Original Research Article

Is export-led-growth hypothesis valid in Uganda? A cointegration and causality analysis (1960-2010)

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The Export Led-Growth paradigm received renewed attention following the highly successful East Asia export-led growth strategy during the 1970s and 1980s and especially when compared to the failure of import substitution policies in most of Africa and Latin America. Since 1998, Uganda adopted the export-led strategy as a means for promoting economic growth and development. Using annual time series data from 1960 to 2010, this study tested the validity of export-led growth under structural changes that have taken place in Uganda during the period under study. The study estimated the model in the statistical procedure of cointegration and Error-Correction Model (ECM). The study also tested causal relationships between total labour force and exports.The study found a long-run and unidirectional relationship from exports to economic growth only in the post trade liberalization model (1988-2010). The study found that trade liberalization had a negative but insignificant impact while total labour force Granger-causes total exports in the post-trade liberalization period only. It is therefore recommended that more effort be concentrated on increasing labour force and hence exports which cause economic growth. Further research is needed to determine the causes of diminishing contribution of exports to economic growth. It is also recommends that further opening of the economy be halted as this was found to retard the growth of the economy.

Keywords: Export-led-growth, economic growth, trade liberalization.

INTRODUCTION

There has been, for a long time, a debate regarding the significance of export growth and economic growth in both developed and developing countries. The theoretical case for the link between trade and economic growth, dates back to the classical economic theories by Smith (1776), who argued that international trade plays an important role in economic growth and that there, are economic gains from specialization and Ricardo (1817) who emphasized that trade is a positive-sum game and trade improves efficiency of resource utilization, which leads to more productivity, such that every nation achieves a higher level of national wealth that it could not achieve without trade. With time, the economic hardships that faced economies pursuing import substitution strategies led to export promotion strategies and this led to an Export Led-growth (ELG)

strategy in many nations.

In brief, the export-led growth became a basis for structural adjustment programmes whose components included trade liberalization in Uganda among other countries. Uganda has been on the full trade liberalisation path since 1988 (UNCTAD, 2008) which saw the introduction of a dual trade licensing system and suspension of duty exemptions on raw materials and capital goods (See Appendix I). Kilimani (2006) notes that along with this trade liberalisation there has been a marked improvement in the performance of the Ugandan economy with growth in real GDP averaging 5 percent since the launch of the economic recovery programme in the late 1980s.

Generally, empirical studies testing the relationship

between export growth and economic growth are both cross-country (Bbaale and Mutenyo, 2011) and country-specific (Emilio, 2001; Nuwamanya, 2004; Kilimani, 2006). In both current and past empirical studies, first, there has been disagreements among economists regarding the applicability and validity of the Export Led Growth theory. Secondly, there are mixed outcomes regarding the impact of liberalization on the economic performance of a developing economy like that of Uganda.

Uganda's economic growth can be viewed in periods which are characterised and differentiated by different political regimes as follows; the period immediately after the country's attainment of political independence; the period of political upheavals and economic uncertainties of 1970s and early 1980s and the period under the current regime which can be viewed as a period of economic reforms and stability that saw the introduction of the export -led growth in 1998.

The contribution of this research to this debate is to analyse the case of Uganda after recognising that cross-country studies fail to provide relevant country-specific information to policy makers, which is crucial for their development. It is also recognised that structural changes in economies, like that of Uganda, are inevitable and will change the relationships between exports, imports, total labour force and economic growth , an issue that past studies (Nuwamanya, 2004; Kilimani, 2006; Agasha, 2009; Bbaale and Mutenyo, 2011) have neglected in case of Uganda.

Theoretical framework

Early studies examining the relationship between exports and economic growth looked at the simple correlation between these two variables (for example see Michaely, 1977 and Heller and Porter, 1978). Another group of studies including among others Michalopoulus and Jay (1973) and Balassa (1978, 1985) test the hypothesis that exports promote growth by estimating aggregate production functions that included export growth as an explanatory variable for cross-sections of developing countries. The association between exports and output growth was established by looking at the sign and statistical significance of the coefficient of export growth. Although this method may be useful in examining the export-growth relationship, it provides no means of determining the direction of causality. Identification of the direction of the causal relation between these two requires an underlying theoretical model, whose validity is then tested by standard econometric techniques.

Later, improved studies examining the export-growth relationship go beyond looking at the coefficient of exports and address the issue of direction of association using techniques in the Granger (1969) framework (see Jung and Marshall, 1985; Chow, 1987; Kunst and Marin, 1989; Emilio, 2001). The test procedures adopted in these studies have certain advantages over the simple contemporaneous correlation-based tests that are usually employed to investigate the export promotion hypothesis. The use of information about temporal precedence in these test procedures enables them to examine the direction of causation.

There are studies that focus on the determinants of exports in an economy. In this case, they are based on the argument that export is an important factor in the development of a country and therefore, understanding its determinants helps policy makers to make informed decisions about improving exports. Among others, the most factors studied on are; Gross Domestic Product, Foreign Direct Investment, Terms of Trade, Real Exchange rate, Labour force, Capital, and Price level (foreign and domestic).

In these studies, Gross Domestic Product (GDP) is postulated to have a positive impact on exports. Kumar (1998) conducted a study on the determinants of export growth in developing countries and confirmed that GDP has a significant positive impact on volume of exports. He further reasons that higher-level production is the main cause of export expansion since surplus output can be vented in the international markets. Ngeno (1990) carried out a study on determinants of exports and one of his findings was that export growth is positively related to output level (GDP) since higher production leads to increased export volumes. In a more recent study, Agasha (2009) in his study about determinants of export growth rate in Uganda found out that the effect of GDP on export growth rate was significant. However, Agasha (2009) also reports that GDP was not statistically significant in the explanation of the export growth rate and it was made clear in this study that these results were in contradiction with a number of previous findings (for instance Musinguzi, et. al., 2000).

More recently, Bbaale and Mutenyo (2011) who considered a sample of 35 sub-Sahara African countries (Uganda inclusive) based on availability of data on the key variables, included capital goods imports into the Cobb-Douglas production function (with exports, GDP per capita, Labour force, credit to the private sector and government consumption as a percentage of GDP, and gross capital formation as a percentage of GDP) on the argument that they embody knowledge and technology that is productivity enhancing. They found out that a unit percentage increase in capital goods imports is associated with a growth of per capita income of about 0.03 percent and this effect is significant at the 1 percent level. Literature thus strongly supports the widely held theoretical view that capital goods imports, especially from technologically advanced countries, embody the most current knowledge and technology. They, therefore, enhance economic growth via their knowledge and technology-enhancing effect.

Despite the fairly-robust positive relationship between exports and economic growth found in previous studies

that employed cross-section regression type methods, many studies do not uniquely support the export-led growth hypothesis. The empirical evidence of studies, both earlier and recent, is rather mixed: some found no causality between exports and economic growth (Jung and Marshall, 1985; Ahmad and Kwan, 1991; Oxley, 1993), some found uni-directional relationships (Ghartley, 1993) and others found bi-directional relationships (Chow, 1987; Kunst and Marin, 1989).

The promotion of exports, it is believed, allocates resources according to comparative advantage, allows for greater capacity utilization, permits the exploitation of economies of scale, generates incentives for technical improvements and efficient management, and contributes to increase employment and all these positively affect economic growth (Balassa, 1978; Krueger, 1978; Jung and Marshall, 1985).

Economic theory offers many reasons to expect trade liberalization to stimulate economic growth. In the medium term, reaping the static (efficiency) benefits of trade could look rather like growth. In the long run, the potential positive forces include access to technology and to appropriate intermediate and capital goods; the benefits of scale and competition; the flexibility induced by relying on market signals, and the constraints on government incompetence or corruption (Winters*et. al.*, 2004).

There are many studies based on the orthodox supply tradition which explain the impact of trade liberalisation on economic growth in developing countries. Some investigations confirm that the countries that embarked on liberalisation programmes have improved their economic performance (Thomas *et. al.*, 1991; Weiss, 1992; Joshi and Little; 1996; Helleiner, 1994).

Some of these studies are multi-country. A Prominent cases in point are two studies, Dollar (1992) and Sachs and Warner (1995), that have been highly influential in forming the widely accepted view that countries with lower policy-induced barriers to trade experience faster growth, once other relevant country characteristics are controlled. On the other hand, other researchers have found little evidence to uphold the relationship between trade liberalisation and economic growth (see UNCTAD, 1989; Agosín, 1991; Clarke and Kirkpatrick, 1992; Greenaway and Sapsford, 1994; Shafaeddin, 1994; and Jenkins, 1996).

Using the two different methods developed by Sachs and Warner (1995) and Wu and Zeng (2008), UNCTAD (2008) found out that Uganda was liberalized in 1988 and 1998 respectively. This study focussed on 1988 since analysis found no structural break in 1998 for the case of Uganda. The study expected the dummy variable for trade liberalization to be statistically significant and have a positive coefficient basing on the economic theory.

METHODOLOGY

Our investigation of the impact of Ugandan exports and trade liberalization on economic growth begins with an examination of the normality and stationarity of the variables, undertaking systems of co-integrating analysis plus Granger-Causality tests basing on the Vector Error Correction (VEC) model. In order to check the structural stability of study variables, our analysis is performed over two sub-samples (restricted models) in addition to the full-sample (unrestricted model). The first sub-sample covers a period 1960-1987, which is a period before Uganda achieved full trade liberalization (UNCTAD, 2008). The second sub-sample covers a period 1988-2010, which is a period after Uganda achieved full trade liberalization.

This study used secondary data of time series nature that was obtained mainly from World Bank Tables, International Monetary Fund databases, and Uganda Bureau of Statistics (statistical abstracts). The variables that were used in this study are Real Gross Domestic Product (LGDP), Real Exports of goods and services (LEXPO), Real Imports of goods and services (LIMPO), Real Gross Capital Formation (LGCF), Total Labour Force (LLBR), Degree of Openness (LDOP), and Trade Liberalization (DUM88).

Model specification

The paper builds on Emilio (2001) who formulated an augmented growth model where he added exports to labour and capital (Gross Capital Formation) as variables that affect economic growth. The strength of this model is that the inclusion of exports, as an input, gives his model an alternative way of capturing total factor productivity growth. However, the weakness of this model is that, apart from the three variables he used, different studies found other variables that significantly affect economic growth of developing countries. For instance, Riezman et al., (1996) found imports, Henriques and Sadorsky (1996) found real exchange rates and others. This study adds other variables in particular imports, degree of openness of the economy and trade liberalization that may have significant influence on export-economic growth relationship in Uganda. Thus, the model specified in the linear logarithmic regression form is:

$$LGDP_t = \alpha_1 + \alpha_2 LEXPO_t + \alpha_3 LIMPO_t + \alpha_4 LGCF_t + \alpha_5 LLBR_t + \alpha_6 LDOP_t + \alpha_7 DUM88_t + \varepsilon_t$$
. (1)

Where: ε_t is the error term of the model

LGDP is natural log of real Gross Domestic Product
LEXPO is the natural log of real Exports of goods and services
LIMPO is the natural log of real Imports of goods and services
LGCF is the natural log of real Gross Capital Formation
LLBR is the natural log of Total Labour Force
LDOP is the natural log of Degree of Openness
DUM88 is the dummy variable for trade liberalization in Uganda since 1988 i.e. $DUM88_t = 1$ for $DUM88_t = 0$

and for $1960 \leq t \leq 1987$

The study therefore has incorporated a number of variables rather than the uses of bivariate approaches (e.g. export and imports) which some scholars such as Njikam(2003) have cited as being biased. These variables have been included in the model basing on the following arguments;

Economic growth

Economic growth as the change in GDP is the dependent variable and denoted as LRGDP.

Exports

Exports denoted as LREP in the model captures goods and non- factor services. Export expansion is a significant catalyst in improving productivity. Balassa (1985) argued that in general, once the production of export goods is focused on those economic sectors which are efficient helps to concentrate investment in sectors which increase overall total productivity of the economy. Additionally, exports may relieve the economy of the foreign exchange constraint, allowing capital goods to be imported to boost economic growth Therefore a positive sign between exports and economic growth was expected in this study.

Imports of goods and services

Imports have been used as one of the macroeconomic variables that may have an effect on the export-economic growth linkage. This is based on the argument of Riezman, et. al.,(1996) that imports are crucial in testing the ELG hypothesis in order to avoid producing a spurious causality results. Further importation of capital goods is necessary for enhancement of export and domestic production. Increase in imports however, may reduce the country's international reserves, thereby slowing down the economic growth (Serletis, 1992). Theoretically, a negative correlation is expected between imports and economic growth. Therefore, a negative sign/relationship between imports and economic growth was expected in this study.

Total labour force

Labour is considered to play a vital role in export-growth relationship. The neoclassical theory, stipulates that as the input (labour and capital) increases, total output increases. It was therefore, expected that labour force will have a positive relationship with economic growth. Kilimani (2006) used population growth as a proxy to the growth of labour force and he found that while labour force had a positive relationship with economic growth, this relationship was insignificant. Bbaale and Mutenyo (2011) found that labor force (total number of active) had a negative relationship with economic growth and it was significant at 5 percent level (model 1). This means that

even for Uganda, the impact of labour force can be either negative or positive and this study relied on the economic theory that assumes that any addition of labour force leads to an additional output as long as the country has not reached it maximum growth potential beyond which the law of diminishing factor productivity applies. This study therefore, expected that labour force will have a positive relationship with economic growth.

Gross capital formulation

The neoclassical theory, stipulates that an increase in capital as an input in production leads to increases in output. In his study on the impact of Uganda's trade liberalization on economic growth, Kilimani (2006) used an aggregated Cobb-Douglas production function in which he used Private Fixed Capital Stock as a proxy for Gross Capital Formation. He found that, the first difference of private fixed capital stock was positively significant at a one percent level and he concluded that this implies that a conducive environment for private capital formation through saving and investment can be a prerequisite for successful and steady growth of the economy and the trade sector.

Balassa (1978) dwells on an indirect argument linking exporting to economic growth. He argues that exporting activities generate foreign exchange that is required to import capital goods. Increase in capital goods imports in turn stimulate a country's capacity to produce and that this is more pronounced in developing countries that have an extreme disadvantage in the production of capital goods. In a more recent study, Bbaale and Mutenyo (2011) in their study on export composition and economic growth in Sub-Saharan Africa presented the productivity parameter in the Cobb-Douglas production function as being influenced differently by the different export components. We also include capital goods imports because they embody knowledge and technology that is productivity enhancing. It was therefore, expected that Gross Fixed Capital Formation will have a positive relationship with economic growth.

Degree of openness of the economy

According to Chang et al., (2005), openness promotes the efficient allocation of resources through comparative advantage, allows the dissemination of knowledge and technological progress, and encourages competition in domestic and international markets. This implies that openness was expected to have a positive impact on economic growth. Kilimani (2006) used the ratio of the sum of exports and imports to GDP as a proxy to degree of openness of Uganda's economy and he found that the coefficient of the openness indicator was significantly positive at the one percent level meaning that opening up the economy to international trade through the trade Liberalisation policy makes a positive and significant

Table 1. Augmented Dickey-Fuller tests for stationarity of study variables

	LGDP	LEXPO	LIMPO	LGCF	LLBR	LDOP
SECTION A: FULL PERIOD (1960-2010)						
Variables in Levels: Critical Values (-4.154 for 1% and -3.503 for 5%)						
ADF Test	-3.420	-1.821	-2.529	-2.480	0.363	-1.701
1st Differences: Critical Values (-3.568 for 1% and -2.922 for 5%)						
ADF Test	-5.360**	-5.896**	-7.328**	-7.104**	-5.662**	-6.667**
SECTION B: SUB-PERIOD (1960-1987)						
Variables in Levels: Critical Values (-4.355 for 1% and -3.594 for 5%)						
ADF Test	-2.019	-2.672	-1.951	-1.811	-0.403	-2.545
1st Differences: Critical Values (-3.708 for 1% and -2.980 for 5%)						
ADF Test	-4.204**	-5.141**	-5.881**	-5.179**	-3.909**	-4.787**
SECTION C: SUB-PERIOD (1988-2010)						
Variables in Levels: Critical Values (-4.417 for 1% and -3.622 for 5%)						
ADF Test	-4.425**	-2.399	-3.338	-3.098	0.109	-1.876
1st Differences: Critical Values (-3.749 for 1% and -2.997 for 5%)						
ADF Test	-3.440*	-3.094*	-4.302**	-4.630**	-5.483**	-5.282**

** and * denote that a test statistic is significant at the 1 and 5 percent levels of significance respectively. The lag length in the ADF tests range from 1-2 and are chosen using the AIC and SIC criteria

contribution to the performance of the economy.

Unfortunately, none of the benefits expected by all proponents of openness of economies is guaranteed, and some empirical studies have constructed models in which openness pushes countries into less dynamic sectors for example primary extraction and harms growth (see, for example, Rodriguez and Rodrik (1999). Therefore, ultimately the link between openness of the economy and its economic growth is an empirical matter and is country-specific.

It was therefore, expected that openness of the economy will have a positive relationship with economic growth on an account that openness increases trade and factor productivity of the domestic country

Data presentation and discussion of the findings

The results of the descriptive statistics of the study variables are presented in the appendix while the tests carried out on the data which included the normality test, stationarity test, multi-collinearity test, serial correlation test and the structural stability test are presented in the proceeding sections.

Stationarity of study variables

Analysis on every individual variable was carried out to investigate their respective stationarity properties using the Augmented Dickey-Fuller (ADF) tests. In this case, we tested the presence of a unit root for the study variables

both in their raw form and their first differences as shown in Table 1. The Table is divided into three sections with Section A showing full-time period 1960-2010, Section B showing period before Uganda's full trade liberalization (1960-1987) and lastly Section C showing period after Uganda's full trade liberalization (1988-2010). Using different methods (SIC and AIC), a lag length of 1 was chosen for ADF tests in order to have white-noise residuals.

For each of the periods, study variables are considered in their level modes as the natural logarithms of; (i) real GDP (LGDP), (ii) real total exports of goods and services (LEXPO), (iii) real total imports of goods and services (LIMPO), (iv) real gross capital formation (LGCF), (v) total labour force (LLBR), and (vi) degree of openness of the Ugandan economy.

Table 1, using ADF tests, shows that none of the variables represents stationarity process apart from LGDP in Section A. However, its graphical representation shows that it still has a trend thus differencing would make it stationary yet significant at 5 percent.

After taking the first difference of all study variables, they all appeared stationary at 5 percent level of significance for all time-periods meaning that each variable is integrated of order 1 i.e. $I(1)$.

Testing for structural or parameter stability

Since this study used a regression model involving time series data, tests were carried out in search of structural change in the relationship between the dependant variable
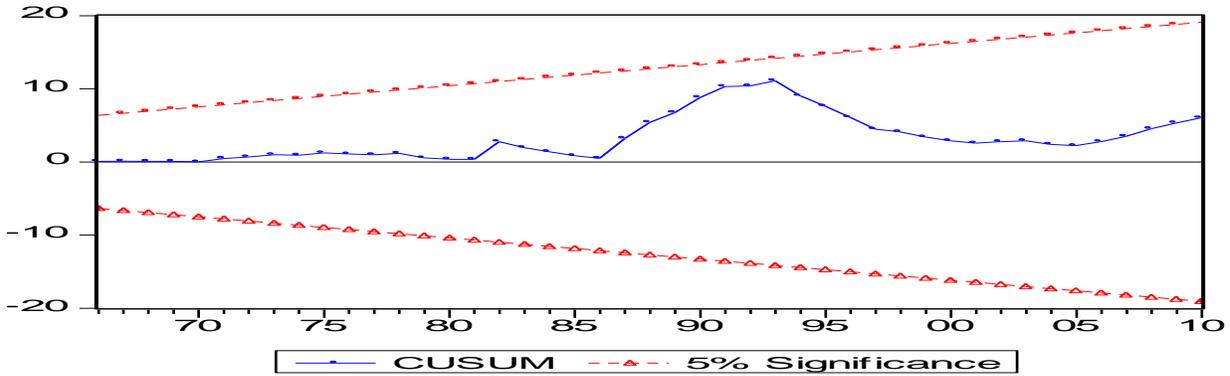
Figure 1: CUSUM Test for structural change in the regression model

Table 2. Structural change for 1988 and 1998 using Chow-breakpoint test

Chow Breakpoint Test: 1988			
F-statistic	9.271	Probability	0.000
Log likelihood ratio	45.204	Probability	0.000
Chow Breakpoint Test: 1998			
F-statistic	0.625	Probability	0.709
Log likelihood ratio	4.685	Probability	0.585

(for instance economic growth for this study) and the regressors of the study.

First, the CUSUM Test was employed to find the years of structural changes (if any) and Figure 1 shows the results.

From the graph in Figure 1, there is a clear indication that prior to 1970, there was no structural change and that major structural changes occurred in the period between 1981 and 2000. These findings are in line with UNCTAD (2008) where the study found that Uganda was trade liberalized in 1988 and 1998.

Basing on these findings, the study used the Chow-Breakpoint Test to determine if structural changes occur in the pre-determined years of 1988 and 1998. Results of the Chow-Breakpoint Test for both years are given in Table 2.

With a Null Hypothesis of "No Structural Change in 1988", the study finds enough evidence to reject this hypothesis and conclude that a structural change exists in 1988 with the P-Value of the F-Statistic of 0.000 which is highly significant at 95 percent confidence level. However, with a null Hypothesis of "No Structural Change in 1998", the study finds not enough evidence to reject this hypothesis and conclude that a structural change does not exist in 1998 (P-Value = 0.709 >0.05). Therefore, the study included a dummy for year 1988 only and neglected 1998 since there is no evidence of a structural change in that year.

Cointegration analysis

Quite often, the individual series used in the model could be non-stationary while their linear combination is stationary.

In the event of such a scenario, there is a possibility that the series are cointegrated, which further reveals that there is a long run relationship between the series. According to Gujarati (2004), economically speaking, two variables will be cointegrated if they have a long-term, or equilibrium relationship between them. In the words of Granger (1986), "A test for cointegration can be thought of as a pre-test to avoid 'spurious regression' situations". The fundamental equation for testing for cointegration using Johansen's procedure is as:

$$\Delta Y_t = \sum_{i=1}^{p-1} \left(\Pi_i \Delta Y_{t-1} \right) + \Pi Y_{t-p} + \varepsilon_t \quad \text{............. (2)}$$

Equation 2 represents the cointegration test where;

$$\Pi_i = -\left[I - \sum_{j=1}^{i} (A_j) \right] \text{is} \quad \text{trace} \quad \text{statistic} \quad \text{and}$$

$$\Pi = -\left[I - \sum_{i=1}^{p} (A_i) \right] \text{is Eigen value}$$

The key feature in Johansen's value is the rank (Π), which equals the number of independent cointegrating equations. The series will be tested for cointegration and if the tests confirm its presence, then an Error Correction Model (ECM) will be constructed, and later a parsimonious model of the series will also be developed.

The long-run relationship among variables in equation (2) is estimated using the Johansen cointegration technique. This technique is based on the vector autoregressive (VAR) models. We used three different sub-periods with one combination of variables to construct

Table 3. Tests for cointegration using Johansen procedure

Section A: full period model (1960-2010)				
Eigen Values	0.681	0.576	0.345	0.185	0.093
Hypotheses[a]	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	$r \leq 4$
L.R. Statistic	134.553**	78.521**	36.455	15.738	5.708

Cointegrating Equation A:

$$LGDP = 4.578 + 0.236 EXPO + 0.021 LGCF + 0.868 LIMPO - 0.405 LLBR - 0.958 LDOP$$
$$\quad\quad\quad (0.059) \quad (0.017) \quad (0.121) \quad (0.166) \quad (0.020)$$

Section B: first sub-period model (1960-1987)				
Eigen Values	0.884	0.843	0.776	0.433	0.317
Hypotheses[a]	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	$r \leq 4$
L.R. Statistic	169.015**	112.894**	64.730**	25.852	11.077

Cointegrating Equation B:

$$LGDP = 1.182 + 0.420 EXPO + 0.002 LGCF + 0.581 LIMPO - 0.035 LLBR - 0.995 LDOP$$
$$\quad\quad\quad (0.005) \quad (0.004) \quad (0.009) \quad (0.013) \quad (0.004)$$

Section C: second sub-period model (1988-2010)				
Eigen Values	0.956	0.886	0.835	0.711	0.628
Hypotheses[a]	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	$r \leq 4$
L.R. Statistic	214.005**	142.546**	92.699**	51.256**	22.720**

Cointegrating Equation C:

$$LGDP = 1.589 + 0.16 EXPO + 0.046 LGCF + 0.883 LIMPO - 0.177 LLBR - 0.941 LDOP$$
$$\quad\quad\quad (0.033) \quad (0.020) \quad (0.041) \quad (0.037) \quad (0.011)$$

[a] r is the hypothesized number of cointegrating vectors

* and ** denote rejection of the hypothesis at 5 percent and 1 percent significance level

three unrestricted VAR models. Section A represents Model 1, which is a VAR for full period from 1960 to 2010 using the variables for growth (LGDP), exports (LEXPO), imports (LIMPO), gross capital formation (LGCF), total labour force (LLBR), and degree of openness of the Ugandan economy (LDOP). These variables are used to Model 2 (sub-period 1960-1987) and Model 3 (sub-period 1988-2010) in Sections B and C (Table 3).

We present the results of the Johansen tests for cointegration for the three models with VAR lag length of 1 (one) in Table 2. Section A reveals that with data of full period (1960-2010), there are at most 2cointegrating equations meaning that the null hypothesis ($r \leq 1$) cannot be rejected. However, the LR test statistics show that the null hypothesis of "No Cointegrating equation" ($r = 0$) can be rejected at the 1 percent level. Thus, Ugandan economic growth, exports, imports, gross capital formulation, total labour force and degree of openness of the economy are cointegrated and a significant long run relationship exists among them for the period 1960-2010.

For both Section B (1960-1987) and Section C (1988-2010), the LR statistics indicate that the null hypothesis of no cointegrating vectors ($r = 0$) can be rejected at the 1 percent level. Consequently, economic growth, exports, imports, gross capital formulation, total labour force and degree of openness of the economy are cointegrated and a significant long run relationship exists among them for both the period before full trade liberalization and after.

The normalized equation that comprises all the variables in the model has been obtained from cointegration test are shown in Table 3 as Cointegrating equation A for full period 1960-2010, Cointegration equation B for sub-period 1960-1987, and lastly cointegration equation C for sub-period 1988-2010. The normalized cointegration equations (A, B and C) in Table 3 show that: coefficients of each variable have correct signs as predicted by theory in this study except for imports and degree of openness of the economy, which have positive and negative signs respectively that are opposite signs compared to what the theory predicts.

Findings show that real total exports are positively correlated to economic growth with estimated elasticities of 0.236. This implies that a 10 percent change in exports will lead to 2.4 percent change in economic growth. These results are significant at 5 percent level of significance. This result is similar to the findings of many researchers for instance of Ngeno (1990), Vohra (2001), Sentsho (2002), Broda and Tille (2003), and Musonda (2007) who found that exports positively affect the economic growth. However, the findings contradict findings by Musinguzi et. al., (2000) who assert that export growth does not affect economic growth rate. The disagreements might be a result of both timeframe (the period under study) and methodology employed in this study and by Musinguzi et al., (2000) who studied the case of Uganda more than a decade prior to this study. Since there are many changes regarding export promotion that have been made in

Uganda's economy, this might explain why this study findings disagree with Musinguzi et al.(2000) findings and this might be due to an improvement in the export sector over the last decade.

Considering the structural changes, whereas the impact of real total exports is positive for all periods, its positivity has significantly reduced from the elasticities of 0.42 in the period 1962-1987 to 0.16 in the period 1988-2010. This means that a 10 percent increase in total exports which would lead, on average, to a proportionate increase of 4.2 percent in economic growth before full trade liberalization, it now leads to only 1.6 percent increase in economic growth. This should be an eye opener to the policy makers that the contribution of exports to economic growth is positive but at a decreasing rate meaning that there could be necessary changes in the structure of exports to suit current and ever-changing international demands.

The estimated coefficient of imports entails that a 10 percent increase in real imports will lead to approximately 9 percent increase in GDP in the long term, assuming all other factors constant. Perhaps, positive sign for imports can be attributed to importation of capital goods, which were meant for the capital developments in Uganda. We find in the same results that, 10 percent increase in the real gross capital formation leads to an average increase of 0.2 percent in the economic growth in the long run. It should be noted that this positive contribution of imports has significantly increased from 0.581 before full trade liberalization to 0.883 after full trade liberalization.

Testing for causality

Gujarati (2004) noted that, although regression analysis deals with the dependence of one variable on other variables, it does not necessarily imply causation.

To provide light on this dilemma for the case of Uganda, this study examined the causal linkage between export and economic growth using Granger Causality Test. Based on F-statistics and t-statistics causality is determined for short and long term respectively. Null hypothesis implies non-causality while alternative means causality exists. Table 4 shows the results of the test.

The results in Table 4 show that, for the full-period model (1960-2010), there is not enough evidence to reject both the null hypotheses of "exports does not Granger cause GDP" and "GDP does not Granger cause exports" at (5%) significant level. This means that neither exports nor economic growth causes the other in the period from 1960 to 2010. Before Uganda attained full trade liberalization (1960-1987), findings reveal that economic growth Granger-caused exports while after attaining full trade liberalization, it is that exports Granger-cause economic growth and the converse is not true.

In addition,the study results in Table 4 show that, for the full-period model (1960-2010) and pre-trade liberalization for Uganda (1960-1987), there is not enough evidence to reject both null hypotheses of "exports does not Granger cause total labour force" and "total labour force does not Granger cause exports" at (5%) significant level. This means that neither exports nor total labour force causes the other in the two periods. However, in the period after trade liberalization (1988-2010), findings reveal that total labour force Granger-cause exports and the converse is not true. This implies that, in the current period of Ugandan economy, exports cause economic growth (GDP) but GDP does not cause exports. Hence export-led growth hypothesis is valid for the Ugandan economy. These results are consistent with the findings of Ghartley (1993); however, they are not consistent with findings of Dodaro (1993) and Onafowora et al., (1996) among others who found a bi-directional relationship between exports and economic growth. They are also not consistent with findings of Jung and Marshall (1985), Ahmad & Kwan (1991) and Oxley (1993) who found no causality relationship between exports and economic growth. The reason for these disagreements might be a result of country specific conditions since none of the above studies was specifically for Uganda and in the period from 1960 to 2010.

Error correction Model

Granger representation theorem puts it clear that if variables are cointegrated, there must be an Error Correction Model (ECM), which describes the short-run dynamics or adjustments of the cointegrated variables towards their equilibrium values. After confirming that the variables are cointegrated, this study estimated an ECM using the Vector Auto-regression (VAR) method.

Table 5 represents the ECM, which consists of two-period lagged cointegrating equation and the lagged first differences of the endogenous variables.

Results in Table 5 show that approximately 99 percent of the variation in economic growth is explained by the real exports of goods and services, real imports of goods and services, real gross capital formation, total labour force, degree of openness of the economy, and trade liberalization from 1988. The probability of the F-statistic is highly significant at 95 percent level of confidence, which is an implication of a very well-specified model.

The economic growth rate of the previous year does not significantly impact on the current year's economic growth rate. However, this effect is positive (0.027), which means that previous year's economic growth helps in the moving forward of the economy in the following year assuming all other factors constant.

The effect of export growth was positive and highly statistically significant. This finding is in line with that of Emilio (2001) who found out that in developing countries, exports significantly impacts on economic growth (output). Exports can explain not only cyclical changes in output (short-term) but also the long-term trend of output Emilio

Table 4. Testing for causality between exports and economic growth

Pairwise Granger Causality Tests for Full Period (1960-2010)			
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LEXPO does not Granger Cause LGDP	50	0.704	0.406
LGDP does not Granger Cause LEXPO		0.455	0.503
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LLBR does not Granger Cause LEXPO	50	2.649	0.110
LEXPO does not Granger Cause LLBR		1.856	0.179
Pairwise Granger Causality Tests for Sub-Period (1960-1987)			
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LEXPO does not Granger Cause LGDP	27	0.624	0.437
LGDP does not Granger Cause LEXPO		5.592	0.026*
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LLBR does not Granger Cause LEXPO	27	2.761	0.109
LEXPO does not Granger Cause LLBR		0.045	0.834
Pairwise Granger Causality Tests for Sub-Period (1988-2010)			
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LEXPO does not Granger Cause LGDP	23	7.259	0.014*
LGDP does not Granger Cause LEXPO		0.281	0.602
Null Hypothesis: (Lag 1)	Obs	F-Statistic	Probability
LLBR does not Granger Cause LEXPO	23	7.971	0.011*
LEXPO does not Granger Cause LLBR		4.183	0.054

* and ** denote rejection of the hypothesis at 5 percent and 1 percent significance level

Table 5. Error correction model

Dependent Variable: DLGDP		Method: Least Squares		
Sample (adjusted): 1963- 2010		Included observations: 48 after adjusting endpoints		
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.073	0.039	-1.851	0.074
DLEXPO	0.398	0.010	38.318	0.000
DLGCF	0.003	0.015	0.233	0.817
DLIMPO	0.571	0.022	25.571	0.000
DLLBR	2.784	6.832	0.407	0.686
DLDOP	-0.994	0.017	-57.34	0.000
DLGDP(-1)	0.027	0.217	0.125	0.901
DLEXPO(-1)	-0.014	0.087	-0.167	0.868
DLGCF(-1)	-0.027	0.015	-1.760	0.089
DLIMPO(-1)	0.007	0.119	0.058	0.953
DLLBR(-1)	-3.899	12.930	-0.301	0.765
DLDOP(-1)	0.027	0.216	0.126	0.900
DLGDP(-2)	-0.209	0.183	-1.144	0.261
DLEXPO(-2)	0.070	0.076	0.927	0.361
DLGCF(-2)	0.015	0.015	0.993	0.329
DLIMPO(-2)	0.105	0.104	1.007	0.322
DLLBR(-2)	3.638	7.222	0.503	0.618
DLDOP(-2)	-0.208	0.188	-1.107	0.277
DUM88	-0.002	0.004	-0.651	0.520
ECT(-1)	-0.795	0.276	-2.875	0.007
R-squared	0.997	Adjusted R-squared		0.996
S.E. of regression	0.011	F-statistic		667.071
Durbin-Watson stat	1.880	Prob(F-statistic)		0.000

(2001). The positive effect of exports implies that a 10 percent change in exports will lead to 4 percent change in economic growth. This result is similar to findings of many researchers for instance of Ngeno (1990), Vohra (2001), Sentsho (2002), Broda and Tille (2003), and Musonda (2007) who found that exports positively affect the economic growth. However, the findings contradict findings by Musinguzi et al., (2000) who assert that export growth does not affect economic growth rate. However, the previous year's export growth does not significantly affect

the current year's economic growth and this finding contradicts findings of Agasha (2009) who found that the previous quarter's export growth affects the current quarter's economic growth. This contradiction might be differences in methods used by Agasha (2009) and this study. First, whereas this study used annual data points, he transformed annual data into quarterly points, which could lead to automatic trend between variables. Secondly, the effects of export growth on economic growth found by Agasha (2009) are on a quarterly basis while in this study, they are on an annual basis.

The study found the growth of imports to have a positive effect with economic growth and this effect was highly statistically significant at 95 percent level. These results partly disagree with findings of Kagnew (2007) who found out that the effect of imports on economic growth is negative and statistically significant. The estimated coefficient of imports entails that a 10 percent increase in real imports will lead to approximately 5.7 percent increase in GDP in the long term, assuming all other factors constant.

The effect of gross capital formation (investment in capital assets) was positive even though it was not statistically significant in the explanation of the economic growth of Uganda. This result is in agreement with the findings of Musonda (2007) and Kagnew (2007) on the issue of positivity ofthe coefficient of gross capital formation but the results differ on the significance of the relationship between the growth of gross capital formation and economic growth.

The degree of openness of the economy (LDOP) in this study has a highly statistically significant negative effect (-0.994) on the economic growth of Uganda, which implies that a 10 percent increase in the degree of openness of Ugandan economy leads to a decrease of 10 percent in economic growth (GDP). The findings of this study are in line with Dollar (1992) and Sachs and Warner (1995), whose studies found that growth was negatively correlated with each of the two indices of openness used. These results are, however, in disagreement with findings of Chang, *et. al.,* (2005) who argued that an increase in degree of openness of the economy means that more is exported that improves foreign exchange position of the economy. This may mean that Uganda's economy has not yet reached the level where it is necessary to open more its economy since the openness has a negative long run effect on its economic growth.

Labour force growth has a positive coefficient (2.784), which shows the true picture regarding the theoretical importance of labour in the economic growth of Ugandan economy. This means that a 10% percent increase in labour force leads to an average increase of 28 percent in economic growth and these results are in line with findings of Emilio (2001) and Henrique and Sadorsky (1996). The study found a negative effect (-0.002) of trade liberalization (from 1988) on the economic growth of Uganda. This effect, however, was not statistically significant at 95 percent level

of confidence. For the insignificance of the effect of trade liberalization, the study findings are in line with Agosín (1991) and Clarke and Kirkpatrick (1992).

This study's result of negative effect of trade liberalization on Uganda's economic growth in comparison with economic theory might clarify the conclusion of Morrissey (2000) who concluded that not all countries will benefit equally from trade liberalization and some countries may not benefit at all while, at least in the short-run, liberalization is likely to impose costs on some developing countries. Furthermore, even when significant trade reforms are implemented, important constraints remain. Many countries face natural barriers to trade arising from geographical remoteness, especially if land-locked, and high transaction costs. In Uganda, for example, transport costs represent an implicit tax equivalent to 24 percent of value added of coffee exports (Milner et. al., 2000). The study findings are not in agreement with the findings of Kilimani (2006) who found a positive though weak and insignificant effect of trade liberalization on economic growth. The difference between these findings and Kilimani (2006) may be stemming from the different period of the study since he used data 1981-2005 while this study used period 1960-2010.

The negative coefficient of the Error Correction Term implies that there is a feedback mechanism in the short run. Table 5 also shows that the ECM is valid because the coefficient of error correction terms ECT(-1) is negative (-0.795). The coefficient of ECT1(-1) suggests that about 79 percent of deviation from long-run equilibrium is made up within two-year period. This therefore, demonstrates that any imbalances between the desired or actual level of economic growth is resolved or corrected within two years. In this case, long-run influences are given from the exports, imports, gross capital formation, labour force, degree of openness of the economy, and full trade liberalization. Further, the results indicate that in short run, explanatory variables that significantly influence economic growth are growth of total exports, growth of total imports, change in degree of openness of the Ugandan economy.

Conclusions

This study empirically examined the export-led growth hypothesis for Uganda considering the economic structural changes with emphasis on the attaining of full trade liberalization in 1988. The main objective was to analyze exports and economic growth and test the validity of the export-led growth strategy by analyzing the long run impact of exports on economic growth from 1960-2010.
The Granger-causality study findings suggest that the export-led growth hypothesis can be rejected for the full period model (1960-2010) and for the pre-trade liberalization model (1960-1987). However, there was no evidence to reject the export-led hypothesis for the post-

trade liberalization model (1988-2010.

In addition, economic growth has been influenced by factors such as exports, imports, gross fixed capital formation, labour force and degree of openness. Further, a uni-directional relationship between exports and economic growth has been found and this is consistent with the findings of Ghartley (1993).

The study found out that there is a feedback mechanism in the short run suggesting that about 79 percent of deviation from long-run equilibrium is made up within two-year period. This therefore, demonstrates that any imbalances between the desired or actual level of economic growth is resolved or corrected within two years.

Policy implications

The positive relationship between exports and economic growth indicates that an expansion of exports will lead to an increase in economic growth. But the study reveals that because of structural changes in the economy, the contribution of exports to economic growth has significantly reduced over time. In policy terms this implies that more effort be put on export growth as this will leads to increased economic growth which is necessary for economic growth. We recommend that there be more investment in research and development to establish the underlying cause of this decrease. This is the same for labour force which has the capacity to increase the rate of economic growth by 28 percent with a 10 percent increase and was found to Granger-cause exports only in the current era of post-trade liberalization. The study further recommends more efforts in improving the labour force for it causes exports and increases economic growth.

With causal relationships between exports, GDP and gross capital formation, it is important for the government to improve its capital on capital formation, which improves the quality and quantity of exports. The importance of improving the export sector cannot be more over emphasised for the Ugandan case since study finds evidence that it has capacity to solve unemployment. The study therefore recommends the use of resources available, including labour, to make value added or improve exports.

With a negative impact of trade liberalization and openness of the economy, the study recommends that further opening of the economy be halted for some time. This is because, any further opening of the economy leads to retardation of the economy.

Finally policy makers need to increase the pace of transformation of the agricultural sector and strengthen the sector's weak link to industry, where outputs from agriculture can be used as inputs in industries. Given that the sector employs 70% of the work force, doing so would spur equitable growth and reduce high unemployment.

Areas for further research

The positive uni-directional causality relationship between exports and economic growth in Uganda found by this study may also pave way for further research. Particularly other areas of study may especially examine the impact of export diversification (using different combinations for instance traditional visa-vie non-traditional exports, manufactured visa-vie agricultural raw exports) on economic growth for long periods spanning at least 3 decades.

REFERENCES

Agasha N (2009). Determinants of Export Growth Rate in Uganda 1987-2006, Scientific Programme/IPMS/0320.

Agosín MR (1991), Trade Policy Reform and Economic Performance: A Review of the Issues and Some Preliminary Evidence, UNCTAD Discussion Papers No.41, UNCTAD, Geneva.

Ahmad J, Kwan AC (1991). Causality Between Exports and Economic Growth, Economic Letters, 37: 243-248.

Balassa B (1978). Exports and economic growth: Further evidence, J. Dev. Econ., 5 (2): 181-189.

Balassa B (1985). Exports, policy choices, and economic growth in developing countries after the 1973 oil shock, J Dev. Econ., 4(1): 23-35.

Bbaale E, Mutenyo J (2011), Export Composition and Economic Growth in Sub-Saharan Africa: A Panel Analysis. Consilience: The J. Sustain. Dev. 6(1): 1–19

Broda B, Tille C (2003). Coping with Terms-of–trade shocks in Developing countries Current Issues in Economics and Finance 9:(11)

Chang R, Kaltani L, Loayza N (2005). Openness Can be Good for Growth: The Role of Policy Complementarities,NBER Working Papers 11787.

Chow PCY (1987). Causality between export growth and industrial development: Empirical evidence from the NICs,. J. Dev. Econ., 26 (1): 55-63.

Clarke R, Kirkpatrick C (1992). Trade Policy Reform and Economic Performance in Developing Countries: Assessing the Empirical Evidence, in Industrial and Trade Policy Reform in Developing Countries, R, Adhikari, C, Kirkpatrick and J, Weiss (eds), Manchester: Manchester University Press.

Dodaro S (1993): Exports and growth: a reconsideration of causality, J. Dev. Areas 27:227-44

Dollar D (1992). Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LDCs, 1976-85. Economic Development and Cultural Change 40(3): 523-544.

Emilio J (2001). Is the Export-Led Growth Hypothesis valid for Developing Countries? : Case Study of Costa Rica,Policy Issues in International Trade and Commodities Study Series No. 7

Ghartley EE (1993). Causal Relationship between Exports and Economic Growth: Cointegration and Causality evidence for Malaysia, Appl. Econ. 25:553-563.

Granger CWJ (1969), Investing casual relationships by

econometric models: Cross spectral methods, Econometrica 37:424-38.

Granger CWJ(1986) Developments in the Study of Co-Integrated Economic Variables,Oxford Bulletin of Economics and Statistics,. 48: 226.

Greenaway D, Sapsford D (1994), What Does Liberalisation Do for Exports and Growth?Weltwirtshcftliches Archive, 130 (1):152-174.

Gujarati ND (2004). Basic econometrics, 4th edition. McGraw-Hill, New York, U.S.A.

Helleiner GK (1994). Trade Policy and Industrialisation in Tabulent Times,Routledge, London and New York

Heller PS, Porter RC (1978). Exports and growth: An empirical re-investigation. J. Dev. Econ., 5(2): 191-93.

Henriques I, Sadorsky P(1996).Export-led Growth or Growth-driven Exports? The Canadian Case , Canadian J. Econ. 29: 540-55

Jenkins R (1996). Trade Liberalisation and Export Performance in Bolivia , Development and Change, 27(4):693-716

Joshi V, Little D (1996). India's Economic Reforms 1991-2001, Oxford University Press, Oxford

Jung WS, Marshall PJ(1985). Exports, growth and causality in developing countries, J. Dev. Econ., 18(1): 1-12.

Kagnew W (2007). Export Performance and Economic Growth in Ethiopia.

Keong CC Yusop Z, Liew V (2005) Export-Led Growth Hypothesis in Malaysia: An Investigation Using Bound Test.

Kilimani N (2006), The impact of Uganda's Trade Liberalisation policy on Economic growth. Uganda Programme on Trade Opportunities and Policy (UPTOP)

Krueger AO (1978). Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences. Cambridge, MA: Ballinger.

Kumar N (1998). Emerging outward foreign direct investment from Asian developing countries: prospects and implications, in N. Kumar, Ed., Globalization, Foreign Direct Investment and Technology Transfers (London and New York: Routledge), pp. 119-52.

Kunst R, Marin D (1989). On Exports and Productivity: A Causal Analysis, The Review of Economics and Statistics, MIT Press, 71(4):699-703.

Michaely M (1977). Exports and growth: An empirical investigation, Journal of Development Economics, 4, (1): 49-53.

Michalopoulus C, Jay K (1973). Growth of exports and income in the developing world: a neoclassical view, DP. 28, US Agency of International Development, Washington DC.

Milner C, Morrissey O, Rudaheranwa N (2000). Policy and non-policy barriers to trade and implicit taxation of exports in Uganda, Journal of Development Studies, 37 (2): 67-90.

Morrissey O (2000). Foreign aid in the emerging global trade environment. In F. Tarp, ed. Foreign aid and

development, London: Routledge, pp. 375-391.

Morrissey O, Rudaheranwa N, Lars M (2003), Trade Policies, Performance and Poverty in Uganda, ODI, EPRC and University of Nottingham.

Musinguzi P, Obwona BM, Stryker JD (2000). Monetary and Exchange Rate Policy in Uganda. African Economic Policy Discussion Paper, Number 23. Economic Policy Research Centre, Kampala.

Musonda I (2007). Is Economic Growth Led by Exports in Zambia Ministry of Finance, National Planning and Economic Management. Lusaka, Zambia.

Nakaweesi D (2009). The Daily Monitor, Tuesday, September 29, 2009, Pg. 30

Ngeno KN (1990). Comparative analysis of economic reform and structural adjustment programme in Eastern Africa with emphasis on Trade Policies. Technoserve/University of Nairobi, Technical Paper No. 19 and 20, Nairobi, Kenya.

Njikam O (2003). Exports and Economic Growth in Sub-Saharan Africa: Is There a Connection?Faculty of Economics and Management. University of Yaounde II, Yaounde

Nuwamanya M (2004). Determinants of economic growth in Uganda. An unpublished Master's Dissertation, Makerere University, Kampala, Uganda.

Onafowora OA, Owoye A, Nyatepe-Coo A (1996). Trade Policy, export performance and economic growth: evidence from sub-Saharan Africa, J. Int. Trade Econ. Dev. 5:341-360.

Oxley L (1993). Cointegration, Causality and Export-led growth in Portugal, 1865-1985,Economic Letters, 43:163-166.

Ricardo D (1817). Principles of Political Economy. London: John Murray, Albemarle-Street

Riezman RG, Summers PM, Whiteman CH(1996), The Engine of Growth or its Handmaiden? A Time Series Assessment of Export-led Growth, Empirical Economics, 21:77-113.

Rodriguez F, Rodrik D (1999). Trade policy and economic growth: A skeptic's guide to The Cross-National Evidence. Nber Working Paper No. 7081, April, National Bureau Of Economic Research, Cambridge, Ma.

Sachs J, Warner A (1995). Economic reform and the process of global integration. Brookings Papers on Economic Activity 1: 1-118.

Sentsho J (2002). Export Revenues as Determinants of Economic Growth: Evidence from Botswana

Serletis A (1992). Export growth and Canadian economic development, J. Dev. Econ. 38(1):133-45.

Shafaeddin SM (1994).The Impact of Trade Liberalisation on Export and GDP in Least Developed Countries, UNCTAD Discussion Papers No.85, UNCTAD, Geneva.

Smith A (1776). Wealth of Nations: Theory of Absolute Advantage. McGraw Hill companies, Inc., 2000

Thomas V, John N, Sebastian E (1991), Best Practices in Trade Policy Reform,Oxford University Press for the

World Bank, Oxford.

UNCTAD (1989). Trade and Development Report, UCTAD, Geneva.

UNCTAD (2008). Economic Development in Africa: Export Performance Following Trade Liberalization. Some Patterns and Policy Perspectives.United Nations publication, sales No. E.08.II.D.22. New York and Geneva

Vohra R (2001). Export and Economic Growth: further time series evidence from less developed countries. Int. Adv. Econ. Res., 7:345-350.

Weiss J (1992).A Trade Liberalization in Mexico in the 1980s: Concepts, Measures and Short-Run Effects, Weltwirtschaftliches Archiv, 128(4): 711-25.

Winters LA, Mcculloch N, Mckay A (2004). Trade Liberalization and Poverty: The Evidence so far. J. Econ. Lit 42(1): 72-115.

Wu Y, Zeng L (2008). The impact of trade liberalization on the trade balance in developing countries. IMF Working Paper WP/08/14. Washington, DC. IMF.

APPENDIX : Descriptive statistics of study variables

	LGDP	LEXPO	LGCF	LIMPO	LLBR	LDOP
Mean	21.788	19.846	19.724	20.196	15.825	-1.038
Median	21.892	19.557	19.543	20.085	15.808	-1.036
Maximum	23.557	22.131	22.119	22.486	16.612	-0.529
Minimum	19.863	18.496	17.621	18.340	15.066	-1.774
Std. Dev.	0.972	0.856	1.239	1.074	0.456	0.293
Skewness	-0.250	0.949	0.179	0.275	0.045	-0.249
Kurtosis	2.282	3.658	2.020	2.308	1.803	2.502
Jarque-Bera	1.629	8.587	2.310	1.658	3.059	1.053
Probability	0.442	0.013	0.314	0.436	0.216	0.590
Observations	51	51	51	51	51	51