of freedom for (approximate) chi-square distribution

Annex IV
Residual Hetroskedacity Test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Ho: No Heteroskedasticity
Sample: 1971 2006
Included observations: 33

Joint test:					
Chi-sq	df	Prob.			
187.2553	190	0.5427			
Individual components:					
Dependent	R-squared	F(19,13)	Prob.	Chi-sq(19)	Prob.
res1*res1	0.347238	0.363968	0.9777	11.45887	0.9074
res2*res2	0.444881	0.548336	0.8863	14.68107	0.7426
res3*res3	0.324265	0.328333	0.9863	10.70075	0.9335
res4*res4	0.636973	1.200527	0.3748	21.02011	0.3357
res2*res1	0.359579	0.384166	0.9715	11.86612	0.8913
res3*res1	0.301353	0.295126	0.9920	9.944654	0.9543
res3*res2	0.450119	0.560078	0.8781	14.85393	0.7318
res4*res1	0.617276	1.103527	0.4373	20.37010	0.3726
res4*res2	0.626476	1.147559	0.4080	20.67370	0.3551
res4*res3	0.386694	0.431400	0.9532	12.76091	0.8506

Annex V
Variance Decomposition Graph



DECLARATION

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

DECLARED BY:

NAME: WUBSHET OTORO LUTE

SIGNATURE: _____

DATE: _____

CONFIRMED BY ADVISOR:

NAME: _____

SIGNITURE: _____

DATE : _____

Place and date of submission: ADDIS ABABA, JUNE 2008