An export-led growth (ELG) paradigm in Africa: Panel data Approach.

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Abstract

The purpose of this paper is to investigate the export-led growth (ELG) paradigm for African countries. The data used is a panel data covering 30 African countries for the period 1990 to 2005. The paper uses five panel data models: pooled ordinary least square (OLS), fixed effects model (FE), random effects model (RE), Two-Stage Least-Squares (2SLS) and generalized methods of moments (GMM). The results from these models provide some support for the export-led growth (ELG) paradigm in Africa.

JEL Codes: O41

Key words: Export led growth hypothesis exports, economic growth, and labour force

1. Introduction

Are exports engine for growth? An answer to this astonishingly simple question seems to generate more heat than light. This is because previous empirical studies have produced mixed and conflicting results regarding nature of the relationship between export and growth (Awokuse, 2003:127). For example, empirical studies by (Krueger, 1978; Chenery, 1979; Tyler, 1981; Kavoussi, 1984; Balassa, 1985; Ram, 1985, 1987; Chow, 1987; Fosu, 1990; and Salvatore and Hatcher, 1991) generally provide support for the export led growth paradigm. On the other hand, (Jung and Marshal, hereafter referred as JM,1985; Kwan and Cotsomitis, 1990; Ahmad and Kwan, 1991; Dodaro, 1993; Oxley, 1993; Yaghmaian, 1994; and Ahmad and Harnhirum, hereafter referred as AH, 1995) did not find much support to the export led economic growth hypothesis. The differences in the results obtained by the

abovementioned researchers can be attributed to use different datasets, different statistical techniques and different control variables (de Pineres and Cantavella-Jorda, 2007). Presumably the contradictory results obtained by these researchers might have been also due to the choice of sample size[1] and the theoretical frameworks assumed[2].

Although a number of empirical studies have been conducted on ELG for developed countries very few empirical studies have been done in the recent past to investigate the export led growth (ELG) hypothesis for African countries. The few studies that exist includes the works of Jung and Marshall (1985); Fosu (1990) and Ukpolo (1994)

In their paper Jung and Marshall (1985) used granger causality test to examine the causality link between exports and economic growth in developing countries which included four African countries. Only four cases out of 37 provided support for export led growth hypothesis. And only 1 case (Kenya) out of 4 African countries included in the sample was there evidence which supported ELG.

Fosu (1990) used African pooled cross-sectional two period data covering the period 1960-1970 and 1970-1980, he found evidence to support Export–led growth Hypothesis. Researching a slightly similar conclusion Ukpolo, 1994) used a time-series data covering the period 1969-1988, and he reported that while non-fuel primary exports had a positive impact on economic growth, the impact of manufactured exports on economic growth was inconclusive.

While these studies have shed some light and brought the relationship of export and growth to the fore of academic discussion, the literature is still very much limited and the empirical results remain inconclusive. Thus the objective of this paper is to attempt to close this research gap by re-investigating the relationship between export and economic growth in African countries and to improve the quality of the results by using more appropriate econometric technique that has not been used by the abovementioned studies (i.e. in the African context): use pooled ordinary least square (OLS), fixed effects, random effects, Two-Stage Least-Squares and GMM models.

[1] Most of the earlier studies included limited amount of countries in their sample—less than 12(see Bagwati (1978), Balassa (1978)

[2] These studies predominantly used bivariate models or adhoc production functions

So far to our knowledge only one paper Pazim (2009) has attempted to use this technique in BIMP-EAGA countries (i.e. Indonesia, Malaysia, and the Philippines). However one doubts the validity of his results. The reason for this is two fold. Firstly, the author utilized a bivariate model — two variable framework. But using a two-variable framework is not without its own problems – leads to misspecification bias (i.e. omitting important variables). Secondly, the author used random effect model as an appropriate model, effectively assuming that the error term (i.e. unmeasured omitted variables) is not correlated to the explanatory variables and he also completely ignores the possibility of a feedback relationship between export and growth — endogeneity problem. And failure to consider endogeneity problem always leads to biased and inconsistent estimates.

Our paper attempts to also correct for misspecification in Pazim (2009) and other previous studies by adopting a multivariate framework with an introduction of important variables such as inflation, labour force and government spending. Further an attempt is made in our paper to take into account the possibility of endogeneity problem by employing the 2SLS and GMM approach.

Lastly unlike some of the above mentioned studies such as Jung and Marshall (1985) our paper does not assume that the time series data are stationary in their levels, but check the *stationary* of the explanatory variables in the models to be estimated., as this assumption can lead to spurious results. It is therefore expected that this study will make some modest but important contribution to empirical literature.

Our analysis follows on the work on export and growth by Pazim (2009), which used a panel data analysis. In addition to the use of panel data analysis, in our paper two variables used by Pazim (2009) are expanded to include government expenditure, Gross domestic investment, labour force and inflation. Our finding of evidence in support of ELG hypothesis for African countries is consistent with a number of studies that have been done in the African context such as Fosu (1990) and Ukpolo (1994).

The rest of this paper is organized as follows. Section 2 provides empirical analyses and section 3 summarize the paper's findings and conclude.

2 Empirical Analysis

2.1 Empirical Specification

The sample used in this study consists of 30 African countries. Appendix 1, provides a list of countries used in the sample. The growth regression models estimated are specified as follows:

Under the pooled-OLS model, fixed effect and Random effect we have:

$$GROWTHit = \beta 0 + \beta 1(EXP)it + \beta 2(INFI)it + \beta 3(GOV)it + \beta 4\ (GDI)\ it + \beta 7\ (LF)\ it + \gamma it \ldots\ldots\ldots\ldots 1$$

Under the Two-Stage Least-Squares we have:

$$GROWTHit = \beta 0 + \beta 1(EXP)it\text{-}1 + \beta 2(INFI)it + \beta 3(GOV)it + \beta 4\ (GDI)\ it + \beta 7\ (LF)\ it + \gamma it \ldots\ldots\ldots\ldots 2$$

Under the Generalized Methods of Moments we have:

$$GROWTHit = \beta 0\ (GROWTH)\ it\text{-}1 + \beta 1(EXP)it + \beta 2(INFI)it + \beta 3(GOV)it + \beta 4\ (GDI)\ it + \beta 7\ (LF)\ it + \gamma\ it \ldots\ldots\ldots\ldots 3$$

Where *i* represents each country and *t* represents each time period; *Growthit* is average annual growth for country *i* during period *t*; EXPit; GOVit ;INFit; GDIit; LFit are, respectively Export, the government expenditure, Inflation, Gross domestic investment and Labour force for country i during period t. The βs are the estimated coefficients and the γit is the error term. Equation (1) defines our benchmark growth regression model but in equation 2, when the lagged value of Export is included as an explanatory variable, we apply the Two-Stage Least-Squares estimation technique. The last equation where the lagged value of GROWTH is included as an explanatory variable, we apply the GMM estimation technique. The set of explanatory variables included in the growth regression specifications are based on the endogenous growth theory and can all be considered to be important determinants of economic growth.

2.2 Expected Sings of the variables

The signs of the coefficient are underpinned by an economic theory, thus it is important to have a sense of the signs of the coefficients before estimating any model. The expected signs of the coefficient are analysed in the following table:

Variable	Theory underpinning the sign	Expected sign
Gov	Keynesian theory suggest that an increase in gov spending will lead to an increase in income or GDP	**Positive(+)**
INFL	Inflation means an increase in the general price level. When prices of goods and services are high, production or economic growth will decrease.	**Negative(-)**
INV	Investment is a component of aggregate expenditure, thus an increase in investment will lead to an increase in economic growth	**Positive(+)**
Exp	Is also component of of aggregate expenditure, which means, the higher the level of export the higher the level of economic growth	**Positive(+)**
LF	The neoclassical theory, stipulates that as the input (labour and capital) increases total output increases as well. It is therefore expected that labour force will have a positive relationship with economic growth	**Positive(+)**

Source: own

2.3 Methodology

As mentioned in the introduction some previous studies such as Jung and Marshall (1985) were conducted with the assumption that the time series data are stationary in

their levels, but this assumption is incorrect as some series may be non-stationary. And some studies have demonstrated that non-stationary time series may lead researchers to mistakenly accept spurious relationships, and thus their results would be meaningless. To avoid the shortcoming of the previous studies we first check the *stationary* of the explanatory variables in the models to be estimated. We do this in order to establish whether the series had a stationary trend, and, if non-stationary, to establish orders of integration. Using the Levin Lin and Chu unit root test we found that our variables are stationary.

There are a variety of different techniques that can be used to estimate equation (1). The standard methods of panel estimation are pooled OLS (i.e. used as a benchmark model), fixed effects and random effects. The difference between them is that the pooled OLS assume that all cross-sectional units are the same (i.e. countries are the same), whereas fixed effects and random effects models don't make that assumption. The major difference between fixed effects and random effects is that the fixed effects estimates are calculated from differences within each country across time, whereas the random effects estimates are more efficient, because the predictors are used to explain not only change over time but also differences among countries. However the random effect is only efficient if the specific effects are not correlated with the explanatory variables.

Our results of standard test such Hausman's specification test of Random Effect versus Fixed Effect clearly supports the Fixed Effect estimator in this context, we nevertheless report pooled OLS, fixed effect and random effects results in table 1 as these estimates give us a sense of the relationship between growth and the explanatory variables, and can be used to compare with other models.

3 Empirical results

Firstly, we begin by reporting the results of the pooled OLS model. As indicated earlier on, OLS estimation model is the most restrictive of all the specifications because it does not take into account the fact that there maybe differences in cross-sectional units — assuming a common intercept for the whole panel.

Thus we need to make sure first that pooling the data is the solution in our case. The null hypothesis based on the poolability test is that all the individual effects are zero.

To verify this hypothesis we perform a poolability test. The result obtained rejects the null hypothesis that all the individual effects are zero (see table 2). This also means that the OLS estimator is biased and inconsistent and we accept the presence of the individual effects.

Even although the OLS estimators are biased and inconsistent we nonetheless report the results of the OLS, because we use it as a benchmark model and OLS results do give us a sense of the relationship between export and growth. The OLS results reported in table 2 show that although export which is a variable of interest is positively related to growth, it is insignificant – a 1% increase in export will lead to 0.056% increase in economic growth ceteris paribus.

Table 2 *Regression results: what affects the coefficient on growth?*

VARIABLES	POOLED-OLS	FIXED EFFECT	RANDOM EFFECT	2 STAGE LEAST SQ	GMM
Export	0.0569669 (0.128)	0.1509988 (0.000)	0.8325141 (0.036)	0.1257798 (0.000)	0.2075991 (0.002)
GDI	0.2811708 (0.000)	0.1580176 (0.000)	0.2387611 (0.000)	0.1807763 (0.000)	0.15722 (0.017)
Labour force	0.8815621 (0.000)	0.9918717 (0.000)	0.9531522 (0.000)	0.9610173 (0.000)	0.6821067 (0.003)
Inflation	-0.0003988 (0.000)	-0.0002084 (0.000)	-0.0003252 (0.000)	-0.0001781 (0.000)	0.0000298 (0.845)
Gvt exp	-0.1988273 (0.003)	-0.3137298 (0.000)	-0.2455957 (0.000)	-0.3366747 (0.000)	-0.240161 (0.195)
Growth(-1)					-0.1902337 (0.002)
Hauseman Test		Prob>chi2 = 0.0000			
Poolability test		T - stat = 3.24 Prob> f = 0.000			
Countries	30	30	30	30	30
Observations	480	480	480	450	420
Period	1990-2005	1990-2005	1990-2005	1990-2005	1990-2005

Gross domestic investment and labour force as expected, presents positive and significant estimates on Growth. The other control variables inflation and growth present negative and significant estimates on growth. The fact that Government expenditure is negatively related to growth – presents negative and significant estimates on growth is worrisome because it suggests that governments tend to be detrimental to economic Growth. There is however a great deal of controversy about the nature of relationship between government size and growth. Some studies suggest that there is a negative relationship between these variables. These include the work of (e.g., Barro (1991), Engen and Skinner (1992), Hansson and Henrekson (1994), Gwartney, Holcombe and Lawson (1998), Fölster and Henrekson (2001)). In sharp contrast, a study by Ram (1986), analyzed a panel data of 115 countries, and concluded that growth of government is positively related. So our result on the relationship between growth and government expenditure is consistent with the former studies. Presumably the negative relationship between growth and government expenditure could be attributed to the fact that high levels of government expenditure tend to crowd out investment which in turn reduces growth.

Having reported the results based on the pooled OLS we now turn to fixed and random effect results. Employing fixed and random effect models requires one to check which of the two models is most appropriate, because as indicated earlier on, these models are not the same – they are underpinned by different assumptions. An attempt was made in this article to check which model is more efficient between fixed effects model and random effects by using Hausman specification test which compares the fixed versus random effects under the null hypothesis that the individual effects are not correlated with the other explanatory variables in the model (Hausman 1979). If correlated (H0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions. (Park, 2009) According to Hausman specification test result which we performed, H0 is rejected. This means that fixed effect model is more appropriate and preferred model. The results of the Hausman specification test result are shown in Table 2 above.

In column 3 and 4 we report the estimates of Export, Labour force, Gross domestic investment, Inflation and Government expenditure using fixed effects and random effects estimators respectively. The results are quite similar to OLS results except for export: Gross domestic investment and labour force as expected, still presents positive and significant estimates on Growth. And again, inflation and growth present negative and significant estimates on growth. However, the magnitude of export is greater and its significance is stronger than the corresponding OLS estimates. For example a 1% increase in export leads to 0.15% increase in growth for a FE model and 0.83% increase in growth for RE model, ceteris paribus.

Implicit in the pooled-OLS, Fixed effect and random effect models is the assumption that explanatory variables are exogenous. However this assumption is not necessarily true. To correct for this, the firth column of Table 2 reports two-stage least squares estimates (2SLS). Two-stage least squares is important because it allows us to relaxes the assumption that the explanatory variables are exogenous and thus attempts to correct for both the simultaneity bias (endogeneity problem) and the bias coming from the correlation between the country-specific effects and the regressors. The 2SLS regression assumes that export variable is endogenous and instruments for it by lagging it. As seen from the fourth column, the estimated coefficient of the lagged dependent variable is 0.12, which lies between bounds estimated by the FE and pooled-OLS. The estimates for the controlled variables are consistent with the fixed and random effects: the GDI and labour force are positively and significantly related with growth, while government expenditure and inflation are negatively and significantly related with growth.

In column 6 we report the estimates of Export, Labour force, Inflation and Government expenditure using generalized methods of moments estimators. This model is slightly different from the other models in the sense that growth is now incorporated as the lagged explanatory variable. The lagged growth presents negative and significant estimates on Growth. This indicates that the African countries under study are converging. In other words, the poorer countries within the sample will catch up to the richer countries in due course and thus we have a greater persistence of economic growth.

Rather like the other models (fixed effect, random and 2SLS) in this article the estimates for export is found to be positively and significantly related to growth. Likewise, the estimates for controlled variables GDI and labour force are found to be strongly positive and significant with respect to growth, while government expenditure is negatively and significantly related with growth. The only variable that changed sign is inflation, but this not problematic at all because even although it was significant and negatively related with growth and its magnitude was extremely small (0.00003988) in most cases. In a nutshell, the results consistently indicate that export has a positive and significant impact on growth in African countries. The signs of the significant variables all go in the expected direction except for government expenditure, as pointed out earlier on this is a bit worrisome as it indicates that governments is detrimental to economic Growth. These results are very much in line with previous empirical studies such as, (Krueger, 1978; Chenery, 1979; Tyler, 1981; Kavoussi, 1984; Balassa, 1985; Ram, 1985, 1987; Chow, 1987; Fosu, 1990; and Salvatore and Hatcher, 1991) which generally provide support for the export led growth paradigm.

Concluding remarks

The purpose of this paper has been to investigate the export-led growth (ELG) paradigm for African countries using panel data covering 30 African countries for the period 1990 to 2005. The paper applied five panel data models: pooled ordinary least square (OLS), fixed effects model (FE), random effects model (RE), Two-Stage Least-Squares (2SLS) and generalized methods of moments (GMM) to investigate the link between growth and export. The results from these models provide evidence of the existence of the export-led growth (ELG) paradigm for African countries – a 1% increase in export leads to 0.056% increase in economic growth ceteris paribus. These results are very much in line with previous empirical studies such as, (Krueger, 1978; Chenery, 1979; Tyler, 1981; Kavoussi, 1984; Balassa, 1985; Ram, 1985, 1987; Chow, 1987; Fosu, 1990; and Salvatore and Hatcher, 1991) which generally provide support for the export led growth paradigm. These results have some important policy implications. If as the results seem to suggest that export is an engine for growth then policy-makers would therefore need to pursue policies that promote export expansion.

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APPENDIX 1A

COUNTRIES		
1	Botswana	BOT
2	Malawi	MAL
3	Swaziland	SWAZ
4	Burundi	BUR
5	Mozambique	MOZA
6	Zambia	ZAMB
7	South Africa	SA
8	Congo	CONG
9	Burkinafas	BURKN
10	Cote d'lvoire	COT D
11	Cameroon	CAMER
12	Algeria	ALGER
13	Ethiopia	ETHIO
14	Gabon	GABON
15	Ghana	GHANA
16	Guinea – Bissan	GUINEA-B
17	Equatorial Guinea	EQUAT G
18	Kenya	KENY
19	Morocco	MOROC
20	Madagascar	MADAG
21	Mali	MALI
22	Mauritius	MAURITI
23	Niger	NIGER
24	Rwanda	RWAND
25	Sudan	SUDAN
26	Senegal	SENEG
27	Chad	CHAD
28	Togo	TOGO
29	Tanzania	TANZANI
30	Uganda	UGANDA