The Dynamics between Real Exchange Rate Movements and Trends in Trade Performance: The Case of Ethiopia

Melesse, Wondemhunegn Ezezew

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Wondemhunegn Ezezew Melesse

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KEYWORDS: Real Exchange Rate, Devaluation, Export Performance.

ABSTRACT Ethiopia's exchange rate policies have been a bone of contention for concerned economic analysts and commentators alike. This study takes a new look at the record to explore the impact of exchange rate liberalization reforms on export growth in Ethiopia. I employ generalized method of moments estimators (GMM) techniques on time series data for the period 1981- 2009. The study does not support the widely held view that exchange rate reforms induce export growth. But world income was found to positively impact Ethiopia's export receipts over time.

Λέξεις κλειδιά: Πραγματικές συναλλαγματικές ισοτιμίες, Υποτίμηση, Αποδοτικότητα εξαγωγικός τομέα

Η μελέτη αυτή προσπαθεί να διερευνήσει τη σχέση μεταξύ των μεταρρυθμίσεων της συναλλαγματικής ισοτιμίας και της απόδοσης εξαγωγικού τομέα στην Αιθιοπία εφαρμόζοντας την Μέθοδο Γενικών Ροπών σε χρονολογικές σειρές για την περίοδο 1981-2009. Η μελέτη δεν υποστηρίζει την ευρέως διαδεδομένη άποψη ότι οι μεταρρυθμίσεις των συναλλαγματικών ισοτιμιών προωθούν την βέλτιωση εξαγωγικών εσόδων. Πιο συγκεκριμένα, ο συντελεστής για την μεταβλητή πραγματική συναλλαγματική ισοτιμία ήταν ασήμαντος, γεγονός που επιβεβαιώνει ότι η πραγματική υποτίμηση ή υπερτίμηση του νομίσματος της Αιθιοπίας, Μπιρ, είναι ουδέτερη όσον αφορά την εξέλιξη των εισπράξεων από τις εξαγωγικές δραστηριότητες της χώρας.

I. Introduction

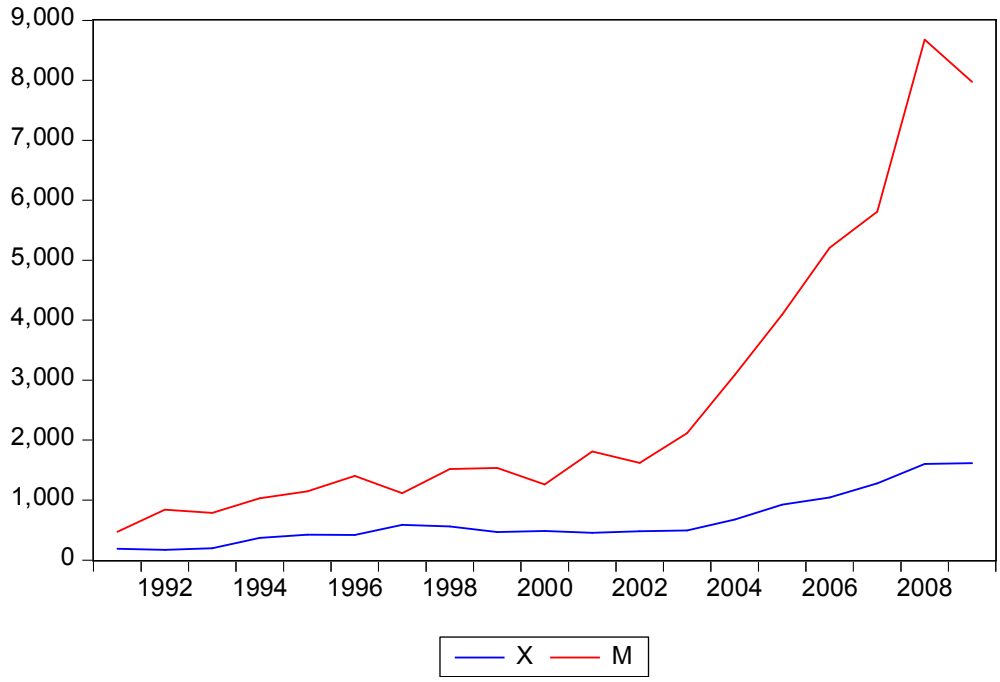
Ethiopia is a predominantly agricultural economy. Agriculture is traditional and accounts for nearly half of the total value added and absorbs about 80% of the labour force. It generates approximately 90% of the country's export receipts. The manufacturing sector is more labour intensive, largely dominated by food processing and beverage industries. The industrial sector contributes 13% of the national pie and employs some 4.9 percent of the labour force. The commercial services sector, which stands on par with agriculture in terms of its contribution to value added, generates 15% of the employment opportunities, of which nearly half of it comes from the public service sector. In 2009/2010 fiscal year, the real growth rates for agriculture, industry and services were 7.6%, 10.6% and 13.0% respectively (Mofed, 2010).

Based on the 2005/2006 Ethiopia's Social Accounting Matrix (SAM) jointly prepared by the University of Sussex and the Ethiopian Development Research Institute (EDRI), a pro-government think thank, labour is the most dominant factor input used by the agricultural sector, constituting about 70% of the total factor utilization, followed by rural capital-land which stood at 13%. Fertilizer consumption represented a mere 3%. On the other hand, for the manufacturing sector, manufactured goods accounted for 35.4% of the total factors of production, followed by non-agricultural capital-land (18%), primary agricultural products (16%) and non-agricultural labour (13%). In the services sector, non-agricultural capital-land represents the highest factor input consumed, accounting for 47% of the total factor consumption for the sector (EDRI, 2009).

Ethiopia's external sector is fairly open, with the sum of its imports and exports accounting for nearly 40% of its GDP in 2008/09 fiscal year. However, it is very weak with an ever yawning gap in its trade imbalance. As shown in Figure 1 below, the trade deficit continued to widen since 1991, from less than 300 million dollars when the reforms were initiated to more than 6 billion dollars in 2009 (an increase of more than 1,900%!). This is in sharp contrast with the widely cherished neoclassical argument that devaluation promotes exports, discourages imports and improves the balance of payments position of the country experimenting with devaluation.

The records of the National Bank of Ethiopia reveal that in 2008/09, the total import was about 7.7 billion US dollars, whereas exports stood at 1.4 billion. Ethiopia's external trade is dominated by primary products which account for more than three-fourth of total export. Therefore, any change in the customs duties of trading partners or fluctuations in exchange rates disproportionately impact Ethiopian traded agricultural activities and the effects, thereafter, diffuse to other sectors of the economy. This was clearly evident following the global financial crisis and economic down turn in 2008 when annual exports growth fell below zero for the first time since the conclusion of the Ethio-Eritrean border conflict in 2001.

Figure 1: Ethiopia's Real Imports and Exports in 2000 Constant Dollar for the Period 1991-2009 (millions dollars)



Source: Author's construction based on World Bank Data for 1991-2009

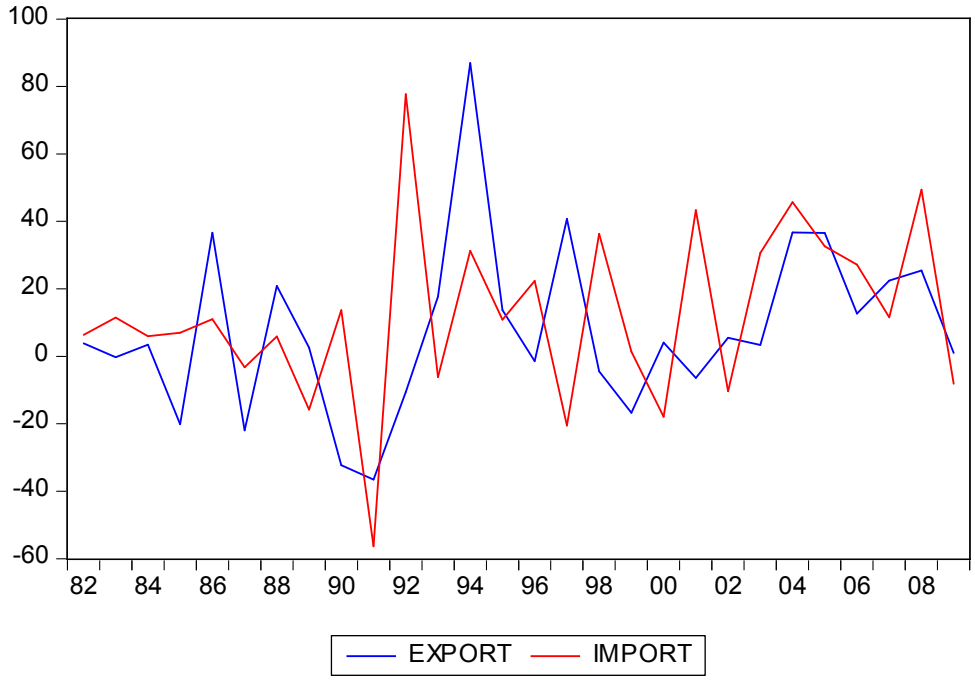
In May 1991, the Ethiopian landscape was markedly overwhelmed by major economic and political changes. The military junta that terrorized the country for 17 years collapsed and a coalition of liberation fronts assumed political power. Extremely delighted with and motivated by the fall of the communist regime in the country, delegates of Western governments and their institutions hurried to the capital Addis Ababa to sell their free market economic policies toolkits, packaged as Structural Adjustment Programmes (SAP), sponsored by the International Monetary Fund (IMF) and the World Bank (WB). Though deeply communist themselves, the new leaders, desperately in need of resources and foreign exchange, were easily persuaded to undertake the proposed economic reforms in exchange for low interest loans and development aid.

Under the new reform program, foreign trade and exchange rate regimes were liberalized; prices of domestic inputs and finished goods were decoupled from arbitrary government regulation and interference; public sector reform that accorded autonomy to the state owned enterprises (SOEs) was implemented; and some enterprises were privatized; the financial market was reformed to allow private sector participation in commercial banking, insurance and micro credit service; export tariffs were abolished; export subsidies to domestic export firms were eliminated and were replaced by incentives that provided the duty-free importation of raw materials.

Most important, in October 1992, Ethiopia's national currency, the Birr, saw a major free fall when it was devalued by 242% from its pegged rate of 2.07 per US dollar to 5 per US dollar, signalling the first major onslaught on the value of Birr which since then has been virtually in a slippery slope. The authorities defended

and justified such massive, one-time devaluation by pointing to the high premium on the parallel market which was close to 238% on the eve of the devaluation. In May 1993, the transitional government also introduced a 'Ducth auction' system for foreign exchange with the objective of liberalizing the foreign exchange market. The auction system operated side by side with the official exchange rate until the two were finally unified in July 1995. Before the unification, the dual-exchange rate regime was maintained by an amalgam of government decree (relevant for the official rate) and quasi-market mechanism (which applied to the auction rate). (Asmerom, 1997, Alemayehu, 1999 and Deresse, 2001). It was expected that the new devaluation measure would enhance domestic production and employment; eliminate the gap between the official and the parallel market rates, and improve the country's foreign reserves by minimizing illegal trade in smuggled goods and by re-directing much of the unofficial remittance flow towards official intermediaries.

Figure 2: Ethiopia's Real Import and Export Growth Rates 1981-2009



Source: Author's construction based on World Bank data.

Though still fragile and vulnerable to the vagaries of nature and aid money, the export sector in Ethiopia has shown tangible improvements since the country abandoned the fixed exchange rate regime in 1991 and implemented a series of macroeconomic stabilization and adjustment programmes. For instance, real export receipts have increased fivefold between 1992 and 2009. The export industry has also seen significant diversification away from its dependence on coffee. In 1991, when the reform package was launched, coffee brought more than 55% of the country's total export revenue but by the end of 2009 its share declined to less than 35% while the shares of other goods such as chat, flower, leather and leather products have increased substantially. The flower industry represents the major success story, whose share registered remarkable growth from less than 1% at the beginning of the 2000s to about 10% a decade later. Though much of this diversification is within the same industry, the over all result show a significant departure from the traditional, mono-crop dominated export sector.

Another way of assessing the performance of Ethiopia's export industry is to look at the employment figures that the export sector generates, particularly in agriculture where almost 90% of the country's exportable commodities come from. Because data on export sector employment for Ethiopia is unavailable, I make a back-of-the-envelope calculation to arrive at the number of jobs created each year. To do so, first I calculated the GDP per worker by dividing the real gross domestic product by the size of the work force, where I assume the annual unemployment and underemployment rate to be 20%, that is, 80% of the labour force is assumed to be in employed each year (a realistic assumption for a country with estimated urban unemployment rate of as high as 30%). The GDP per worker gives the average annual income that supports the employment of a single worker. Then to find out the number of jobs created by the export sector, I divide the annual export value by the corresponding average worker's income.

For example, in 1981 the GDP and export value of Ethiopia measured in 2000 constant dollar were 5.147 billion and 389 million respectively, while the estimated number of workers for that year was 12.8 million. So the GDP per worker in 1981 was about 402 dollars. If we divide the value of export by 402, we get the number of jobs in export-oriented activities (coffee plantation, brokering, transportation, etc.), which was roughly 967, 400. Following this line of reasoning, we would find that the number of jobs in 2009 stood at around 3 million, which is a 200% increase compared with the level of export sector employment in 1981.

Table 2: Cumulative Export and Export Sector Job Growth Rates 1982-2009

Period	Cumulative Export Growth (%)	Cumulative Export Sector Job Growth (%)
1982-1986	23.57	19.25
1987-1991	-67.41	-62.17
1992-1996	106.39	94.92
1997-2001	17.27	12.42
2002-2006	94.73	74.55
2007-2009	48.88	22.11

Source: Author's calculation based on World Bank Data.

Table 1 above shows the five year cumulative growth rates in export earnings and export sector employment generation for the period 1982-2009. Particularly interesting is the continuous decline in export growth and employment during the five years (1987-1991) preceding the downfall of the military junta, a period characterized by heightened conflict, uncertainty, massive defense spending and impulsive resettlement and villagization programmes following the 1984/85 famine. During this period, overall exports and export-oriented jobs shrank by 67% and 62% respectively. Moreover, though cumulative growth rates are still positive, we observe simultaneous drop in both exports and export sector jobs in the period 1997-2001 (a time period flanked by the costly Ethio-Eritrean border conflict) and

2007-2009 (due to the impact of the Great Recession that started in mid 2008). Not surprisingly, the most dramatic improvements occurred in the two five-year periods following the end of the civil war (1991/92) and the termination of the border conflict with Eritrea.

As can be seen from Figure 3 below, export earnings and export sector employment not only experience extreme fluctuations but also follow almost overlapping trends for most of the period under investigation.

Figure 3: Ethiopia's Export and Export-Sector Job Growth Rates 1981-2009

Source: Author's construction based on World Bank data.

Now the key question is, how much of this improvement in export growth and export sector employment can be attributed to exchange rate reforms? Does devaluation always enhance export performance, domestic production and overall national welfare? This paper attempts to empirically examine whether or not devaluation encourages export growth by applying Generalized Method of Moments on time series data covering the period between 1981 and 2009. The outline of the rest of the paper is organized as follows: the next section briefly reviews the relevant theoretical and empirical literature. Data and methodological issues are presented in section III. Section IV analyzes and discusses the findings while the conclusions and relevant recommendations of the study are presented in section V.

2. Review of Literature

In a Keynesian economy, devaluation promotes exports and aggregate economic activity through the famous "multiplier effect." However, currency devaluation may not produce the desired outcomes for several reasons:

First, the Marshall-Learner (ML) condition may not hold in the short run. The ML condition is a theoretical viewpoint that links exchange rate fluctuations and trade performance from the perspective of elasticity. According to this theory, ceteris paribus, a country will improve its current account deficit by devaluing its currency provided that the sum (in absolute value) of the elasticity of demand for its exports and imports is greater than one. But most empirical results show that short run elasticities are smaller than their long run counterparts and countries may not achieve increased employment, investment and output following devaluation.

Second, if we allow for changes in some variables, such as changes in the national income, devaluation will improve the trade balance only if the improvement in trade balance generated by currency depreciation more than offsets the improvement in imports brought about by a rise in the national income. This is called the Lausen-Metzler effect.

Third, the so called J-curve effect may dilute the immediate benefits from devaluation for two major reasons: a) even if the ML condition held, export receipts may not increase in the short-run due to supply side constraints associated with time lags, which is largely the case for agricultural commodities that need several months to harvest; b) most imports are less responsive, if not, non-responsive at all despite the increase in their prices after devaluation. This applies to most capital goods and raw materials (such as oil) that have inelastic demand in capital-deficient and oil importing countries such as Ethiopia. As a result, the fall in foreign spending on the country's exports and the increase in domestic spending on imports will cause the trade deficit to get worse before it improves, which makes the trade balance curve assume the shape of letter "J."

The empirical evidence on the relationship between devaluation and export performance is generally mixed with the conclusions differing depending on the nature of the economies investigated, the type of methodology employed, and/or the sample size and data frequency used in the specific study.

Bahmani-Oskooee et al (2007) use monthly data on effective exchange rate and covering 89 countries to examine whether nominal devaluation leads to real devaluation. Their findings reveal that changes in nominal devaluations lead to changes in real devaluation for all countries in the short run. But, the short-run effects translate into long-run effects only in the results for 24 countries.

Connolly and Taylor (1976, 1979) found that nominal devaluation results in real devaluation in the short to medium run while Donovan (1981), Bautista (1981) and Morgan and Davis (1982) hold that the relationship between nominal devaluation and real exchange rate becomes dampened in the long run. De Grauwe and Holvoet (1978) rely on input–output analysis for the European Community and show that the outcome depends on the assumption of whether or not wage indexing exists. In the absence of wage indexing, a 1% nominal devaluation gives rise to 0.70% real devaluation in all countries. Under complete wage indexation, a 1% nominal devaluation leads to 0.5% real devaluation in all countries (cited in Bahmani-Oskoee and Mitzeta, 2002).

On the flip side, therefore, devaluation may make imports less attractive leading to increased spending by domestic consumers and investors as measured by domestic currency. Moreover, inflationary infection induced by currency depreciation could eat up the potential gains from nominal devaluation. A number of studies have shown that changes in nominal devaluation entail massive increase in the prices of goods and services, thereby diminishing the international competitiveness of the economy. In other words, nominal devaluation results in real devaluation and effectively improves a country's trade performance only if we have net positive change after adjustment in the price levels (Bahmani-Oskooee, 1998).

Edwards (1986) tested the contractionary devaluation hypothesis for 12 developing countries using pooled time series data covering the period 1965-1980. His study concluded that devaluations result in contractionary effect on aggregate output in the short run; more specifically, a 10% devaluation on average led to a 1% decline in output. He also found out that this contractionary effect was later on counterbalanced by expansionary influence on output, thus suggesting that in the long run devaluations are neutral to output growth. In a similar venture Bahmani-Oskooee (1989), but focusing on four countries—Greece, India, Korea, and Thailand—and covering the period 1973-1980, found that devaluation initially improved the trade balances of those countries but this was followed by deteriorating effect later on, a movement which appeared to follow the inverse of the so called J-curve effect.

Still even more interesting is the impact of devaluation on income re-distribution. According to Paul Krugman and Lance Taylor (1997), even when devaluation does not affect the country's terms of trade, it, however, could entail a number of income effects. To this effect, they have identified three major channels through which devaluation could possibly redistribute income among various economic actors:

Firstly, when the devaluation measure is undertaken in an environment where trade deficit prevails, the increase in the prices of traded goods are immediately followed by a reduction in real domestic income and by a corresponding rise abroad, since export receipts of the devaluing country are overwhelmed by its swelling expenditures on imported items. Thus, the value of the home country's 'foreign savings' rise ex ante, while aggregate demand falls ex post, and imports decline along with it. The bigger the initial trade deficit, the more pronounced the cotractionary effects.

Secondly, even if the country had balanced trade initially, the prices of traded goods increase relative to domestic goods following devaluation, resulting in windfall profits and rents for businesses and investors engaged in export and import-competing industries. If wages are rigid in the short run and if the marginal propensity to save from profits exceeds the one from wages, ex ante national savings rise. The magnitude of the resulting contraction is a function of the difference in savings propensities between wage earners and businesses specializing in exports and import-competing industries.

Finally, devaluation can also affect the fiscal position of the national government. Particularly, assuming that budget was initially unbalanced, the government can raise substantial additional money if there are progressive taxes on income as well

as if taxes on profits are higher than taxes on wages. Moreover, if exports or imports are subject to ad valorem taxes, devaluation generates redistribution of income from the private sector to the state coffers, whose saving propensity is unity in the short run. Once again, the final outcome is reduction in aggregate demand.

Haughton and Kinh (2003), based on disaggregated household income and expenditure data for Vietnam found that devaluation of dong has modest effect on redistribution in favour of the poor and the rich while the middle class was a net loser. Acharya (2010) investigates the impact of devaluation on the Nepalese economy by applying general equilibrium model and finds that while devaluation is expansionary most of the benefits, however, accrue to the rich, thereby creating unequal income distribution. He attributes this pro-rich growth to the fact that returns to high-skilled labour and capital grow faster than returns to their low-skilled counterparts. Moreover, while the expansion was more concentrated in agricultural and industrial activities, the service sector actually suffered contraction following devaluation.

While much of the redistribution literature focuses on income transfer between domestic agents (workers, firms and governments), the income transfer could also assume international dimension. Ciuriak (2010) in diagnosing the demand and supply side constraints affecting Ethiopia's export performance observes that market structure may also diminish the positive impact of devaluation, working in favour of few omnipotent global firms that dominate international commodity markets. He notes that international commodity markets where developing countries sell their products are dominated by a handful of buyers with considerable power of influence that enables them to amass enormous profits and rents. Thus, such asymmetric power of influence will likely create a situation whereby the devaluation measure will boost the profits of multinational buyers with little of the benefit trickling down to the Ethiopian producers.

Bahmani-Oskooee and Miteza (2003) sort out the devaluation literature along four main categories: The first category compares output growth before and after devaluation (Cooper, 1971); the second category compares output growth in the devaluing countries against a group of non-valuing countries, called the control-group (Donovan, 1981; Edwards, 1989); the third category focuses on macro-simulation approach and includes theoretical models and simulations that investigate different transmission mechanisms (Krugman and Taylor, 1978; Barbone and Rivera- Batiz, 1987; Gylafson and Schmid, 1983; van Wijnbergen, 1986; Agenor, 1991; and Taye, 1999); and the fourth category uses econometric techniques in assessing the impact of different stabilization policies (Sheehey, 1986; Bahmani-Oskooee and Rhee, 1997). This specific study belongs to the last category and employs econometric approach based on time series data covering the period 1981-2009.

3. Methodology and Econometric Formulation

This paper follows the conventional analytical framework in which trade flow is explained in terms of income and relative prices of goods and services. I adopt the following simple linear method:

$$Expor_t = \alpha + \beta WGDP_t + \gamma RER_t + \delta Impr_t + u_\tau \quad (1)$$

In equation (1) $Expr_t$ and $Impr_t$ stand for Ethiopia's real annual export and import values respectively; $WGDP_t$ is world per capita income used as proxy variable to capture world demand for Ethiopia's exports; and RER_t represents the real exchange rate for Birr. The RER was computed using the following formula:

$$RER = E^*(P_f/P_d) \quad (2)$$

Where E represents the nominal bilateral exchange rate between Birr and the US dollar; P_f and P_d are US and Ethiopia's GDP deflators, representing foreign and domestic price levels respectively. GDP deflators rather than CPIs were chosen as the difference between the two indices is insignificant. In this study an increase in RER is interpreted as real devaluation and a positive coefficient, if statistically significant, indicates that the depreciation of Birr entails expansion in exports, reduction in imports and improvement in the country's trade balance. In contrast, if the coefficient on RER is negative and significant, devaluation inhibits export growth. Regardless of its sign an insignificant coefficient on RER implies the devaluation of Birr is neutral to export growth. Similarly, positive and statistically significant coefficients on WGDP and Import show that a rise in world income and imports leads to an increase in Ethiopia's exports.

Econometric Method

Traditional least square regression techniques are appropriate when the data used for estimation are generated from stationary process, that is, when each variable has constant mean, variance and covariance across time. If all variables under investigation are stationary, so are the disturbance terms. But most time series data are non-stationary and estimating such series with least square methods creates "spurious regression" where we have wrong (inflated) standard errors and incorrect inference about the parameter estimates (see Dickey and Fuller 1981).

Whether or not a variable is stationary is a function of the presence or absence of unit root(s) in the series. Stochastic or random trends are characteristic features in non-stationary variables while deterministic or fixed trends are common in stationary variables. Because stochastic trends usually produce spurious correlations, it is necessary to carry out diagnostic tests on the existence of unit roots in each variable before proceeding with the estimation of the model. To do so, I employ the popular Augmented Dickey Fuller (ADF) unit root test to examine if the relevant series is stationary. Testing for a unit root enables us to determine the order of integration of each series. So, if a series must be differenced d times before it becomes stationary, then it is said to be integrated of order d, denoted by I(d).

The ADF test uses the following equation to test the null hypothesis of unit root against the alternative that the series is stationary. Constant and trend are included:

$$\Delta x_t = \alpha + \gamma t + \sum_{i=1}^{p} \delta_i \Delta x_{t-i} + u_t \quad (3)$$

Where X stands for each variable (world per capita income, Ethiopia's imports and exports, RER, all in real terms). The letters Δ, α, and u are difference operator, constant, and errors respectively. The errors are assumed to be independent and identically distributed. P is the lag length which is essential to render the error terms white noise. All variables are in 2000 constant dollars. I took the logarithm of the series to test for staionarity in levels and differences.

Once we deal with the problem of serial correlation, the required model can be consistently estimated using least square methods so long as there is no simultaneous equation bias in the model.

However, the least square method got its popularity from one of its simplistic assumptions that the errors are orthogonal to regressors, that is, the explanatory variables are not correlated with errors. In other words, all regressors are assumed to be exogenously determined. But when the assumption that the errors are conditionally uncorrelated with regressors breaks down, the problem of endogeneity arises, which is usually the case when two or more variables are simultaneously determined in a given behavioral model.

In this specific study, because import and export values instead of volumes are used, endogeneity is suspected to be on the horizon and the appropriate correction procedures must be undertaken to remove the bias from our model. One way to tackle the problem of endogeneity is to apply Generalized Method of Moments (GMM). GMM uses a category of variables called instruments which enable us to obtain consistent estimators when the orthogonality conditions in least square estimators fail to hold. Instruments must satisfy two conditions: (1) they are correlated with the endogenous regressors they are going to replace (2) they must be orthogonal to the error terms. It follows that exogenous regressors are instruments for themselves.

When the disturbance terms are conditionally heteroskedastic and/or serially correlated, achieving increased asymptotic efficiency becomes, to a certain point, a function of employing additional instruments. (Anatolyev et al, 2007). Thus, when dealing with time series models in the presence of endogeneity, one is confronted with cumbersome problems regarding the optimal choice of instrumental variables because the number of potential instrumental variables increases as the sample size increases. This is usually the case when the endogenous variables are instrumented by the lagged values of endogenous and/or exogenous variables. In many instances, if a given variable fulfills all the criteria to be used as instrument, so too will its lags. As a result, the choice of the right lag length becomes a tricky undertaking.

GMM Model Specification

Generalized method of moments estimation framework begins with the following condition:

$$E(g(x_t, \beta_0)) = 0 \qquad (4)$$

The vector of functions $g(x_t, \beta_0)$ is an L vector and is at least twice differentiable, with K parameters to be estimated, and x_t is assumed to be stationary process.

The existence of endogenous variables implies that there exists some kind of correlation between regressors and error terms. If we denote the endogenous variables by x_t and the errors by u_t, then x_t is endogenous if,

$$E(x_t u_t) \neq 0 \tag{5}$$

When endogeneity is identified the OLS produces biased and inconsistent estimates.

Let m_t represent the vector of $\{y_t, x_t, z_t\}$ with y_t the real export (our dependent variable) while x_t and z_t as defined previously. Further, we assume that m_t is stationary and ergodic process.

Moment Conditions,

$$g_i(m_t, \beta_0) = z_t u_t = z_t(y_t - x_t'\beta_0) \tag{6}$$

The instruments z_t have to satisfy the following orthogonality conditions:

$$g_n(\beta_0) = \frac{1}{n}\sum_{i=1}^{n} g(m_t, \beta_0) = \frac{1}{n}\sum_{i=1}^{n} z_t(y_t - x_t'\beta_0) = 0 \tag{7}$$

which correspond to the sample moments for the parameter vector β_0,

$$= \begin{pmatrix} \frac{1}{n}\sum_{i=1}^{n} gdp(y_t - x_t'\beta_0) \\ \frac{1}{n}\sum_{i=1}^{n} rer(y_t - x_t'\beta_0) \\ \frac{1}{n}\sum_{i=1}^{n} l_{it}\_\exp r(y_t - x_t'\beta_0) \end{pmatrix} \tag{8}$$

where gdp and rer are world income and real exchage rates as their own instruments (both exogenous), while l_{it}_expr indicate the lagged values of the dependent variable with i = 2, 3, 4 (second to fourth lagged values of exports).

By equating the population and sample moments with each other we have,

$$s_{zy} - s_{zx}\beta_0 = 0 \tag{9}$$

where,

$$s_{zy} = \frac{1}{n}\sum_{i=1}^{n} z_t y_t \text{ and } s_{zx} = \frac{1}{n}\sum_{i=1}^{n} z_t x_t'$$

The order condition which is necessary for the identification of β_0 is,

$L \geq K$

where L is the number of instrumental variables and K is the number of parameters to be estimated. When L > K our model is said to be overidentified and there is no unique solution to equation (9). Such models are conveniently estimated using GMM method. The intuition behind the GMM method is to find an estimator for the parameter vector β that brings the sample moments as close to zero as possible. This is achieved by minimizing the following criterion function,

$$J(\beta_0, \hat{W}) = n g_n(\beta_0)' \hat{W} g_n(\beta_0) = n(S_{zy} - S_{zx}\beta_0)' \hat{W} (S_{zy} - S_{zx}\beta_0) \quad (10)$$

where W is an $L \times L$ positive definite weighting matrix.

Iterative Efficient GMM

The export demand equation is estimated using Eviews where Iterative Efficient GMM is employed. Typically, the following procedures are involved:

1. We estimate an initial parameter vector β and obtain $\hat{\beta}$ by minimizing the above objective function (equation 10) for an arbitrary weighting matrix W =I_n which is an identity matrix.

2. We use $\hat{\beta}$ to produce an initial estimate of the optimal weighting matrix, i.e.
We compute the errors u_t and estimate the optimal weighting matrix S which is the inverse of covariance matrix:

$$\hat{S} = \frac{1}{n} \sum_{i=j+1}^{n} \hat{u}_j \hat{u}_{j+1} \qquad \text{j= 0, 1, …..L.} \quad (11)$$

We estimate the covariance matrix as suggested by White for heteroskedasticity consistent and Newey and West for autocorrelation consistent estimator:

$$\hat{S} = \hat{S}_o + \sum_{j=1}^{L} w_j (\hat{S}_j + \hat{S}_j') \quad (12)$$

where $w_j = 1 - j/(L+1)$ and is known as the Bartlett weights with L the maximum selected lag length in autocorrelation and $\hat{S}_o$ represents the heteroskedasticity consistent part devised by White.

So our optimal weighting matrix will be $W = \hat{S}^{-1}$ (13)

3. We re-minimize the objective function using the weighting matrix from step 2

4. Our Iterative GMM repeats step 2 until we achieve convergence of the β-estimate, that is, when the k^{th} step estimate almost equal to its immediate predecessor, i.e, when $\hat{\beta}^{(k+1)} \approx \beta^{(k)}$

If the disturbance terms are independent and identically distributed and satisfy all the classical assumptions, then the error variance-covariance matrix represented by equation (11) will be reduced to an identity matrix and $S = \sigma_u^2 I_n$ and the GMM estimator will be the standard Instrumental Variable or Two Stage Least Square estimator. But if we identify heteroskedasticity of unknown form, we must employ heteroskedasticity consistent estimates in order to get robust standard errors used for statistical inference. In this case our optimal weighting matrix will be:

$$\hat{S} = \frac{1}{n}\sum_{i=1}^{n} \hat{u}_i^2 z_i' z_i \tag{14}$$

where $\hat{u}$ is the vector of disturbance terms obtained from any consistent estimates of β such as Two Stage Least Square.

Testing Overidentifying Restriction

There are several ways of testing overidentifying restrictions. One commonly used method is the so called J-test which involves (i) estimating the specific equation by Instrumental Variable and obtaining the residuals (ii) regressing the residuals from (i) on all exogenous variables (iii) computing the F-statistic to test the null hypothesis that all instruments are jointly insignificant. The test statistic will be J = LF and has chi-square distribution with L-K degrees of freedom where L and K are the number of instruments and parameters respectively.

Another but related test of over identifying restrictions is the Sargan test where we (i) regress the residuals from instrumental variable estimates on all exogenous variables and obtain R^2 (ii) compute the test statistic J= nR^2 where n represents the number of observations. Like the J-test, the Sargan test is also chi-square distributed with L-K degrees of freedom.

4. Discussion of Results

Before carrying out the unit root test, growth rates were computed for each series using the formula,

$$\frac{x_t - x_t(-1)}{x_t}$$

where x_t stands for each observation series (Import, Export, WGDP and RER). As presented in Table 1 below, import and RER variables were found to be stationary in their levels while export and world per capita income needed differencing once before they became stationary. Thus, whereas RER and Import are I (0), WGDP and Export are I (1).

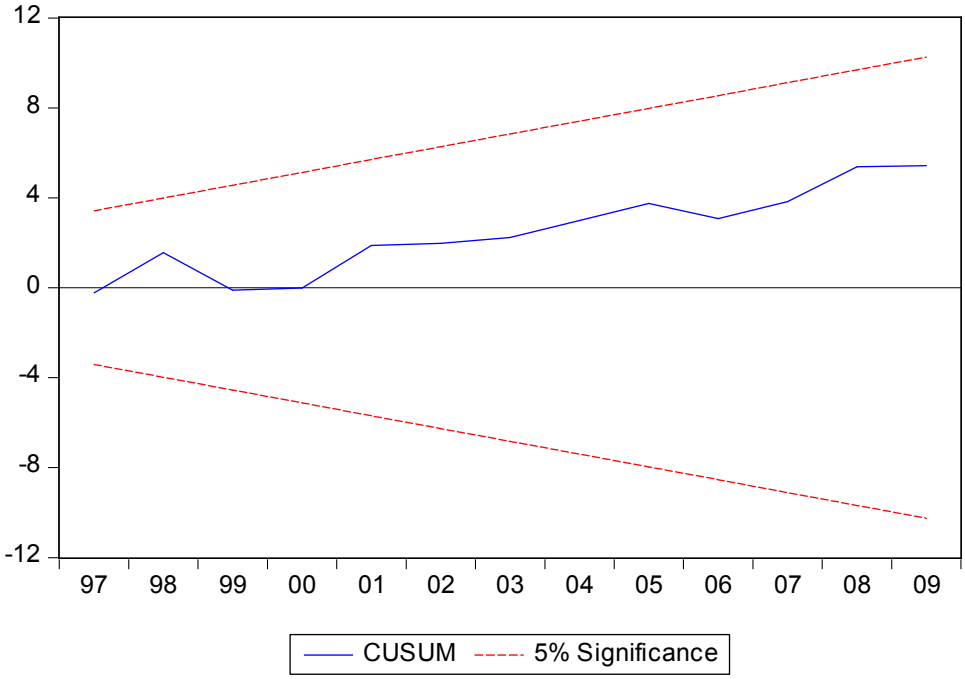
Table 2: Augmented Dickey-Fuller (ADF) unit root tests

Variable	Levels	Differences
Import	-7.20 (0)	-11.98 (0)
RER	-4.30 (0)	-5.70 (1)
Export	-3.36 (1)	-4.60 (1)
WGDP	-2.28 (0)	-3.90 (0)

Notes: Figures in parentheses indicate the lag order. The lag lengths were chosen based on Schwartz Information Criteria (SIC). The ADF unit root test for each variable includes trend and constant term. The 95% critical value for ADF test is -3.587

The export equation was estimated using Eviews. For the purpose of comparison results from the OLS method are juxtaposed with those from GMM (Iterative to convergence). As shown in Table 4, there are significant differences in the results from these methods:

Figure 4



- The fitness of the model is 0.51 when the least square method is employed and 0.28 for the GMM. The OLS model is overall significant since the probability of F-statistic (0.002) is less than the critical value (0.05) and the null hypothesis that the coefficient of determination (R^2) is equal to zero is rejected. The CUSUM plot shown in Figure 4 above confirms the stability of the model.

- By conducting appropriate test for autocorrelation, I found strong evidence for first order serial correlation among the residual series (with DW 2.7 for OLS). In order to get appropriate standard errors for correct inference, the first lagged values of the forecast error terms were used in the case of OLS and I chose as weighting matrix the Newey-West Heteroskedasticity-

Autocorrelation Consistent (HAC) weight in the case of GMM. After these adjustments were made the Durbin-Watson statistic for the GMM was found to be 1.66, and for OLS 1.83 suggesting that the problem of serial correlation was effectively dealt with.

- Moreover, since our GMM model involved more moment conditions than parameters, it was appropriate to conduct diagnostic test for model specification. In an exactly identified model, the number of moment conditions is the same as the number of parameters and the corresponding J-statistic for overidentification will be exactly zero. In our case, we have worked with an overidentified framework and the J-statistic was found to be positive as expected but it is sufficiently low (2.18) indicating that our model is well identified. Alternatively, this can be confirmed from the probability value of the J-statistic (0.54) which is much larger than the critical value 0.05, thus the null hypothesis that the model is correctly identified cannot be rejected.

- Regarding the estimated model, it is interesting to observe that no single parameter of interest is statistically significant in OLS while world income was found to be significant in GMM. The least square estimate reveals that a 1% rate of increase in world income gives rise to about 5% rate of increase in global demand for Ethiopia's exports though the corresponding t-statistic is lower than the 95% critical value. However, the GMM estimate produces a substantial improvement both in terms of the size of the coefficient and the related t-statistic—a 1% rate of increase in world income induces about 9% rate of increase in world demand for Ethiopia's exports and this was statistically significant at 5%.

- The coefficient on real exchange rate is positive (0.34 in OLS and 0.09 in GMM) but it is statistically insignificant in both cases, indicating that changes in exchange rate have little effect on export growth. Like real exchange rate, imports do not directly impact export growth which could be due to the fact that the country's export portfolio is composed of mostly agricultural goods that depend more on cheap and surplus labour than on expensive imported capital. It could also be due to the fact that a large proportion of the country's imports comprise non-durable consumer goods most of which could be produced domestically. This implies that the country's limited foreign reserves which could have been spent on productive capital goods are wasted on low-tech consumption items (such as biscuits and orange juice) that the country can produce locally. According to the National Bank of Ethiopia, in the first quarter of fiscal year 2009/10, such consumer goods accounted for nearly 20 percent of the total imports.

Table 3: Regression Results

Variable	OLS	GMM
Constant	-0.54 (-0.43)	4.37 (1.28)
Import	0.13 (1.44)	-0.05 (-0.29)
RER	0.34 (1.29)	0.09 (0.23)
WGDP	2.69 (1.08)	9.19 (2.76)
MA (1)	-0.99 (-5.73)	
R^2	0.51	0.28
DW	1.83	1.66
Prob (F-statistic)	0.11	
Heteroskedasticity (P value)	0.64	
J-statistic		2.18
Prob (J-statistic)		0.54

5. Conclusion and Recommendations

Ethiopia's export sector has shown certain signs of improvement since 1991 despite the continued worsening in its current account balance. While exports and export sector jobs have increased fivefold and threefold respectively, it is possible that those poor Ethiopians engaged in labour intensive, tradable goods sector have benefited from increased export of goods and new market opportunities. But unlike the widely held view, this study finds that whatever improvement was recorded in export growth, it cannot be attributed to exchange rate reforms. Particularly, the coefficient on the real exchange rate was insignificant suggesting that real devaluation or overvaluation of Ethiopia's currency, Birr, has no discernible association with trends in the country's export receipts.

The most important policy implication of this study is that a developing country like Ethiopia cannot revolutionize its export industry through exchange rate manipulation.

Even when domestic and external circumstances call for devaluation measures, such measures will facilitate export growth and enhance aggregate economic activity when they are accompanied by conservative monetary policies and fiscal restraints. In contrast, post-reform Ethiopia has seen consistent increase in budget deficits along with massively accommodative monetary policies. While much of the foreign expenditure shortfalls have been covered with international loans and grants, the Central Bank of Ethiopia has been the last resort to cover domestic expenditure shortfalls. For instance, broad money supply increased, on average, by 11.4% annually between 1961 and 1974. The average broad money expansion during the military regime (1974-1991) was only slightly higher (12.4%), which is essentially marginal, especially in light of the seemingly incessant civil war and the huge government defense spending which financed that war. But the post-reform period, and particularly the period immediately after the conclusion of the Ethio-Eritrean

border conflict (1998-2000) has seen enormous increase in "quantitative easing" with average broad money growth of over 17% between 2001/02 and 2009. Thus, not surprisingly, devaluation and inflation spirals went hand-in-hand from 2002 onwards.

Moreover, on top of the need for credible and predictable macroeconomic policy mix, concerted efforts should be directed towards expanding and raising the quality of physical and institutional infrastructures. For instance, poor transport infrastructure networks increase the cost of trade and reduce the country's international competitiveness while poor institutions (bureaucratic morass, rampant corruption, lack of transparency in public resource management and contract, etc.) raise the costs of starting business, discourage creative entrepreneurship, and thwart private sector development, which are the engine of economic growth and prosperity for any economy. In addition to poorly developed transportation and communication networks, the state of being landlocked has been costing Ethiopia nearly 1 billion dollars annually in port fees and charges, a staggering amount which is almost equal to the country's annual export earnings these days. Unless the political leadership takes the issue of port services seriously and champion for Ethiopia's rightful access to the sea based on international law, the country will continue to hemorrhage huge amount of hard currency, a situation which will continue to dampen the prospect of its export led/supported growth strategy.

The recommendations provided in here concur with the findings of a recent study by Dan Ciuriak (2010) which investigated the demand and supply side constraints affecting Ethiopia's export industry. Ciuriak identifies a number of domestic and regional factors that hamper the country's export growth, among which the most important ones included inappropriate macroeconomic policy mix, extremely prohibitive costs in trade administration (such as the lack of access to the sea and the high costs of port service and massive fees for cargo transportation); inefficient producer services (such as finance, transportation and communication);cumbersome customs procedures; high business concentration, huge costs of entry and fragile and poorly developed private sector.

Furthermore, Seid Hassen (2010), following the surprise 16% devaluation of Birr on September 1, 2010, has written extensively on how recurrent devaluation could not solve many of the longstanding structural problems associated with the country's limited capacity of domestic production. In his explanation he underscored the malignant consequences of the numerous party-owned-and-operated business companies that stifle competition and hinder the development of a vibrant private sector-led economy. He further emphasized Ethiopia will not be able to gain competitive edge and devaluation will not be a magic potion for the structural (political and economic) problems of the country and the continuous manipulation of the birr will unlikely correct the general economic malaise.

Therefore, many of the impediments to Ethiopia's export growth are institutional and structural and need to be assessed and addressed within the wider context of its geographic location, lack of access to the sea, slow pace of regional integration and limited market opportunities for its products, as well as its poor technological progress and increased dependence on agricultural commodities which are vulnerable to wide price fluctuations, etc.

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