An Empirical Estimations of Aggregate Import demand under Foreign exchange Constraint (Evidence from Ethiopia)

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An Empirical Estimations of Aggregate Import demand under Foreign exchange Constraint  
(Evidence from Ethiopia)  

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Abstract  
This study utilizes the estimation of aggregate import demand under foreign exchange constraints in Ethiopia using annual time series data from 1985 to 2020. Regression analysis was carried out using the nonlinear autoregressive distributed lag (NARDL) approach to examine the impact of the accumulation of foreign exchange reserves on aggregate import demand in Ethiopia. The estimation results indicate that, in the long run, all the variables i.e., foreign exchange reserve, the relative price of import, real income, volatility of exchange rate, money supply, and policy dummy significantly determined the behavior of aggregate imports over the reference period. Findings also show that in the long-run foreign exchange reserve, real income, and exchange rate affect positively the demand for imports in Ethiopia. While a positive shock in relative import price and money supply negatively affect import demand in Ethiopia. Thus, the price and income elasticity estimates have correct signs and are statistically significant. The variables included in the model strongly affect import demand in both the short and long run. Accordingly, policy makers aiming significantly influence import demand through effective management of those variables as it strongly affects import volume.  

Keywords: NARDL, Import demand, and foreign exchange reserve  

Introduction  
Now a day, there is mutual interdependence among countries through globalization. The global world is increasingly behaving as though it were a part of a single market, with interdependence in the production, consumption, and distribution of goods and services. This interdependence is displayed in the growth of world trade as a proportion of output. The ratio of world imports to world gross domestic product has alarmingly increased from 7% in the 1930s to about 10% in the 1970s and over 18% in 1996 (Williamson, 1998).  

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The international conditions sometimes give us opportunities for both developed and developing countries. Particularly, the less developed countries depend on the developed countries for finance, technology, and even technical workforce while the advanced countries depend on the less developed countries, especially for their raw materials (Lardy, 2003). International trade is generally believed to create a favorable atmosphere that results in quality products contributing to the economic growth and development of participating nations (Aradhyula et al., 2007).

Furthermore, in the global world, consumers are used to seeing goods and services from every corner of the globe in their retail shops and local wholesale market. These foreign products (imports) provide more choices to users because such products are usually manufactured at the least opportunity cost than any domestically produced equivalent, henceforth, imports help consumers manage their household finance (Kramer, 2022). Countries need foreign reserves to pay external debts, afford the capital to fund sectors of the economy, and profit from diversified portfolios. Acute shortage of foreign exchange reserves is the main problem in developing countries and this further limits output growth and has been a crucial problem. The animated role played by imports in external trade and development is perhaps what generated the current widespread interest in explaining the determinants of imports under foreign exchange constraints in developing countries (Cheelo, 2000). In most international economic literature, the problem is usually discussed within the framework of the “two” gap models developed. Based on this model, a foreign exchange shortage becomes an almost absolute constraint on the economic growth of a nation through domestic savings were available in sufficient amounts.

The neo-classical growth theories emphasize the role of relative prices particularly exchange rate adjustment are a means for overwhelming any foreign exchange constraint. The implication is that the foreign exchange gap as only reflects an overvalued real exchange rate. Nonetheless, if the exchange rate is determined by the force of demand and supply of foreign currency (i.e. flexible exchange rate), there can be no foreign exchange gap (Kemal D, et al, 198).

Imports have a pivotal role in foreign trade and economic development of a nation, though it is unfortunate that in Ethiopia only scanty empirical evidence exists to explain import behavior. Dorosh et al (2009), examined on the Economic Implications of Foreign Exchange Rationing in Ethiopia, and they found that due to the increase in foreign transfers and capital inflows the country enjoyed remarkable economic growth from 2004/05 to 2008/09. Conversely, this rapid
growth was accompanied by a major appreciation of the real exchange rate\(^4\) that reduced incentives for domestic production of exportable and non-protected importable. In addition, major external shocks to the economy\(^5\) aggravated foreign exchange and macroeconomic imbalances.

They consider imports within a wider trade model. Being primarily concerned with the impact of the parallel foreign exchange market, they do not draw specific import policy implications from their evidence. In this respect, policy-makers have struggled to devise import strategies that promote growth without a significant deterioration in the trade balance. Being unable to adequately predict the response of imports to external and domestic shocks in the presence of foreign exchange constraints, the import strategies have not achieved their desired goals.

Considering the Ethiopian economy is open to international trade and finance and heavily import dependent. Thus, the behavior of imports has strong implications for external balance. The foregoing background analysis of Ethiopia exposes the weakening impact of imports on the balance of payment (BOP) as evidenced by a persistent current account deficit, which is about -2.72 USD in 2020 (WDI, 2021).

Besides now a day in Ethiopia, the supply of foreign currency available for importers and travelers is increasingly facing chronic shortages, its provision falls into a whirlpool, and the parallel market for hard foreign currency is growing in the country. As a result, net export and terms of trade will deteriorate, debt service costs will increase and this leads the import capacity of the nation will be limited. Therefore, the motivations of this study are to explicitly examine the determinants of import demand under a foreign exchanges constraint in Ethiopia. Essentially, there are five types of models so far regarding estimating import demand function for estimating aggregate import demand function:

\[\text{The traditional model: This model incorporates relative income and price to determine the import demand behavior. In this model, income is measured as real GDP.}\]

\[\text{The Senhadji model (the revised traditional model: Essentially, the revised model also uses relative price and income. Income is measured as the real GDP minus exports.}\]

\(^4\) It appreciates about 34 percent between July 2004 and July 2008.

\(^5\) For instance, the increment in world prices of fuel in 2007 and 2008.
The disaggregated or decomposed GDP model: This approach decomposes GDP into three categories: final consumption expenditure, expenditure on investment goods, and exports (Tang, 2003).

The “National Cash Flow” model (the dynamic structural import demand model): the model is developed by Xu (2002). It takes into account a growing economy, rather than an endowment economy, and investment and government activity. The model replaces real GDP with a “national cash flow” variable.

The “Emran & Shilpi” model: Employed the general import model to analysis the demand for import under foreign exchange constraints, in such a way that the structural model incorporates a binding foreign exchange constraint.

In this study, the researchers attempt to contribute to the existing body of literature by considering: firstly, the researchers has been considering the reserve tranche position in an international monetary fund (IMF) and special drawing right (SDR) as a part of foreign exchange receipts into the current import decision. Secondly, money supply and volatility of exchange rate are included in the model, which are the leading determinant factors for determining import demand.

Moreover, the researchers updated the work by Emran and Shilpi models of import demand, with the inclusion of the latest data and the use of a representative agent model on the variables under consideration. and thirdly, since the specification issues in the import demand model is liable to bias and errors if import liberalization is not considered between the Derg and EPRDF regime, so in this study, the researchers have looked at the effect of import liberalization which is captured by the inclusion of dummy variable.

Finally, this study therefore adequately explained the determinants of aggregate official imports and components in Ethiopia, explicitly showing the role of foreign exchange reserves in influencing import demand. since, estimating import demand function is an important step in providing a foundation for rational, evidence-guided decision-making, partially filling the information gap and aiding policy-makers to predict the response of imports under foreign exchange constraints.

The main objective of this study is to estimate aggregate import demand under foreign exchange constraints in Ethiopia from the 1985 to 2020 fiscal year.
2. Literature Review

2.1. Import behavior in the Keynesian General Theory

A well-known Keynesian import behavior theory explains the link between import and economic growth and advocates export-led growth as contrasting to import-led growth.

Essentially the theory paying detailed attention to the demand side of the economy, suggests that increases in aggregate demand boost economic growth towards full employment level of output. Thus, any increase in the components of aggregate demand like consumption, investment, government expenditure and net export result in economic growth as much as the increase in aggregate expenditure multiplied by the related expenditure multiplier.

It is clear from the Keynesian point of view that net exports, which equal exports minus imports, positively affect the level of national income. An increase in import over export will reduce aggregate demand and economic growth while an increase in export over import will increase aggregate demand and economic growth.

Accordingly, there is a negative relationship between imports and national income since import decreases the total demand which is the basic source of national income (proxy variable for economic growth). In other words, imports have a negative multiplier effect on output since imports like saving represent leakage from the aggregate demand. Thus, according to the Keynesian approach, import is often recognized as leakage of the total demand which leads to economic downturn. (Chen 2009). Unlike Endogenous growth theory, Keynesian Theory asserts that imports as leakage of total demand inversely affect national income.

On the other way round, the role of relative import prices (proxied by the real exchange rate) is significant in determining import demand from a theoretical perspective (Pilbeam, 1998). The traditional import demand function in its conventional form, therefore, postulates an inverse relationship between the number of imports demanded and relative import prices, assuming that real income (representing economic activity) is held constant.

The traditional import model suggests that importers are always on their demand curve and so that demand is always on their demand curve, and hence demand always equals to the actual levels of output and the importing countries have no foreign exchange constraint.
2.1.2 Import Behaviour and Trade Policy

Most of the economics literature, which is concerned with imports and international trade is focused on trade policy. Arguing, as Collier and Gunning (1994), that trade policy essentially comes down to protection and therefore to government intervention, particularly in an LDC context, we note several aspects of restrictive trade policy.

Firstly, Rodrik (1995) observes that though trade policies are, for some reason or other, politically efficient, they are economically inefficient and cause sizeable deleterious effects on economic growth.

Anderson (1994) and Magee (1994) attempt to determine the relationship between trade policy and economic growth, and they concluded that international trade is not free and an adverse effect on economic growth. Moreover, Magee has surveyed extensive literature and identifies rent-seeking, lobbying by politically influential interest groups and the associated political superiority of protection as some of the reasons for the political efficiency of trade policies. This explains trade policies are generally anti-trade biased and import restricting rather than being pro-trade biased and export promoting. Other scholars like, Collier and Gunning (1994) noted the issue of restrictive trade policy by giving high emphasis on less developed countries. They said the economic inefficiencies of restrictive trade policy are adequately unprotected. The principle avers that trade restriction is inferior to an instrument that acts directly on the target. Direct instruments would include wage subsidies for employment, lump-sum taxes to raise revenue, or stabilization policies for BOP support.

2.1.3 Income and price elasticities in trade theory

Different economics literature accept that income and price elasticities are very important in international trade because of their theoretical and policy inferences. (Mohsen Bahmani-Oskooee & Orhan Kara, 2013).

In the modern theory of international trade, there are three major frameworks of trade theory that explain the roles of income and price in the determination of trade, i.e., the theory of comparative advantage, the Keynesian trade multiplier, and the new trade theory (the imperfect competition theory of international trade).
The neoclassic trade theory of comparative advantage, as characterized by the Heckscher-Ohlin (H-O) framework, focuses on how international trade and its volume are affected by changes in relative prices of factors, which in turn are elucidated by the differences in factor endowments between countries. The neoclassic trade theory is based on the assumptions of neoclassic microeconomic consumer behavior and general equilibrium theory. While in this theory of international trade the effects of changes in income on trade are not the concern. Moreover, the H-O framework assumed that the level of employment is assumed to be fixed and output is assumed to be always on a given production frontier (full employment and full production assumption).

The methodical form of the neoclassical import demand function based on the applications of the general equilibrium framework to the world economy is defined as follows (W. Ethier 1983)

$$ M(P) = D(P,E(P,u)) - S(P) $$

where, $M$ is the real demand for imports, $P$ is the relative price of imports, $D$ is the total demand for importable goods, derived from the optimal consumer assumption, $E$ is expenditure at the given relative price $P$ and the given utility level $u$, $S$ is the domestic supply of importables. Expenditure is equal to income, i.e. $E(P,u) = y(P)$. The elasticity form of (1) is as follows:

$$ \frac{P}{M} \frac{dM}{dP} = \frac{P}{M} \frac{dD}{dP} - \frac{P}{M} M \frac{dS}{dP} - P \frac{dD}{dE} $$

Or

$$ e = c - s - m $$

Where $e$ is the price elasticity of import demand, $c$ is the demand substitution elasticity, $s$ is the supply substitution elasticity and $m$ is the marginal propensity to import. By the same mark, one can also define the import price elasticity of the foreign country as $e*$. The summation of the absolute value of both $e$ and $e*$ plays an important role in international trade policy analyses. For example, $|e| + |e*| > 1$, If devaluation is to be effective in improving the trade balance, the Marshall-Lerner condition must be satisfied, that is, the sum of import and export demand price elasticities must sum to unity. Or the MI-L condition defines a condition for the steady states of international trade.

In the Keynesian framework of international trade, relative prices are assumed inelastic and the level of employment is not constant, unlike the neoclassical comparative advantage analysis.
Additionally, international capital flow is not assumed away and they will impassively adjust as required by the trade balance. Hence, in the Keynesian multipliers of trade, the emphasis is on the correlation between income and import demand at the aggregate level in the short run.

The imperfect competition theory of trade (New trade theory) is noted in intra-industry trade, which is not clearly described by the theory of comparative advantage of the neoclassical model. It concerns the issues of economies of scale, product differentiation and monopolistic competition in international trade (P. Krugman (1987)). In the articles on the imperfect competition theory of trade, one usually assumes an economy containing both a sector of constant returns and a sector of increasing returns. Hence, the neo-classical trade theory and new trade theory can be assimilated to describe both the intra and inter-industry trade, with the increasing returns and difference in factor endowments as the driving forces respectively.

The main distinctive feature of the new trade theory is the existence of increasing returns (economies of scale). Empirically, most international trade studies are categorized in two basic frameworks: the “imperfect substitutes” model and the gravity model.

2.1.4 The imperfect substitutes model
Goldstein and Khan (1985) presented two important trade models, to empirically investigate the price and income effects on foreign trade: the imperfect substitute’s model and the perfect substitute’s model. The former is mainly used in studying imports of manufactured goods and aggregate imports, while the latter focus on the trade of homogeneous commodities. The basic assumption of the imperfect substitute model is that imports and exports are not perfect substitutes for domestic goods.

2.2 Empirical Literature Review
There are several cross-country and country-specific studies that have been conducted and established the link between foreign exchange reserve and the demand for aggregate import and have different results with different methodologies. Now, in this section, the researchers reviewed the existing empirical evidence that focused on developing countries, and finally, we also presented the existing empirical evidence on Ethiopia.

Yan zhou and Smiledube (2011) investigate import demand function, and evidence from CIBS during the period 1970-2007. The CIB countries are China, India, Brazil and South Africa can
potentially become southern engines of global economic growth with increasing capacities to support prosperity in other countries. Yan zhou and Smiledube use the bounds test for the validity of the cointegration or stationarity restriction embodied in the import demand function. Moreover, the study uses this bounds testing approach mainly for two reasons. First, this approach is applicable irrespective of whether the regressors or the predictors are stationary or not. Meaning it avoids problems related to the unit-roots pre-estimation testing and the Second one is that, the small sample bias of co-integration analysis could be addressed by employing the bounds test methods. Next, they adopt the autoregressive distributed lag (ARDL) model to investigate the long-run relationship between import demand and their regressors. Finally, they found that long-run income elasticities are much higher compared to earlier studies and are higher than the short-run counterparts for CIBs.

Bahmani-Oskooee (1998) studied the import and export demand equations for six developing countries, namely Greece, Korea, Pakistan, the Philippines, Singapore, and South Africa. he used Johansen’s cointegration approach for the period 1973-1990. he found that the volume of imports was affected by relative import prices, domestic income and nominal effective exchange rate. Bahmani-Oskooee concluded that the Marshall-Lerner condition was satisfied, meaning devaluations would improve the country’s trade balances. Except for Singapore, import demand for all the countries under study was found to be price elastic.

Margaret (2007) estimates imports under foreign exchange constraints in Nigeria from the period of 1970-1983. The study employs a structural econometric model of aggregate import. he used three models to estimate the import demand function, namely, the traditional model, the Hemphill model, and the general models of import demand. He found that even though income and price effects are important in the analysis of import behavior foreign exchange constraints also play an important role in determining import demand and highly affect the volume of imports in Nigeria.

Emran and Shilpi (2008) Estimating Import Demand Function in Developing Countries based on a structural econometric approach with applications to India and Sri Lanka. They used a rational expectation hypothesis of the permanent income model of a representative agent to derive the import demand function. The model also comprises a binding foreign exchange constraint and
therefore rule out the assumption of a perfect international capital market. The study found that
the parameter estimates are stable across countries.

Tang (2004) investigated the empirical evidence on the co-integration between aggregate import
demand behaviors for the 5 Asian countries. Tang used Autoregressive distributed lag(ARDL)
models of the bound test approach to show the long-run and short-run relationship between
variables. He found that the volume of imports, national cash flow, and relative price of imports
were cointegrated in Malaysia and Singapore. Nonetheless, no empirical evidence supported that
these variables were cointegrated in Indonesia, Thailand, and the Philippines. Finally, the study
recommends that devaluation strengthens the balance of trade.

Empirical Investigation by Panel Data for Latin American and Caribbean Countries. The study is
conducted for 16 Latin American caribbean countries over the period 1975-2005 by using the
dynamic panel data methods. The paper founds that the import demand is negatively correlated
with relative price and correlated positively with real income. Moreover, both the long-run and
short-run relative price elasticities are smaller than unity, yet, both the long-run and short-run
income elasticities are greater than unity. Consequently, any increase in the inflation rate
(domestic) will slowly increase the real aggregate imports. Henceforth, fiscal or monetary
policies may be used as a policy measure to keep the inflation rate low and to cure any trade
distortions. Alternatively, real income as a proxy variable for economic growth has a negative
impact on trade balances.

Khan (1974, cited kebbay (2005) investigated import demand for 15 developing countries and to
test the hypothesis that changes in prices of traded and non-traded goods from the period 1951-
1969

Khan tried to validate how the role of quantitative restrictions on trade can be incorporated into
estimates and show that under certain assumptions, approximations are possible and tests can be
made to evaluate the importance of controls on trade. The 15 countries studied by khan are
Argentina, Brazil, Chile, Columbia, Costa Rica, Ecuador, Ghana, India, Morocco, Pakistan, Peru,
the Philippines, Sri Lanka, Turkey, and Uruguay. He specified import demand as a log-linear
function of real gross domestic product and the ratio of import prices to domestic prices. He,
therefore, estimated the import demand equation in equilibrium and out of equilibrium subject to the errors following a first-order autoregressive process using two-Stages Least Squares (2SLS). Khan found that 11 of the 15 countries indicate that the estimated price elasticity is generally high and thus he concludes that relative prices have a statistically significant effect on the imports of developing countries. Besides this, the researchers also estimates income elasticity and found that 9 of the 15 countries' income elasticity has a positive sign and is significantly different from zero at the 5 percent level. For 8 of 15 countries, the coefficient of autocorrelation is significantly different from zero at the 5 percent level. Khan's noted that a simple equilibrium formulation appears to be adequate for the import demand of the selected countries to appear to adjust within a year. He concluded that import prices play an important role in the determination of imports in developing countries. Khan also ignores the impact of foreign exchange constraints faced by these countries.

Carmen Reinhart (1995) re-investigates the impact of relative prices in affecting trade for the period 1970-93 annually. Carmen Reinhart includes three African countries (Congo, Kenya, and Morocco), four Asian countries (Hong Kong, Indonesia, Pakistan, and Sri Lanka), and five Latin American countries (Argentina, Brazil, Columbia, Costa Rica, and Mexico) as a sample. She specified her models in accordance with the traditional trade models but conducted the study in the light of inference problems associated with the partial adjustment mechanism. Finally, she found that GDP, exports to GDP ratio, and relative prices are integrated of the same order. In the majority of the cases studied, relative import price and income were found to be sufficient in defining a steady state. This implies the variables are co-integrated with imports in a way predicted by theory. Reinhart concludes that devaluation could be an effective tool in influencing trade in the countries understudied.

3. Methodology

3.1 Theoretical framework and Model specification

To investigate the impacts of foreign exchange reserves on Aggregate import demand behavior in Ethiopia, this model is based on the analysis of Ceglowski (1991), Clarida (1994), and Emran (2008). The models of aggregate import demands integrate the idea of a rational expectation in the permanent income model of a representative agent theory. In line with Emran (2008), this model uses binding foreign exchange constraints. The representative agents assumed to
maximize their satisfaction by consuming two composite goods (domestically produced \((D_t)\) and imported goods \((m_t)\). This optimization problem is defined by two constraints: a dynamic budget that reflects the accumulation of assets, and with foreign exchange availability constraint.

The optimization problem of the representative agent is as follows:

\[
\text{Max}(D_t, M_t, A_t) V = E \int_{t=0}^{\infty} e^{-\delta t} U(D_t, M_t) dt
\]

Subject to

\[
\frac{dA_t}{dt} = rA_t + \dot{Y}_t - D_t - P_t M_t .................. (1)
\]

\[
P_t M_t \leq F_t .................................................................................. (2)
\]

Where, \(P_t\) as the relative price of imports at prevailed exchange rate, \(A_t\) as assets, \(\dot{Y}_t\) as labor income \(F_t\) as the amount of foreign exchange availability (reserve) and \(r\) as the constant real interest rate. \(\delta\) as the subjective rate of time preference in which the representative agents discount the future and \(\frac{\dot{A}_t}{dt}\) is a time derivative.

Accordingly, the current value Hamiltonian of the above optimization problem of the representative agent can be written as:

\[
H = U(D_t, M_t) + \lambda t(rA_t + \dot{Y}_t - D_t - P_t M_t) + \mu t(F_t - P_t M_t)
\]

Where in this sake \(D_t\) and \(M_t\) are control variables because they are included in the objective function and \(A_t\) as a state variable. \(\lambda t\) is the co-state variable, interpreted as the marginal utility of money and \(\mu t\) is the Lagrange multiplier associated with the foreign exchange constraint.

Thus, for the above optimization problem we can derive the following the first-order conditions:

\[
\frac{dH}{dD_t} = \lambda t......................................................... (3)
\]

\[
\frac{dH}{dM_t} = P_t(\lambda t + \mu t)......................................................... (4)
\]

\[
\frac{d\lambda t}{dt} = (\delta - r)\lambda t......................................................... (5)
\]

\[
(F_t - P_t M_t) \geq 0 \text{ and } \mu t *(F_t - P_t M_t) = 0................................. (6)
\]

Following on the empirical frameworks Clarida (1994) and Emran (2008); we have assumed that (3) and (4) are an addilog utility function then:

\[
U(D_t, M_t) = C_t \frac{D_t^{1-a}}{1-a} + B_t \frac{M_t^{1-\gamma}}{1-\gamma}
\]
Where $C_t$ and $B_t$ are random and strictly stationary shocks to preference. From the above utility function, we can derive the following first-order conditions:

By inserting Emran (2008) additive log utility function into the original current value, the Hamiltonian equation is rewritten as follows:

$$L = C_t \frac{D_t^{1-a}}{1-a} + B_t \frac{M_t^{1-\gamma}}{1-\gamma} + \lambda_t (rA_t + \hat{y}t - D_t - P_tM_t) + \mu_t(F_t - P_tM_t)$$

With the above function, the first order conditions can be rewritten as:

$$\frac{dL}{dD_t} = C_tD_t^{-a} = \lambda_t \ldots (7)$$

$$\frac{dL}{dM_t} = B_tM_t^{-\gamma} = P_t\lambda_t(1 + \mu_t^*) = \lambda_tP_t^* \ldots (8)$$

Where $\mu_t^* = \frac{\mu_t}{\lambda_t}$ is the scarcity premia, and $P_t^*$ is the scarcity price at which transactions occur at the shop floor in the secondary market. Now let’s eliminate $\lambda_t$ from equation (8) by substituting its figure in equation (7) and if we take logarithm to get the following equation;

$$lnB_t - \gamma lnM_t = lnC_t + lnP_t - a lnD_t + ln(1 + \mu_t^*) \ldots (9)$$

In order to derive the long-run demand for import functions, we have to impose the steady state conditions of variables as $\frac{dA_t}{dt} = \frac{d\lambda_t}{dt} = 0$ and as $P_t = P_t^*$. Hence total household income is, a composite of both labor and asset income which is evaluated at the equilibrium price vector, denoted by $Y_t^*$. As a result, the steady-state solution implies that:

$$Y_t^* = D_t + P_t^*M_t \ldots (10)$$

Using the steady state condition and taking logarithm, we get the following expression for $K_t$

$$K_t = \ln (Y_t^* - P_t^*M_t)$$

$$= \ln (Y_t - P_tM_t) \ldots (11)$$

Where, $Y_t = Y_t^* - \mu_t^*P_t^*M_t$ is the observed income in the regime where foreign exchange is constrained likewise $P_t$ is the observed price.

Now, to eliminate the $K_t$ from equation (9) and solve for $M_t$:

$$lnM_t = \frac{a}{\gamma} ln(Y_t - P_tM_t) - \frac{1}{\gamma} P_t - \frac{1}{\gamma} ln(1 + \mu_t^*) + \varepsilon_t \ldots (12)$$
Where,  
\[
\varepsilon_t = \frac{1}{\gamma} (ln Bt - ln Ct)
\]
is a random and strictly stationary shock of preferences, \(Y\) is the total expenditure by domestic consumers on both domestically produced goods and imports and the scale variable \(ln(Yt - PtMt)\) in the right-hand side of the equation defined as GDP minus exports.

When the foreign exchange constraint is binding\(^6\), the Kuhn-Tucker theorem requires that \(\mu_t > 0\), and hence \(\mu_t^* > 0\). For most of the developing countries time series data on the scarcity premia on imports, are not available. In order to make the estimating procedure easy, we need a theoretically consistent parameterization of \(\mu_t^*\) in terms of the observed variables. Since \(\mu_t^*\) represents the scarcity premia on foreign exchange, it should be, ceteris paribus, a negative function of the amount of foreign exchange available. So one would tend to think that a good proxy for \(\mu_t^*\) can be the foreign exchange receipts \((Ft)\), thus providing an ex-post rationalization of the widely used foreign exchange availability approach.

In order to capture openness (import liberalization), through easing access to imports, a dummy variable has to be included in the model. Henceforth, this dummy variable is used to separate market structure categories as command economy and market-oriented economy which is important to address the effect of policy variation on import behavior.

Taking into account the above information, we can straightforwardly recapitulate the demand for import function, which can be estimated with the data available in Ethiopia as follow:

\[
ln M_t = a \ln(Yt - PtMt) - \frac{1}{\gamma} Pt - \frac{1}{\gamma} ln Ft + Dm + \varepsilon_t
\]

\[
ln M_t = \beta_1 \ln(Yt - PtMt) - \beta_2 Pt + \beta_3 ln Ft + \beta_4 Dm + \varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (13)
\]

\[
ln M_t = \beta_0 + \beta_1 ln RGDPt - \beta_2 Pt + \beta_3 ln Ft + \beta_4 ln MSt + \beta_5 ln VOLt + \beta_6 ln D + \varepsilon_t - - - - - - - - \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (14)
\]

Equation (14) contains the determinants of import behavior.

---

\(^6\) If the foreign exchange constraint is not binding, then \(\mu^* t\) is equal to zero, and equation (12) provides an import demand function which is close to the standard double-log specification irrespective of developing and developed countries (Goldstein and Khan, (1985), Faini et al., (1992), and Ghei and Pritchett(1999)) cited in Emran(2010))
Where, \( M_t \) = Real import, \( RGDP_t \) = Real gross domestic product, \( P_t \) = Relative import price, \( MSt \) = Money supply, \( VOLt \) = Volatility of the exchange rate, \( D \) = dummy variable \( \epsilon_t \) = error term and \( \beta_0 – \beta_6 \) are coefficients to be estimated.

4. Econometric Result and Discussion

Table 4.1: Results of Unit Root Tests for Order of Integration of the Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Test statistics</th>
<th>Critical values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I(0)</td>
<td>I(1)</td>
</tr>
<tr>
<td>LnMt</td>
<td>-2.02</td>
<td>-6.64***</td>
</tr>
<tr>
<td>LnFx</td>
<td>-4.85***</td>
<td></td>
</tr>
<tr>
<td>LnM2</td>
<td>-0.94</td>
<td>-4.21**</td>
</tr>
<tr>
<td>LnRip</td>
<td>-1.30</td>
<td>-7.30***</td>
</tr>
<tr>
<td>LnY*</td>
<td>-2.17</td>
<td>-4.29***</td>
</tr>
<tr>
<td>Volte</td>
<td>-3.20*</td>
<td></td>
</tr>
</tbody>
</table>

*** significant at 1% significance level
** significant at 5% significance level
*significant at 10% significance level

As we can be perceived from the above table, the logarithm of foreign exchange reserve and volatility of exchange rate was found stationary at level and significant at 1% and 10% significance level respectively. While, the logarithm of real import, the logarithm of relative import price, the logarithm of income and the logarithms of money supply were not found to be stationary at level, however, it was found to be stationary after taking its first difference.

The next step is to check for the existence of a long run relationship among the variables. This is done by investigating whether any linear combination of the series are taken from a stationary distribution. In such a case, the series is said to be co-integrated, in which case the model under consideration can be used to make conclusions about long-run relationships. This will be dealt with in the next sub-section following to optimal lag length selection criterion.

4.2 Lag length Selection Criteria

Before proceeding to a long-run relationship of the import model, the determination of the lag length is a critical element, because the computation of F-Statistics for co-integration is very sensitive to lag length in the specification of the vector autoregressive model since the lag length will be tested using an unrestricted autoregressive methodology. For the models, the optimum
lag is fixed using the Akaike information criterion (AIC) (test at 5% level). As suggested by Pesaran and Shin (1999) since the observation is annual, choosing one (1) as the maximum order of lags is appropriate. Accordingly, one lag order is the optimal lag length for the selected model in table 4.2 below.

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-49.96119</td>
<td>NA</td>
<td>1.284923</td>
<td>3.088557</td>
<td>3.133906</td>
<td>3.103815</td>
</tr>
<tr>
<td>1</td>
<td>10.94423</td>
<td>114.4284*</td>
<td>0.034054*</td>
<td>-0.542075*</td>
<td>-0.451377*</td>
<td>-0.511558*</td>
</tr>
<tr>
<td>2</td>
<td>11.42661</td>
<td>0.877054</td>
<td>0.035152</td>
<td>-0.510704</td>
<td>-0.374658</td>
<td>-0.464928</td>
</tr>
<tr>
<td>3</td>
<td>11.48102</td>
<td>0.095624</td>
<td>0.037251</td>
<td>-0.453395</td>
<td>-0.272000</td>
<td>-0.392361</td>
</tr>
</tbody>
</table>

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

### 4.3 Bound test (Co-integration Test)

In order to confirm whether there exists co-integration among the variables, the study adopts the bounds testing approach for the nonlinear autoregressive distributed lag (NARDL) approach to test whether the regressors are co-integrated /not with the observed variables. The key merits of the ARDL model are that the variables in the model are integrated into I(0) or I(1) or both. This supports the implementation of the bound testing approach. The critical F-statistics used for the co-integration relationship test are also displayed in Table 4.3.

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>Signif.</th>
<th>I(0)</th>
<th>I(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>25.18125</td>
<td>10%</td>
<td>1.76</td>
<td>2.77</td>
</tr>
<tr>
<td>K</td>
<td>11</td>
<td>5%</td>
<td>1.98</td>
<td>3.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.5%</td>
<td>2.18</td>
<td>3.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1%</td>
<td>2.41</td>
<td>3.61</td>
</tr>
</tbody>
</table>
From Table 4.3, the F statistic (25.181) is larger than both the lower and upper bound critical values at 1%, 5% and 10% levels of significance. Henceforth, we can reject the null hypothesis of no long-run relationship between the dependent variable of real import and the other explained variables.

4.4 Long-run Relationship of Asymmetric model

This study confirmed the long-run asymmetric co-integration of log of real import and other regressed variables. Given this, the studies proceed to estimate the long-run and short-run asymmetric coefficients to achieve their objectives to determine the asymmetric impact of imports on money supply, real income, foreign exchange reserve, and relative import price.

Table 4.4: Long-run asymmetric relationship of the import demand model

Estimated Long Run Coefficients using the NARDL Approach

NARDL ((1, 1, 0, 1, 0, 0, 0, 1, 1, 0) Selected based on Akaike info criterion

Dependent variable is LNMT

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LNFX_POS</td>
<td>0.166647</td>
<td>0.085900</td>
<td>1.940015</td>
<td>0.0702</td>
</tr>
<tr>
<td>LNFX_NEG</td>
<td>-0.097205</td>
<td>0.032310</td>
<td>3.008509</td>
<td>0.0083</td>
</tr>
<tr>
<td>LNY__POS</td>
<td>1.835848</td>
<td>0.220769</td>
<td>8.315714</td>
<td>0.0000</td>
</tr>
<tr>
<td>LNY__NEG</td>
<td>0.360492</td>
<td>0.445473</td>
<td>0.809236</td>
<td>0.4303</td>
</tr>
<tr>
<td>LNRIP_POS</td>
<td>-0.528394</td>
<td>0.101363</td>
<td>5.212872</td>
<td>0.0001</td>
</tr>
<tr>
<td>LNRIP_NEG</td>
<td>0.290400</td>
<td>0.153256</td>
<td>1.894867</td>
<td>0.0763</td>
</tr>
<tr>
<td>VOLTE_POS</td>
<td>0.016335</td>
<td>0.002992</td>
<td>5.460348</td>
<td>0.0001</td>
</tr>
<tr>
<td>VOLTE_NEG</td>
<td>-0.006403</td>
<td>0.002004</td>
<td>-3.195363</td>
<td>0.0056</td>
</tr>
<tr>
<td>LNM2_POS</td>
<td>-0.334798</td>
<td>0.113744</td>
<td>-2.943435</td>
<td>0.0095</td>
</tr>
<tr>
<td>LNM2_NEG</td>
<td>0.442327</td>
<td>0.371513</td>
<td>1.190609</td>
<td>0.2512</td>
</tr>
<tr>
<td>D01</td>
<td>-0.716290</td>
<td>0.155885</td>
<td>-4.594995</td>
<td>0.0003</td>
</tr>
<tr>
<td>C</td>
<td>-6.639814</td>
<td>0.393880</td>
<td>-16.85744</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Source: Own computation from Eviews 10

The long-run impact of the explanatory variables on Mt as shown in table 4.4 is illustrated using equation 4.1:
\[ LNMT = -6.6398 + 0.1666 LNFX_{POS} - 0.0972 LNFX_{NEG} + 1.8358 LNY_{POS} \]
\[ + 0.3605 LNY_{NEG} - 0.5284 LNRIP_{POS} + 0.2904 LNRIP_{NEG} \]
\[ + 0.0163 VOLTE_{POS} - 0.0064 VOLTE_{NEG} - 0.3348 LNM2_{POS} \]
\[ + 0.4423 LNM2_{NEG} - 0.7163 D01 \] (4.1)

Based on table 4.4, all the control variables are asymmetric long-run relationships with the import demand. Foreign exchange reserve, real income, and volatility of exchange rate has a positive long run relationship with aggregate import demand. The policy dummy has a negative impact on import demand. Those of the listed explanatory variables are statistically significant in explaining import demand since they have absolute t-values greater than 2.

The levels of the dynamic relationship of macroeconomic indicators or variables as determinants of aggregate import demand have severally proved to be non-linear. It is possible that positive and negative changes in foreign exchange reserve, relative import price, real income, volatility of exchange rate can have differential impacts on aggregate import demand.

The NARDL estimates, presented in Table 4.4, provide evidence on asymmetry (Non linear relationship) between foreign exchange reserve and Ethiopian real imports. The asymmetric long-run coefficients \([LNFX + and LNFX−]\) are both negative and positive changes in foreign exchange reserves that significantly affect aggregate import demand.

Meaning, Real import will decrease by 0.09% due to a negative shock in foreign exchange reserves. The relationship is consistent with theory as foreign exchange reserves can be explained as deposits of a foreign currency held by the central bank of a country; it has been curtailed by the ease of currency availability from the financial sector. This has implications of increased foreign exchange reserve. This emanates from the fact that the more foreign exchange reserve that the country has the more capacity to import its desired raw materials. Hence a positive relationship with import demand (lnmt) is monitored (Bougrine and Seccareccia (2004).

The asymmetric NARDL model also gives information on the impact of control variables on real import demand. For instance, the asymmetric relationship between real income (LNY) and Aggregate import demand. Due to the negative shock in real income, there is no significant impact on aggregate import demand in the study area. However, real imports increased by 1.83% because of a positive shock in the real income of the country. The result is plausible since it is
compatible with the theoretical suggestion of the marginal propensity to import (MPM) which implies the amount of imports increases or decreases with each unit rise or decline in disposable income. The marginal propensity to import is thus the change in imports induced by a change in income. Thus, an economy with a positive marginal propensity to consume is likely to have a positive marginal propensity to import. This is because a portion of goods consumed is likely to be imported (Emran and Shilpi, 2008).

Relative import price also highly affects the real import demand in Ethiopia negatively and significantly, the estimated long-run coefficients of the asymmetric ARDL model show that the positive change in relative import price ($LNRIp +$) significantly affects Ethiopian real import demand, and the sign is significant at 5% level of significance.

A positive shock in relative import price causes a decrease in import demand by 0.52 percent. With respect to the relative price variable, a 1-birr increase in relative price leads to a 0.52-birr fall in Ethiopia’s demand for imports. This is compatible with the theory. In theoretical suggestions, relative import price causes a decrease in the import demand schedule. This emanates from the spillover effects of low demand for capital and technology and a decrease in production. As a result, there impedes the flow of imported items. yet, with a negative shock in relative import prices, there is no significant impact on aggregate import demand.

Results from the NARDL model also provide further evidence of the asymmetry impact of money supply ($LNM2 +$) on real import demand is positive and this is consistent with the theory. The result shows that the estimated long-run coefficients of the asymmetric ARDL model noted that the increase in money supply negatively affects real import demand. When the money supply increase by 1 percent, real import demand will decline by 0.33 percent. The implication is that when the money supply increase, the interest rate decrease, and this leads the domestic currency depreciates as a result imports become expensive. Henceforth import demand becomes decreases because of a positive shock in the money supply. Nonetheless, a negative shock in the broad money supply is statistically insignificant.

The NARDL estimates also provide further evidence of asymmetry of the impact of the $VOLTE$ on real import. Both the positive and negative shocks of the volatility of the exchange rate significantly affect real imports in the area under consideration. Because of a positive
change in \( \text{VOLTE} \), real import demand also increases by 1.6 percent. The economic intuition for the positive association between real imports and volatility of exchange rate is that volatile exchange rates make international trade and investment decisions more difficult because volatility increases exchange rate risk. However, a positive shock on exchange rate volatility triggers the import demand. On the other way round a negative shock on the volatility of the exchange rate leads to demanding less import. This is in line with the studies conducted by Muhia (2019).

A dummy variable as proxy policy variation between Derg and the current EPRDF on international trade was found to be significant and negatively related to the demand for imports. The t-value of -4.59 is significant at 1 percent level. A change in the trade policy regime reduces demand for imports by 0.71. This is compatible with economic theory. In theoretical suggestions, developing countries have somewhat relied on capital control to adjust economic activities. This has a negative implication on demand for imports in Ethiopia.

### 4.5 Short run dynamics of import demand model

**Table 4.5: short-run dynamics of the import demand model**

<table>
<thead>
<tr>
<th>NARDL Long Run Form and Bounds Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: D(LNMT)</td>
</tr>
<tr>
<td>Selected Model: NARDL(1, 1, 0, 1, 0, 0, 0, 1, 1, 0)</td>
</tr>
<tr>
<td>Case 2: Restricted Constant and No Trend</td>
</tr>
<tr>
<td>Date: 04/16/22  Time: 03:40</td>
</tr>
<tr>
<td>Sample: 1985 2020</td>
</tr>
<tr>
<td>Included observations: 34</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Conditional Error Correction Regression</td>
</tr>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>LNMT(-1)*</td>
</tr>
<tr>
<td>LNFX_POS(-1)</td>
</tr>
<tr>
<td>LNFX_NEG**</td>
</tr>
<tr>
<td>LNY__POS(-1)*</td>
</tr>
<tr>
<td>LNY__NEG(-1)</td>
</tr>
<tr>
<td>LNRIP_POS*</td>
</tr>
<tr>
<td>LNRIP_NEG</td>
</tr>
<tr>
<td>VOLTE_POS*</td>
</tr>
<tr>
<td>VOLTE_NEG*</td>
</tr>
<tr>
<td>LNM2_POS(-1)</td>
</tr>
<tr>
<td>LNM2_NEG(-1)</td>
</tr>
</tbody>
</table>
Using results from table 4.5, the coefficient of \((E_{\text{ct}})\) is reported as -0.566. This shows that the speed of adjustment is approximately 56.6 percent. The implication is that, if there is a deviation from equilibrium, 56.6 percent is corrected in one year as the variable moves towards restoring equilibrium. Thus, there is strong pressure on import demand to restore long-run equilibrium whenever there is a disturbance. The speed of adjustment is statistically significant with a negative t- a value of -9.74.

In the short term, a negative shock in foreign exchange reserves was found to have a positive impact on import demand in Ethiopia. Thus, aggregate imports are, in the short-run, significantly constrained by the availability of foreign exchange. However, a positive shock of foreign exchange reserves is not significant at a 95% confidence level.

The positive shock of lag of real income \((LNY)\) was found to have a positive effect on aggregate import demand in Ethiopia. Due to a positive shock in real income, the import demand increased by 1.96%. This shows that the exogenous component of real GDP exerts a reliable, positive impact on demand for imports. This study is consistent with Aron and Elbadawi (1994). Whereas a negative shock on real income does not affect real imports in Ethiopia the period under consideration.

On the other way round, a positive shock in relative import price was also found to have statistically significant and associated directly with aggregate import demand. Due to a positive shock in relative import prices in Ethiopia, real imports decreased by 0.56%. Whereas, a negative shock in relative import price does not affect real imports.

Moreover, The NARDL estimates also provide further evidence of the asymmetric relationship between the volatility of the exchange rate and real imports. In line with the long-run models of real import, both the positive and negative shocks of the volatility of the exchange rate significantly affect real import in the area under consideration. Because of a positive change in
VOLTE, real import demand also increases by 0.01 percent. Also, real imports decreased by 0.006 percent, due to a negative shock in the volatility of the exchange rate in the short run. It implies a positive change in volatility of the exchange rate leads to demanding more imports. Additionally, the NARDL also estimates the short-run asymmetric relationship between broad money supply and real imports.

<table>
<thead>
<tr>
<th>Test</th>
<th>Null Hypothesis</th>
<th>T-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (Chi-sq.)</td>
<td>No conditional heteroscedasticity</td>
<td>20.49</td>
<td>0.24</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>There is normal distribution</td>
<td>0.43</td>
<td>0.80</td>
</tr>
<tr>
<td>Langrage Multiplier (LM)</td>
<td>No serial correlation</td>
<td>2.43</td>
<td>0.12</td>
</tr>
</tbody>
</table>

**Conclusion and Recommendations**

All the variables included in the model are integrated order I(0) and integrated order I(1), henceforth NARDL model is more appropriate. The optimum lag of the variables is one to show their asymmetric relationship. Besides, F-statistic (25.18) is greater than both the lower and upper bound tests at 1%, 5%, and 10% significance level. The empirical result of the NARDL model shows, that there is strong evidence of the existence of both the short-run and long-run relationship among the variables included in the import demand models.

In the long run, the NARDL model result reveals that all the variables are found to have a significant impact on determining aggregate import demand. For instance, the accumulation of foreign exchange reserves positively determines the import demand. A 1% increase in foreign exchange reserves will increase real imports by 3.0%. The relationship is consistent with theory and the implications of increased foreign exchange reserve. This emanates from the fact that the more foreign exchange reserve that the country has the more capacity to import its desired raw materials.

Real income was also found to have a positive significant effect on aggregate import demand in Ethiopia. This implies that import demand increases by 1.83 percent with an increase in real imports by one percent.
On the contrary, Relative import prices and money supply also highly affect the real import demand negatively and significantly in Ethiopia. When the money supply increase, the interest rate decrease and this leads the domestic currency to depreciate as a result import become expensive. Henceforth, Foreign exchanges play a critical role in determining imports, as they strongly affect import volume, henceforth, the government should encourage local sourcing of raw materials for the productive sector, channeling of these will bring the economy together, reduce the cost of production and promote competitive export that will make available foreign exchange to import at greater volume. Besides, the government of Ethiopia gives attention to monitoring and evaluation irrespective of the quality of exportable products to overcome the foreign exchange crunch. The policy implication to the government of Ethiopia must take into consideration not just one policy but a broad set of policies to assuredly determines a country’s overall capacity to import.

**Acronyms**

NARDL-Nonlinear autoregressive distributed lag, VOLTE; volatility of exchange rate, USD-United states dollar, WDI- World development indicator, GDP-Gross domestic product, SDR-special drawing right, TOT- terms of trade, IFS-International financial statics , CUMSUM-cumulative sum, CUMSUMsq-cumulative sumsquare, ECM-error correction model, VAR-Vector autoregressive OLS-Ordinary least square, FX- Foreign exchange, ADF-Augumnted dicky fuller, AIC-Akaki information criterion

**Declarations**

**Competing interests**

* The authors declares that there are no competing interest.

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**Availability of data and materials**

All data are included in the manuscript and available on hand too.

**Author’s contributions**

1. Mohammed Yimam Ali (first author): Generate the idea about the research title, problem statement, research objectives, writing literature review, Methodology selection and data analysis.
2. **Ahmed Mohammed Yimer**: Literature writing, data management & analysis and recommendations

3. **Tsadiku Setegne Dessie**: Participated in Literature review, Methodology selection and data management and analyses

* In general Authors prepared the article in a team

All authors read and approved this Manuscript

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**References**


  Bangladesh Studies, 4, 37-46.

➢ Daniel workman (2020), Ethiopia’s Top 10 Imports, report on Ethiopian economy
➢ Fazhar Sumantria and Umi latifah (2019), the influence of interest, money circulation, inflation and CPI against export and import in Indonesia, journal ekonomicpembangunan(JEP), VOL 17.


➢ John muhie (2019) effect of exchange rate volatility on import and export, Capital University of economics and business masters paper.

➢ John Williamson, 1998 Globalization: The Concept, Causes, and Consequences, Keynote address to the Congress of the Sri Lankan Association for the Advancement of Science Colombo, Sri Lanka

➢ kebbay ,kawusu(2005), Determinants of import demand in sierra Leone, A Dynamic Specification, African institute for economic development and planning institute African de development economies

➢ Kemal Dervis, Jaime de Melo, and Sherman Robinson a General Equilibrium Analysis of Foreign Exchange Shortages in a Developing Economy

➢ Khan (1985), Income and price effect in Foreign Trade, Hand book of international economics, volume II, New york city

➢ Kramer(2022) How Importing and Exporting Impacts the Economy ,investpedia


Research Conference, A Tale of Two Giants: India’s and China’s Experience with Reform and Growth, New Delhi.

- Margaret A.Loto (2007), Imports under foreign exchange constraint in Nigeria, a co-integration analysis, Ghana journal of economics, department of economics.
- Paul Dorosh, Sherman Robinson and Hashim Ahmed (2009), examined on the Economic Implications of Foreign Exchange Rationing in Ethiopia, the Ethiopia strategy support program 2 (essp2) discussion papers
➢ Yan zhou and Smiledube (2011), Import demand functions: Evidence from CIBs, Journal of economic development Volume 36, Number 4, California state university, USA.