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04. August 2009

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ABSTRACT

The relationship between globalization and economic growth in the developing countries remains controversial. Liberals argue that globalization will lead to higher economic growth and prosperity. Skeptics contend the opposite, where globalization processes might lead to increased inequality and lower economic growth. Previous studies have examined this issue with single indicators such as trade openness or foreign direct investment (*FDI*) or aid etc. In this study we make use of a comprehensive measure of globalization developed by Dreher (2006), which measures globalization along three important dimensions viz., economic, political, and social fields to assess the pros and cons of globalization. Our panel data results with a systems based *GMM* (*SGMM)* method show a small but significant positive association between globalization and economic growth for a panel of 21 low income African countries for the period 1970 – 2005.

Keywords: Globalization, Economic growth, Solow model, Africa

JEL: : N1, O1, O4, O57

1. Introduction

In the development literature the relationship between globalization and economic growth is contentious. Liberals argue that globalization causes higher growth, providing trade and investment opportunities for much needed employment generation thereby leading to declines in income inequality and poverty levels. On the contrary, skeptics contend that higher levels of globalization have adverse effects on domestic economy leading to economic and social inequalities through negative effects on economic growth. Their main argument is that globalization increases economic insecurity and risk, which may in turn result in economic hardships. Thus, the question of whether globalization affects growth and development in the less developed countries is yet to be analyzed properly. The main objective of this paper is to examine the relationship between globalization and economic growth in the low income African countries during the period 1970 – 2005. In doing so, we consider the countries which are classified as "low income countries" under the World Bank classification of country list. According to the World Bank, those countries whose per capita GNI (as on 1st July, 2006) is equal or below US$935 are considered to be low income countries. Accordingly, although we have 50 countries in the list, we could examine only 21 countries because of data constraints and are listed in Annexure 1 and also in Table 3. Unlike previous studies using any one of the proxies for globalization e.g., foreign direct investment, financial development, reforms, aid and so on, we use an index that aggregates several factors that measures globalization along three important dimensions viz., economic, political, and social dimensions. This index is the contribution of Dreher (2006) which is perhaps the most comprehensive measure of globalization, and has the potential to reduce the controversy on the measurement issues[1]. His measure uses the principal components method to combine several variables from the economic, political and social sectors and updated every year. In one of his studies, Dreher has shown with conventional panel techniques and panels of five-year averages that the growth affects of his measures of globalization are significant, implying that countries with higher globalization grow faster. Similarly, using Dreher's index, Rao et al. (2009) by extending the Solow (1956) model derived country specific estimates of the Steady State Growth Rates (SSGRs hereafter) for

[1] These indices can be downloaded from http://globalization.kof.ethz.ch/

Singapore, Malaysia, Thailand, India and the Philippines, showing that countries with higher levels of globalization have higher SSGRs. However, the growth effects of globalization on SSGRs are smaller than in many studies.

Studies measuring the growth effects of globalization using panel data methods for the least developed poor countries are scarce and the purpose of this paper is to fill this gap using a comprehensive measure of globalization. Furthermore, we control for possible endogenity using the systems *GMM* method (*SGMM)* of Arellano and Bover (1995) and Blundell and Bond (1998), which also minimizes the persistence in the variables. The outline of this paper is as follows: Section 2 briefly reviews important studies on the growth effects of globalization. Section 3 presents data description and develops specification for estimation. Estimates with our specifications are reported in Section 4 and section 5 concludes.

2. Globalization and Economic growth: A Brief Survey

Most economists agree that international trade and globalization are important factors in building an economic system. Throughout recent history, policy-makers have attempted to produce efficient trade policies that can boost economic growth. However, there is no consensus among economists regarding the effect of openness in trade on economic growth.

According to Baldwin (2003), there are several reasons for this disagreement. The first and most important reason is the differences in the way economists define and treat the question that is being investigated. Some researchers are concerned about the impact of outward-oriented policies on economic growth. Others are looking at the causal relationship between the increase in trade and the increase in growth. Furthermore, the interpretation and definition of openness differs among authors. Another reason for the disagreement is reflected by the nature of the data and econometric approaches in the models. A variety of cross country methods have been used and these range from pure cross section techniques to time series methods based on unit roots and cointegration.

Pritchett (1996) has raised doubts on whether researchers have adequately measured openness. In Pritchett (1999) he has examined the correlations between a number of measures of openness to see if they were capturing some common aspect of trade policy or openness and found that the link between various empirical indicators are pair-wise uncorrelated. This finding raises questions about their reliability in capturing some common aspect of trade policy and the interpretation of the empirical evidence. Hence, his findings cast a doubt on the interpretation of the empirical evidence on openness and economic growth.

Dollar (1992) found that outward oriented economies as well as high exports and the sustainability of imported goods and machinery accelerate growth.[2] Barro and Sala-i-Martin (1995), Sachs and Warner (1995), Edwards (1998), Greenaway, Morgan, and Wright (1998), and Vamvakidis (1998) show, with cross-country regressions, that trade protection reduces growth rates. Ben-David (1993), and Sachs and Warner (1995) show that only open economies experience unconditional convergence. Quinn (1997) proposed an openness indicator based upon a coding of the domestic and international laws of 64 nations, most of whose legislation is available from 1950 to 1994. The results suggest that capital account deregulation may contribute to economic growth and investment. Frankel and Romer (1999) provide instrumental variables estimates and confirm a significant and robust positive impact of trade on growth, using cross-country geographic indicators. Brunner (2003) extended Frankel and Romer's (1999) cross-sectional approach to panel estimation and found a significant positive impact of trade on income.

On the contrary, Rodriguez and Rodrik (2000) challenge the robustness of the openness-growth correlations found by Dollar (1992), Ben-David (1993), Sachs and Warner (1995), and Edwards (1998). They argue that some of these studies did not control for other important growth indicators and that important drawback is their usage of the openness measures. However, Warner (2002) refuted the argument of Rodriguez and Rodrik (2000). His results re-established the positive growth-openness link. In fact, Warner (2002) argued

[2] Recently, Subasat (2003) demonstrates that the index developed by Dollar (1992) has fundamental flaws and therefore has no relevance to the debate on trade orientation and should be abandoned.

that Rodriguez and Rodrik (2000) base their claims on empirical specifications with low statistical power for testing the impact of trade restrictions on growth and development. Warner also presented additional tests of the growth-openness relation based on specifications similar to Sachs and Warner (1995). The weight of the evidence argues that protection is harmful to growth. At the same time, Vamvakidis (2002) and Clemens and Williamson (2004) examine longer-period historical data. They found that the existing correlation between openness and growth becomes significant only in recent decades. Rodrik (2007) argued that trade and financial openness by themselves are implausible to lead to economic growth, and may occasionally even backfire, in the absence of a wider range of complementary institutional and governance reforms. Here, it is worth noting that even such outstanding defenders of globalization like Blinder (2006), Summers (2006) or Krugman (2007) have acknowledged that globalization has also some adverse effects and increases inequality and insecurity.

3. Model Specification

Unlike in the previous studies on globalization, our main objective is to test the long run and permanent growth effects of globalization through their effects on the total factor productivity (*TFP*). One confusion in the previous studies is that there is no clear distinction between the transitory growth effects of globalization and their permanent growth effects because in many specifications the actual rate of growth out put is regressed on some measure of globalization and a few control variables. It is also not clear what are the theoretical growth models from which the specifications have been derived. In this paper we shall use an extended form of the Solow (1956) growth model. Although *TFP* in the Solow model is exogenous, we modify the production function to capture the growth effects of globalization through its effects on *TFP*. This is consistent with the suggestions of Edwards (1998) and Dollar and Kraay (2004) to use a similar procedure. The Solow (1956) exogenous growth model is relatively easier to extend and estimate compared to other endogenous growth models which are more complicated if properly specified and estimated;

see Greiner et al (2004).[3] Let the Cobb-Douglas aggregate production function with constant returns and Hicks neutral technical progress at time t be:

$$Y_t = A_t K_t^{\alpha} L_t^{(1-\alpha)} \qquad (1)$$

Where, *Y, K, L* denote, respectively, output; capital stock and labour and *A* is the stock of knowledge. This equation can be expressed in per worker terms and with the assumption that $A_t = A_0 e^{gt}$ i.e., initial stock of knowledge A_0 *grows* at a constant rate of *g* in time as follows.

$$y_t = A_0 e^{gt} k_t^{\alpha} \qquad (2)$$

The rate of growth of *TFP* thus equals *g* in equation (2). If a vector of variable Z_i has permanent growth effects, e.g., globalization and institutional reforms etc., then *g* can be assumed to be a function of the variables in Z_i. Therefore, (2) can be expressed as:[4]

$$y_t = A_0 e^{(g_0 + g_1 Z_1 + g_2 Z_2 + \ldots)T} k_t^{\alpha} \qquad (3)$$

[3] Many empirical works that claim to be based on some endogenous growth model have used by and large arbitrary specifications. Easterly et. al. (2004) express serious concerns about such specifications as follows: "This literature has the usual limitations of choosing a specification without clear guidance from theory, which often means there are more plausible specifications than there are data points in the sample". Rogers (2003) also takes a similar view but justifies *ad hoc* specifications because though this is less than ideal, the complexity of economic growth and the lack of an encompassing model make it a necessity. Although it is not easy to say what will be the nature of biases in the estimated parameters with ad hoc specifications, our subsequent empirical results indicate that the permanent growth effects of the explanatory variables are likely to be overestimated.

[4] For example, Winters (2004), Edwards (1998) and Dollar and Kraay (2004) take the view that a more convincing and robust evidence between openness or globalization and growth should be derived from their effects on productivity.

Where time is expressed now as T and g_0 captures the growth effects of ignored and trended variables on *TFP*. It is generally hard to include more than a few variables in the Z vector because these growth enhancing variables are generally trended and correlated. Therefore, it is hard to estimate accurately the individual growth effects of these variables in the Z vector.

It is well known that the Steady Sate Growth Rate, *SSGR*, in the Solow model equals the rate of growth of *A* i.e., *TFP*. We have selected 4 variables for inclusion into the Z vector and these are Dreher's comprehensive measure of globalization (*GLO*), an index of institutional reforms (*INSTI*), the rate of inflation (*DLP*) and the ratio of current government expenditure to GDP (*GRAT*). Definitions of the variables and sources of data are in the appendix. *DLP* and *GRAT* proxy good economic policies and institutional reforms have been emphasized as a growth improving variable by aid giving agencies like the IMF and the World Bank. Other potential variables for inclusion into the Z vector are overseas development aid, other measures of economic stability such as the ratio of budget deficit to GDP and stock of human capital etc. In fact there is no end to the list such potential variables that can be included into the *Z* vector. In this context Durlauf, Johnson, and Temple (2005) have noted that the number of potential growth improving variables, used in various empirical works, is as many as 145. We have not added any more additional variables into the *Z* vector partly due to the limitations of data and possible multicolinearity between the variables. However, the intercept term viz., g_0 should capture the effects of some of these ignored variables if they have significant growth effects.

4. Empirical Results

The specifications in equations (1) and (2) can be estimated with the standard penal data methods of fixed and random effects. However, the specifications in (3) cannot be easily estimated with these methods because of the nonlinearity of the variables in *TFP*. Generalized Method of Moment (*GMM*) proposed by Arellano and Bond (1991) is the commonly employed estimation procedure to estimate the parameters in a dynamic panel data model with nonlinearities in the variables. In this method first differenced transformed series are used to adjust for the unobserved individual specific heterogeneity in the series.

But Blundell and Bond (1998) found that this has poor finite sample properties in terms of bias and precision, when the series are persistent and the instruments are weak predictors of the endogenous changes. Arellano and Bover (1995) and Blundell and Bond (1998) proposed a systems based approach to overcome these limitations in the dynamic panel data models. This method uses extra moment conditions that rely on certain stationarity conditions of the initial observation. The systems *GMM* estimator (*SGMM*) combines the standard set of equations in first differences with suitably lagged levels as instruments, with an additional set of equations in the levels with lagged first differences as instruments; see for further details on the advantages of *SGMM* Rao, Tamazian and Singh (2009) and Rao, Tamazian and Kumar (2009). We shall use this estimation method in this paper.

Our data covers the period 1970-2005 for 21 African countries. The list of these countries is in the appendix. The average per capita incomes during our study period range from a low of U$ 122 of Burundi to a high of US$ 765 of Cote d'Ivoire. It is estimated by the World Bank that about 46.4% of the population in Africa lives under US$ 1.0 per day (WDI, 2005). In contrast to other developing nations, the number of extremely poor people in African region has almost doubled from 1981 to 2005, from 200 to 380 million people and is likely to increase to 404 million in 2015 (WDI, 2005). Furthermore, most of the countries in the region have poverty rate of over 50% to 70%. For example, the percentage of people living below poverty line in Mali, one of the low income African countries, is about 73%. Many agree that if Africa is to achieve its millennium development goal of reducing poverty, then the best strategy is high and sustained economic growth.

We first estimated the standard specifications of the production function in equations (1) and (2) with three alternative methods viz., *OLS* (pooled data), Generalized Least Squares (*GLS*) and the standard *GMM* and the results are in Table 1. All the estimated coefficients are significant at the 5% level. However, the *OLS* estimate of profit share (α) in column 1 at 0.858 seems to be too high and the $\overline{R}^2$ of *GMM* estimate in column 3 is very low. This leaves the *GLS* estimate in column 2 at this stage as more reliable. This estimate implies that the profit share is at about 0.2 and is also close to the *GMM* estimate. Both the *OLS* and

GMM estimates imply that *TFP* is negative at about 0.4 percent whereas *GMM* estimate implies a positive rate of growth of 0.16 percent.

Table 1 Estimates of Production Function

$$\ln y = A_0 + gT + \alpha \ln k$$

	OLS	*GLS*	*GMM**
A_0	-0.773 (0.00)	-1.611 (0.00)	-0.011 (0.07)
g	-0.714E^{-02} (0.00)	-0.427E^{-02} (0.00)	0.163E^{-02} (0.00)
α	0.858 (0.00)	0.197 (0.00)	0.204 (0.02)
$\bar{R}^2$	0.877	0.872	0.002

Notes: p-values in the parenthesis below the coefficients.

* An arbitrary intercept has been added.

Since these estimates have some limitations we shall present now the *SGMM* estimates in Table 2. In the first column of Table 2 estimates of the modified production function where *TFP* depends only on trend and *GLO* are presented. All the coefficients are significant and the estimate of profit share at 0.37 is close to its stylized value of one third in the growth accounting exercises. The coefficient of trend at -0.026 implies that the overall *TFP* is negative at -2.6 percent per year. However, *GLO* has a small but significant growth effect on *TFP*. The $\bar{R}^2$ of the levels equation is high and that of the first differences low but an improvement over the *GMM* estimate in Table 1. The average value of GLO ranged from a high of 40 for Nigeria to a low of 16.5 for Burundi. To offset the negative value of *TFP* it is necessary for *GLO* to increase by another 8 points even for Nigeria.

We have added other control variables viz., *GRAT, INSTI* and *DLP* to the estimate of the equation with *GLO* alone, but none of the coefficients of these control variables are significant. These estimates are not reported to conserve space. Therefore, we have

Table 2 *SGMM* Estimates of Extended Production Function

$$LYL = A_0 + \left(g_0 + g_1 GLO + g_2 GRAT + G_3 INSTI + G_4 DLP + G_5 (GLO \times Z)\right) \times T + \alpha LKL$$

	1	2	3	4
A_0	-1.324 (0.00)	-1.341 (0.00)	-1.322 (0.00)	-1.328 (0.00)
g_0	-0.026 (0.00)	-0.026 (0.00)	-0.025 (0.00)	-0.025 (0.00)
α	0.370 (0.00)	0.354 (0.01)	0.372 (0.00)	0.369 (0.00)
g_1	$0.543E^{-03}$ (0.00)	$0.602E^{-03}$ (0.00)	$0.543E^{-03}$ (0.00)	$0.541E^{-03}$ (0.00)
g_5 $(Z = INSTI)$	--	$-0.123E^{-03}$ (0.48)	--	--
g_5 $(Z = GRAT)$	--	--	$-0.214E^{-06}$ (0.75)	--
g_5 $(Z = DLP)$	--	--	--	-0.049 (0.73)
$\overline{R}^2$	Levels: 0.861 Diff: 0.033	Levels: 0.880 Diff: 0.036	Levels: 0.880 Diff: 0.036	Levels: 0.880 Diff: 0.036

estimated specifications where the positive growth effects of *GLO* are conditional on these additional control variables. In the estimates of column 2 it is assumed that the positive growth effect of *GLO* is conditional to good institutions. Likewise, estimates in columns 3 and 4 assume that the positive *GLO* effect is conditional on low government expenditure and low inflation rate respectively. One would expect that the coefficients of these conditional variables should be positive. However, none of these coefficients are significant and even have the expected positive signs. In all these estimates the coefficients of trend, capital stock and *GLO* have remained stable. This result may be partly due to the fact that Dreher's globalization index is comprehensive and captures the economic, social and political dimensions of globalization. Therefore, estimates in column 1 with *GLO* alone as a measure

of globalization are our preferred estimates. Our preferred equation implies that overall the steady state rate of growth of output per worker in these low income African countries is negative at -2.6%. However, globalization, in contrast to the strong arguments put by the pessimists, has moderated somewhat these negative *TFP* effects. But the degree of globalization has to increase significantly to about 50 at least to offset the negative effects of *TFP*. To increase per worker incomes in the steady state to 1.5%, *GLO* needs to be increased to about 75.5. *GLO* for all the countries is much lower than this value.

In Table 3 the average values of *GLO* ($\overline{GLO}$) for all the countries for the periods of 1970-1999 and 2000-2005 are shown in columns 1 and 2 respectively. The percentage change in *GLO* between the 2 average values in columns 1 and 2 is in column 3 and gives an indication of how rapidly these countries have been globalizing in the recent years. In column 4 the average growth rate of output per worker is shown.

In Burundi and Rwanda *GLO* is the lowest and below 20. Countries with *GLO* higher than 30 are Cote d'Ivoire, Ghana, Kenya, Malawi, Nigeria, Senegal, Togo and Zambia. In the other 11 countries *GLO* is between 20 and 30. Burundi and Rwanda are still the least globalized countries in the new millennium with an average of *GLO* below 30 and Sierra Leone is another country with a *GLO* below 30. On the other hand in Ghana, Nigeria and Zambia, *GLO* in the new millennium is sufficiently high to offset the negative trend effect of *TFP*.

In Congo, Niger and Togo globalization process seems to be progressing at a slow rate. Since in the majority of these African countries the negative *TFP* effects are not completely offset, much of their growth seems to be determined by factor accumulation and therefore transient in nature. When an *OLS* regression is estimated between the average growth rate of output (*DLYL*) on the average growth rate of capital per worker (*DLKL*) and the average value of *GLO*, the coefficient of *GLO* was insignificant but the coefficient of *DLKL* is 0.158 and significant with a *p*-value of 0.066. These observations are also valid for Ghana, Nigeria and Zambia although globalization is high and may have contributed only a small increase to their long run growth rates.

Table 3
Average *GLO* and its Progress

		1	2	3	4
		$\overline{GLO}$ 1970/99	$\overline{GLO}$ 2000/05	%change in $\overline{GLO}$	% Growth in per worker output
1	Benin	26	37	37%	0.93%
2	Burundi	17	23	31%	-0.27%
3	Central African Republic	22	33	43%	-0.59%
4	Chad	24	33	31%	1.15%
5	Congo	27	33	17%	1.61%
6	Cote d'Ivoire	34	45	27%	-1.06%
7	Ghana*	39	53*	32%	-0.10%
8	Kenya	36	45	23%	1.02%
9	Madagascar	21	31	40%	-1.67%
10	Malawi	33	42	23%	0.80%
11	Mali	25	38	44%	1.03%
12	Niger	28	31	12%	-1.74%
13	Nigeria*	40	53*	29%	0.56%
14	Rwanda	18	26	36%	0.50%
15	Senegal	37	47	24%	0.19%
16	Sierra Leone	22	28	27%	-0.30%
17	Tanzania	29	40	31%	0.75%
18	Togo	34	39	12%	-0.22%
19	Uganda	26	37	38%	0.69%
20	Zambia*	39	50*	25%	-1.22%
21	Zimbabwe	30	40	31%	-1.35%

Notes: *GLO* for 0% *TFP* growth is 47.88. In only 3 countries with asterisk *GLO* reached this threshold.

5. Conclusions

In this paper we have used a systems *GMM* method of estimation to determine the effects of globalization on the long run growth rate of 21 poor African countries. We found that Dreher's comprehensive measure of globalization, *GLO*, has in fact significant but small permanent effects on the growth rate of output. However, without globalization, the underlying long run growth rate in these countries is negative at about -2.5%. To achieve a positive long run growth rate of 1.5%, *GLO* needs to be increased to 75.5. However, none of these 21 countries have attained this level of globalization and therefore the scope for increasing the growth rate through globalization is vast.

Some limitations of our paper need to be noted. Firstly, we our panel data is unbalanced due to limitations in the availability of data. Second, our estimates of capital stock with the perpetual inventory method may not be very accurate. Needless to say there is scope for more robust estimates with alternative assumptions for the depreciation rates and initial capital stock. Nevertheless, we hope that our methodology and use of *SGMM* method would interest other investigators.

Data Appendix

Annex 1: Low Income African countries in the panel

Benin	Niger
Burundi	Nigeria
Central African Republic	Rwanda
Chad	Senegal
Congo, Democratic Republic	Sierra Leone
Cote d'Ivoire	Tanzania
Ghana	Togo
Kenya	Uganda
Madagascar	Zambia
Malawi	Zimbabwe
Mali	

Annex 2: Data Sources

Data Appendix

Indicator	Source
Y is the real GDP at constant 1990 prices (in millions and national currency)	Data are from the UN National accounts database.
L is labour force: working age group (15-64),	Data obtained from the World Development Indicator CD-ROM 2002 and new WDI online. URL:http://www.worldbank.org/data/onlinedatabases/onlinedatabases.html
K is real capital stock estimated with the perpetual inventory method with the assumption that the depreciation rate is 4%. The initial capital stock is assumed to be 1.5 times the real GDP in 1969 (in million national currencies).	Investment data includes total investment on fixed capital from the national accounts. Data are from the UN National accounts database.
Globalization Index	Data obtained from the study of Dreher (2006) from http://globalization.kof.ethz.ch/
Inflation	Data obtained from the World Development Indicator CD-ROM 2002 and new WDI online. URL:http://www.worldbank.org/data/onlinedatabases/onlinedatabases.html
Government Consumption	Data obtained from the World Development Indicator CD-ROM 2002 and new WDI online. URL:http://www.worldbank.org/data/onlinedatabases/onlinedatabases.html
Civil war presence	Data obtained from the study of Gleditsch et al. (2002) from PRIO website (www.prio.no)
Institutions (Political Constraints Index)	Data obtained from the study of Witold J. Henisz and Bennet A. Zelner (2008) from http://www-management.wharton.upenn.edu/henisz/_vti_bin/shtml.dll/POLCON/ContactInfo.html

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