Pakistan Journal of Social Sciences 6 (4): 219-223, 2009
ISSN: 1683-8831
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Export-Led Growth Hypothesis: Further Econometric Evidence from Nigeria

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Abstract: This study examines the export-led growth hypothesis for the case of Nigeria. In carrying out this task, the study investigates both the causal and dynamic long run nature of the relationship between economic growth and export by using annual time series data from Nigeria. These series include output (y), which is measured by gross domestic product, export value (exp), import value (im), exchange rate (exr), labour stock (lbr) measured in terms of labour force and capital stock (cap), which is also measured by gross capital formation, respectively. The data are expressed in their real forms. The data scope ranges from 1970-2006. The econometric procedure followed in this study is clear. The study employs the Toda-Yamamoto non-causality test and the Autoregressive Distributed Lag (ARDL) bounds testing cointegration technique. The unit root test result indicates that the variables are all stationary at first difference, i.e., they are I(1) series. Meanwhile, the result of Toda-Yamamoto non-causality test shows, a bidirectional relationship between output and export. The result of bounds testing cointegration analysis suggests a long run relationship among the variables when the vector of variables is normalized on output. All variables, with exception of capital, display high level of statistical significance in explaining output. Of special interest to this study is the long run relationship between output growth and export growth. The result is not invariant with economic intuition. For instance, with about 10% increase in the growth of export, there is a corresponding increase of about 35% in output growth. The adjusted R^2 of 0.79 gave an indication that the variables under consideration explain a high proportion of variation in output of about 79%. The findings as revealed in this study thus, support the export-led growth hypothesis for the case of Nigeria.

Key words: Export, growth, causality, bounds testing, cointegration, ARDL, export-led growth hypothesis

INTRODUCTION

Export-led growth hypothesis postulates a relationship between the growth of export and the economy such that export expansion becomes one of the main determinants of economic growth. This hypothesis holds that overall growth of different economies could be generated not only by increasing the amounts of labour and capital, but also by expanding exports. The significant relationship between export expansion and economic growth could also be traced down to the possible positive externalities caused by the involvement of different countries in the international trade. Different strands of empirical works have extensively stressed the importance of trade especially export expansion in the explanation of growth. To this end, various models have employed different variables such as the degree of trade openness, term of trade, tariff and exchange rate to verify the hypothesis that open economies grow more rapidly than those that are closed (Edwards, 1998).

Changes that have taken place in the fields of economic development and international trade in the last two decades, such as modification from inward-oriented policies to export promoting strategy, are believed to have been majorly responsible for the vast and extensive empirical literature concerning the relationship between trade and growth. How sustainable this trade policy (i.e., export promotion) is in terms of economic growth and development has been greatly debated. Export expansion or import substitution strategy has been advocated as a mean, by which countries especially the developing ones can evolve their own style of development and control their own destiny. This is because export expansion is believed to lead to better resource allocation, economies of scale, production efficiency through knowledge and technological transfer, capital formation, employment creation and thus, economic growth and development. Export promotion is also seen in most developing countries as a way of correcting imbalances in the external sector and at the same time assisting them in ensuring that their domestic economies made a full recovery.

In Nigeria, following the discovery of oil in a large commercial quantity in the early 1960, agricultural sector, which before had been playing significant role both in both domestic and external sectors became neglected. This therefore, led to a significant decline of agriculture in external sector performance. In 1986, following the International Monetary Fund (IMF) recommendation,

Fig. 1: Output and export growth rates in Nigeria (1970-2006)

Nigeria adopted the Structural Adjustment Policy (SAP) as a mean of economic liberalization. One of the main reasons for adopting SAP was to adjust and correct for imbalances in the basic macroeconomic indicators and also encourage a free market through policies that relied heavily on export expansion and/or import substitution approach(s).

As earlier said, there have been numerous theoretical and empirical studies directed towards investigating the relationship between trade (export expansion) and economic growth all with varying and sometime conflicting results. For instance, given the theoretical framework underlying the Export-Led Growth Hypothesis (ELGH henceforth), it is widely accepted among economists that economic growth is an extremely complex process, which, of course, depends on factors such as capital accumulation (saving), technological advancement, institutional framework, income distribution and even geographical characteristics. Meanwhile, ELGH simply postulates export-growth relationship. Thus, the inclusion of all or some of these factors in the analysis will eventually lead to different results hence, interpretations. Similarly, differences in the variables' definitions in the analysis of ELGH are also, a contributory factor why varying empirical evidences are established.

Figure 1 and 2 reveal, the significance of export in the Nigerian economy. As evident in Fig. 1, under the duration of time covered in this study (1970-2006), there exists a high and positive correlation between the growth rates of output and export. This is not surprising given the role of oil first in the domestic economy and also in the international market. Compared to the situation in 1970, when export percentage in output in Nigeria amounted to about 8%, the situation has changed drastically especially from 1987-2006. For instance, the percentage of export in output amounted to about 58% in 2006. This also points to the importance of export in the Nigerian economy.

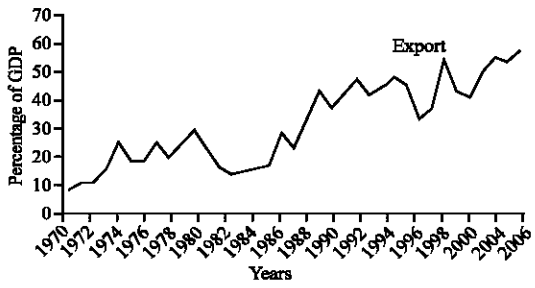

Fig. 2: Export as a percentage of output (1970-2006)

Having revealed a strong and positive correlation between the growth of export and output, the empirical evidence in this study also suggest a bidirectional causal relationship between the growth rates of the variables.

MATERIALS AND METHODS

Data definitions and sources: With the aim of examining the export-led growth hypothesis, this study shall employ Nigerian annual time series data from 1970-2006. These series include output (Y), which is measured by gross domestic product, Export value (EXP), Import value (IM), real Exchange rate (EXR), Labour stock (LBR) measured in terms of labour force and Capital stock (CAP), which is also measured by gross capital formation, respectively.

The variables under consideration are mainly sourced from World Development Indicators (WDI) (2007) and the Central Bank of Nigeria Statistical Bulletin (2006).

Model specification: Contrary to many of the earlier studies, which simply concentrated mainly on the direct linear relationship between output and export growth, this study extends its tentacle by specifying the growth-export model in a multivariate structure. The aim here is to incorporate other relevant factors that explain growth. Therefore, following Solow (1957), it is assumed that output, (Y), depends positively on both Capital (CAP) and Labour (LBR) thus, the subsequent output equation is outlined thus:

$$Y = f(CAP, LBR) \quad (1)$$

However, to augment the tradition neoclassical output specification, we include export value, import value and exchange rate into Eq. 1. This becomes necessary, as it has been recognized that these factors are proper

arguments of production in that they do influence a nation's productivity. Consequently, an augmented output function is produced in Eq. 2:

$$Y = f(CAP, LBR, EXP, IM, EXR) \quad (2)$$

A log-linear representation of Eq. 2 necessary for ease of estimation is generated giving us the following Eq. 3:

$$y = \alpha cap + \beta\, lbr + \varphi exp + \delta im + \psi exr + \mu \quad (3)$$

Note that the lower case letters in Eq. 3 indicate that the variables are in their log forms.

It is now a common practice in econometric analysis to perform some pre test assessments on the time series data to be employed. Tests such as the stationarity (unit root), causality and cointegration are often performed on variables for various plausible reasons. Consequently, in this study, in order to investigate the export-led growth hypothesis in Nigeria, the following methodological procedures are followed:

Firstly, to avoid the problem of spurious regression, the stationarity properties of the time series data used are examined with the aim of determining their order of integration. Thus, the unit root tests are carried out by employing the Ng-Perron (2001) modified unit root tests. The choice of the Ng-Perron (2001) modified unit root test is based on the fact that the tests are more suitable for small samples than the traditional tests. Again, the null hypothesis of a unit root is not over-rejected when Ng-Perron modified unit root tests are employed (Ng-Perron, 2001; Sinha Dipendra, 2007; Omisakin, 2008).

Secondly, the causal interrelationships among output, export, import and exchange rate (which can either be unidirectional, bidirectional or even neutral) are examined by carrying out the non-causality test of Toda and Yamamoto (1995). This test does not require prior knowledge of the cointegration nature of the system and also the usual lag selection procedure can still be applied in a situation where, the stability and rank conditions are not satisfied. In this study, the approach of Rambaldi and Doran (1996) shall be followed.

Lastly, having ascertained the direction of causality, this study proceeds unto testing the long run (cointegration) relationship among the variables by employing the cointegration approach of Pesaran *et al.* (2001). Pesaran *et al.* (2001) proposed an Autoregressive Distributed Lag (ARDL) bounds testing approach to investigating the existence of cointegration relationship among variables. This approach appears to have gained popularity in recent times due to the following reasons among others: both the long- and short-run parameters of the specified model can be estimated simultaneously, the econometric burden of testing the integration order among variables are avoided. The model is specified thus:

$$\begin{aligned}\Delta y_t = {} & c + \eta y_{t-1} + \alpha cap_{t-1} + \beta lbr_{t-1} + \phi exp_{t-1} + \delta im_{t-1} \\ & + \psi exr_{t-1} + \sum_{i=1}^{p} \eta_{2i} \Delta y_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta cap_{t-i} + \sum_{i=1}^{r} \beta_{2i} \Delta lbr_{t-i} \\ & + \sum_{i=1}^{s} \phi_{2i} \Delta exp_{t-i} + \sum_{i=1}^{w} \delta_{2i} \Delta im_{t-i} + \sum_{i=1}^{z} \psi exr_{t-i} + \mu_t\end{aligned} \quad (4)$$

RESULTS AND DISCUSSION

This study presents the results of systematic econometric processes in this study. For ease of appreciation and following the methodological procedures earlier stated, our results are presented in the following order:

Unit root test: Table 1 demonstrates the result of the stationariry test in this study. Here, the Ng-Perron modified unit root tests are applied on the variables under consideration. The lag length was selected in order to ensure that the residuals were white noise. The results show that all variables are stationary at first difference, i.e, I(1). Thus, this evidence suggests that the first differencing is sufficient for modeling the time series in this study. The essence of testing for the stationarity properties of the variables is founded in the assumption of (ARDL) bounds testing approach to cointegration that the time series most be I (0) or I (1) variables. Thus, indicating that the assumption of bounds testing will collapse in the presence of I (2) variable. The result therefore, implies that the bounds testing approach is applicable in this study since, the variables are stationary at first difference that is I (1).

Now, following the results in Table 1, which suggest that the variables under consideration are all I(1) series, the implication for the Toda-Yamamoto non-causality test is that the maximum number of order of integration is 1. Again, estimating the lag structure of a system of VAR in levels reveals that the optimal lag length based on the Akaike Information Criterion in this study is 1. Therefore, our total lag for VAR estimation equals 2 (Omisakin, 2008). Table 2 shows the result of Toda-Yamamoto non-causality test. As suggested by the result, there is an indication of bidirectional causal relationship between output and export such that output causes export and growth of export also induces output. This result therefore lends credence to the export-led growth hypothesis in Nigeria.

Consequent upon the established long run relationship as evident in Table 3, we estimate the long run output equation (y). The result is depicted in Table 4. As evident from Table 4, not only are the variables well signed, they also, with exception of capital, display high level of statistical significance in explaining output. Looking at the coefficients signs in Table 4, all the variables in the model demonstrate not only positive but also significant relationship with output.

For instance, with about 10% increase in the growth of export, there is corresponding increase of about 35% in output growth. The adjusted R^2 of 0.79 gave an indication that the variables under consideration explain a high proportion of variation in output of about 79%.

The short run model of output is presented in Table 5. Except for the lagged difference of output (y) and difference of import, the short run behavoiur of the variables seems not to have been influencing the short run dynamics of output (y). About 10 change in the lagged difference of output results to 48% in output growth in the short run. Again, for every 10% increase in the growth rate of import in the short run, about 47% growth is experienced in output in the short run. A closer look at the result in Table 5 clearly reveals the significance of error correction estimate having rightly signed. The intuition here is that about 34% discrepancy in the output this year is adjusted for next year.

Table 1: The Ng-perron modified unit root tests results

Variables	MZa	MZt	MSB	MPT
y	0.35254	0.22226	0.63045	28.19530
Δy	-13.64260*	-2.61147**	0.19142*	1.79699*
Cap	-0.21825	-0.14159	0.64875	26.18250
Δcap	-12.71770*	-2.51366*	0.19765*	1.95741*
lbr	0.62588	0.43787	0.69960	34.96630
Δlbr	-13.41000*	-2.61057**	0.18281*	1.75329**
Exp	1.76047	1.07903	0.61292	34.22770
Δexp	-17.75380	-2.97217	0.16741	1.40633
Im	-0.09016	-0.05596	0.62066	25.21320
Δim	-10.27660	-2.26643	0.22054	2.38542
Exr	0.64771	0.52440	0.80962	44.71280
Δexr	-18.07130	-3.00559	0.16632	1.35699
Level of significance (%)				
1	-13.80000	-2.58000	0.17400	1.78000
5	-8.10000	-1.98000	0.23300	3.17000

The variables are expressed in their natural logarithms. While, "Δ" symbolizes first difference, **(*) denotes the rejection of the null hypothesis at 1 (5%) significance level. The asymptotic critical values for each of the test for 1 and 5% level of significance are specified

Table 2: Toda-Yamamoto non-causality test result

Direction of causality	(k+d)	Wald statistics	p-value	Status
y→exp	2	3.50115	0.04299*	Accept
exp→y	2	4.10423	0.03510*	Accept

*indicates 5% level of significance

Table 3: Bounds testing cointegration result

Dependent variables	Lags	F-statistic	Outcome
F_y(y|im, exp, cap, lbr, exr)	1	5.2481**	Cointegration

Table 4: Estimated Long Run (ARDL) output model (Y)

Regressors	Coefficients	SE	t-statistics	p-value
Cap	0.0818550	0.120275	0.680566	0.5012
lbr	2.0844350	0.297576	7.004717	0.00120**
Im	0.8352550	0.122435	6.822043	0.0051**
exp	0.3495890	0.084756	4.124656	0.00110**
exr	0.0066780	0.001196	5.585517	0.00640**
c	50.6552300	6.304631	8.034606	0.00000**
R^2	0.8403305	Mean depend. Var	23.584630	-
Adj. R^2	0.7943250	SD depend. Var	1.917653	-
SE of regression	0.1690910	Akaike info criterion	-0.569365	-
Sum squared resid.	0.886346	Schwarz criterion	-0.308135	-
Log likelihood	16.533250	F-statistic	919.842600	-

**Denotes the rejection of the null hypothesis at 1% significance level

Table 5: Short run estimated (ARDL) output model (DY)

Regressors	Coefficients	SE	t-statistics	p-value
D (y(-1))	0.484598	0.172376	2.811278	0.0093**
D (cap(-1))	0.161754	0.109032	1.483547	0.1500
D (lbr(-1))	1.235225	1.180603	1.046266	0.3051
D (im)	0.468154	0.120219	3.894183	0.0006**
D (exp(-1))	0.125789	0.087342	1.440184	0.1617
D (exr)	0.000554	0.001753	0.316041	0.7545
D (exr(-1))	0.002948	0.002577	1.144116	0.2630
ecm (-1)	-0.338192	0.144946	-2.333231	0.0276*
C	0.008018	0.059728	0.134250	0.8942
R^2	0.554793	Mean dependent var	-0.153822	-
Adj. R^2	0.417806	SD dependent var	0.149333	-
SE of regression	0.113944	Akaike info criterion	-1.289187	-
Sum squared resid	0.337563	Schwarz criterion	-0.889240	-
Log likelihood	31.560770	F-statistic	4.049969	-
Durbin-watson stat	2.090266	Prob (F-statistic)	0.003075	-

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

CONCLUSION

This study examines the export-led growth hypothesis for the case of Nigeria. In carrying out this task, the study investigates both the causal and dynamic nature of the relationship between economic growth and export by using annual time series data from Nigeria. These series include output (y), which is measured by gross domestic product, export value (exp), import value (im), real exchange rate (exr), labour stock (lbr) measured in terms of labour force and capital stock (cap), which is also measured by gross capital formation, respectively. The data scope ranges from 1970-2006. The econometric procedure followed in this study is clear.

Having ascertained the stationarity status of the time series employed with the aim of determining level of integration by employing the unit root test, the study proceeded by testing for the causal (or precedence) relationship between output (y) and export (exp). Also, in addition to these, this study investigated the long run relationship among the variables under consideration. Thus, the result gotten from the cointegration test gave an indication for a long run specification and estimation of the output (y) equation.

The unit root test indicates that the variables are all stationary at first difference, i.e, they are I(1) series. Thus, the application of ARDL bounds testing cointegration is possible. Meanwhile, the result of Toda-Yamamoto non-causality test shows a bidirectional relationship between output and export. The result of bounds testing cointegration analysis suggests a long run relationship among the variables when the vector of variables is normalized on output.

The long run elasticity of output with respect to export shows that given about 10% increase in the growth of export, there would be a corresponding increase of about 35% in output growth. The adjusted R^2 of 0.79 gave an indication that the variables under consideration explain a high proportion of variation in output (y) of about 79%.

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