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Economic Globalisation, Democracy and Income in Sub-Saharan Africa: A Panel Cointegration Analysis

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Economic Globalisation, Democracy and Income in Sub-Saharan Africa: A Panel Cointegration Analysis

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Abstract

Sub-Saharan Africa has been characterised by low-income levels for decades. This paper analyses the impact of economic globalisation and democracy on income in sub-Saharan Africa using panel cointegration techniques. The paper considers a composite indicator for economic globalisation and several alternative indicators of democracy and highlights the essence of the simultaneous adoption of economic globalisation and democracy for sub-Saharan African countries. The empirical results based on a sample of 31 countries over the 1980-2005 period, clearly indicate that, whilst the total long run impact of economic globalisation on income has been beneficial, the total long run impact of democracy has been the bane of income in sub-Saharan Africa. The paper concludes that policy reforms should aim to improve democratic institutions in sub-Saharan Africa for its potential benefits to be realised.

Key words: Economic Globalisation, Democracy, Income, Sub-Saharan Africa

JEL classification: P0, E0, O1, O55

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[1] The author is a PhD student. An earlier version of the paper have been presented at a lunch seminar (Department of Economics, University of Pisa), April 7, 2011. I am grateful to all participants for the valuable comments.

1. Introduction

The past few decades have seen a resurgence of research on the impact of economic globalisation and democracy on economic performance of developing countries. Does economic globalisation and democracy go hand in hand to impact positive on economic performance of developing countries in the long run? For sub-Saharan Africa (SSA), most governments prior to the 1980s were very skeptical on the success of opening their economies to international competition. However, this perception changed in the early 1980s and the result has been the adoption of trade and financial liberalisation policies for many of these countries (Rudra, 2005). Democracy, on the other hand, was virtually not in existence in SSA prior to the 1990s as many impediments[2] existed that undermined democratisation (Ndulu and O'Connell, 1999; Brown, 2005). Nonetheless, as Fosu (2008) note, democracy became important in SSA beginning in the early 1990s as it was expected would help improve the dismal economic performance that had existed for decades.

The arguments in favour of economic globalisation as a determinant of economic performance are well documented in the literature. For example, Dreher (2006) and Villaverde and Maza (2011) argue that economic globalisation is conducive for economic performance, although this effect is small in magnitude. For many developing countries, economic globalisation (in particular trade liberalisation) became important, due to the perceived ineffectiveness of foreign aid as an "engine" of development. Trade liberalisation makes possible to import intermediate inputs to augment domestic savings, as well as the exploitation of economics of scale and technological/knowledge spillovers (McKinnon, 1964; Grossman and Helpman, 1991; Marin, 1992; Prasad et al., 2003). Financial liberalisation on the other hand has the potential to stimulate the development of the domestic financial sector for long-term growth (Levine, 1996; Henry, 2000). Therefore, economic globalisation would in general play a critical role as a catalyst for economic prosperity in the developing world.

[2] As Brown (2005) note, such impediments mainly constituted lack of formal institutional structures (including rule of law) conducive for sustaining the immediate survival of democracy

Many empirical studies on the relationship between economic globalisation and economic performance have focused on specific dimensions of economic globalisation (mainly trade and financial liberalisation). The most interesting discussion on the link between economic globalisation and economic performance is the contrast between empirical papers on trade and financial liberalisation. For example, trade liberalisation has often reported statistically significant positive relationship with income and/or growth (see Balassa, 1978, 1985; Ram, 1985, 1987; Sachs and Warner, 1995; Harrison, 1996, Thornton, 1996; Dalley and Kraay, 2001; Ibrahim and MacPhee, 2003; Yanikkaya, 2003; Abual-Foul, 2004). However, the result of a positive impact of financial liberalisation especially for developing countries has been limited, although the financial integration of developing countries to the global economy has increased in recent decades (Prasad et al., 2003)[3]. For example, Edwards (2001) notes that financial liberalisation is conducive for economic performance in high-income countries but not in low-income countries. Moreover, not all developing countries have benefited adequately from capital flows as the inflows of capital have only been confined to a few developing countries, with the majority left behind (Mishkin, 2007). One reason being that many developing countries are characterised by low institutional quality (Alfaro et al., 2005). For these reasons, the predictions of theoretical models on the benefits of financial liberalisation for developing countries are not evident so far.

The accession of SSA countries to the global economy[4] has been achieved through trade and financial liberalisation programmes initiated by the IMF, the World Bank and the WTO. However, the choice of trade and/or financial liberalisation policies involves a political component. According to Gordon

[3] Prasad et al. (2003) further note that for developing countries financial liberalisation is neither a necessary nor sufficient condition for economic performance, as over the period 1970-2000 for example, Botswana relatively closed to capital flows achieved strong growth rates whilst Peru relatively open to capital flows suffered a decline in growth rates.

[4] SSA countries have been involved in numerous bilateral and multilateral development partnership agreements with the external world for decades. Recent agreements have included the New Partnership for Africa's Development (NEPAD), the Economic Partnership Agreements (EPA), Heavily Indebted Poor Countries (HIPIC) Initiative and Aid for Trade (AFT), all aimed at improving economic performance of the sub-region

(1996), "the single most important characteristic of recent political change in sub-Saharan Africa is the diminished ability of the states to monopolize the political, economic, and institutional environments as they had since independence". Moreover, although the benefits of economic globalisation can fully be realised when combined with improvements in governance and democratic institutions (Gordon, 1996), trade and financial liberalisation have both economic and political consequences. For many developing countries "globalization has provided the best opportunities for political democracies and good governance" (Marquardt, 2007). As Sorensen (2010) note, an important element associated with democratisation is the support of a market-based economy. Thus, while economic globalisation may pave the way for democracy, this may also have the potential to develop market-oriented policies[5] that may or may not be conducive for a better economic performance. Moreover, the simultaneous adoption or the interaction of both economic globalisation and democratisation, though may also have short-run conflicting impact on economic performance, has the potential for a long run complementary role on economic performance (Van De Walle, 1994; Gordon, 1996). For this reason, if the concept of "policy trilemma", as discussed in Rodrik (2002), is what actually explains the relationships between economic globalisation, the nation state and democratic politics, then with the current speed (and it seems irreversible nature) of economic globalisation, democratic politics seem to be the choice alongside economic globalisation with the role of the nation state left at the background (Bairoch, 2000; Nasstrom, 2003). This result is particularly important for SSA countries, as economic globalisation would not impact on income in isolation from democratic institutions[6].

Democracy is crucial to economic success (Giavazzi and Tabellini, 2005) and it can affect economic performance through a number of channels. Democratic institutions have the potential to redistribute income from the rich to the poor,

[5] For a discussion on the relationship between economic globalisation and democracy readers are referred to (Giavazzi and Tabellini, 2005; Eichengreen and Leblang, 2008)

[6] A special case in contrast to this point is China that has chosen economic globalisation (without democracy) and has performed so well in terms of economic performance in recent decades. However, we do not know if China had performed much better than its present state if it was also a democracy.

reduce corruption and support policies encouraging international trade and investment (Acemoglu, 2009; Aghion and Howitt, 2009). Moreover, in addition to sound macroeconomic policies, democracy can have an important impact on a country's ability to attract less volatile capital inflows (Prasad et al., 2003). It is not surprising that different authors (Barro, 1996; Sala-i-Martin, 1997; Minier, 1998; Rodrik, 2002; Roll and Talbott, 2003; Rigobon and Rodrik, 2005) provide empirical evidence in support of a positive relationship between democracy and economic performance. For instance, Roll and Talbott (2003), in a cross-country investigation for between 134 and 157 countries over the period 1995-1999, find highly significant positive impact of political rights and civil liberties on Gross National Income per capita. They further stress that democratic institutions "allow citizens to provide feedback to government leaders about the effectiveness of policies and their impact on general welfare". Rigobon and Rodrik (2005) used identification through heteroskedasticity to study the interrelationship between rule of law, democracy, openness, and income and concluded that democracy is good for economic performance.

Nonetheless, many countries in SSA are not only characterised by low-income (based on World Bank classification, 2011)[7], but they still remain nondemocracies (Acemoglu et al., 2008). Moreover, although many empirical studies test specific dimensions of economic globalisation and income, a comprehensive study on SSA that considers a composite indicator for economic globalisation as well as the interaction of economic globalisation and democracy is rare. The results of many of the existing studies are also plagued by estimation problems. For example, the problem of unit root, cross-country dependence, cross-country heterogeneity and potential endogeneity of regressors are often not addressed. We overcome some of these problems in this paper. We use a composite indicator for economic globalisation and alternative indicators of democracy[8] to analyse the relationship between economic globalisation,

[7] Out of 40 low-income economies, 29 are from SSA. In addition, 11 economies from SSA fall in the lower-middle-income group. Details on World Bank classification of economies 2011 is available at URL http://data.worldbank.org/about/country-classifications/country-and-lending-groups

[8] Details on these indicators are discussed under the data in Section 2

democracy and income for SSA countries. We adopt panel cointegration techniques that allow us to deal with problems of non-stationarity, cross-country dependence, cross-country heterogeneity and potential endogeneity of regressors. Moreover, we address the issue of whether the link between economic globalisation, democracy and income can be considered a long run relationship for SSA countries. The main results of the paper, clearly indicate that, whilst the total long run impact of economic globalisation on income has been beneficial, the total long run impact of democracy has been the bane of income in sub-Saharan Africa. The paper concludes that policy reforms should aim to improve democratic institutions in sub-Saharan Africa for its potential benefits to be realised.

The rest of the paper is organised as follows. In section 2 we specify the empirical model to be estimated and a description of the data. In addition, we consider issues of cross-sectional dependence in panel data models and provide some preliminary results using OLS methodology. Section 3 describes the panel cointegration techniques. Section 4 presents and discusses the panel cointegration results. Section 5 concludes the paper with some policy implications of the empirical findings.

2. Empirical Model

2.1 Model specification

To estimate the impact of economic globalisation and democracy on income, we consider the following model specification:

$$y_{it} = \alpha_i + x'_{it}\beta_i + \varepsilon_{it}, \;\; i = 1, 2, \ldots\ldots, N, \;\; t = 1, 2, \ldots\ldots, T \qquad (1)$$

where y_{it} is the dependent variable, i is the cross-section dimension for individual countries, t is the time series dimension of the data, α_i denotes

country-specific intercept, $\beta_i = (\beta_{1i}, \beta_{2i}, ..., \beta_{Mi})$, $x_{it} = (x_{1i,t}, x_{2i,t}, ..., x_{Mi,t})$, $m = 1, 2, ..., M$ where m is the number of regressors and ε_{it} is the error term[9]. To define m we consider economic globalisation, democracy and their interaction term. Therefore, based on equation (1) the following specific equation is estimated:

$$\log Y_{it} = \alpha_i + \beta_1 EG_{it} + \beta_2 DM_{it} + \beta_3 (EG * DM)_{it} + \varepsilon_{it} \qquad (2)$$

where Y_{it} is real GDP per capita (i.e. income), EG_{it} is economic globalisation, DM_{it} denotes measures of democracy, $EG_{it} * DM_{it}$ is the interaction term between economic globalisation and democracy, log is the logarithm operator, α_i and ε_{it} are as previously defined and β_1 to β_3 are the parameters of interest to be estimated.

2.2 The Data

The panel data consists of annual observations for 31 SSA countries (i.e. N=31) for the period 1980-2005 (i.e. T=26). The countries included in our panel dataset are: Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Congo, Republic of; Cote d'Ivoire; Gabon; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Madagascar; Malawi; Mali; Mauritania; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; South Africa; Swaziland; Tanzania; Togo; Uganda; Zambia; Zimbabwe[10].

The data have been drawn from various sources. Data for real GDP per capita is taken from African Development Indicators (2010). Data for economic

[9] Where appropriate the intercept/country-specific fixed-effects (α_i) is extended to include deterministic time trends. In addition, the intercept, deterministic time trends and the slope coefficients (β_i) are allowed to vary across individual countries. The inclusion of country-specific fixed-effects and deterministic time trends allow us to capture any omitted variables assumed to be stable in the long run relationship.

[10] The selection of countries have been influenced by data availability for all variables considered

globalisation is taken from KOF Index of Globalisation 2010[11]. KOF's economic globalisation index combines data on trade, foreign direct investment (flows), foreign direct investment (stock), portfolio investment, income payments to foreign nationals, hidden import barriers, mean tariff rate, taxes on international trade and capital account restrictions.

The democracy variable is proxied by three indicators[12]. The first indicator of democracy is Polity2 obtained from Polity IV Project (Marshall and Jaggers, 2009). Polity2 is a continuous variable that measures the democratic quality of political regimes using polity scores; it ranges from -10 (strongly autocratic) to +10 (strongly democratic). Polity scores (i.e. autocracy score (-10 to 0) and democracy score (+10 to 0) - from which Polity2 is derived - are themselves derived from a combination of measures: competitiveness of executive recruitment, constraint of chief executive, openness of executive recruitment, regulation and competitiveness of participation. The second and third indicators of democracy are political rights and political rights + civil liberties respectively. Data for political rights and civil liberties are obtained from the Heritage Foundation's subjective "Index of Economic Freedom" (Freedom House, 2006). These two measures are based on annual ranking of countries from 1 (the highest rank) to 7 (the lowest rank) for each measure[13]. We normalise the three indicators of democracy to range from 0 (full autocracy) to 1 (full democracy). We denote the three normalised democracy indicators as *PS* (Polity2), *PR* (political rights) and *PC* (political rights + civil liberties). It is important to note that, although the three democracy indicators may be highly correlated, they are measuring different dimensions of the political system and we should expect that they have independent implications on income. Additional information on the data are presented in Appendix A1.

[11] Details on KOF's Index is available at URL http://globalization.kof.ethz.ch/

[12] We define democracy in this paper as the extent to which the political system is democratic or nondemocratic

[13] We combine the two measures (i.e. political rights + civil liberties) for our third indicator of democracy such that the annual ranking of countries ranges from 2 (the highest rank) to 14 (the lowest rank)

2.3 Cross-sectional dependence in panel data models

Economic globalisation implies strong and increasing interdependencies between countries so it is no wonder that the importance to consider the impact of cross-sectional dependence in cross-country panels has been emphasised in the literature (see Frees, 1995; Driscoll and Kraay, 1998; Pesaran, 2004, 2007; De Hoyos and Sarafidis, 2006; Baltagi, 2008). As De Hoyos and Sarafidis (2006) note, cross-sectional dependence may be present in cross-country panels due to unobserved common shocks that become part of the error term. For this reason, cross-sectional dependence if present and not accounted for may result in inconsistent standard errors of the parameters, although the estimated parameters may be consistent (Driscoll and Kraay, 1998). This effect becomes even more important in cross-country panels where N>T.

To determine the presence of cross-sectional dependence the two semiparametric test proposed by Friedman (1937) and Frees (1995), and the parametric test proposed by Pesaran (2004) appropriate for N>T panels are employed in this paper. The procedures involved in computing the test statistics as well as the test results are provided in Appendix A2. Where appropriate, Tables in this paper report in columns I, II and III the model with *PS*, *PR* and *PC* respectively. The results suggest that there is enough evidence to reject the null hypothesis of error cross-sectional independence in all estimated models. In the presence of cross-sectional dependence Driscoll and Kraay (1998) propose a nonparametric correction for the standard errors in standard panel data estimators such as pooled OLS. We provide preliminary results (Table 2.1) using the pooled OLS estimator with Driscoll and Kraay corrected standard errors.

The coefficient on *EG* is positive and statistically significant at the 1% error level for all estimated models. The coefficient on all indicators of democracy is negative, but statistically significant only when we consider *PS* as an indicator of democracy. However, the result is different when we consider the impact of the interaction terms. All interaction terms enters positive and statistically significant for all estimated models. It is important to note that the impact of

economic globalisation (democracy) on income is not only captured by the coefficient on economic globalisation (democracy) but depends also on their respective interaction terms. For this reason, the results clearly show that, the total effect of economic globalisation on income is positive for the alternative indicators of democracy whilst that of democracy is negative (although this negative effect is not captured when we consider *PR* and *PC* as indicators of democracy as they are not statistically significant). Nonetheless, an important limitation of the Driscoll and Kraay pooled OLS estimator is that potential endogeneity problems are not catered for. Moreover, pooled OLS estimates are based on stationarity assumption (i.e. for panels where *T* is of moderate size). For these reasons, we resort to panel cointegration techniques to check the robustness of the results.

Table 2.1 Pooled OLS estimates

Variables	I	II	III
EG	0.021***(0.002)	0.026***(0.003)	0.024***(0.004)
PS	-1.496***(0.277)		
PR		-0.611(0.507)	
PC			-0.6762(0.554)
*EG*PS*	0.032***(0.004)		
*EG*PR*		0.019*(0.010)	
*EG*PC*			0.023*(0.011)

Note: Dependent variable log*Y*. Driscoll and Kraay standard errors are reported in parenthesis. ***(*) denote statistical significance at the 1% (10%) error level.

3. Panel cointegration approach

3.1 Unit root and cross-sectional dependence in panels

Testing for panel unit roots has become conventional in panel cointegration studies. The argument in favour of panel unit root tests (as against performing individual unit root test for each cross-section of the panel) is the increased

power associated with the test especially for N>T panels[14]. Due to the problem of cross-sectional dependence in our panel dataset we only rely on unit root tests that allow us to treat this effect. Two alternative unit root tests, the LLC statistic due to Levin et al. (2002) and the CADF statistic due to Pesaran (2007), are considered[15].

The LLC test evaluates the null hypothesis that each individual unit in the panel contains a unit root against the alternative hypothesis that all individual unit of the panel is stationary. The test is appropriate for panels of moderate size (i.e. N=10-250 and T=25-250) and is generalised to allow for "fixed effects, individual deterministic trends and heterogeneous serially correlated errors" (Baltagi, 2008). Both N and T are allowed to approach infinity asymptotically. In the presence of cross-sectional dependence, Levin et al. (2002) suggest allowing for a limited degree of cross-sectional dependence by subtracting cross-sectional averages from the data. In order to mitigate the impact of cross-sectional dependence we demean the data when implementing the LLC test.

Pesaran (2007) provides cross-sectionally augmented Dickey-Fuller (CADF) test statistic in heterogeneous panels with cross-sectional dependence. The tests augment the standard ADF regressions with the cross-sectional averages and their first differences to eliminate the impact of cross-sectional dependence. The null hypothesis assumes that all series are non-stationary versus the alternative hypothesis that only a fraction of the series is stationary. The asymptotic distribution of CADF is non-standard and asymptotic critical values are provided for different values of both N and T.

The panel unit root test results reported in Appendix 3A suggest that all variables can be treated as $I(1)$ stationary or integrated of order one. This indicates that the Driscoll and Kraay pooled OLS results may not be adequate

[14] See Levin et al. (2002)
[15] Additional information on LLC and CADF panel unit root test are provided in the Appendix A3. Readers are also referred to (Levin and Lin, 1992; Levin et al., 2002; Pesaran, 2007) for further technical details

since OLS estimates are based on stationarity assumption. For this reason, the use of panel cointegration techniques becomes particularly important.

3.2 Panel cointegration test

In this paper we employ Pedroni (1999, 2004) panel cointegration test to determine whether the variables included in our panel data models are cointegrated[16]. Pedroni (1999, 2004) proposes seven panel cointegration test statistics that correct for bias introduced by potentially endogeneous regressors. The test allows "not only the dynamics and fixed effects to differ across members of the panel, but also that they allow the cointegrating vector to differ across members under the alternative" (Pedroni, 1999). For this reason, all the test statistics are robust in the presence of panel data heterogeneity. Moreover, in the presence of cross-sectional dependence (most importantly in small samples), Pedroni suggest including common time dummies to mitigate this effect. This is important as Pedroni's test is only valid on the assumption that any cross-sectional correlations are captured by an aggregate time effect.

Four of Pedroni's tests are based on within-dimension of the panel (panel cointegration test statistics): panel v-statistic, panel ρ-statistic, panel t-statistic (non-parametric) and panel t-statistic (parametric). The other three (that allows for potential heterogeneity across individual members of the panel) are based on between-dimension of the panel (group mean panel cointegration test statistics): group ρ-statistic, group t-statistic (non-parametric) and group t-statistic (parametric).

These tests are particularly appropriate as they are applied to the estimated regression residuals after the panel statistics have been normalised with correction terms. The procedure involved in computing the seven test statistics as well as the test results are provided in Appendix 3A. The panel cointegration test results suggest that there is enough evidence to reject the null hypothesis of

[16] Pedroni's panel cointegration test is an extension of the Engle and Granger (1987) two-step procedure applied to panel data

no cointegration for all estimated models. In other words, the link between economic globalisation, democracy and income can be considered a long run relationship.

3.3 Estimation of panel cointegration regression

Given that we find panel cointegration, we need to estimate the associated long run cointegration parameters. The OLS estimator is known to yield biased and inconsistent estimates. For this reason, several estimators have been proposed. For example, Kao and Chiang (2000) argue that their parametric panel Dynamic OLS (DOLS) estimator (that pools the data along the within-dimension of the panel) is promising in small samples and performs well in general in cointegrated panels. However, the panel DOLS due to Kao and Chiang (2000) does not consider the importance of cross-sectional heterogeneity in the alternative hypothesis. To allow for cross-sectional heterogeneity in the alternative hypothesis, endogeneity and serial correlation problems to obtain consistent and asymptotically unbiased estimates of the cointegrating vectors, Pedroni (2000; 2001) proposed the group mean Fully Modified OLS (FMOLS) estimator for cointegrated panels.

The group mean FMOLS estimator (which is based on the between-dimension of the panel) applies a semi-parametric correction to the OLS estimator and it produces *t*-statistic that allows for more flexibility in the alternative hypothesis. Pedroni (2001) argues that pooling the data along the between-dimension of the panel have a more useful interpretation as the mean value of the cointegrating vectors in heterogeneous panels. Moreover, the group mean FMOLS estimator generates consistent estimates in small samples and does not suffer from large size distortions, in the presence of endogeneity and heterogeneous dynamics (as it allows for heterogeneity in the fixed effects and in the short run dynamics). In the presence of cross-sectional dependence, Pedroni (2001) suggest estimating the model with common time dummies to mitigate this effect. We employ the group mean FMOLS estimator to estimate the long run cointegration parameters in equation (2). The procedure involved in estimating the panel group mean

FMOLS is provided in Appendix A4. However, we complement the group mean FMOLS results with the within-dimension panel DOLS (WPDOLS) estimates due to Kao and Chiang (2000) as well as the between-dimension group mean panel DOLS (BPDOLS) estimates due to Pedroni (2001). All estimators are asymptotically normally distributed[17].

Table 4.1 Panel FMOLS estimates

Variables	I	II	III
EG	0.003***(3.712)	0.002*(1.937)	-0.0004(-0.435)
PS	-0.310***(-4.911)		
PR		-0.446***(-6.669)	
PC			-0.542***(-7.399)
*EG*PS*	0.007***(3.918)		
*EG*PR*		0.015***(8.209)	
*EG*PC*			0.019***(9.392)

Note: Dependent variable log*Y*. In parenthesis are t-ratios. ***(*) denote rejection of the null hypothesis at the 1%(10%) error level.

4. Panel cointegration results and discussion

In this section, we report and discusses the estimated long run results. The estimated long run estimates from the FMOLS, WPDOLS and the BPDOLS results are reported in Tables 4.1-4.3 respectively.

The coefficient on *EG* enters positive and statistically significant in the panel WDOLS estimates for all indicators of democracy and positive and statistically significant in the panel FMOLS and BDOLS estimates when we consider *PS* and *PR* as indicators of democracy. However, *EG* enters negative in the panel FMOLS and BDOLS estimates when we consider *PC* as an indicator of democracy, but insignificant at any conventional error level. The results, clearly indicate that, the

[17] For more technical details on the panel FMOLS and the panel DOLS estimators, readers are referred to (Pedroni, 2000, 2001) and (Kao and Chiang, 2000) respectively.

impact of economic globalisation on income in SSA countries is positive (though marginal in magnitude). The coefficients on all democracy indicators are negative and statistically significant for all estimators. The estimated panel results, clearly indicate that, the impact of democracy on income in SSA countries is negative. Nonetheless, the impact of the interaction of economic globalisation and democracy is positive and statistically significant for all estimators and for all democracy indicators. This interaction effect makes the total impact of economic globalisation positive (although still marginal) whilst that of democracy still remains negative.

Table 4.2 Panel WDOLS estimates

Variables	**I**	**II**	**III**
EG	0.020***(7.84)	0.025***(9.86)	0.022***(7.88)
PS	-1.839***(-12.40)		
PR		-0.894***(-5.91)	
PC			-0.923***(-4.88)
*EG*PS*	0.041***(10.33)		
*EG*PR*		0.027***(6.60)	
*EG*PC*			0.030***(6.10)

Note: Dependent variable log*Y*. In parenthesis are t-ratios. *** denote rejection of the null hypothesis at the 1% error level.

As a further robustness check we consider a general production function that incorporate economic globalisation, democracy and their interaction term as additional explanatory variables to labour and capital (see Appendix A1). The estimated results based on panel FMOLS are presented in Appendix A4. In all cases, the results clearly indicates that the total impact of economic globalisation is positive and statistically significant whilst that of democracy still remains negative and statistically significant. Overall the result suggests that, whilst the total impact of economic globalisation on income has been beneficial, the total impact of democracy has not been beneficial for economic performance in SSA countries.

Table 4.3 Panel BDOLS estimates

Variables	I	II	III
EG	0.003***(5.744)	0.004***(6.282)	-0.001(-1.117)
PS	-0.247***(-6.379)		
PR		-0.517***(-11.86)	
PC			-0.745***(-14.14)
*EG*PS*	0.005***(5.568)		
*EG*PR*		0.018***(16.264)	
*EG*PC*			0.021***(15.295)

Note: Dependent variable log*Y*. In parenthesis are t-ratios. *** denote rejection of the null hypothesis at the 1% error level.

The results of a negative impact of democracy on income is not surprising as the level (and quality) of democracy in SSA countries is too low for its potential positive impact to be felt on income and/or growth. In particular, the mean values of our democracy indicators of 0.3818, 0.3201 and 0.3419 for *PS*, *PR* and *PC* respectively are too low for their potential benefits to be realised. Moreover, one could think of what has happened to the level of income in Cote d'Ivoire, for example, between December 2010 and March 2011. This phenomenon has also characterised many other SSA countries for decades. Our results which support the predictions of theoretical models on the impact of democracy on income confirms further the results in Fosu (2008) that greater democratic advancement would be conducive for economic performance in SSA countries. Overall our result indicates that the simultaneous adoption of both economic globalisation and democracy is crucial for economic performance. Therefore, both economic globalisation and democracy do matter for the level of income in SSA.

5. Conclusion and Policy Implications

This paper has analysed the long run cointegration relationship between economic globalisation, democracy and income for 31 SSA countries using panel cointegration techniques, over the 1980-2005 period. We estimated a model that

considered a composite indicator for economic globalisation and several alternative indicators of democracy. Different tests for unit roots and cointegration for panels were considered. The panel unit roots test results show that all series are stationary only after first differencing. The panel cointegration test establishes long run cointegration relationship between economic globalisation, democracy and income. The long run coefficients were estimated using alternative estimators. The empirical results clearly indicate that, whilst the total long run impact of economic globalisation on income has been beneficial, the total long run impact of democracy has been the bane of income in SSA.

Our empirical results reveals important policy implications. The panel estimates suggest the essence of the simultaneous adoption of both economic globalisation and democracy for SSA countries. This implies that the recent adoption of economic and political liberalisation policies in SSA countries are in the right direction so far as economic performance is concerned. However, due to the negative impact of democracy on income, policy reforms should aim to improve democratic institutions in SSA for its potential benefits to be realised.

Reference:

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Appendix A1

Augmented Production Function Model

To further check the robustness of the empirical results we estimate the impact of economic globalisation and democracy on income using alternative model specification. For this reason, we define m (see equation (1) by considering a general production function that incorporate economic globalisation, democracy and their interaction term as additional explanatory variables to labour and capital. Therefore, based on equation (1) the following specific equation is estimated:

$$\log Y_{it}^{*} = \alpha_i + \beta_1 \log L_{it} + \beta_2 K_{it} + \beta_3 EG_{it} + \beta_4 DM_{it} + \beta_5 (EG * DM)_{it} + \varepsilon_{it} \qquad (2A)$$

where Y_{it}^{*} is real GDP, L_{it} is labour, K_{it} is the capital stock, EG_{it}, DM_{it}, $EG_{it} * DM_{it}$, log, α_i and ε_{it} are as previously defined and β_1 to β_5 are parameters to be estimated with β_3 to β_5 the parameters of interest.

Data definition and sources

Y: Real GDP per capita; African Development Indicators (2010), The World Bank
*Y**: Real GDP; African Development Indicators (2010), The World Bank
L: Labour Force; African Development Indicators (2010), The World Bank
K: Gross fixed capital formation (% of GDP); United Nations Statistical Division
PS: Polity2; Marshall and Jaggers (2009)
PR/PC: Heritage Foundation; Freedom House (2006)
EG: Economic Globalisation; KOF Index of Globalisation (2010)

Table 1.1A Components of KOF's Economic Globalisation Index

Indices and Variables	Weights
i) Actual Flows	**50%**
Trade (% of GDP)	19%
Foreign Direct Investment, Flows (% of GDP)	22%
Foreign Direct Investment, Stock (% of GDP)	24%
Portfolio Investment (% of GDP)	17%
Income Payments to Foreign Nationals (% of GDP)	20%
ii) Restrictions	**50%**
Hidden Import Barriers	22%
Mean Tariff Rate	28%
Taxes on International Trade (% of current revenue)	27%
Capital Account Restrictions	22%

Appendix A2

Cross-sectional dependence in panel data models

To compute the three statistics we estimate equation (2) and then compute the following:

Frees' statistic compute

$$R^2 = \frac{2}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{r}_{ij}^2 \qquad (3)$$

Friedman's statistic compute

$$R = \frac{2}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{r}_{ij} \qquad (4)$$

where $\hat{r}$ is the estimate of Spearman's rank correlation coefficient $r_{ij} = r_{ji} = \dfrac{\sum_{t=1}^{T}\left(r_{it} - \left(T + \frac{1}{2}\right)\right)\left(r_{jt} - \left(T + \frac{1}{2}\right)\right)}{\sum_{t=1}^{T}\left(r_{it} - \left(T + \frac{1}{2}\right)\right)^2}$ of the residuals.

Pesaran's statistic compute

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \qquad (5)$$

where $\hat{\rho}_{ij}$ is the estimate of $\rho_{ij} = \rho_{ji} = \dfrac{\sum_{t=1}^{T}\varepsilon_{it}\varepsilon_{jt}}{(\sum_{t=1}^{T}\varepsilon_{it}^2)^{1/2}(\sum_{t=1}^{T}\varepsilon_{jt}^2)^{1/2}}$. The null hypothesis tests $\rho_{ij} = \rho_{ji} = corr(\varepsilon_{it}, \varepsilon_{jt}) = 0$ for $i \neq j$ versus the alternative hypothesis that $\rho_{it} = \rho_{ji} \neq 0$ for some $i \neq j$. The test results are reported in Tables 2.1A – 2.2A[18].

Table 2.1A Tests for cross sectional independence (equation 2)

Test statistics	I	II	III
Frees	9.281***	9.230***	9.607***
Friedman	35.908	46.683**	46.683**
Pesaran	1.790*	3.751***	3.716***
ABS	0.512	0.521	0.540

Note: *ABS* is the average absolute value of the off-diagonal elements of the residuals. Critical values from Frees' Q distribution are 0.1870, 0.1297 and 0.0996 for the 1%, 5% and 10% error level respectively. ***(**)(*) denote statistical significance at the 1%(5%)(10%) error level.

[18] The three test statistics have been computed using the "XTCSD" routine in STATA

Table 2.2A Tests for cross sectional independence (equation 2A)

Test statistics	I	II	III
Frees	8.170***	8.807***	8.861***
Friedman	38.056	48.982**	45.988**
Pesaran	2.214**.	3.592**	3.694***
ABS	0.467	0.496	0.497

Note: *ABS* is the average absolute value of the off-diagonal elements of the residuals. Critical values from Frees' Q distribution are 0.1870, 0.1297 and 0.0996 for the 1%, 5% and 10% error level respectively. ***(**) denote statistical significance at the 1%(5%) error level.

The results suggest that there is enough evidence to reject the null hypothesis of error cross-sectional independence for the case of Frees' R^2 and Pesaran's CD tests for all estimated models. There is also enough evidence to reject the null hypothesis of error cross-sectional independence for the case of Friedman's R for models II and III. Nonetheless, not enough evidence exists to reject the null hypothesis of cross-sectional independence for the case of Friedman's R for model I. It is important to note that both Friedman's R and Pesaran's CD tests are known to lack power when the error structure alternate in sign[19]. This is the case as both tests compute the sum of the pair-wise coefficients of the residual matrix that may cancel out when averaging. However, since Frees' R^2 compute the sum of the squared rank correlation coefficients it is not subject to this drawback. For this reason, De Hoyos and Sarafidis (2006) argue that if there is not enough evidence to reject the null hypothesis of cross-sectional independence for Friedman's R and/or Pesaran's CD (but not the case for Frees' R^2) and there is also enough evidence to believe that the correlation coefficient of the errors alternate in sign (for which the average absolute value of the off-diagonal elements of the correlated residuals is large)[20] then inference should be based on Frees' R^2. This result is exactly the case in model I and it suggests that there is enough evidence to reject the null hypothesis of cross-sectional independence.

[19] See De Hoyos and Sarafidis, 2006
[20] Not reported, the correlation coefficients of the errors are available upon request

Appendix A3

Panel unit root and cointegration tests

The LLC test is based on the following regression

$$\Delta y_{it} = \delta y_{i,t-1} + \sum_{L=1}^{pi} \theta_{iL} \Delta y_{i,t-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \qquad (6)$$

where m=1, 2, 3, and d_{mt} and α_{mi} are used to indicate the vector of deterministic variables and the corresponding vector of coefficients for a particular model m=1, 2, 3 respectively. LLC suggest three-step procedure that implements the test, since the lag order pi (which is allowed to vary across individuals in the panel) is unknown. The three-steps involves the estimation of a separate Augmented Dickey-Fuller (ADF) regression for each N, the estimation of the long run to short-run standard deviations and the estimation of the panel test statistics.

Pesaran considers the following CADF regression

$$\Delta y_{it} = \alpha_i + \rho_i * y_{i,t-1} + d_0 \bar{y}_{t-1} + d_1 \Delta \bar{y}_t + \varepsilon_{it} \qquad (7)$$

where $\bar{y}_t$ is the average at time t for the cross-sectional dimension of the panel. The presence of cross-sectional averages of lagged levels ($\bar{y}_{t-1}$) and first differences ($\Delta \bar{y}_t$) of the individual series capture the cross-sectional dependence through a factor structure[21]. In the presence of serial correlation in the error term, Pesaran suggest augmenting (7) with appropriate lags. Pesaran obtain the $CADF$ ($CIPS \quad Z_{t-bar}$) statistic by averaging the t-statistic on the lagged value for each unit i ($CADF_i$).

[21] See Baltagi, 2008

$$CADF = \frac{1}{N}\sum_{i=1}^{N} CADF_i \quad (8)$$

The panel unit roots test results are presented in Tables 3.1A – 3.2A[22].

Table 3.1A Panel unit root test results

Variables	Levels		First Differences	
	LLC	CADF	LLC	CADF
log*Y*	3.753	-2.335	-13.053***	-3.891***
EG	1.629	-2.305	-7.737***	-2.721***
PS	1.326	-2.254	-12.161***	-4.158***
PR	1.326	-2.114	-13.791***	-3.534***
PC	3.483	-2.267	-15.621***	-3.878***
*EG*PS*	2.300	-1.583	-13.258***	-2.842***
*EG*PR*	2.928	-2.239	-12.936***	-3.565***
*EG*PC*	2.802	-2.339	-12.057***	-3.737***
log*Y**	2.909	-2.166	-12.689***	-3.893***
log*L*	0.788	-2.284	-9.824***	-3.991***
K	-0.616	-2.019	-11.828***	-2.998***

Note: We include a linear time trend in the deterministic component in all tests since the series are trended. Issues related to the choice of optimal lag length are settled with the Akaike Information Criterion (AIC). The critical values for LLC and CADF are based on Levin and Lin (1992) and Pesaran (2007) respectively. *** denote rejection of the null hypothesis of unit root at the 1% error level.

Pedroni's panel cointegration test procedure

The procedure involved in computing the seven test statistics first estimate and stores the residuals from equation (1). The second step uses kernel estimator to

[22] The LLC and CADF statistics have been implemented using the routine "XTUNITROOT" and "PESCADF" in STATA respectively. Not reported, we also performed the Fisher-type panel unit root test due to Choi (2001) using the routine "XTUNITROOT" in STATA that provides additional support to our results

compute the long run variance ($\hat{L}^2_{11i}$) from the residuals ($\hat{\eta}_{it}$) of the differenced regression of the form $\Delta y_{it} = \sigma_{1i}\Delta x_{1it} + ... + \sigma_{Mi}\Delta x_{Mit} + \eta_{it}$. This long run variance is required to compute the panel statistics. In the third step, we use the estimated residuals ($\hat{\varepsilon}_{it}$) from equation (1) to compute the appropriate autoregressive models. For the non-parametric statistics we estimate $\hat{\varepsilon}_{it} = \hat{\rho}_i \hat{\varepsilon}_{i,t-1} + \hat{\varphi}_{it}$ and compute the long-run variance ($\hat{\sigma}^2_i$) and the simple variance ($\hat{s}^2_i$) from the residuals ($\hat{\varphi}_{it}$). Then the terms $\hat{\lambda}_i$ and $\tilde{\sigma}^2$ can be computed as $\hat{\lambda}_i = \frac{1}{2}(\hat{\sigma}_i^2 - \hat{s}_i^2)$ and $\tilde{\sigma}^2 \equiv \frac{1}{N}\sum_{i=1}^{N} \hat{L}_{11i}^{-2} \hat{\sigma}_i^2$ respectively. For the parametric statistics we estimate $\hat{\varepsilon}_{it} = \hat{\rho}_i \hat{\varepsilon}_{i,t-1} + \sum_{k=1}^{K_i} \hat{\rho}_{ik} \Delta \hat{\varepsilon}_{i,t-k} + \hat{\varphi}^*_{it}$ and compute the simple variance ($\hat{s}^{*2}_i$) from the residuals ($\hat{\varphi}^*_{it}$). In this expression K denotes the truncation lag permitted to vary by individual countries. The term $\tilde{S}^{*2}$ is computed as $\tilde{S}^{*2} \equiv \frac{1}{N}\sum_{i=1}^{N} \hat{s}_i^{*2}$. The seven panel statistics expressed in equations (9) to (15) are then computed with the appropriate mean and variance adjustment terms as in Pedroni (1999).

Panel *v*-statistic:

$$Z_v \equiv T^2 N^{3/2} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1} \tag{9}$$

Panel ρ-statistic:

$$Z_\rho \equiv T\sqrt{N} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{\varepsilon}_{i,t-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i) \tag{10}$$

Panel t-statistic (non-parametric):

$$Z_{pp} \equiv \left(\tilde{\tilde{\sigma}}^{2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^{2} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{\varepsilon}_{i,t-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i) \tag{11}$$

Panel t-statistic (parametric):

$$Z_t^* \equiv \left(\tilde{\tilde{S}}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}^{*2}_{i,t-1} \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}^{*}_{i,t-1} \Delta \hat{\varepsilon}^{*}_{it} \tag{12}$$

Group ρ-statistic:

$$\tilde{\tilde{Z}}_{\rho} \equiv TN^{-1/2} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{\varepsilon}_{i,t-1}^{2} \right)^{-1} \sum_{t=1}^{T} (\hat{\varepsilon}_{i,t-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i) \tag{13}$$

Group t-statistic (non-parametric):

$$\tilde{\tilde{Z}}_{pp} \equiv N^{-1/2} \sum_{i=1}^{N} \left(\hat{\sigma}_i^2 \sum_{t=1}^{T} \hat{\varepsilon}_{i.t-1}^{2} \right)^{-1/2} \sum_{t=1}^{T} (\hat{\varepsilon}_{i,t-1} \Delta \hat{\varepsilon}_{it} - \hat{\lambda}_i) \tag{14}$$

Group t-statistic (parametric):

$$\tilde{Z}_t^* \equiv N^{-1/2} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{s}_i^{*2} \hat{\varepsilon}^{*2}_{i,t-1} \right)^{-1/2} \sum_{t=1}^{T} \hat{\varepsilon}^{*2}_{i,t-1} \Delta \hat{\varepsilon}_{it}^{*} \tag{15}$$

All statistics test the null hypothesis of no cointegration against the alternative hypothesis of cointegration. The distinction rests on the treatment of ρ_i in the formulation of the alternative hypothesis. The panel cointegration statistics test the null hypothesis that $\rho_i = 1$ for all i, versus the alternative hypothesis that

$\rho_i = \rho < 1$ for all i. While the group mean panel cointegration statistics test the null hypothesis that $\rho_i = 1$ for all i, versus the alternative hypothesis that $\rho_i < 1$ for all i. Thus, whilst under the alternative hypothesis the former assumes a common value for ρ_i (i.e. $\rho_i = \rho$), the later does not.

The estimated results of Pedroni's seven panel cointegration test statistics are reported in Table 3.2A – 3.3A[23].

Table 3.2A Panel cointegration test results (equation 2)

Models	**I**	**II**	**III**
Pedroni's panel cointegration statistics			
Panel *v*-statistic	-0.977	-0.881	-0.919
Panel ρ-statistic	-1.261	-1.505	-1.783*
Panel *pp*-statistic	-9.487***	-10.162***	-10.913***
Panel *adf*-statistic	-9.674***	-11.165***	-11.124***
Pedroni's group mean panel cointegration statistics			
Group ρ-statistic	3.011***	2.499**	2.122**
Group *pp*-statistic	-2.689***	-3.998***	-4.416***
Group *adf*-statistic	-3.747***	-5.404***	-4.935***

Note: All test statistics are asymptotically normally distributed. However, for the panel *v*-statistic only the right tail of the normal distribution is used to reject the null hypothesis as it diverges to positive infinity under the null hypothesis of no cointegration. ***(**)(*) denote rejection of the null hypothesis of no cointegration at 1%(5%)(10%) error level.

[23] The tests include deterministic time trend and common time dummies and are implemented using Pedroni's procedure available in RATS. Not reported, we also considered the panel cointegration test due to Kao (1999) that assumes slope homogeneity across the cross-sectional units of the panel. Kao's test results provides additional support to Pedroni's test results.

Table 3.3A Panel cointegration test results (equation 2A)

Models	I	II	III
Pedroni's panel cointegration statistics			
Panel *v*-statistic	-1.801	-1.631	-1.744
Panel ρ-statistic	1.934*	1.595	1.953*
Panel *pp*-statistic	-7.646***	-9.529***	-8.356***
Panel *adf*-statistic	-7.444***	-8.872***	-7.984***
Pedroni's group mean panel cointegration statistics			
Group ρ-statistic	4.601***	4.641***	4.617***
Group *pp*-statistic	-4.154***	-4.093***	-4.010***
Group *adf*-statistic	-3.480***	-3.124***	-4.224***

Note: All test statistics are asymptotically normally distributed. However, for the panel *v*-statistic only the right tail of the normal distribution is used to reject the null hypothesis as it diverges to positive infinity under the null hypothesis of no cointegration. ***(*) denote rejection of the null hypothesis of no cointegration at 1%(10%) error level.

Appendix A4

Panel group mean FMOLS estimator

The panel group mean FMOLS estimate equation (1) and $x_{it} = x_{i,t-1} + e_{it}$. The innovation vector $\omega_{it} = (\varepsilon_{it}, e_{it})'$ is $I(0)$ with asymptotic long run covariance matrix $\Omega_i = \begin{pmatrix} \Omega_{11i} & \Omega_{12i} \\ \Omega_{21i} & \Omega_{22i} \end{pmatrix}$ and autocovariances Γ_i, and $z_{it} = (y_{it}, x_{it})$ is $I(1)$ and y_{it} and x_{it} are cointegrated. The panel group mean FMOLS estimator for β gives:

$$\hat{\beta} = N^{-1}\sum_{i=1}^{N}\left(\sum_{t=1}^{T}(x_{it}-\bar{x}_i)^2\right)^{-1}\left(\sum_{t=1}^{T}(x_{it}-\bar{x}_i)\right)y_{it}^{*} - T\,\hat{\tau}_i \qquad (16)$$

where $y_{it}^{*} = (y_{it}-\bar{y}_i) - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}\Delta x_{it}$, $\hat{\tau}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}(\hat{\Gamma}_{22i} - \hat{\Omega}_{22i}^{0})$ and $\hat{L}_i$ is a lower triangular decomposition of $\hat{\Omega}_i$. The associated *t*-statistic gives:

$$t_{\hat{\beta}^*} = N^{-1/2}\sum_{i=1}^{N} t_{\hat{\beta}^*,i} \text{ where } t_{\hat{\beta}^*,i} = (\hat{\beta}_i^* - \beta_0)\left(\hat{\Omega}_{11i}^{-1}\sum_{t=1}^{T}(x_{it}-\bar{x}_i)^2\right)^{1/2}.$$

Table 4.1A Panel FMOLS estimates (equation 2A)

Variables	I	II	III
log*L*	0.605***(8.206)	0.616***(8.051)	0.560***(8.164)
K	0.004***(9.305)	0.004***(7.971)	0.003***(7.496)
EG	-0.0005(-0.665)	-0.0003(-0.384)	-0.0016*(-1.883)
PS	-0.131**(-2.556)		
PR		-0.213***(-3.649)	
PC			-0.242***(-3.96)
*EG*PS*	0.0031**(2.108)		
*EG*PR*		0.0072***(4.447)	
*EG*PC*			0.0095***(5.356)

Note: Dependent variable log*Y**. In parenthesis are t-ratios. ***(**)[*] denote rejection of the null hypothesis at the 1%(5%)[10%] error level.