INSTITUTIONAL QUALITY AND ECONOMIC PERFORMANCE:
NEW EVIDENCE FROM SUDAN

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ABSTRACT

The paper investigates the way institutions along with other economic variables may affect the development process of a country. Our analysis focuses on Sudan, a Sub-Saharan African country which like many developing countries experienced vast changes in its economic and institutional environment and, despite all the efforts, it sufficiently lacks sound economic and political environment. For the years 1972-2008, the short-run and long-run relationships between institutions and other conditioning economic variables with economic growth are explored by using the Autoregressive Distributed Lag approach to cointegration. The empirical results of the analysis suggest that the policy makers should primarily focus on improving the institutions in Sudan, since along with other economic variables used in conventional growth studies, they play a key role in delivering long-run economic prosperity in this highly underdeveloped region of the world.

Keywords: Institutions Quality, Economic Growth, ARDL, ECM, Sudan.
JEL Classification: O5, C2.

1. INTRODUCTION

A great number of studies on the determinants of growth confirms the relevance of institutions' quality into the processes of economic development (Tavares and Wacziarg, 2001; Acemoglu, *et al.*, 2003; Easterly, *et al.*, 2004; Rigobon and Rodrik, 2005; Lee and Kim, 2009 among many others). In fact, in the past few years, we witness a resurgence of the research into the sources and channels through which institutions may affect the economic performance of a country or region without, however, clear evidence about these links (Pistor, 1995; Eweld, 1995; Weder, 1995, *etc.*). Hence, it becomes imperative to explore to what extent institutional features and other macro variables employed in conventional growth analysis form an

appropriate framework and platform upon which the inherent dynamics of the Sudan economy should be sought for the period 1972-2008.[1]

Like many developing countries, Sudan experienced vast changes in its economic and institutional environment. During the last 20 years, Sudan became an oil exporting country and the applied economic and trade liberalization policies allowed its rapid integration into the world economy (Shafaaeddin, 2007). However, Sudan, like many other underdeveloped countries that sufficiently lack of sound economic and political institutions is vulnerable to shocks and crises that often cause economic and political instability (Ali, *et al.,* 2002). Hence, using Sudan as the case study in our analysis, we attempt to explore to what extent the conventional methods used in the majority of relevant growth studies can successfully interpret the economic performance of a highly underdeveloped country. The empirical analysis is carried out by employing Autoregressive Distributed Lags (ARDL) bounds test proposed by Pesaran, *et al.,* (2001) in order to explore the short-run and long-run relationships between institutions and other conditioning economic variables with economic growth for the period 1972-2008.

2.   BRIEF LITERATURE REVIEW

The 'institutions quality hypothesis' contends that economic development is affected by the institutional framework within which the economic agents interact with each other in an economy.[2] According to this view, what matters most are the 'rules of the game' in a society which are defined by the prevailing explicit and implicit behavioural norms and their ability to create appropriate incentives for desirable economic behaviour (Rodrik and Subramanian, 2003). The majority of early studies focussed on the relationship between economic development and political institutions (Wittman, 1995; Clague, *et al.,* 1996; Haggard, 1997; Scully, 1988; Sen 1999; Wu and Davis, 1999; Farr, *et al.*, 1998). Over the years, however, the development of new measures has led to a number of different institutional issues to be addressed in the discussion (Butkiewicz and Yanikkaya, 2006; Vukotic and Bacovic, 2006; Brunt, 2007; Kostevc, *et al.*, 2007).

Studies by Dawson (2003), Adkins and Savvides (2002), Gwartney, *et al.*, (1996), and Scully and Gerald (1988) showed that institutions that promote economic freedom have a positive effect on economic performance. In addition, a strand of the extant empirical research has scrutinized the extent to which more political freedom leads to less income inequality and to economic prosperity. Studies by Muller (1995), Granato, *et al.,* (1996), Li, *et al.,* (1998), Barro (1999), Bourguignon and Verdier (2000), Easterly (2001), Gradstein, *et al.* (2001), Sylwester (2002), and Easterly and Levine (2003), among many others, report that countries with greater civil liberties have lower levels of income inequality. In time, the debate on institutions moved beyond the measures of economic freedom or civil liberties onto issues such as corruption, quality of bureaucracy, rule of law, *etc.,* and many studies explored their impact on economic performance (Huntington, 1968; Leff, 1964; Krueger, 1974; De Soto, 1989; Kaufmann and Wei, 1999; Wei, 1999; 2000; Knack and Keefer, 1995; 2002; Svensson, 1998; Barro, 1996; Demirguc-Kunt and Detragiache, 1998).

Currently, the bulk of research on the determinants of economic performance strongly introduces the role of institutions in the discussion and its focus has shifted from

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[1] Moreover, the quest of the development determinants for this poor country of the world may suggest that the 'conventional' fundamentals of economic growth theory ma[1]y not fully explain Sudan's experience (Easterly and Levine, 1995).

[2] According to Rodrik, *et al.*, (2002) the institutional characteristics of an economy have a much broader impact on its development than the geographic and natural resource characteristics.

macroeconomic to institutions quality variables. The empirical evidence from several studies (Rodrik, *et al*., 2002; Acemoglu, *et al.,* 2003; Easterly, *et al.*, 2004) even suggests that the positive correlation between good economic policies and development is the result of good institutions, which once are introduced in the analysis the correlation disappears.

Like most African countries, Sudan continuously struggles to establish political and economic freedoms since its independence in 1956. Since then, the country has experienced numerous military coups and counter coups and has survived disastrous civil wars.[3] Sudan's complex armed conflicts[4] have been characterized as 'interlocking civil wars' whose causes interwove economic, resource-based, ethnic, cultural, religious and international dimensions. However, all the causes are underpinned by the state's crisis of legitimacy which permits political elites to control its institutions for their own benefits. Ali, *et al.,* (2005) shows that in Sudanese society there is an "overwhelm agreement" that bad institutions and unstable political environment are the main causes of its poor development performance.

According to Ali (2006), the highly volatile growth[5] record of Sudan is related to the inherited structure of institutions from the colonial period which was not only weak but has not changed over the years in any significant fashion; at the same time, it dramatically failed to provide a viable solution to country's major political and economic challenges and to propel growth. Johnson (2003) points out that the civil violence in Sudan has roots in the deep injustices created historically during the two waves of colonization. The old social hierarchy[6] is still reproduced in contemporary Sudan and it significantly contributes to political, economic and social marginalisation of large parts of the population, and to poverty and horizontal inequality. Elbadawi (2006) also states that the inherited colonial legacy was further reinforced by the lack of vision of the Sudanese political establishment following independence. The ensuing political landscape was, therefore, characterized by a high degree of political instability, which produced three short-lived democracies and three long-reigning military regimes.[7]

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[3] The civil wars between the government and southern armed groups (1955-1972 and 1983-2005) has received the most international attention. However, the Beja in the east, the Fur in Darfur, the Nuba in Kordofan are some among many others that came into armed conflict with the Sudanese government or government-backed militias.

[4] See Ali, *et al.,* (2005) for a review of the conflict causes and the historical preconditions leading   to the civil wars in Sudan.

[5] Similarly, Elbadawi (2006) notes that the growth record of Sudan has also been very volatile with two distinctive periods of high records: the first during the peace era following the Addis Ababa agreement (1975-79) and the second during the current growth spell (1995 to present) which is mostly driven by the exceptionally favourable weather conditions and the drilling of oil.

[6] Institutions related to imperialism and exploitation created a particular type of social hierarchy in which Arab and Muslim identity population dominates other groups that are marginalized in the peripheral regions.

[7] The first military intervention in politics took place in November 1958 by overthrowing the parliamentary government. The ensuing regime of Major General Ibrahim Abbud lasted for six years before dissolving itself by widespread popular opposition in 1964. The civilian democratic government was terminated by a military coup in 1969. Colonel Jaafar Nimeiri remained in power for sixteen years (April 1985) and he was toppled under the combined weight of a popular *Intifada* and some form of a military acquiescence. A Transitional Military Council (TMC) ruled for one year paving the way for democratic elections which were conducted in March 1986 and brought in power a coalition of center-right civilian parties. In turn, a group of mid-ranking ideologically motivated - this time Islamic - army officers seized power in June 1989 and they remain to the present. In summary, during its 54 years of independence (1956-2010), the country has experienced 41 years of military rule and 13 years of civilian rule.

Sudan is not among the African countries that enjoy democracy[8] however, it is one that has embarked on pursuing several market institutions reforms which attempt to liberalize its institutional and economic environment. Hence, the assessment of the impact of these institutional reforms and institutional environment in general for its economic growth becomes imperative. None of the studies for the Sudanese economy has focused on how institutional reforms have affected its economic performance and the few studies on its economic growth mostly relies on descriptive empirical techniques[9] The present study by including institutional quality variables along with other control variables and by employing the ARDL method to cointegration attempts to provide insights into growth determinants of Sudan during the period 1972-2008.

3. MATERIALS AND METHODS

In order to explore the presence of a long run and short run relations between Sudan's economic performance and institutional and economic environment variables, we apply the ARDL approach to co integration (see Pesaran *et al.*, 2001). The ARDL approach to cointegration, also known as bounds testing, has certain advantages in comparison to other cointegration methodologies. More specifically, the ARDL is a single-equation method and thus requires the estimation of a fairly small number of parameters; as a consequence, this approach is more efficient especially with small data samples. The commonly used Johansen Maximum Likelihood method is based on a VAR system of equations which is fairly data intensive and there is a substantial loss of degrees of freedom. It follows, therefore, that most of the hitherto econometric results based on relatively small samples are very likely to be of dubious validity. These limitations[10] do not apply to the ARDL (Romilly, *et. al.*, 2001).

In addition, the ARDL method avoids the problem of pre-testing for the order of integration of the individual variables which is a matter of crucial importance in any empirical analysis. In the case where a long run relationship between the variables involved is confirmed, an Error Correction (EC) model can be used to test for Granger-type causality. The advantage of using an EC specification to test for causality is that on the one hand it allows testing for short-run causality through the lagged difference explanatory variables and on the other hand for long-run causality through the lagged EC term. As Granger, *et al.* (2000) suggest, a significant EC term implies long-run causality running from the explanatory variables towards the dependent variable.

The ARDL approach begins with the estimation of the following unrestricted EC version of the ARDL model for, let us say, two variables *Y* and *X*:

$$DY = \alpha_0 + \sum_{i=1}^{p} b_i DY_{t-i} + \sum_{i=0}^{p} c_i DX_{t-i} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + e_i \qquad (1)$$

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[8] Since 1972, Freedom House has provided annual rankings of political freedom and civil liberties for countries around the world. In the case of Africa, modest but significant gains have been made in the quest for democratic governance. In sub-Saharan Africa, while only 2 countries (Gambia and Mauritius) were considered free in 1972, currently 11 countries (Benin, Botswana, Cape Verde, Ghana, Lesotho, Mali, Mauritius, Namibia, Sao Tome and Principe, Senegal and South Africa) are classified as free.

[9] According to Kireyev (2001) the erratic shift in an agricultural economy, like the Sudanese one, cannot be faithfully be described by econometric models.

[10] In fact, the reliability of the unit root tests depends more on the time span of the data, ceteris paribus, than on the number of observations. In other words, if we were to choose between annual data that span a long period of time and a larger number of say quarterly observations that cover shorter period of time, then the former is preferred to the latter (Kennedy, 1998, p. 267).

$$DX = \alpha_0 + \sum_{i=1}^{p} b_i DX_{t-i} + \sum_{i=0}^{p} c_i DY_{t-i} + \delta_1 X_{t-1} + \delta_2 Y_{t-1} + e_i \qquad (2)$$

On the basis of equations (1) and (2), we form bounds testing procedure in order to ascertain the presence of a long-run relationship between the variables. Actually, an *F*-test is applied for the joint null hypothesis that the coefficients on the level variables are jointly equal to zero (Pesaran and Shin, 1999; Pesaran, *et al.*, 2001). The test statistic displays a non-standard *F* distribution which depends on whether the variables are individually *I* (0) or *I* (1), the number of regressors and the existence of an intercept and/or a trend. Instead of the conventional critical values, Pesaran, *et al.* (2001) report two sets of critical bound values for all classifications of the regressors, that is purely *I*(1), purely *I*(0) or mutually cointegrated. If the test statistic exceeds the respective upper critical value, it may be argued that there is evidence of a long-run equilibrium relationship. If the test statistic falls below the lower critical value, we cannot reject the null hypothesis of no cointegration. Finally, if the test statistic lies between the two bounds, then the test becomes inconclusive.

The conditional long-run models can be produced from the reduced form solution of equations (1) and (2), when the first-difference variables are set jointly equal zero. The long-run coefficients of the EC models are estimated through the ARDL approach to cointegration and the use of OLS. The corresponding EC specification is based on the implied ARDL specification, through a simple linear transformation (Banerjee, *et al.,* 1993). The lag structure of the ARDL specification to account for the short-run dynamics is determined by the Akaike's Information Criterion (AIC), which also controls for the problem of autocorrelation. In our analysis, we employ a simple linear growth model of the following form:

$$Y_t = \alpha + \beta D_t + \psi P_t + + \omega Z_t + \mu_t \qquad (3)$$

Where the subscript t is the time dimension ($t=1...T$); Y_t is the growth rate of GDP per capita income; D_t is a vector of institutional variables; P_t is a vector of variables that approximates macroeconomic environment (*i.e.,* inflation rate, government size, trade openness, *etc.*); Z_t is a vector of control economic explanatory variables (*i.e.,* population growth, investment share, FDI, *etc.*) which in many growth studies have shown a robust link to economic growth and μ_t is the error term.

The dependent variable (*Y*) in our analysis is the average growth rate of real GDP per capita income (in constant 2000 US dollars).[11] The first explanatory variable in the equation (3) refers to institutional quality measures. Unfortunately, there is only one source that provides respective information for such a long period for Sudan and this is the Freedom House (2009). The Freedom House has been watching political freedom around the world and monitors political freedom in each country on an annual basis using two criteria, political rights and civil liberties. Political rights refer to the freedom of participating in the political process[12] whereas civil liberties are the rights to free expression, to organize or demonstrate, and to freedom of religion, education, travel, and other individual rights.[13] We employ the combined rankings applicable to Sudan over the years 1972-2008. In order to employ the ordinal combined rankings, we transform them into a set of dummy variables which takes the value of 2 for

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[11] Data on the variables used in our empirical analysis come from *World Development Indicators* (WDI) published online by the World Bank.

[12] In a democracy, this means the right of all adults to vote and compete for public office and for elected representatives to have a decisive vote on public policies.

[13] Freedom House derives the annual status of political freedom for each country, with 1.0 and 2.5 classified as "free", between 3.0 and 5.5classified as "partly free", and between 5.5 and 7.0 as "not free".

"free" classification, 1 for "partly free" and 0 for "not free". In the case of Sudan, the dummy index ranges between 0 and 1.[14]

Following the respective growth literature, we introduce a number of macroeconomic policy measures (vector P_t). The first policy variable employed in the analysis is inflation (*INF*) as an indicator of macroeconomic instability which is proxied by the growth rate of CPI (Consumer Price Index). It is expected that high inflation will distort economic activity and reduce economic growth (Fischer, 1993). The second policy variable is government size (*GOV*) measured as a percentage of government spending to GDP and it is used in an attempt to capture the stimulating effect of an expansionary government policy (Barro, 1991). Given the existing theoretical approaches (Keynesian and mainstream), an ambiguous relationship is possible. Finally, the third policy variable employed in the empirical analysis is the degree of economy's openness (*OPN*) measured by the sum of exports and imports as a percentage of nominal GDP. According to Feder (1982), Romer (1989) and Levine, *et al.,* (2000), a country's open trade policies may increase profitability and by extent the incentives to invest which in turn may promote growth in a country.

An additional set of explanatory variables (Z_t) often used in this type of research refers to a set of variables that describe the credit conditions, population growth, *etc*. of the country. Among these variables we include domestic investment measured as a share of gross fixed capital formation to GDP, since in the growth literature it is considered an important factor propelling the growth performance. An additional factor included in the pool of control variables attempts to capture the domestic financial environment (*PSC*) and it is measured as the share of the domestic credit provided by the banking sector to GDP. A variable of population growth (*POP*) is also introduced in our empirical work in order to capture its effect on economic performance. According to the literature, the impact of *POP* on growth is expected to be of a negative nature; however few studies indicated that high growth in population may positively affect growth by supplying cheap labor and human capital (see Baumol, *et al.*, 1989). Table 1 contains the variables used in our model specifications and their expected signs from the traditional growth theory.

Table 1: Variables and Expected Signs

Code of Variable	Definition of Variables	Expected sign
Dependent variable *Y*	Growth rate of real per capita GDP	
Independent Variables • *Institutional Quality* PFDUM	Political Freedom Index	-

• *Policy Variables*
    INF
    GOV
    OPN
	Inflation
	Government Spending (% GDP)
	Trade openness (% GDP)
		-
		- or +
		+

• *Control Variables*
    POP
    INV
    PSC
	Population Growth
	Domestic Investment as (% GDP)
	Domestic credit (% GDP).
		+ or -
		+
		+

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[14] Out of the 37 years in our sample, only for 9 years the Sudanese society is characterized as "partly free", whereas in the remaining years it is characterized as "not free".

4. RESULTS AND DISCUSSION

The standard procedure requires the testing of the stationarity of the series. Although the ARDL methodology does not require pre-testing for a unit root, in the case of $I(2)$ variables, the computed F-statistic for the existence of a cointegration relationship is not valid (Peasaran, *et al.,* 2001). Thus, we applied conventional ADF tests for all the variables and we found no evidence of $I(2)$ series. In the next step of the ARDL analysis, we test for the existence of a long-run causal relationship between the growth performance and the group of explanatory variables used in our research for Sudan.

Table 2: Results from bounds tests on equation (3)

Dep. Var.	AIC Lags	F-statistic	Intercept	trend	Bounds testing (at 99%)	Outcome
F(Y/ INF, GOV, OPN, INV, POP, PSC, PFDUM)	3	F (3, 26) = 7.45 [0.01]	yes	yes	lower: 3.220 upper: 4.411	Co integration

Notes: Asymptotic critical value bounds are obtained from Table F in appendix C, Case III: intercept and trend for k = 8 in Peasaran and Peasaran (1997, p. 478)

As suggested by the bounds testing procedure in Table 2, the results are in favour of the existence of a cointegrating relationship. In addition, the analysis which follows regarding the estimation of the implied ECM models reveals the validity of long-run cointegration relationships. Table 3 reports the diagnostic tests for the ARDL equation

Table 3: ARDL-VECM model diagnostic tests (LM test statictic)

Model ARDL (1,2,0,2,1)	R^2-Bar = 0.69 Serial Correlation $\chi^2 (1)$ = 1.312 [0.252] Functional Form $\chi^2 (1)$ = 0.789 [0.374]	F-Stat. F (16, 18) = 5.63 [0.00] Normality $\chi^2 (2)$ = 1.601 [0.449] Heteroscedasticity $\chi^2 (1)$ = 0.182 [0.670]

Notes: The ARDL equations are selected based on AIC

Based on the evidence presented in table 3 we argue that the estimated regression fits very well and passes all the tests regarding the serial correlation, heteroscedasticity and non-normality. In some cases, the functional form test reveals mis-specification which could be expected since according to Shrestha and Chowdhury (2005) it is natural to detect misspecification problems because ARDL equations are probably of a mixed order of integration, *i.e.,* $I(0)$ and $I(1)$. Tables 4 and 5 summarize the results with respect to the long run coefficients and the ECM specification estimates for equation (3). The final model reported in the Tables has been selected according to the usual statistical model selection criterion (AIC).

More specifically, Table 4 reports the long-run estimates of the properly selected ARDL specifications for our model having standardized the cointegration vector with respect to growth performance.

Table 4: Estimated long-run coefficients using the ARDL Approaches

ARDL (2,0,2,0,0,2,2,0) selected based on AIC. Dependent variable is Y_t			
Regressor	Coefficient	T-Ratio	P-Value
INV	0.61477	1.9790*	[0.063]
GOV	-0.25746	-0.76071	[0.457]
INF	-0.00671	-0.22646	[0.823]
OPN	-0.40789	-3.8223***	[0.001]
POP	48.4843	3.2226***	[0.005]
PSC	0.33921	0.46693	[0.646]
PFDUM	-10.6984	-4.0769***	[0.001]
C	-41.5735	-2.6045**	[0.018]
T	0.30278	1.9614*	[0.065]

Note: *** significant at 1% level, ** significant at 5% level, * Significant at 10% level. $R^2 = 0.8334$; $F_{(16, 18)} = 5.6270$ ***

The results on the estimated coefficients of the long-run relationship reported in Table 4 reveal that the institution quality index (*PFDUM*) has a significant impact on economic growth in Sudan during the period under investigation. A 1% decrease in political freedom leads to 10.7% decrease in real GDP per capita income. In Sudan the right to participate in the political process, the right to free expression, to organize or demonstrate, and other individual rights are almost absent. As such, the two components of political freedom, *i.e.* civil liberties and political rights, record high scores which reflect the weak quality of the institutional environment in Sudan. This outcome confirms the proposed link between the quality of a country's institutions and their level of economic development (Keefer and Knack, 1997; Hall and Jones, 1999; Chong and Calderon, 2000; Glaeser, *et al.*, 2004) and supports the main idea shared out in growth literature that institutions define the 'rules of the game' and the conditions under which economic agents operate in an economy (Butkiewicz and Yanikkaya, 2006; Vukotic and Bacovic, 2006; Brunt, 2007; Kostevc, *et al.*, 2007).

With respect to policy variables included in the present analysis, the results confirm the argument posed by Acemoglu, *et al.,* (2003) according to which macroeconomic variables (*i.e.,* inflation, government spending, exchange rates, *etc.*) have no predictive power in growth models once institution quality indexes are included in the analysis. Easterly, *et al.*, (2004) have also arrived to the conclusion that macroeconomic policies do not affect economic performance after accounting for institutions; similarly, Rodrik, *et al.*, (2002), show that once institutions are introduced in the analysis, macroeconomic variables, such as trade, have no direct effect on income. Turning now to the results reported in Table 4 for the policy variable we observe that the coefficient of *INF* although retains the negative sign suggested by economic theory, it is found no significance (*p*-value=0.823). This result may be attributed to large structural fiscal deficit and to erratic monetary and exchange rate policies that weakness the financial system in many Sub-Saharan African countries including Sudan.

The coefficient of *GOV* is found also negative and not significant (*p*-value=0.457). The negative sign indicates that an increase in government size has a detrimental impact on Sudan's economic growth and it harms its economy's capacity. This outcome is in accordance with the results obtained by Ghura (1995) and Nelson and Singh (1994). More specifically, Ghura (1995) testing the relation between government consumption and economic performance in developing countries found a negative relation, whereas, Nelson and Singh (1994) found no relation between the two variables.

With respect to *OPN,* the results in Table 4 confirm a negative and statistically significant relation with the *Y* (*p*-value=0.001) indicating that policies designed to promote trade openness may not have the expected from the theory positive impact since in Sudan imports dominate exports and there is a chronic trade deficit. It is worth noting at this point that Rodrik, *et al*., (2002) showed that once institutions are introduced in the analysis, trade variables exert no direct effect on growth performance.

Continuing the discussion of the results reported in Table 4, we may argue that *INV* exert a positive and significant effect on Sudan's economic growth since a 1% increase in *INV* positively increases *Y* by 0.61%. The small and the statistically weak effect [*p*-value=0.063] of investment on growth may be attributed to prevailing political instability and prolonged civil wars which hamper the growth effects of the undertaken investment projects. An interesting result that our analysis brings is that *PSC* is positive but not significant (*p*-value=0.646) which implies that a rise in private credit will not boost private investment and by extend growth as economic theory suggests. These weak findings for the Sudanese economy may be attributed to banks' inefficient allocation of resources, the absence of appropriate investment attitude and the poor quality of credit disbursal. This outcome is in accordance with other studies for developing countries which indicate that the impact of the financial sector for growth is either negligible (*e.g.,* Anoruo and Ahmad, 2001) or no positive (Reinhart and Tokatlidis, 2003). Finally, the population variable exerts a positive and statistically significant effect that promotes economic growth.[15]

With regard to the short-run dynamics, Table 5 reports the findings (Wald test probability values) from the EC models corresponding to the adopted ARDL specifications for equation (3).

Table 5: Error correction representation for the selected ARDL model

ARDL (2,0,2,0,0,2,2,0) selected based on AIC. Dependent variable is ΔY_t			
Regressor	Coefficient	T-Ratio	P-Value
ΔINV	0.61477	1.9790*	[0.061]
ΔGOV	-0.25746	-0.76071	[0.455]
ΔINF	-0.00671	-0.22646	[0.823]
ΔOPN	-0.40789	-3.8223***	[0.001]
ΔPOP	48.4843	3.22261***	[0.004]
ΔPSC	0.33921	0.46693	[0.645]
$\Delta PFDUM$	-10.6984	-4.0769***	[0.001]
ΔC	-41.5735	-2.6045**	[0.017]
ΔT	0.30278	1.9614*	[0.063]
ECM (-1)	-1.5260	-8.3944***	[0.000]
Diagnostic Test Statistics			
R-Squared 0.8733			
F (13,21) 9.5439 ***			
DW 2.2056			

Notes: *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
The numbers for EC term represent *t*- values, whereas the others are the *p*-values of Wald χ^2 tests for short run causality effects. In addition, Δ denotes first difference.

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[15] The time trend variable shows positive and statistically significant relationship that reflects an upward trend in real GDP per capita, much of which could be attributed to the success of the structural adjustment program and the export of oil.

The EC term in our model is found *t*-significant (*p*-value of 0.00) confirming the existence of a long-run equilibrium relation in Sudan with long-run causality running from the group of the core explanatory variables towards the growth rate. Its sign implies the presence of a fairly high speed of adjustment to equilibrium after a shock and approximately 1.5% of the disequilibria in real GDP per capita growth of the previous year's shock adjust back to the long-run equilibrium in the current year. The Wald (χ^2) tests for the lagged first-differenced explanatory variables included in the estimated EC specification provide evidence in favour of a significant short-run causal effect running from *INV, OPN, POP* and *PFDUM* towards the growth rate of GDP per capita with *p*-value of 0.061, 0.001, 0.004 and 0.001, respectively. However, there is no such evidence for the *GOV, INF* and *PSC* variables; their respective Wald tests display a *p*-value of 0.455, 0.823 and 0.645.

The stability of the long-run coefficients is checked by using the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) tests suggested by Brown, *et al,* (1975). According to this procedure, the CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bounds of 5% level of significance, the null hypothesis that all coefficients in the given regression are stable cannot be rejected. As can be seen in Figures 1 and 2, the estimated CUSUM and CUSUMSQ statistics stay within the critical bonds indicating that all coefficients in the employed ARDL error correction model are stable.
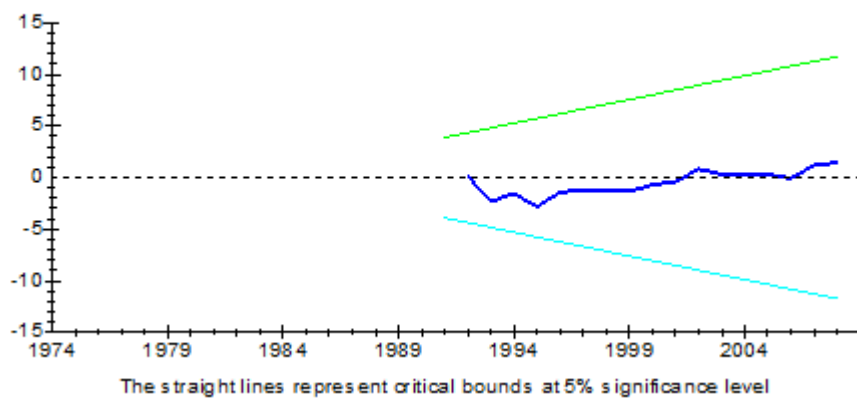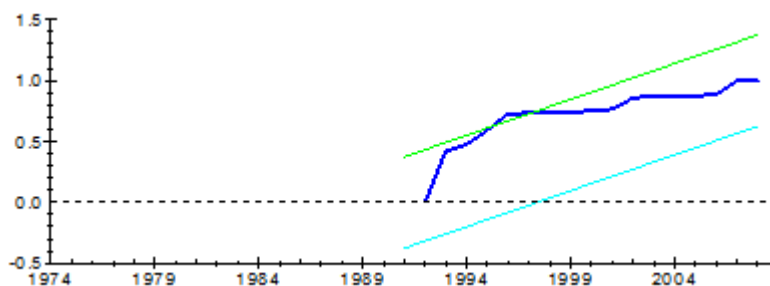

Figure 1: Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Figure 2: Plot Cumulative Sum of Squares of Recursive Residuals

5. CONCLUSION

The present work attempts to evaluate the impact of institution quality on real GDP per capita in Sudan over the period 1972-2008. The short-run and long-run relationships between institutional quality and other conditioning economic variables with economic growth are explored by using the Autoregressive Distributed Lag approach to co integration. The empirical

results of the study indicate that for Sudanese economy the institutional quality environment is one of the most important factors in defining its economic prosperity. The political freedom index is found to exert a negative and statistically significant effect on the economic performance of Sudan indicating that the absence of political freedoms is detrimental to its society in general. Taking into consideration that the improvements in institutions is a long time project and that over the fifty-four years of independence the country was unable to drastically change its weak institutions inherited from the colonial period, it becomes imperative that policy makers should focus their efforts in improving the quality of institutions of the country in order to propel the economic prosperity in Sudan. Hence, from a policy perspective the result of our analysis can be taken as a first move toward a road-map for institutional reform which might be proved of great importance in promoting economic growth.

The empirical evidence showed that the estimated coefficient of trade openness variable does not display the expected from the conventional trade theory relation; it is negative and statistically significant indicating that policies designed to promote trade liberalization policies may not have the expected positive impact in the Sudanese economy in which imports dominate exports and there is a chronic trade deficit. Hence, some measures of protectionism might be proved to be very fruitful in the case of the Sudanese economy. Another interesting result of our empirical analysis is the positive and statistically significant long-run relationship between population increases and Sudan's economic growth. This result, in a way, contradicts the general belief that big population works to the detriment of the economic prosperity in a poor country. However, big population may provide cheap labour and future human capital which are both basic elements to propel growth; hence, in Sudan, the implementation of future development policies should take into consideration that big population may be proved a very useful tool for designing appropriate economic policies.

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