# International Trade and Income in Malawi: A Co-integration and Causality Approach

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## Abstract

*This paper investigates causal relationships between exports, imports, and economic growth in Malawi over the period 1961-2010. These relationships are examined using the Johansen frameworks for co-integration whereas the Vector Error Correction (VECM) framework is further used to provide estimates for both short-run and long-run dynamics in the series under study. The empirical results, including the impulse responses support the export-led economic growth and export driven imports hypotheses in the long run, but they provide no evidence of any economic growth-driven exports. These results strongly support the role of international trade in Malawi's economic development and hence policies that seek to facilitate Malawi's trade within and outside the SADC regional would be worthwhile to pursue.*

**Keywords:** exports, incomes, Malawi, causality, co-integration

**JEL Classification:** F12; F14; F43

## 1. Introduction

At present, the Malawi government is pursuing an exchange rate regime that can best be described as a free float where central bank intervention is very limited following the IMF's recommendation to the new government of President Joyce Banda who rose to power following the demise of President Bingu wa Mutharika in April 2012. This is in contrast to the stance that her predecessor took since coming to power in 2004.

From 2004, the government started pursuing a fixed exchange rate policy and also embarked on an ambitious Farm Input Subsidy Program (FISP) at the same time with an intention of increasing people's incomes by addressing the pervasive liquidity constraints that almost every rural farmer faces even today (see Chirwa and Chinsinga, 2011).

A combination of the two policies appeared to have exerted enormous pressure on foreign exchange mainly because Malawi imports all farm inputs and the over-valued

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exchange rate regime suppressed export earnings. Moreover, while the subsidy programme should normally have led to burgeoning export values, this was not *per se* the case because Malawi's FISP targeted maize which is not one of Malawi's major export crops. Maize in Malawi has a high political value and its sale is controlled such that despite the record increases in maize production in the post 2008, external trade in maize was still undermined by restrictions and bans e.g. in 2010 (see Chirwa and Chinsinga, 2011).

The change in exchange policy from an inflexible regime to a free float regime following the end of Bingu wa Mutharika's presidency, in the absence of any marked downscaling of the FISP appeared to have done little to reduce foreign exchange rate problems and negative trade balance.

## 2. Malawi's Exports and Imports

As at the end of 2012, Malawi's total imports increased by 74% in 2011 to an overwhelming US$ 2.7 billion, whereas exports only increased by 31% in 2011 to US$1.3 billion in 2012 thereby registering an overwhelming trade balance of US$1.4 billion (Ministry of Trade and Industry, 2012). The trade balance appears to have deteriorated not only because inputs (which are imports) are expensive, but also because under a flexible exchange rate, the country such imports become even more expensive.

Indeed the growth in Malawi's trade deficit post 2001 and 2012 came about because of more rapid growth in imports than in exports in the absence of any ability to the economy to turn imports into a productive base of the economy (Ministry of Trade and Industry, 2012). As such the gap was largely financed by aid flows, such that the cutting of aid in 2011 resulted in the dwindling of foreign reserves and a major foreign exchange crisis that renders 2011 data unreliable for long-term planning purposes (Ministry of Trade and Industry, 2012). The foreign exchange rate demands, could not be met by Malawi's only major export crop-tobacco which generated about $585 million in 2010, accounting for about 50% of exports in that year (Ministry of Trade and Industry, 2012).

Today, there appears to be a realisation that input subsidy program's targeting maize alone may only be expected to have limited influence on poverty and food security. The new export strategy (NES) as well as the MGDSII seek to find ways of expanding international trade through export diversification. Instead of relying solely on tobacco exports, which currently accounts for more than 55% of exports (see Lea and Hanmer 2009) and generates more than 60 per cent of export earnings, the NES identifies oilseeds, and other crops as potential substitutes to tobacco which is facing anti-smoking lobbies, which in 2010 led to drastic negative changes on tobacco prices leading to poverty. The new export strategy also identifies processing as important as raw materials face deteriorating terms of trade over time (Ministry of Trade and Industry, 2012).

Considering international trade as a whole, Malawi imports mostly from RSA (22%), and in 2012, fuel was the major import covering 13% of all imports. Over the same period, Malawi exported mostly to Canada (10%) and tobacco was the major export covering 53% (Ministry of Trade and Industry, 2012b). Within the SADC, Malawi imported goods worth

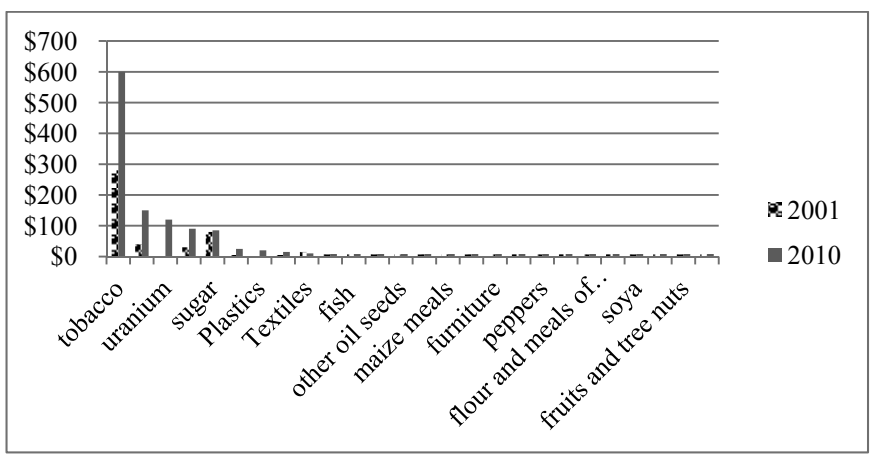
US$1.2 billion from SADC (42% of the World) and Fuel was the major import covering 30% of all SADC imports. Malawi exported goods worth US$0.2 billion to SADC (19% of the world) and cereals were the major exports covering 16% of all SADC Exports (Ministry of Trade and Industry, 2012b).

At the level of COMESA, Malawi imported goods worth US$0.6 billion from COMESA (22% of the World) and fuel was the major import covering 31% of all COMESA imports. Over the same period, Malawi exported goods worth US$0.2 billion to COMESA (14% of the world). Tobacco was the major export covering 14% of all COMESA Exports. Malawi also trades with the EU and she imported goods worth US$0.4 billion from EU (13% of the World). Pharmaceuticals were the major imports covering 29% of all EU imports and Malawi exported goods worth US$0.3 billion to EU (26% of the world). Tobacco was the major export covering 64% of all EU Exports (Ministry of Trade and Industry, 2012b).

With Asia, Malawi imported goods worth US$0.9 billion from ASIA (33% of the World) and fertilizer was the major import covering 23% of all ASIA imports whereas, she exported goods worth US$0.2 billion to ASIA (17% of the world) and tobacco was the major export covering 51% of all ASIA Exports (Ministry of Trade and Industry, 2012b).

Below is a snapshot of the trade situation in Malawi.

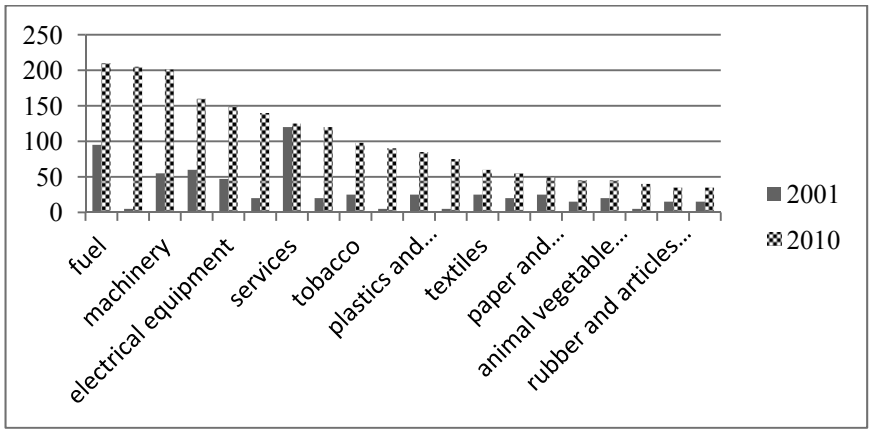
**Figure 1: Malawi's main exports by value, $ million**




**Source:** www.trademap.org. Total exports stood at $493 million in 2001 and $1,208 million in 2010.

Figure 1 shows that while tobacco is an important export crop, tea, sugar, services and mining sectors are coming up as important for exports. On the import side, shown by Figure 2, it appears that fuels, fertilizers, machinery, vehicles, electrical equipment, pharmaceuticals and services were among the major streams of imports into Malawi. An important reason behind the burgeoning trade deficit in Malawi is its lack of industries to manufacture any of the frequently imported goods and services.

**Figure 2: Malawi's main imports by value, $ million**




**Source:** www.trademap.org. Total imports rose from $733 million in 2001 to $2,299 million in 2010.

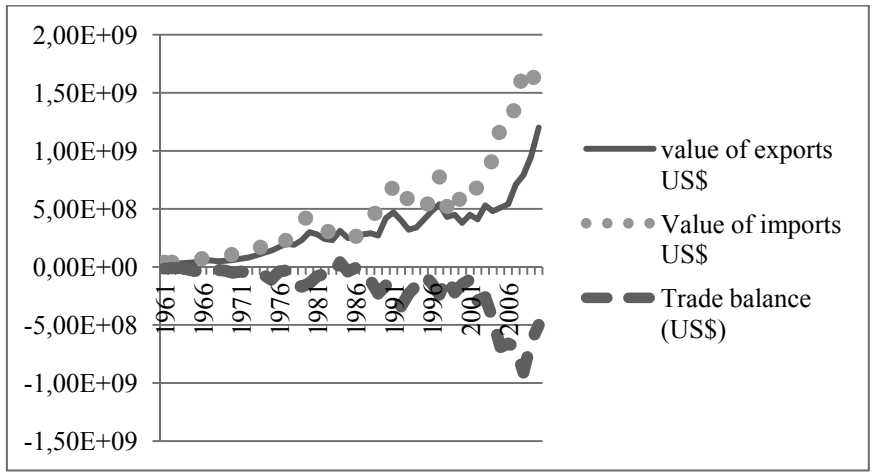
That the fertilizer import bill was large in 2010 is not surprising. The FISP has claimed a lot of resources and has constituted at least 30% of the agricultural budget and in 2012 the proportion of the agricultural budget that went to the FISP rose to 57% (Ministry of Trade and Industry, 2012). It ought to be noted however that the percentage of Overseas Development Assistance (ODA) to agriculture, has averaged only about 8 percent over the entire FISP implementation period, which underscores the importance of national monetary policy on imports.

The Malawi Growth and Development Strategy (MGDSII) highlights the importance of export promotion and diversification in a bid to reduce the balance of payment problems that Malawi is facing currently. It is also noted that 'increased industrial activities are critical for generating employment opportunities, expanded manufacturing base, enhancing value addition and diversifying exports' (Ministry of Trade and Industry, 2012).

Against this background, this paper's objectives were to find out if there is an empirical link between international trade and incomes and if so, what needs to be done in malawi to ensure that trade is enhanced and incomes are enhanced.

Malawi's imports have soared since the 1960's and at present the trade balance has worsened further as exports have stagnated relative to imports. The Figure 3 shows inter-temporal trends in balance of trade, exports and imports and the gap between imports and exports over time is conspicuous.

**Figure 3: Trends in Exports, Imports and Trade Balance for Malawi**




**Source:** Author's computation based on World Bank data (2012)

The worsening trade balance may be attributed to inefficiencies on the supply side of the economy, high population growth that stimulates demand and at least after the 1990's, imports increased sharply owing to the depreciation of the South African rand relative to Malawi Kwacha (see SADC, 2007). This is an important issue because South Africa is Malawi's single most important trading partner in the region. To put it in perspective, Malawi gets almost 40% of its imports from South Africa, which in turn buys 12% of Malawi's exports (SADC 2007). The supply side of the economy has not seen any radical changes in technology and continues to grow at a lower rate over time. Such slow growth has trailed the growth in imports.

The trend in Figure 3 is worrisome for two reasons: (1). If the trend continues such that exports forever trail imports, Malawi will continue to face foreign exchange problems, (2). If indeed it is the case that exports and economic growth have a longrun relationship, there is cause for concern because poor export performance will impact economic growth negatively. It should also be noted that as tobacco revenues, accounts for about 60 percent of total export revenues, the 2010 tobacco price shock caused severe balance of payments problems (see Pauw et al., 2013), which partly explain the further deterioration of the trade balance that year. In 2011, the external debt due to the balance-of-payments was 16.8% of the GDP. This paper seeks to investgate whether exports and economic growth are tied in a long run relationship in the case of Malawi.

Export growth is often considered to be among the main determinants of production and employment growth of an economy (Ramos, 2001; Raju and Kurien, 2005). The said causal relationship is often called the export-led growth (ELG) hypothesis (Ramos, 2001). The proponents of ELG thesis argue that export promotion, for example through policies such as export subsidies or exchange rate depreciation could be good for the growth of incomes (Mishra, 2011).

The ELG hypothesis appears to be substantiated on the grounds that through the foreign trade multiplier, export growth leads to an expansion of production and employment, whereas the foreign exchange made available by growth in export earnings permits the importation of capital goods which, in turn, increases the production potential of an economy (see Ramos, 2001). It is argued that competition in international markets could promote economies of scale and increases efficiency by concentrating resources in sectors in which the country has a comparative advantage (see Mishra, 2011).

The volume of, and the competition in export markets yield economies of scale and an acceleration of technical progress in production (Ramos, 2001). Lastly, given the theoretical underpinnings so flagged, the observed strong correlation of export and production growth is interpreted as empirical evidence in favour of the ELG hypothesis (see Ramos, 2001; Raju and Kurien, 2005).

The relationships between economic growth and exports is well treated in literature (Ramos, 2001), but the lack of consensus on the long-run and short run relationships between incomes, exports and imports implies that the relationships may be context specific (Ramos, 2001). On the Malawian scene, studies that purport to achieve this are hard to find and undoubtedly this study could have policy implications and could add to the general debate on export orientation strategies in development policy with the unique case study of Malawi.

As a case under study, Malawi stands out as a unique case where perhaps the potential policy gain from these studies is the highest especially now because of the many foreign exchange problems that the country faces. At present the Malawi economy is facing difficulties to grow and foreign exchange is often unavailable due to lack of enough exports in the midst of enormous increases in demand for imported goods. Studying the export-economic growth issue for Malawi alone, stimulates the curiosity in the topic among scholars and policy makers and has the potential to add value to economic development policy processes in Malawi.

In order to unravel the importance of exports and imports to incomes, we follow Ramos (2001) and argue that a test for long-run and short-run relationship among these variables is important. As in Ramos (2001) this study applies the theory of co-integration developed by Engle and Granger (1987) Johansen (1988), Stock and Watson (1988) and Johansen and Jesulius (1990) to examine whether Malawi's exports, imports and incomes all in real terms (2000 was the base year), for the period 1961 to 2010 were co-integrated. Unlike in Ramos (2001) and other previous authors, the paper goes further to employ impulse response functions as well as error variance decomposition techniques to confirm the dependence between the variables in subject thereby achieving the main purpose of this paper.

The rest of this paper is organized as follows. The next section discusses the in brief the relationships between the variables under study, while the subsequent sections 3 and 4 present the methodologies, results and conclusions in that order.

## 3. Literature Review

### 3.1 The relationship between exports, imports and income

The relationship between the overseas sector and GDP can be thought of as threefold namely; export-led growth, growth-driven exports, and the two-way causal relationship that may be termed feedback (see Ramos, 2001) and are discussed below:

### 3.2 Export-led growth

The work by Balassa (1978), Michaely (1977), Feder (1982), Marin (1992) , Thornton (1996) as well as Nasreen (2011) provide evidence of export-led growth in that they found that countries exporting a large share of their output seemed to grow faster than others. This is also evident in Chow (1987) who concluded in his study that his findings supported the export-led growth strategy in that expansion in exports not only promoted the growth of national income but also led to structural transformation of the developing countries.

The growth of exports has a stimulating influence across the economy as a whole in the form of technological spill-overs and other externalities (Ramos, 2001). But Mishra (2011) investigating the relationship in India using data for the 1970 to the 2009 period, rejected the ELG hiypothesis.

Grossman and Helpman (1991), Rivera-Batiz and Romer (1991), Romer (1990) appear to suggest that an increase in intra as well as extra-regional trade increases the number of specialized inputs, increasing growth rates as economies become open to international trade (see Ramos, 2001). This is also evident in Chow (1987) and Balassa (1978) and Esfahani (1991) who concluded in their study that export promotion was particularly important for countries with insufficient access to foreign aid and /or capital. Although controversies still rage in this area of research, with Jung and Marshall (1983) and the others such as Love and Chandra (2005) and Dodaro (1993) finding no evidence, it appears that a majority of studies succeed in confirming the export-led growth hypothesis although studies of this kind are rare in Southern Africa.

Shabbaz (2012) investigated the effect of trade openness on economic growth in the long run using the familiar ARDL approach to co-integration. The analysis showed that in the long run, trade openness promoted economic growth and this hypothesis was also upheld by VECM Granger causality test as well as by innovation accounting. On the other hand Shabbaz et al. (2011a) examined the exports-led growth hypothesis using quarterly data over the period 1990-2008 in case of Pakistan. In their study, Ng-Perron unit root test, ARDL bounds testing approach to cointegration and error correction method (ECM) for short run dynamics were employed to test the hypothesis of export-led growth and the results showed that exports were positively correlated with economic growth confirming the validity of exports-led growth hypothesis. Exchange rate depreciation slowed down economic growth. In some way, these results supported Shabbaz et al. (2011), Shabbaz and Rahman (2012), as well as Shabbaz and Rahman (2010) who found that Foreign Direct

Investments (FDI), a proxy of a country's openness, was a promoter of economic growth, at least in Pakstan.

### 3.3 Growth-driven exports

The counterargument of the ELG thesis relies on the notion that gains in productivity give rise to comparative advantages in certain sectors that lead naturally to export growth (see Raju and Kurien, 2005). Also, countries with high growth rates and relatively low absorption rates should export the excess output (see Raju and Kurien, 2005). Indeed as noted by Bhagwati (1988) an increase in GDP often leads to an expansion of trade, unless the pattern of growth-induced supply and corresponding demand creates an anti-trade bias (see Ramos, 2001).

The neoclassical theory of trade stresses the causality that runs from home-factor endowments and productivity to the supply of exports (see Findlay, 1984; Ramos, 2001; Raju and Kurien, 2005). Using the Johansen co-integration procedure, Love and Chandra (2004) found evidence to support export-led growth hypothesis both in the short-run and the long-run with annual data from Pakistan although applying similar procedures to Pakstan data for different years gave no evidence of co-integration using Granger tests (Love and Chandra, 2005). The evidence also appeared elusive in Dodaro (1993) and in Leitão (2012) who showed that economic growth was highly correlated with all measures/indicies of globalization (trade).

### 3.4 Feedback

Bhagwati (1988) and Ramos (2001) further notes that there may be a bidirectional causal relationship between economic growth and exports because increased trade produces an increase in GDP, whereas more income leads to trade expansion. These arguments appear to have also been noted widely by Grossman and Helpman (1991) in models of north-south trade. Other studies by Bahmani-Oskooee and Alse (1993) further reveal evidence of bidirectional causality between output growth and export growth.

Again, Nasreen (2011) examined the export-growth linkages for Asian countries for the period 1975-2008 using panel unit root tests among other strategies and generally found bidirectional causality between exports and economic growth. Their heterogeneous causality hypothesis showed that the causality run from economic growth to exports in case of Pakistan, Sri Lanka and Indonesia and from exports to economic growth in Malaysia and Thailand. But bidirectional causality also was established in cases of India, Sri Lanka and Indonesia whereas a neutral relationship was found in case of Bangladesh (Nasreen, 2011).

## 4. Methodology

In the presence of the highlighted theoretical possibilities regarding the relationships between GDP and exports, it appears that this is an empirical question. The present

investigation proceeds by examining the time-series properties of the data, undertaking a systems co-integrating analysis, and examining Granger causality tests.

### 4.1 The data

The data constitutes annual observations on real GDP, real exports, and real imports for Malawi, sourced from the World Bank's African Development Indicators section and supplemented with the Malawi National Statistical Office data where needed. Annual data on all variables are available from 1961 to 2010.

Plots of the logarithms of the three time series are shown in Figure 4. Figure 4 demonstrates that the natural logarithms of real GDP, (LogY), the real exports (logX), and the real imports log (M), exhibit strong upward trends which provide qualitative evidence that the three series tend to move together. Summary statistics of GDP (Y), Exports (X), and Imports (M) indicate that these variables have means equal to US$8380 million, US$312 million, US$489 million with associated standard deviations of US$3,740 million, US$246 million, US$436 million, respectively. See Table 1 below

**Table 1: Descriptive Statistics**

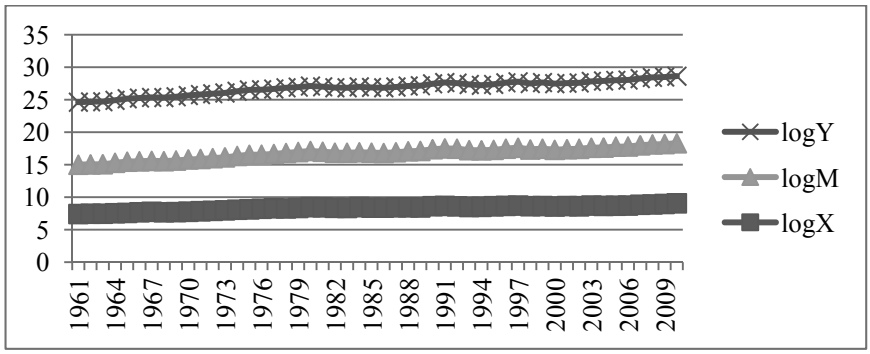
| Variable | Obs | Mean (US$) in Millions | Std. Dev. (US$) in Millions |
|---|---|---|---|
| Imports (M) | 50 | 489 | 436 |
| Exports (X) | 50 | 312 | 246 |
| GDP (Y) | 50 | 8380 | 3740 |

### 4.2 Testing for integration

It is important in multivariate time series analysis to run regressions with similar orders of integration to avoid getting spurious results (Gujarati, 2005). Univariate analysis of each of the three time series real GDP, real exports, and real imports was carried out by testing for the presence of a unit root in order to check for stationarity of the variables. This was achieved using the Dickey-Fuller DF Unit root-tests (Dickey and Fuller, 1979), Phillips and Perron tests (1988) -tests as well as the Augumented Dickey Fuller AGDF tests for the individual time series and their first differences. The major results are shown in Table 2. The lag length for the ADF tests was selected to ensure that the residuals were free from autocorrelation.

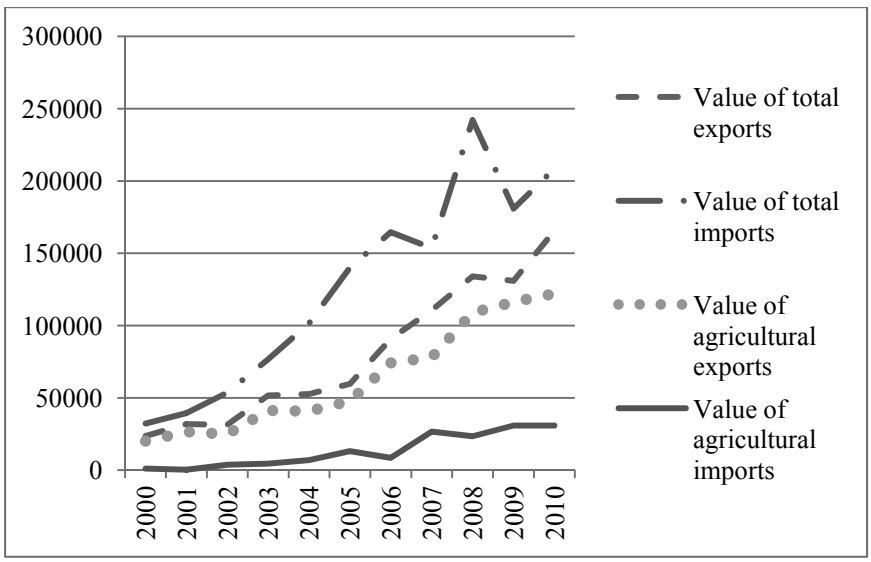
The results from the DF, ADF, DF-GLS tests and the Phillips and Perron PP tests show that none of the variables in their level form represents a stationary process. However the DF, ADF and PP tests applied on the first differences of the three variables confirm that there were stationary and hence presenting some evidence that the series were integrated of order 1i.e. $I(1)$.

**Figure 4: Co-movement of the logY, logM and logX series**



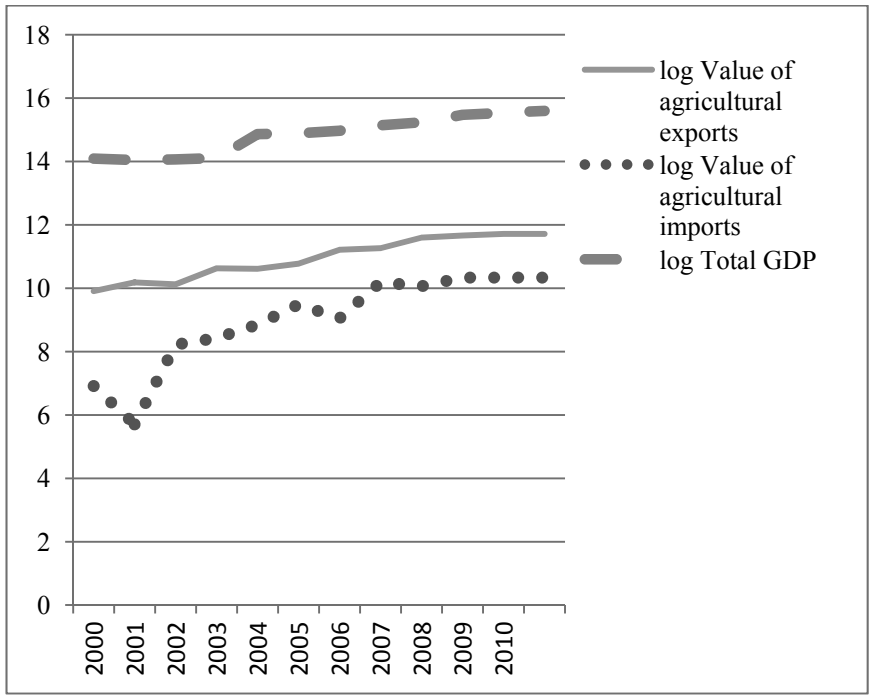

**Source:** Authors computations from World Bank Data

**Figure 5: Co-movement between agricultural trade and total trade variables (million kwacha)**




Data Sources (ReSAKSS-SA)

**Figure 6: Co-movements between GDP and agricultural trade variables**




Data Sources (ReSAKSS-SA)

The Figures 4 up to Figure 6 show that exports, gdp and imports follow each other quite closely. Moreover it is evident from the data from the Regional strategy Analysis and knowledge support system (ReSAKSS-SA) that agricultural exports and imports also follow the GDP curve quite closely too, which is not surprising considering that agricultural exports constitute a large share of Malawi's exports.

**Table 2: tests for orders of integration**

| | Single unit root (i.e. on levels) | | | | Second unit root (i.e. on changes) | | |
|---|---|---|---|---|---|---|---|
| Series | DF | ADF | PP | DFGLS | DF | ADF | PP |
| Y | -1.42 | -2.54 | -1.61 | -1.57 | -8.28*** | -5.71*** | -50.53*** |
| X | -1.71 | -1.94 | -1.66 | -1.28 | -6.89*** | -5.12*** | -42.98*** |
| M | -1.03 | -2.74 | -1.27 | -1.82 | -6.27*** | -4.82*** | -41.82*** |

***; **; * Imply significance at 1%, 5% and 10% levels respectively. The null hypothesis is unit root and so, significance implies stationarity; N=50.

In Table 2, considering that first differencing produced stationarity it may be concluded that each of the series Y, X, and M was integrated of order 1, *I*(1).

### 4.3 Testing for co-integration

The idea behind co-integration is that two or more variables have a long run relationship with each other (co-integrated) even if they may be individually nonstationary, their difference must be stationary (see Ramos, 2001). In the event that nonstationary variables have a nonstationary difference, it is said that they are not co-integrated and any bid to find a long run relationship between them will simply yield spurious results (see Gujarati, 2005; Greene, 2003). As per Ramos (2001) using the idea of a stochastic trend, one may wish to examine whether given variable series are driven by common trends (Stock and Watson, 1988) or whether they are co-integrated (Engle and Granger, 1987; Ramos, 2001). Testing for co-integration implies testing the following relationship (Ramos, 2001):

$$\sum_{j=1}^{3} \beta_{ji} z_{jt} = \varepsilon_{it} \ , \ i = 1,....,r \tag{1}$$

In equation (1) the $\varepsilon_{it}$ are *I(*0) series, although the *Zjt* are *I*(1) variables. Given the *I(*0) nature of $\varepsilon_{it}$, the long-run behaviour of *Zjt* (j=1,...3) is determined by 3-*r* common trends (Ramos, 2001). The question of how many co-integrating relationships and certain linear restrictions in a system of equations is normally tested using the approach proposed by Johansen (1988) and Johansen and Juselius (1990). The other way of testing for the long run relationship is to use what is known-as the residual based approach to co-integration (Gujarati, 2005) where the residuals of an Ordinary Least Squares (OLS) model are subjected to the univariate unit root tests as described previously. A rejection of unit root implies that the residuals are stationary and hence the variables associated with them are co-integrated/they have a long run relationship so that a permanent rise in another will yield a permanent rise in the other.

Tables 3 and 4 present the results obtained by the application of the residual based approach to co-integration and the Johansen's procedure respectively. Considering that the results from these tests are often sensitive to the lag order selected, the lengths of the Vector Autoregressive model (on which the tests were based) were chosen by minimizing the Akaike Information Criterion (AIC). Concerning the number of co-integrating vectors, *r*, the results from the Johansen's procedure support the existence of two co-integrating relations.

**Table 3: Residual based test for co-integration**

| Series | DF | PP |
|---|---|---|
| Residuals for logY | -3.54*** | -19.76*** |
| Residuals for logX | -2.90* | -14.27*** |
| Residuals for logM | -3.84*** | -24.39*** |

Significance: *** ; **, and * stand for signifcance at 1%, 5% and 10% levels respectively. This implies that residuals from the models of logged values of Y, X and M were stationary.

To establish if the variables are co-integrated, the ADF unit roots test was applied on the residuals from the three equations for Y, X and M show co-integration.

**Table 4: Johansen's co-integration tests**

| Hypothesized co-integrating H0 | Number of relationships H1 | Test statistic | | Critical values (95%) | |
|---|---|---|---|---|---|
| | | Max. eigenvalue | Trace | Max. eigenvalue | Trace |
| r=0 | r>0 | 26.6** | 22.51** | 20.30 | 29.68 |
| r<=1 | r>1 | 14.3** | 18.26** | 13.23 | 15.41 |
| r<=2 | r=3 | 3.00 | 1.17 | 3.5 | 3.76 |

Significance: *** ; **, and * stand for signifcance at 1%, 5% and 10% levels respectively
**Source:** Authors' tests using Stata 2012; N=50

The results suggest two co-integrating relationships implying a confirmation of previous residual based co-integration approach that the series under study have a long run relationship.

### 4.4 Granger Causality

The null hypothesis being that all coefficients of the lagged x in the first equation above is zero against an alternative that it's not zero. In this paper, implementation of Granger tests have been conducted in both Vector Auto regressive models (VAR) and Vector Error Correction Model (VECM) settings following Sims (1980) and Johansen and Jesulius (1990) respectively. The ECM-VARs for the three variables in subject are hence characterised as:

$$\Delta y = \alpha_{11}\varepsilon_{1,t-1} + \alpha_{12}\varepsilon_{2,t-1} + \sum_{l=1}^{m}\varphi_{11,l}\Delta y_{t-1} + \sum_{l=1}^{m}\varphi_{12,l}\Delta x_{t-1} + \sum_{l=1}^{m}\varphi_{13,l}\Delta m_{t-1} + u_1 \quad (2)$$

$$\Delta x = \alpha_{21}\varepsilon_{1,t-1} + \alpha_{22}\varepsilon_{2,t-1} + \sum_{l=1}^{m}\varphi_{21,l}\Delta y_{t-1} + \sum_{l=1}^{m}\varphi_{22,l}\Delta x_{t-1} + \sum_{l=1}^{m}\varphi_{23,l}\Delta m_{t-1} + u_2 \quad (3)$$

$$\Delta m = \alpha_{31}\varepsilon_{1,t-1} + \alpha_{32}\varepsilon_{2,t-1} + \sum_{l=1}^{m}\varphi_{31,l}\Delta y_{t-1} + \sum_{l=1}^{m}\varphi_{32,l}\Delta x_{t-1} + \sum_{l=1}^{m}\varphi_{33,l}\Delta m_{t-1} + u_3 \quad (4)$$

The symbols $\Delta y$ , $\Delta x$ , $\Delta m$ , $\varphi_{ij}$ , $\alpha_{ij}$ , $\varepsilon_{ij}$ $m$ and $u_i$ stand for the change in log of real income, change in log of real exports, change in log of real imports, adjustment parameters, speeds of adjustment, error correction terms and disturbance terms respectively. The Granger Causality results are based on the following model

$$\Delta y_t = \sum_{l=1}^{m} \varphi_{11,l} \Delta y_{t-1} + \sum_{l=1}^{m} \varphi_{12,l} \Delta x_{t-1} + \sum_{l=1}^{m} \varphi_{13,l} \Delta m_{t-1} + u_{1t} \quad (5)$$

$$\Delta x_t = \alpha_2 + \sum_{l=1}^{m} \varphi_{11,l} \Delta y_{t-1} + \sum_{l=1}^{m} \varphi_{12,l} \Delta x_{t-1} + \sum_{l=1}^{m} \varphi_{13,l} \Delta m_{t-1} + u_{2t} \quad (6)$$

$$\Delta m_t = \alpha_3 + \sum_{l=1}^{m} \varphi_{11,l} \Delta y_{t-1} + \sum_{l=1}^{m} \varphi_{12,l} \Delta x_{t-1} + \sum_{l=1}^{m} \varphi_{13,l} \Delta m_{t-1} + u_{3t} \quad (7)$$

It has to be said however that since the variables herein are cointegrated, the Granger Causality results may be somewhat misleading because a standard assumption that must be met for Granger causality to be valid is that the variables ought not be con-integrated (see Engle and Granger, 1987; Georgantopoulos and Tsamis, 2012). In view of this, this results should be interepreted with caution. Fortunately though, in this paper these Granger causality results are supported highly by the results of the error correction models as well as the qualitative evidence ensuing from the inpulse response functions, as will be appreciated uponexamining the sections below.

### 4.4.1 Causality results from the standard Vector Auto-Regressive (VAR) model

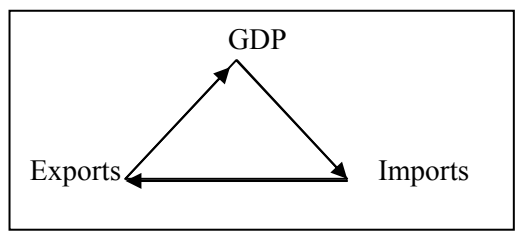
**Table 5: Granger causality Wald tests**

| Equation | Excluded | Chi2 | df | prob > chi2 |
|---|---|---|---|---|
| DlogY | DlogX | 6.2** | 2 | 0.05 |
| DlogY | DlogM | 2.3 | 2 | 0.30 |
| DlogY | ALL | 11.4** | 4 | 0.02 |
| DlogX | DlogY | 0.89 | 2 | 0.63 |
| DlogX | DlogM | 7.1** | 2 | 0.03 |
| DlogX | ALL | 12.5*** | 4 | 0.01 |
| DlogM | DlogY | 5.5* | 2 | 0.06 |
| DlogM | DlogX | 1.5 | 2 | 0.46 |
| DlogM | ALL | 8.3* | 4 | 0.08 |
| Autocorrelation Test | Lagrange Multiplier | Ch2=6.87 Prob>chi2 =0.65 | | |
| Residual normality test | Kurtosis | Chi2=3.52 Prob >Chi2 =0.32 | | |
| VAR-stability | All Eigen-values lie in unit circle | | | |

DlogXi stand for change in the log of variable i. N=50; estimator;oLS
Significance: *** ; **, and * stand for signifcance at 1%, 5% and 10% levels respectively

Table 5 above shows results from the Granger Causality framework. Because the results of the granger causality tests partly depend on stationarity or lack thereof for the variables being tested Adamopoulos (2010) and Georgantopoulos and Tsamis (2012), the results reported above are based on changes in the variables for income, exports, and imports. The results suggest unidirectional causality between changes in exports and changes in income confirming the export-led growth hypothesis. The results also show that changes in imports granger cause changes in exports possibly because being predominantly agrarian, Malawi has to import its factors of production (seeds, fertilizers, pesticides, as well as machinery for manufacturing industries and agriculture). Not surprisingly, an increase in GDP growth granger causes imports. This is again a true reflection of the Malawian economy where imports get stifled with economic downturns. The findings above can be summarized in the following diagram, where the arrows point to the variable being granger caused by the variable on the other end of the arrow.

**Figure 7: The relationships between GDP, Exports and Imports in Malawi**




From the diagnostic tests performed after the Granger methodology, it is clear that there are no problems associated with the model. The model residuals show normality and more importantly they are free from serial autocorrelation which is important for the results to be consistent and unbiased (Greene, 2003). Furthermore, all the eigenvalues associated with the estimation lie inside the unit circle so the VARs satisfy stability conditions (Greene, 2003) which is also important.

These results imply that exports are good for economic growth which makes intuitive sense as exports bring in foreign exchange which in turn is used for imports necessary for production and hence income growth. Growth itself is also important because it makes some sectors of the economy more competitive and hence economic growth appears to stimulate future exports (see Ramos, 2001). The import of high quality capital goods could expand the country's production possibilities. For example this may imply that imports allow the export sector to use more advanced technologies which subsequently lead to higher export activities (Ramos, 2001; Lee, 2010).

Exports may also have a direct effect on the expansion of income of a country Ramos, (2001). For instance, exports may lead to an improvement in efficiency by increasing competition and by allowing export sector to adopt more advanced technologies while on the other hand, addition of international markets to the domestic market allows firms

in the export sector to have higher capacity utilization and to enjoy greater economies of scale (Ramos, 2001). Higher income may encourage domestic firms to invest in the areas which can be used to increase the export capacity of domestic producers and to explore foreign markets (Ramos, 2001). In general, exports, imports and income of a country tend to reinforce each other directly or indirectly (Ramos, 2001; Lee, 2010), and appears so in the case of Malawi.

In the section that follows, we present some discussion and results of co-integration in the renowned Johansen framework (Johansen, 1990).

### 4.4.2 Granger-causality in the ECM-VAR

As in Ramos (2001), the number of co-integrating relationships presented in Table 4 will result in a corresponding number of residual series, and hence error correction terms ECTs, to be used in the subsequent VECM (see Ramos, 2001). The systems under study are anlogous to the following, where the error correction model must be seen as correcting towards an equilibrium which in the present case case has two dimensions (See Ramos, 2001). Table 6 presents results showing the short run elasticities for the relationship between GDP, exports and imports.

### 4.4.3 Results of the short and long elasticities from error correction models

**Table 6: VECM results showing short-run elasticities and adjustment parameters for the three equations**

| | $\Delta y$ (income) | | $\Delta x$ (exports) | | $\Delta m$ (imports) | |
|---|---|---|---|---|---|---|
| | | Std. Err. | | Std. Err. | | Std. Err. |
| _ce1 | | | | | | |
| L1. | -0.11** | 0.04 | -0.14* | 0.07 | -0.11 | 0.08 |
| _ce2 | | | | | | |
| L1. | 0.01 | 0.08 | 0.35** | 0.13 | -031* | 0.16 |
| logY | | | | | | |
| LD. | -0.34** | 0.13 | 0.02 | 0.25 | 0.27 | 0.29 |
| logM | | | | | | |
| LD. | 0.03 | 0.08 | -0.11 | 0.15 | 0.14 | 0.18 |
| logX | | | | | | |
| LD. | 0.25** | 0.09 | 0.04 | 0.16 | 0.16 | 0.18 |
| _cons | -0.01 | 0.01 | 0 | 0.02 | 0 | 0.02 |

*Imply significant at 10%, ** imply significant at 5% and ***, imply significance at 1%; ce1 an ce2 are error correction terms for the models; N=49; Estimator -OLS

The speeds of adjustment (error correction terms) for the GDP equation are -0.11, significant at 1%; and 0.01 which is not significant. This implies that, real GDP adjusts slowly following a shock in the system i.e. in imports, exports, or GDP. The short run adjustment parameters (elasticities) in the real GDP model are -0.34 for real GDP and is significant; -0.03 for imports and is insignificant and finally, 0.25 for exports and is highly significant at 1% level. This implies that shocks to exports have observable impacts to the GDP in the short run but this is not necessarily the case with respect to changes in imports (also see Bindu et al., 2011 for a similar interpretation). This supports the results from standard Granger causality results.

The results also show that in the short run, shocks to exports, imports and GDP do not per se cause observable changes in exports and imports, however once the shocks are experienced, the error correction terms associated with the adjustment process in imports are -0.11 (not significant) and -0.31 which is significant at 5% level. Exports adjust more quickly with error correction terms in the order of -0.14 and 0.36 both of which are significant.

From the results above, it seems that exports responds more / faster than real GDP and imports following a shock in the system in the short run.

The fast adjustment associated with exports is consistent with what is observed. Exports appear to increase more quickly when imports of inputs increase. The speeds of adjustment also show that exports adjust faster followed by imports and then incomes which appears intuitive.

In order to see which of the pairs of the three variables enter into a long run relationship (form co-integrating vectors), and study the long run coefficients, we present results from the Johansen's co-integrating equations in Table 7.

**Table 7: Johansen's Co-integrating equations**

| Beta | Coef. | Std. Err. |
|---|---|---|
| _ce1 | | |
| logY | 1 | . |
| logM | (omitted) | |
| logX | 0.55* | 0.31 |
| trend | -0.03** | .01 |
| _cons | -6.13 | |
| _ce2 | | |
| logY | (omitted) | |
| logM | 1 | . |
| logX | -0.75** | 0.11 |
| trend | -0.01** | 0.003 |
| _cons | 0.69 | |

Significance: *** ; **, and * stand for signifcance at 1%, 5% and 10% levels respectively N=50

From the Johansen's procedure, there are two co-integrating relationships confirmed namely: The first one is that of (logY +0.55logX-0.03 trend- 14.22) implying that GDP and exports are co-integrated in the long run and that the relationship runs from exports to the GDP in other words exports are good for economic growth (export-led economic growth). This is consistent with the previous findings from other studies and from the Granger causality test results presented earlier.

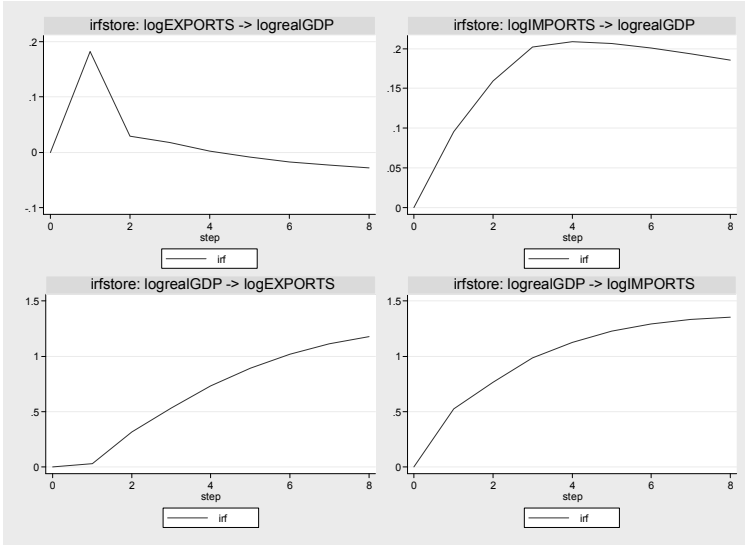
The second long run relationship is that of imports and exports i.e. (LogM- 0.75logX -0.01trend -2.02) implying that there is a long run relationship between imports and exports that runs from exports to imports. Although this results does not per se affirm the granger causality results, it is clear that exports and imports enter a long run relationship in the long run.

The Johansen procedure shows that in the long run a permanent one per cent increase in exports leads to about a half (0.55) per cent increase in real GDP in Malawi, while GDP influences imports. These results in general support the granger causality results that highlighted a Granger causal relationship between imports, exports and GDP and are also in concord with the residual based co-integration results. Again, the results augur very well with the actual Malawi economy whose foreign exchange generation is mainly dependent on export earnings as the reserves are thin and the economy often faces short term foreign exchange problems. There is also no evidence of import-led growth in the long run and in the short run imports appeared to have insignificant impacts albeit adverse ones, which is not a strange finding in the literature associated with these studies. In general the three variables under study are all interdependent as they potentially impact on each other in some degree.

A test of the VECM stability following the Eigen value criterion shows that the model was stable as all Eigen values lied within the unit cycle.

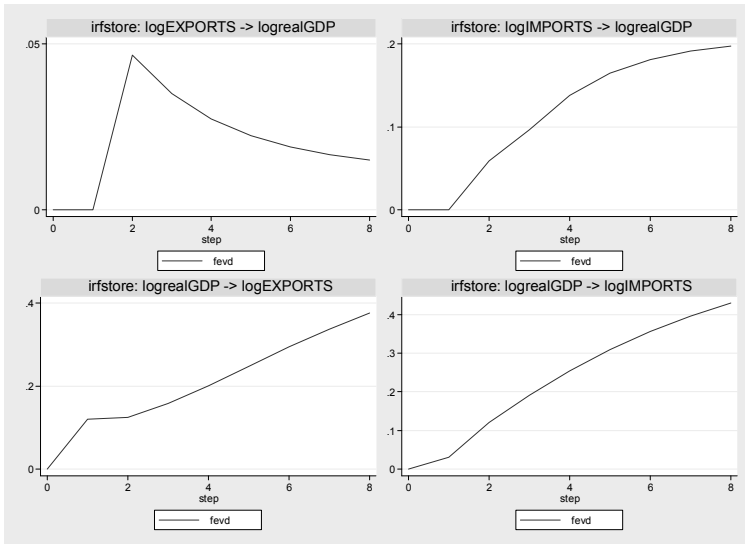
The results from co-integration affirm the long run relationships between some pairs of the three variables. The figures below present some graphs that show some qualitative evidence of the links between pairs of the variables under study. The error variance decomposition procedures are a powerful way of understanding the causality between endogenous variables (see Nkoro and Uko, 2012)

**Figure 8: Impulse Response functions for the three variables**




**the arrows in the headings originate from the impulse variable and point to the variable that responds. E.g. the first part of the figure presents a response of real GDP following a shock to exports. The other tables can be understood the same way.irfstore: stand for impulse response function; step stands for period of prediction; irf is impulse response function*

**Figure 9: Cholesky Forecast Error Variance Decomposition**




**the arrows in the headings originate from the impulse variable and point to the variable that responds. E.g. the first part of the figure presents a response of real GDP following a shock to exports. The other tables can be understood the same way. irf is impulse response function; fevd stands for forecast error variance decomposition*

The general qualitative story coming from the two graphs above is that incomes, exports and imports have some level of interdependence in the long run. Combining these qualitative conclusions with the findings from co-integration tests performed using Granger methodology and the Johansen's procedure, it is clear that international trade is good for income growth and should be encouraged. Policies that seek to remove inefficiencies from the extra and intra-regional agricultural markets, including high tariffs, import duties, and other forms of trade barriers (Non-Tariff Barriers) may not *per se* be the solution as Malawi is already committed to the SADC Trade Protocol and other bilateral trade agreements in the region, such that agricultural trade barriers are generally very low (see SADC, 2007). However, the SADC region needs to ease some trade barriers against Malawi in the area of Malawi's manufactured goods.

## 5. Conclusions

The causality frameworks employed herein have led to the finding that export-led growth and growth-led imports are not rejected. An increase in exports in previous periods, lead to growth in income and imports whereas the in increase in imports in the previous period also leads to gains in exports and incomes. This makes sense for the Malawian economy as exports determine foreign exchange which is crucial for imports of goods used as inputs in agriculture, the main sector whose growth determines income growth. These findings provide evidence in support of export orientation and hence international trade is crucial for the growth of the Malawian economy. Policies that seek to facilitate trade between Malawi and other countries have to be encouraged. On the other hand, since it is clear that exports are good for economic growth, Malawi needs to increase the value of exports, and hence should invest in value addition and general agricultural production (modern seeds, inputs and water use technology) and post-harvesting technology among other things. The notion that this is the right time for radical structural changes on the supply side of the Malawi economy cannot be overemphasized.

Fortunately, the NES detailed in (NES, 2012), appears to be a step towards that direction. Malawi needs to diversify its export base as over reliance on tobacco appears precarious and unsustainable. There is need to think seriously about the FISP strategy in terms of its strategy (what should be subsidized cash crops or food crops, production and/or processing) sustainability as it is intricately linked to international trade and incomes. There is also need to think carefully about the exchange regime of the economy as it determines terms of trade and other important indicators such as trade balance.

Evidence on better exchange rate regimes for developing countries appear to show that less flexible exchange rates enhance better macroeconomic environment characterised by low inflation rates, higher economic growth and low interest rates., Very flexible exchange rates, on the other hand may stimulate exports, but the final economy-wide results are an empirical question because the resulting high inflation rates, economic contraction and higher interest rates (as is the case at present following the free float regime) erode

incomes, create uncertainty and deters economic progress at least in the short to medium term (see Harrigan, 2006).

Radical tructural change in the agricultural sector ought to take the form of introduction of modern/transgenic technology, mechnization, rural re-organziation and development of agroprocessing (value addition) at a larger scale to ensure agriculture can be commerce oriented other than subsistence as it currently is.

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