The Elusive Democracy in SSA

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Abstract

This paper seeks to analyse the modernisation hypothesis in the sub-saharan African (SSA) region in an effort to understand the relationship between economic development and democracy, as hypothesised by Lipset (1959). Using a sample of 48 countries from 1960 to 2010, and based on dynamic panel data analysis which includes time and fixed effects, instrumental variables, SYS-GMM and PCSE, we find a significant and negative relationship between income and democracy. An indication suggesting that the hypothesis may not hold in SSA possibly due to the low levels of economic development in relation to developed countries. We also investigate further by distinguishing between exogenous and endogenous democracy. The former explains whether external factors, such as international organisations (World Bank, United Nations, IMF) and regional organisations (SADC, ECOWAS, AU) play a role in the process of democratisation in the region, while endogenous democracy encompasses the modernisation hypothesis where democracy is an internal process from within each country. We find that external factors, specifically the international organisations, have a significant influence on the democratisation process.

Keywords: modernisation hypothesis, democracy, economic development, sub-saharan Africa
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1. Introduction

Africa has been in the process of modernising and democratising for over five decades now. Wars have been fought and agreements signed for liberalisation. Southern Rhodesia and Northern Rhodesia became known as the Republics of Zimbabwe and Zambia respectively after long periods of political unrest. The Democratic Republic of Congo (DRC) has gone through several 'name changing' phases which have been preceded by some form of internal conflict. Recently in 2011 the Republic of South Sudan was formed putting an end to decades of civil war between the northern and southern regions of Sudan. So why do we still witness violence in several African countries (coup d'etats in Mali 2012 and Guinea-Bissau 2012), flawed elections (Kenya in 2007 and Zimbabwe in 2008) and corruption? Given the economic development taking place on the continent, why does democracy appear to be eluding African economies?

This paper seeks to answer the above question by revisiting the modernisation hypothesis postulated by Lipset (1959). Wealthier countries are more likely to become democracies and sustain it as compared to poor nations. This research tests the hypothesis between development and democracy using the Sub-Saharan African (SSA) region between 1960 and 2010. Using dynamic panel data techniques with fixed and time effects to control for heterogeneity, instrumental variables and SYS-GMM to account for statistical and economic endogeneity, as well as the panel corrected standard errors (PCSE) estimator to control for cross-section dependence, we obtain a negative and significant relationship between income and democracy in the region, evidence suggesting that the levels of economic development being experienced by the region are still relatively low to sustain democracy.

According to Przerworski & Limongi (1997), democracy could be exogenous (influenced by external factors) or endogenous (influenced by internal social conditions that promote democracy as in the modernisation hypothesis). We therefore investigate whether external factors impact the process of democratisation in the region by including a dummy variable capturing the end of the Cold War. This signified a global movement to promote democracy in developing countries. The dummy is positive and significant indicating that democracy may indeed be exogenous in Africa. There has been a growing body of research that has shown that international organisations have influenced the process of democratisation in third world countries, especially Africa (Easterly, Satyanath & Berger, 2008; Gleditsch & Ward, 2006; Huntington, 1991; Pevehouse, 2002; Przeworski & Limongi, 1997; Van Cranenburgh, 1999).

The scope of this research is interested in investigating whether the current economic development taking place in SSA in terms of infrastructure, education programmes, health awareness campaigns, industrialisation, will work in stabilising and sustaining these young democracies. Given the region's track record so far in the development of institutions, both economic and political, it is imperative to bring to light these issues faced by SSA. Given also that outside international organisations seem to have a strong influence on democracy in developing countries, it may aid investors wanting to invest in Africa, or policy makers to concentrate on social conditions that are more conducive for promoting a peaceful and democratic state.

For the purpose of this research democracy is defined as a political system in which people have an equal say in decisions that affect their lives. It involves a system of beliefs where ruling parties are selected through legitimate and periodic elections in which candidates freely compete for votes, and in which all the adult population is eligible to vote. This implies one set of political leaders in office, and one or more sets of leaders, out of office, who act as recognised opposition to the ruling party (Huntington, 1991; Lipset, 1959). Economic development encompasses changes in social structures, popular attitudes, and national institutions, as well as the acceleration of economic growth, the reduction of inequality and the eradication of poverty. It improves the quality of life.

2. Africa's story in brief

Europeans travelled to Africa from as early as the nineteenth century to seek new lands with mineral and agricultural wealth to claim. This movement led to the colonisation of African countries by political division and spheres of interest that remain today (that is English speaking nations, French and Portuguese). According to Acemoglu, Johnson & Robinson (2001) Europeans that failed to settle down in the colonies implemented extractive institutions for the purpose of personal gain. Several states were exploited of their mineral wealth with no long-term institutions put in place, such as protection against expropriation of private property, or infrastructure and development taking place, (Rwanda and Democratic Republic of Congo (DRC) under Belgium rule, or Angola and Mozambique under Portuguese rule). These areas remain underdeveloped today as compared to the British colonies, such as Zimbabwe, Swaziland, or South Africa where colonial governments invested in schools, health, judicial and financial systems. Although this may have precipitated the colonisers' demise in the end as the growing number of educated Africans became exposed to ideas of self-determination and independent rule and started becoming frustrated with social and political oppression.

These internal conflicts, along with the fact that it was becoming too costly to maintain these colonies, pressurised colonisers into a speedy process of liberating their colonies. As a result, ruling parties were formed quickly and electoral support secured just as quick. Voters were offered incentives such as access to basic amenities (roads, water or electricity) for their votes, while candidates were given individual benefits such as land, property or tenders. And these underlying issues have persisted over generations in most of SSA. Block (2002) provides evidence in support of opportunistic political business cycles in newly democratising countries, especially in Africa. He finds that during election years, politicians are more interested in re-election and tend to manipulate the fiscal and monetary policy instruments in order to win the support of voters. This kind of set-up has disintegrated over the years. It has triggered conflict within the ruling parties, abuse of political power with no checks and balances, corruption, not to mention violation of human rights (Rwandan genocide).

After their respective liberalisations, African states forged ahead with macroeconomic reforms as they attempted to restore growth. However the region continues to be troubled by periods of economic stagnation, political instability, corruption, violence and authoritarianism. Lack of good governance has seen countries like Zimbabwe and Nigeria fail to sustain democracy and proper political institutions. Others have cycled through a series of coups, producing military dictatorships or single party rule, for example DRC under Mobutu Sese Seko or Uganda under Idi Amin's tyranny.

While African states were trying to deal with internal conflicts and leaders that had become their colonisers reincarnated, they also had to contend with aligning themselves with the ideologies of one of the two superpowers during the Cold War in the 1970s, as the Americans and Soviets tussled for political influence in African countries. As with colonialism, the effects of the Cold War are still being felt three decades later in Africa. Countries caught up in civil conflicts like Angola, DRC, Eritrea, Ethiopia and Somalia received military aid from the United States and the Soviet Union in exchange for their support and adopting their beliefs. The very same weapons that were intended to bring change have left these countries in poverty with little improvement to the quality of life. And states like Egypt and Central African Republic (CAR) are fighting self destructive wars supported by the continuous supply of weapons by western countries, further hampering efforts to sustain democracy and the rule of law.

Since the end of the Cold War, there has been a global shift away from nondemocratic governments. Within the African countries, governments continue to work towards promoting democracy, stable growth and development through the implementation of macroeconomic structural programmes. National Development Plans (South Africa), Structural Adjustment Programmes (Zimbabwe, South Africa) and Economic Recovery Programmes (Sudan) are evident in the region in an effort to lower poverty and inequality, and increase economic growth.

There is also little doubt that events outside the region have been an important accelerator for Africa's wave of democratisation. International organisations have played a crucial role in supporting African democracies by incorporating goals that promote both economic and political reforms into their policies, for example the Washington Consensus implemented under the International Monetary Fund and the World Bank guidance, or the Millenium Development Goals initiated by the United Nations.

Evidence shows that African countries where democracy has been established have tended to perform better as agents of economic development (Alence, 2009). Botswana is a prime example. Of course these effects rely on good governance and good political institutions such as multi-party elections, civil and political rights, rule of law, freedom of speech, checks and balances on ruling party. Although Africa is lagging behind in terms of democracy and socioeconomic development, there is evidence of progress. Modernisation is after all a lengthy process which also took western societies several centuries to acquire (Huntington, 1971).

3. Literature Review

Modernisation has become a global process, originating in fifteenth and sixteenth century Europe (Huntington, 1971). All societies were at one time traditional but are now either modern or in the process of becoming modern as is the case in developing regions such as SSA. In 1959 Lipset published a paper that has become the backbone of modernisation hypothesis in which he contends that democracy in a country is supported by economic development. He states that democracy emerges from a set of conditions or institutional characteristics of a society that are already in existence in the country, such as wealth, urbanisation, education and industrialisation. He further states that democracy stabilises and matures because of the improvement of these supporting institutions and values, as well as because of the country's own 'self-maintaining processes'. As countries become richer, democracy develops an inept ability to survive. According to Huntington (1968), economic development would lead to increased education, urbanisation and the emergence of modern values such as rationalism and freedom of speech, thus allowing for corresponding political development. In a review of Africa by Alence (2009), he finds that the lack of faith greeting Africa's new democracies is mainly from doubts stemming from the absence of these same structural requisites observed in established democracies. Democratisation has historically been part of a broader social transformation encompassing the modernisation theory.

While Lipset (1959) is primarily concerned with explaining the internal social conditions which serve to support a democratic political system, this paper deviates by highlighting the parallel role that external conditions also play in the formation and sustainability of democracy, especially in developing regions like SSA. Przerworski and Limongi (1997) believe that there are two distinct reasons the relationship between democracy and economic development will hold; either democracies emerge as countries develop economically, or democracies are established independent of economic development. They distinguish between exogenous and endogenous democracy and find that emergence of democracy is not a by-product of economic development or that political regimes do not transition as per capita income increases. Democracy inherited or imposed by outside influences is exogenous, that is in the event of war or economic crises such as conflicts, coup d'etats, or death of a founding dictator. The endogenous explanation encompasses the modernisation hypothesis. Though their evidence finds a negative relationship between democracy and economic development, Przerworski & Limongi (1997) do not dispute the fact that once established democracies are more likely to survive in wealthier countries than in poor ones (Alence, 2009; Barro, 1996 and Gundlach & Paldam, 2008).

Several papers also verify the influence of external factors in the democratisation processes of third world countries (Easterly *et al.*, 2008; Huntington, 1991; Gleditsch and Ward, 2006 and Pevehouse, 2002). Gleditsch and Ward (2006) find that prospects for democracy are not exclusive to domestic social requisites, but that international events and processes can exert a strong influence on democratisation. While Pevehouse (2002) confirms that pressure from international and regional organisations can influence the dynamics of political liberalisation, Huntington (1991) contends that even though external influences were significant causes of third wave democratisations, the processes themselves were 'overwhelmingly indigenous'. Easterly *et al.* (2008) find that superpower interventions are followed by significant declines in democracy. Both the United States and the Soviet Union have equally detrimental effects (witnessed in Africa) on the subsequent level of democracy suggesting that it doesn't matter whether the intervening power is a democracy or a dictatorship. The Bush administration attempted to implant democracy in Afghanistan and Iraq without first establishing internal security and ensuring that certain social and cultural conditions were in place (Inglehart & Welzel, 2009). Both countries are still in chaos.

Przerworski and Limongi (1997) however use a dichotomous classification of political systems which may ignore the possibility of partial democracies in their categorisation. We use a continuous variable which captures all categories of democracy from autocracy, partial and full democracies obtained from the Polity IV dataset.

Barro (1996) uses cross-country evidence to examine the modernisation hypothesis and he confirms that prosperity stimulates democracy and that countries at low levels of economic development fail to sustain democracy, as may be the case in SSA. Barro (1999 & 2012) also reports similar findings in favour of the modernisation theory, even after using different proxies for democracy. Despite Acemoglu, Johnson, Robinson & Yared (2008) criticising his findings for not controlling for factors that simultaneously affect both variables of democracy and income, Barro (1999) counters their argument by taking these factors into account and finds that education and income per capita do not have statistically significant causal influences on democracy if fixed effects are not included. Our paper makes use of panel data instead of cross-section analysis which has more efficiency and analytical power. Our estimations also include fixed and time effects, as well as control for simultaneity problem.

Other studies that report a positive relationship between democracy and economic development include Benhabib, Corvalan & Spiegel (2011), who find that the statistically significant positive relationship is also robust to the inclusion of country fixed effects. However their tobit estimates may be inconsistent due to incidental parameter problem. Bittencourt (2012) tests the hypothesis using data for the Latin American region and finds evidence that it holds. Epstein, Bates, Goldstone, Kristensen & O'Halloran (2006) confirm that higher per capita incomes increase the likelihood of movement away from autocracy, while Glaeser, La Porta, Lopez & Shleifer (2004) are inclined to agree with Lipset that countries which emerge from poverty accumulate human and physical capital under dictatorships, and once they become richer, are more likely to improve their institutions. Gundlach & Paldam (2008) find a large long-run positive causal effect of income on the degree of democracy. Heid, Langer & Larch (2011) also find a statistically significant positive relation between income and democracy after accounting for the dynamic nature and high persistence of the two variables. Inglehart & Welzel (2009) confirm that causality runs mainly from economic development to democratisation and also suggest that beyond a certain level of economic development, democracy becomes increasingly likely to emerge and survive. Murtin & Wacziarg (2011) also find strong empirical evidence supporting the modernisation hypothesis over the long run, specifically primary schooling as a better determinant of the quality of political institutions than per capita income. However their Arellano-Bond GMM estimator may have been subject to small sample bias.

One of Lipset's (1959) major critics has been Acemoglu *et al.* (2005, 2008 & 2009). They fail to find any significant relationship between income and democracy, and refute studies that find such a relationship. Acemoglu *et al.* (2009) argue that these studies fail to control for the presence of omitted variables and that including fixed effects in a linear model removes the correlation between income and the likelihood of a transition to and from democratic regimes. Barro (1999) as stated above was able to disprove this argument. He counter argues that their quality of institutions lacks explanatory power for economic growth (Barro, 2012). Acemoglu *et al.* (2005) also dispute that education is likely to make countries more democratic. But several papers (Barro, 1999; Przerworski, Alvarez, Cheibub & Limongi, 2000; Glaeser, La Porta, Lopez & Shleifer, 2004) contest their argument and find a very robust and positive relationship between education and democracy.

Bates, Fayad & Hoeffler (2012) decompose income per capita into resource and non-resource component. They discover that the nations whose income is not dependent on resources validate the modernisation hypothesis, while resource rich nations, which are plenty in the SSA region (DRC, Sierra Leone, Angola, Nigeria, to name a few) hinder democracy. Burke & Leigh (2010) find that more rapid growth reduces the short run likelihood of change towards democracy. However countries are more likely to democratise after a recession than a boom because citizens are fed up and want a change, hence one needs a catalyst, and an economic crises may serve as that catalyst.

4. Methodology

4.1 Data

Most studies use global datasets in an effort to have more coverage and tend to include SSA as a dummy or to take a random number of African countries to represent the region. Acemoglu *et al.* (2008) use 150 countries in their dataset, while Barro (1999) and Bates *et al.* (2012) choose datasets that cover 104 and 105 countries respectively. This does not give an informative estimate of the region especially since some of the variables get dropped due to missing data. And because this region has some of the poorest countries in the world, such analytical results are biased towards richer countries.

Data used in this paper spans over 48 countries in SSA for the period 1960 to 2010. The aim is to have a more informative reflection of the causal effect of development on democracy in the region. This may also help in the future for comparison purposes with other developing regions like Latin America, or developed areas such as Europe.

The dependent variable $polity$ is used to measure democracy and is obtained from the Polity IV Project (2010). It is a revised combined score that is computed by subtracting the autocracy score from the democracy score. The resulting unified polity score ranges from +10 (strongly democratic) to -10 (strongly autocratic). This modified version of the dependent variable facilitates the use of polity regime measure in time series analysis by converting standardised authority scores to conventional polity scores within the range specified above. This study investigates whether the level of democracy will change due to a change in a country's rate of economic development, hence a decrease in the polity score will indicate a decrease in democracy while an increase will indicate improvement in the country's democracy. The variable is normalised so that the values are between zero and one, and logs are taken which makes it possible to interpret results as changes.

Different proxies for democracy can be used, such as the Freedom House Index, constraints on the executive, or protection against expropriation. However the choice of measure used should be guided by its theoretical and empirical model such that the results can be evaluated in terms of whether they serve to address important research questions, they can be interpreted meaningfully and are reproducible (Cheibub, Gandhi & Vreeland, 2009). For the purpose of this study, the polity score variable is more than adequate and data is available for all countries except Sao Tome & Principe and Seychelles which should not bring in a significant bias to the results.

The main explanatory variable used to measure income is the real gross domestic product (GDP) per capita obtained from the Penn World Tables 7.1. The variable is converted using the purchasing power parity at 2005 constant prices, and logs are taken. A positive and significant coefficient for GDP would validate the modernisation hypothesis that democracy is more likely to mature in richer countries.

The controls are independent variables which are added to the equation to avoid omitted variable bias. Omitted variable bias arises when other variables that are correlated to income are not included in the regression. This can lead to inconsistent and biased estimates. The following independent variables are therefore included in this model according to Lipset's hypothesis. Education obtained from the Barro-Lee education dataset measures the percentage of population aged 15 years or over with complete primary education. Since the data is taken at 5 year intervals, the variable is interpolated in

Stata to fill in the missing years, and logs are taken. Education is expected to have a positive effect on democracy according to the modernisation hypothesis. Education teaches people to interact with others and raises the benefits of citizen participation including voting and organising. This raises the support for more democratic regimes relative to dictatorships (Glaeser, Ponzetto & Shleifer, 2006).

The urbanisation variable is obtained from the World Bank and measures urban population as a percentage of total population. It also captures some aspects of industrialisation since people migrate from rural to urban seeking better job opportunities in industries located in the cities, or better facilities in terms of housing, hospitals, schools, banks and access to electricity and water. Lipset (1959) uses percentage of males in agriculture and per capita energy consumed as indices for industrialisation. However data availability for SSA poses a limitation in studies and in this case urbanisation was the most suitable index as it had more data covering all 48 countries over the time period under review. Democracy and urbanisation are expected to be positively related. Logs are also taken for the variable.

Given Africa's history with decolonisation and its involvement in the Cold war, we expect democracy in the region to be influenced by exogenous factors to a certain extent. We therefore include a dummy variable capturing the political influence of the Cold War. A positive and significant coefficient would indicate that democracy in Africa may indeed be exogenous. We also include a dummy variable indicating whether a country belongs to an economic community in the region, in this case SADC, to see if this may have an effect on democracy since all countries within the group have to converge to one common goal given similar guidelines. Again a positive and significant coefficient would indicate that belonging to a regional organisation plays an important role in the state's democratisation process.

Political regimes are dynamic processes which happen in the long-run, hence we include a lagged democracy variable. We expect a positive and significant relationship to indicate the persistence of democracy.

4.2 A bird's eye view

Although the correlation matrix does not show causality, it does give an indication of the degree of linear relationship between two variables.

Table 1: Correlation Matrix (SSA 1960-2010)

	Polity	GDP	Educ	Urban	Dumcoldwar	Dumsadc
Polity	1.0000					
GDP	0.1096*	1.0000				
Educ	0.3777*	0.1046*	1.0000			
Urban	0.2477*	0.5450*	0.4944*	1.0000		
Polity(-1)	0.9368*	0.1111*	0.3093*	0.2095*		
Dumcoldwar	0.5072*	0.0586*	0.7735*	0.3881*	1.0000	
Dumsadc	0.1628*	0.1071*	0.3272*	0.1231*	0.2807*	1.0000

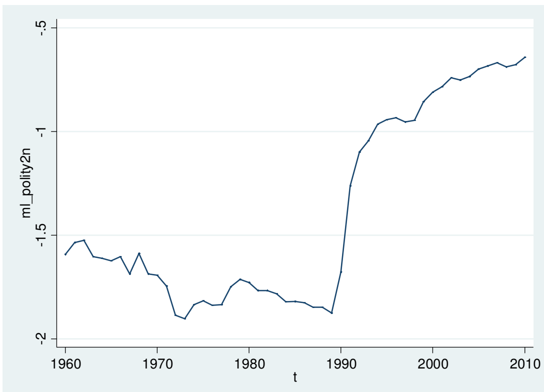
Sources: Polity IV, Penn World, Barro-Lee and World Bank

* indicates significance at 5% level

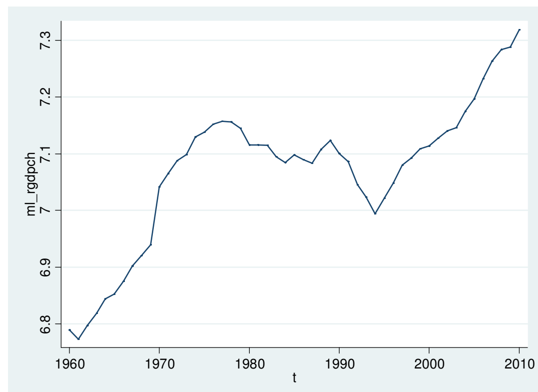
Given the hypothesis the paper is investigating, it is interesting to note that the signs of the correlation coefficients for the democracy variable are in line with expectations. All variables are positively and significantly related to democracy indicating that statistically the modernisation hypothesis holds, hence in theory the same conclusion should follow.

A look at the average polity score in Graph 1 over the years shows the rather erratic trend of democracy in SSA. The decolonisation process was obviously not conducive to democracy, neither were the internal conflicts that followed in some states (Angolan war; Mozambique's 16-year armed conflict; Ethiopia-Eritrea war). 1990 shows a huge spike in the polity score justifying the use of a dummy to capture that period.

Graph 1: Mean of Polity score[3]



Graph 2: Mean of Real GDP



The recent politics of democractisation in SSA have been determined by various intertwined sets of events: the end of the Cold War, the rise of regional powers (ECOWAS, SADC, AU)[4], and the intensification of internal and often ethnic conflicts (Prikic, 1999). After the Cold War many developed countries started pressing for democracy in third world countries. In order to facilitate the economic and political reform process in poor developing countries, World Bank, U.S Treasury and the International Monetary Fund (IMF) implemented the macroeconomic reforms by economist John Williamson, termed the Washington Consensus (1989). This saw many cash-strapped governments adjusting their political goals, such as reducing inflation and budget deficits, removing trade tariffs, devaluing currencies, in an effort to qualify for much needed financial assistance and be perceived as democratic republics. African governments found themselves caught between a rock and a wall. Expenditures that the international organisations wanted cut were central to protection networks that helped keep incumbents in power, but at the same time they were desperate for the funding. As a result, governments typically responded with varying degrees of partial reform, delivering enough policy change to keep external donors quiet, while dragging their feet on the most politically sensitive issues (Alence, 2009). According to Block (2002), there was an increase in the number of African

[3] Individual countries' polity scores and graphs can be found in the Appendix A in Table 6. Close to half of the countries indicate low polity scores, a sign that the democratisation process is struggling to take hold in the region.

[4] ECOWAS – Economic Community of West African States; SADC – Southern African Development Community; AU – African Union

countries holding competitive legislative elections from 1990-1994. This period coincides with when the external reforms were being implemented.

Following a United Nations initiative which focused on Millenium Development Goals (MDGs), highly indebted poor countries (HIPC), of which 30 are currently from the SSA region, were granted amnesty by the World Bank, IMF and African Development Bank to relieve debt burden (www.imf.org). The HIPC initiative was launched by the IMF and World Bank in 1996 and was supplemented by the Multilateral Debt Relief Initiative (MDRI) in 2005 to help accelerate progress towards the MDGs. These MDGs included universal primary education, promoting gender equality, eradicating extreme poverty and hunger, reducing child mortality and improving maternal health. But several African governments failed to take advantage of this opportunity to re-channel resources saved from the foreign debt to social programs for improving health, education, or eradicating poverty. Among them include CAR, DRC, Rwanda, Sierra Leone.

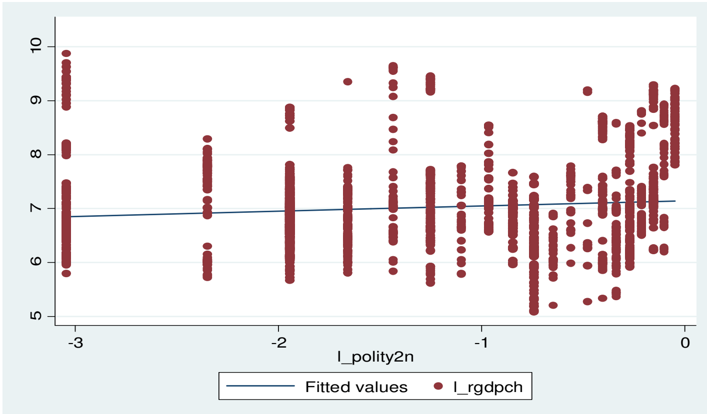
This type of exogenous democracy, which was encouraged by international organisations from the 1990s, through incentives, worked for as long as the countries received the aid. During that period one-party states were becoming persistent with power concentrated in the hands of the elite. This probably led to a higher risk of expropriation which in turn reduced economic activity. In the last couple of years we have seen funding stopped and foreign investors pull out of developing countries that remain politically unstable. This is at the detriment of the region's self-maintaining processes conducive for sustaining endogenous democracy. Most of the states made appearances of democratisation in the 1990s to get funding from western countries, and international organisations, but in truth the governments were not really interested in these democratisation reforms. They probably just needed to line their pockets. The reality is that the political institutions are lagging behind economic development in SSA.

Although nearly every country in the SSA region has entered into at least one adjustment lending agreement with the World Bank or the IMF (Block, 2002), these policy reforms are failing to sustain the democratisation process in Africa, especially when the aid is used for personal gain other than its rightful intention which is to facilitate development in the nation.

The graph for income (Graph 2) shows a steady increase as the economies in the region develop and mature. The 1990s show a dip which could be the effects of the Cold War. The increase in GDP could also simply be from political transactions, such as arms deals, or sales of natural resources like oil and diamonds. So despite GDP increasing, the country itself is not actually benefiting from these deals and moving out of poverty, only the elite are getting richer.

A look at the fitted Graph 3 shows a relatively flat line indicating that political institutions are not developing as fast as the economy is improving in terms of income, education, infrastructure, or health. Not only that but economic crises faced by some of the African countries (Central African Republic, Sudan, Zimbabwe) has led to a regime collapse and hence democracy fails to survive.

Graph 3: Fitted democracy on RGDP



4.3 Empirical Approach

Since we have a large cross section (N=48) and a long time period (T=51), essentially T>N, we have a panel time series. This study therefore uses the panel data approach to investigate the impact of economic development on the level of democracy within the SSA region. Although panel data has its limitations such as design and data collection problems, its advantages are numerous and include controlling for heterogeneity amongst countries, as well as being able to construct and test for more complicated behavioural models than purely cross section or time series.

Several estimations have been used by various studies to investigate the relationship between democracy and economic development. Barro (2012) uses cross sectional analysis, while Burke & Leigh (2010) use a linear probability model (LPM) and logit model for their estimations. Benhabib *et al.* (2011) and Epstein *et al.* (2006) utilise tobit estimations in their papers respectively.

This paper presents results for a dynamic two way error component model which is based on Lipset's (1959) theoretical model:

$$polity_{it} = \alpha_i + \lambda_t + \beta_1 gdp_{it} + \beta_2 educ_{it} + \beta_3 urban_{it} + \beta_4 dumcoldwar_{it} + \beta_5 dumsadc_{it} + \beta_6 polity_{it-1} + u_{it} \quad (1)$$

The fixed effects α_i control for heterogeneity across countries such as geographic area, population, historical and colonial background, ethnic and religious composition. The time effects λ_t take into account time differences such as dates of independence (RSA-1992, Zimbabwe-1980), or political conflicts (DRC-1998, Sierra Leone-1991, Ivory Coast-2010 elections).

Instrumental variables (IV) are used to solve the problem of possible statistical endogeneity in the form of unobserved heterogeneity, as well as economic endogeneity in the form of reverse causality. Reverse causality may be present in the model through income and education, given that Barro (1996) investigates the effects of democracy on economic growth, while Papaioannou & Siourounis (2008) find evidence that democracy increases growth by 1%. Stasavage (2005) maintains that democratic governments have greater incentive than authoritarian states to provide primary education for their populations. In such instances, when the explanatory variables are correlated with the residual then the ordinary least squares (OLS) classical assumption $cov(x,u) = 0$ is violated. The IV method allows consistent estimation when the explanatory variables are correlated with the error terms of a regression relationship. The identification assumption is that the instrument is not correlated with the error term in the equation, but it must be correlated with the endogenous explanatory variable. In other words, the instrumental variables used only influence the level of democracy through their impact on income and education respectively. IVs also provide consistent estimates in large samples. The most effective IVs in this model turned out to be the lagged variables of the endogenous variables.

Fixed Effects with Instrumental Variable Estimation:

$$polity_{it} = \alpha_i + \beta_1 \hat{g}dp_{it} + \beta_2 \hat{e}duc_{it} + \beta_3 urban_{it} + \beta_4 dumcoldwar_{it} + \beta_5 dumsadc_{it} + \beta_6 polity_{it-1} + u_{it} \quad (2)$$

where first stage regressions include:

$$\hat{g}dp_{it} = \alpha_i + \lambda_i gdp_{it-1} + \lambda_i controls_{it} + \epsilon_{it} \quad (2.1)$$

$$\hat{e}duc_{it} = \alpha_i + \delta_i educ_{it-1} + \delta_i controls_{it} + \pi_{it} \quad (2.2)$$

Acemoglu *et al.* (2008), Bittencourt (2012) and Gundlach & Paldam (2008) use a similar approach in their estimations.

We also estimate the model using General Method of Moments (GMM), specifically SYS-GMM (Blundell & Bond, 1998). We use it to check the robustness of our FE-IV estimation, since we expect our lagged dependent variable to be persistent and approach one. In this case the instruments in the FE-IV may be weak, without much explanatory power and we may end up with a weak instrument bias. GMM estimates parameters of interest by using a set of moment conditions as instruments. It is a more efficient estimator which makes use of deeper lagged levels of the endogenous variable as instruments for the first-differenced model, as well as additional moment conditions in first differenced form of the endogenous variable for the model in levels. The number of lagged instruments depends on the number of potentially endogenous variables the equation has on the right hand side.

SYS-GMM Estimation:

$$\Delta polity_{it} = \alpha_i + \beta_1 \Delta\hat{g}dp_{it} + \beta_2 \Delta\hat{e}duc_{it} + \beta_3 \Delta urban_{it} + \beta_4 dumcoldwar_{it} + \beta_5 dumsadc_{it} + \beta_6 \Delta polity_{it-1} + \Delta u_{it} \quad (3)$$

where the following lagged instruments in levels (moment conditions) are used on the first differenced model:

$$\hat{g}dp_{it} = \alpha_i + \lambda_i gdp_{it-3} + \lambda_i controls_{it} + \epsilon_{it} \quad (3.1)$$

$$\hat{e}duc_{it} = \alpha_i + \delta_i educ_{it-3} + \delta_i controls_{it} + \pi_{it} \quad (3.2)$$

and first differenced lagged instruments (additional moment conditions) are also used but on the original equation in levels (not differenced):

$$\Delta\hat{g}dp_{it} = \alpha_i + \lambda_i \Delta gdp_{it-3} + \lambda_i \Delta controls_{it} + \Delta\epsilon_{it} \quad (3.3)$$

$$\Delta\hat{e}duc_{it} = \alpha_i + \delta_i \Delta educ_{it-3} + \delta_i \Delta controls_{it} + \Delta\pi_{it} \quad (3.4)$$

SYS-GMM takes care of serial correlation and persistence which is more than likely to be present in the lagged dependent variable on the right hand side of the equation. Unit roots are however less of a problem in panels because of the averaging across the cross sections which could possibly reduce spurious regression (Phillips & Moon, 1999). Acemoglu *et al.* (2009) use a similar estimation over 40 years in 5 year intervals. A standard procedure in the literature to mitigate the persistence in the data is to rely on 5 year intervals or averages. This however reduces the number of observations considerably while income and democracy are still persistent (Heid *et al.*, 2011). Hence their GMM estimator may suffer from small sample bias when the number of time periods is small. Since our time period is large and we use annual data, this should not pose a problem for our estimation. Other papers that also use SYS-GMM include Bittencourt (2012), Heid *et al.* (2011) and Murtin & Wacziarg (2011).

A shock to one country may have a spill over effect on another. Political trends in African states have a knock on effect in neighbouring countries. Following the Rwandan genocide, a civil war erupted in the DRC in 1998 which spilled over the borders into Burundi. The civil war in Liberia was moved to Sierra Leone by the same perpetrators and their affiliates. The proliferation of arms in the region and hired freedom fighters further resulted in two rounds of political conflict in Ivory Coast, Togo and internal conflict in Nigeria. As people migrate to neighbouring countries seeking refuge, there is an impact on the small open economies of these countries receiving war refugees. The Ivory Coast crisis in 2010 saw many of its citizens crossing over into Liberia for safety. This represents spatial effects (cross-sectional dependence) between institutions' developments in one country and others in the region.

In order to take into account cross-section dependence, we run an OLS estimation with panel corrected standard errors (Beck & Katz, 1995). Both the temporal and spatial properties of panel data make the use of OLS problematic because the OLS standard errors are assumed to have the same variance and are independent of each other. These assumptions may be violated under panel models as the errors may be contemporaneously correlated across units. This is likely in cross-national context, where the economies of say, South Africa and Namibia are linked. We may also expect the errors in panel models to show panel heteroskedasticity where the variances of the error process differ from unit to unit. The errors of a cross-national panel study may show panel heteroskedasticity because the scale of the dependent variable, in this case democracy, may differ between countries (in 2010 Botswana had a polity score of 8, while DRC had a 5 – Polity IV Project). Finally, it is possible that the errors may show temporal dependence in the form of first-order serial correlation (Beck & Katz, 1995).

Parks (1967) and Kmenta (1986) proposed a method for dealing with these problems based on the feasible generalized least squares (FGLS). But this method assumes that the variance-covariance matrix of the errors is known not estimated which can pose a problem for panel models with a large number of parameters. Beck and Katz (1995) show that the overconfidence in the standard errors makes the FGLS estimation unsuitable for panel models with more time points than cross-section units, as is the case in this study, T>N. A more suitable approach would be to use the OLS parameter estimates but replace the OLS standard errors with panel corrected standard errors (PCSE). Equation (4) is estimated by OLS and the standard errors by PCSE in order to take into account contemporaneous correlation of the errors and heteroskedasticity:

$$polity_t = \alpha + \beta_1 gdp_t + \beta_2 educ_t + \beta_3 urban_t + \beta_4 dumcoldwar_t + \beta_5 dumsadc_t + \beta_6 polity_{t-1} + u_t \quad (4)$$

The sampling variability of OLS estimates is then given by the roots of the diagonal of the following expression:

$$Cov\left(\widehat{\beta}\right) = (X'X)^{-1}(X'\Omega X)(X'X)^{-1} \quad (4.1)$$

The middle term of the above equation contains the correction for the panel data[5].

5. Results

The following table shows results for the two way error model which factors in differences across countries and time periods:

Table 2: Dynamic Model with fixed and time effects (SSA 1960-2010)

Polity	1	2	3	4	5	6
GDP	-.062** (.024)	-.062** (.024)	-.057** (.027)	-.057** (.027)	-.057** (.026)	-.057** (.027)
EDUC		.893*** (.164)	.920*** (.173)	.829*** (.192)	.921** (.172)	.829*** (.192)
URBAN			-.031 (.055)	-.031 (.055)	-.031 (.055)	-.031 (.055)
DUMCOLDWAR				.606*** (.101)		.606*** (.101)
DUMSADC					-.014 (.042)	-.014 (.042)
Polity(-1)	.853*** (.021)	.853*** (.021)	.853*** (.020)	.853*** (.020)	.853*** (.020)	.853*** (.020)
F test	244.10***	244.10***	239.47***	239.47***	234.94***	234.94***
F test u_i=0	1.94***	1.94***	1.93***	1.93***	1.93***	1.93***
R^2	0.901	0.9010	0.8994	0.8994	0.8993	0.8993

Coefficients reported. Robust standard errors in parentheses take care of heteroskedasticity and serial correlation.

***, **, *** Significant at 10%, 5% and 1% respectively.**

A significant but negative relationship is found between income and democracy, results which suggest that the economic development taking place in the region is below what is necessary to support a lasting democracy. According to the World Bank Report (2011), Africa remains the poorest region in terms of national income relative to the rest of the world, averaging at US$1,257. This in turn may lead to a lag in development of social structures and political institutions that would be conducive to promoting stability and peace in the region. Education is positively and significantly related to democracy, which is in line with the modernisation hypothesis. This result is consistent with other literature (Barro, 1996; 1999; Bittencourt 2012; Glaeser *et al.* 2004, 2006 & Murtin & Wacziarg, 2011). Urbanisation is statistically insignificant and negative which is not in line with economic theory. The variable may not play a significant role for SSA data because the region is

[5] For further explanation on PCSE, see Appendix B.

largely agricultural and mining based. Barro (1996) also finds an insignificant but positive relationship between democracy and urbanisation. He fails to give a reason for the result. The lagged dependent variable is positive and significant, confirming that political regimes are persistent over time. The F-statistic for individual effects is statistically significant indicating that fixed effects are valid. The F-statistic for overall joint significance of the regressors is also statistically significant.

The dummy capturing the end of the Cold War is positive and significant indicating that the possibility of international organisations imposing democratisation in the region is very likely true. The dummy for SADC[6], which captures whether belonging to a regional economic community will influence democracy, is insignificant and negative indicating that it does not have as much influence on democracy in the region as international organisations. This is surprising given that one of SADC's goals is to promote democracy within the southern region of Africa. Increasing concerns over regional security and the possibility of an unconstitutional ascension to power in SADC member states led to the launching of a special conflict resolution mechanism in 1996, the Organ for Politics, Defence and Security (OPDS), also known as the SADC Organ (Makoa, 2005). The SADC Organ was established to prevent security threats such as genocides, civil wars, coups, riots and other protests that paralyse governments and create a climate for violent regime transitions. As such, the SADC Organ was also supposed to guarantee democracy or at least promote and protect it.

The SADC Organ's Protocol assumes that governments in SADC countries cannot threaten national security and peace (that is, each individual member state decides what is a threat to its national security and warrants intervention by the SADC Organ). This not only makes the Organ defunct, but also gives SADC member states veto powers regarding the Organ's operations within their borders or against their governments. Therefore the SADC Organ is not open to participation by the civil society where the ordinary citizens can use it against their rulers in the event that they threaten the security of the people. It thus finds itself in a situation where it may be used to defend autocracies and other authoritarian repressive regimes within SADC membership. This is evident in SADC's reluctance to lend support to struggles against regimes such as Mugabe's authoritarian rule and King Mswati's autocratic feudalism (Makoa, 2005). More often than not autocratic governments are the prime factors behind conflict and insecurity. Nigeria appeared to promote democratisation in Liberia and Sierra Leone in the 1990s to get support from the international organisations when in effect they were more interested in protecting their interests in the warring countries. Hence regional organisations under the guise of peace-keeping operations in actual effect fail to contribute to democratisation.

[6] Dummy for ECOWAS was also interchanged with SADC and used in conjunction with SADC. Results were insignificant (available on request).

Table 3 reports results for the IV estimation to take care of possible endogeneity in the model:

Table 3: Dynamic model with FE-IV (SSA 1960-2010)

Polity	1	2	3	4	5	6
GDP	-.008 (.020)	-.054*** (.020)	-.054** (.021)	-.051** 9.021)	-.054** (.021)	-.050** (.021)
EDUC		.203*** (.019)	.202*** (.036)	.064* (.038)	.201*** (.037)	.068* (.039)
URBAN			.001 (.038)	-.040 (.037)	.001 (.038)	-.040 (.038)
DUMCOLDWAR				.203*** (.021)		.204*** (.021)
DUMSADC					.003 (.029)	-.019 (.029)
Polity(-1)	.932*** (.008)	.884*** (.009)	.884*** (.009)	.839*** (.010)	.884*** (.009)	.839*** (.010)
F test	5978.72***	4241.62***	3179.41***	2680.60***	2542.28***	2233.21***
F test u_i=0	0.56	1.37*	1.35*	2.42***	1.34*	2.43***
R^2	0.903	0.904	0.904	0.9023	0.9040	0.9022
First Stage Regression Instruments						
GDP(-1)	.972*** (.006)	.973*** (.006)	.974*** (.006)	.974*** (.006)	.974*** (.006)	.974*** (.006)
EDUC(-1)		.968*** (.004)	.934*** (.007)	.926*** (.007)	.932*** (.007)	.925*** (.007)
F test for weak instruments	14902.59***	9939.25***	7451.15***	5962.06***	5958.93***	4967.04***
F test for weak instruments		27180.36***	20741.54***	16650.68***	16594.63***	13873.65***

Coefficients reported. Standard errors in parentheses. *, **, * Significant at 10%, 5% and 1% respectively.**

We find a negative and significant relationship again between income and democracy, confirming our previous results that economic development may be too low to support democracy. Education remains positive and significant, as does the dummy for Cold War and the lagged dependent, while urbanisation and the SADC dummy are still insignificant with no influence on democracy. Coefficients are smaller in absolute terms compared to the two way error estimation indicating the upward bias that was introduced by the endogeneity. The identifying instruments in the first stage regression are statistically significant, as well as the F-test for joint significance which minimises the issues of weak instruments. The F-statistic for individual effects remains significant and valid, as well as the F-statistic for overall significance of the model.

The SYS-GMM results are recorded in Table 4:

Table 4: Dynamic model with system GMM (SSA 1960-2010)

Polity	1	2	3	4	5	6
GDP	-.064*** (.023)	-.058*** (.019)	-.044** (.021)	-.044** (.022)	-.040* (.023)	-.040* (.023)
EDUC		.895*** (.164)	.934*** (.168)	-.393*** (.140)	.947*** (.165)	-.401*** (.142)
URBAN			-.054 (.044)	-.054 (.044)	-.059 (.045)	-.059 (.045)
DUMCOLDWAR				1.684*** (.369)		1.709*** (.365)
DUMSADC					-.042 (.047)	-.042 (.047)
Polity(-1)	.893*** (.035)	.897*** (.032)	.893*** (.033)	.893*** (.033)	.893*** (.033)	.893*** (.033)
Wald test	546762.45***	1.29e+06***	6625.70***	6596.17***	1243.54***	1838.21***
Sargan test	1.00	1.00	1.00	1.00	1.00	1.00
AR(2)	0.612	0.609	0.607	0.607	0.608	0.608

Coefficients reported. Robust standard errors in parentheses take care of heteroskdasticity and serial correlation.

***, **, *** Significant at 10%, 5% and 1% respectively.**

Income and democracy are significantly and negatively related, results which are consistent with our previous estimations. Increase in education[7] positively affects level of democracy as does the end of the Cold War. Urbanisation and SADC dummy fail to have a significant impact on the level of political regime. The probability of the Sargan[8] test fails to reject the null for the exogeneity of instruments and we conclude that the instruments are not correlated with the residuals and are valid. The probability of the Arellano Bond (2) test also fails to reject to the null for no second order serial correlation in the first differences. We conclude that we do not have second order serial correlation in the model. The Wald test for overall significance of the model is statistically valid.

[7] The coefficient of the education variable in this estimation however appears to be affected by the inclusion of the dummy for the Cold War. We record this as simply a statistical anomaly in the estimation.

[8] Since our T>15, the likelihood of rejecting the null hypothesis becomes less, as the estimation is more suited to short wide panels (Roodman, 2009). However to reduce the probability of instrument proliferation, we specify the number of lags instead of using all available lags for the instruments (Roodman, 2009). The p-value remains persistent.

Table 5 reports the OLS estimation with panel corrected standard errors:

Table 5: Dynamic model with PCSE (SSA 1960-2010)

Polity	1	2	3	4	5	6
GDP	-.009 (.011)	-.026** (.010)	-.036*** (.012)	-.037*** (.012)	-.035*** (.013)	-.036*** (.012)
EDUC		.288*** (.022)	.271*** (.025)	.104*** (.032)	.270*** (.026)	.102*** (.033)
URBAN			.021 (.015)	.016 (.015)	.021 (.015)	.016 (.015)
DUMCOLDWAR				.212*** (.025)		.213*** (.025)
DUMSADC					.006 (.029)	.009 (.026)
Polity(-1)	.911*** (.010)	.861*** (.011)	.861*** (.011)	.819*** (.012)	.861*** (.011)	.820*** (.012)
Wald Test	7326.68***	8814.16***	8903.17***	9580.68***	8905.66***	9587.67***
R^2	0.875	0.896	0.8962	0.902	0.8963	0.9019

Coefficients reported. Robust standard errors in parentheses take care of heteroskdasticity and serial correlation.
***, **, *** Significant at 10%, 5% and 1% respectively.**

Income and democracy remain negatively and significantly related, while education and the Cold War dummy are positively and significantly related to democracy respectively. Urbanisation, though in line with economic theory now with positive coefficients, remains statistically insignificant and the SADC dummy has no impact on democracy. The Wald test is statistically significant indicating the overall significance of the model.

The results from the different estimations have all indicated that the wealth aspect of the modernisation hypothesis is missing in the SSA region. Economic development so far appears to have been unable to sustain the wave of democratisation experienced by African nations. And this could well be because of both exogenous and endogenous factors. While the democratisation process may have been imposed by outside influences, the level of economic development in the region may also be below what is necessary to support a lasting democracy. Although human capital through education may validate Lipset's hypothesis, it is not enough on its own to sustain democracy. Wealth and industrialisation are also key, and in this Africa appears to be lagging.

6. Conclusion

Economic development promotes changes in social structure and values that, in turn, should encourage democratisation. SSA is somehow falling short of this modernising theory as the results indicate. Although there is improvement in economic development taking place, the region is still plagued by political instability which undermines the development process of the nation's economic and social infrastructures and contributes to intensifying the poverty. There has been no shortage of uncertainty regarding Africa's young democracies, whether they would last and the contribution they would make to economic recovery and poverty reduction in the region (Alence, 2009). Granted SSA is still relatively poor, the democracies are still considered young and modernisation is a long process. But coupled with this is the reluctance of government officials to relinquish their positions to make way for new ideas from a younger generation. Constitutions that included clauses imposing term limits have either been repealed or amended, thus enabling incumbents to extend their time in power.

Leaders in Angola, Burkina Faso, Equatorial Guinea, Cameroon, Uganda, or Zimbabwe, have been in power for over 20 years (Bates, Fayad & Hoeffler, 2012).

Bad governance works against the region's efforts of securing stable democracies. This was evidenced during the decolonisation period when there was a marked increase in political violence and disorder. Demand by the rapidly changing social structures is placed on the ruling party for development of political institutions. Their reluctance to oblige, or their slow reaction, hampers development of new institutions and technologies and causes a lag in the development of political institutions behind social and economic change (Huntington, 1968).

International organisations have also played their part. In their efforts to help developing countries with aid and policy reforms, they have only managed to slow down these countries ability to develop their economies on their own. According to South Africa's Minister of Finance, Trevor Manuel (2003), few African countries actually applied all the Washington Consensus-type reforms because of the difficulties of pursuing them and their appropriateness to Africa's needs (Kahn, 2004). Even the man behind the Washington Consensus John Williamson admitted that SSA responded grudgingly too often under foreign pressure rather than from conviction. A report from the World Bank (2011) also states that some of the African states are highly unlikely to meet their MDGs by 2015, among them Benin, Chad, Nigeria and Sudan. Africa's dependence on funding from international organisations also leaves the region susceptible to misappropriation of the funds and corruption which does not promote democracy.

What is the way forward for Africa? Despite facing developmental challenges such as low literacy rates, rising unemployment rates, or being landlocked with warring neighbours with consequences which spill over the borders, there is still scope for change. Increasingly a number of African states in the region are showing signs of economic progress through the redistribution of public expenditure to health care, education, and other basic social services. The New Partnership for Africa's Development (NEPAD) initiative formed in 2001 reflects the region's favourable intentions to improve structural reforms and implement better economic policies. If these initiatives could be coupled with increased emphasis on governance, we may witness more stable democracies surviving. International organisations may also need to take a step back and give developing regions are chance to rebuild on their own. Creating democracies is a gradual and time-consuming process in a modernising country, but one needs to remember that modernisation is an irreversible and progressive process (Huntington, 1971). Lasting democracies enjoy better protection of contract and property rights than countries with either stable autocracies or unstable democracies and a democracy that fails to last does not protect the rights of its citizens.

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8. Appendix A

The following table shows the variation in polity scores for the SSA region in 1975, 1991 and 2010.

Table 6: Polity Score (Polity IV Dataset)

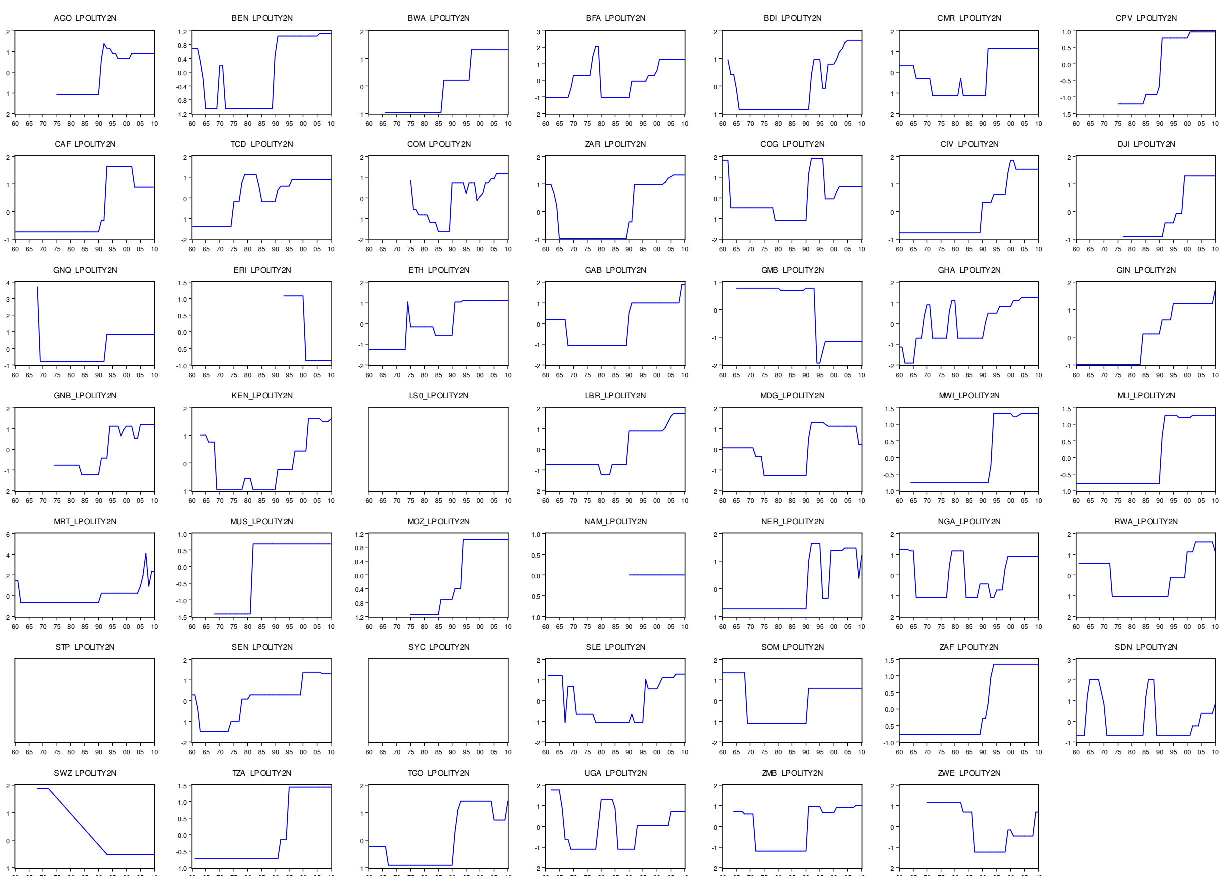
Country	1975	1991	2010
Angola	-7	-3	-2
Benin	-7	6	7
Burkina Faso	-4	-5	0
Botswana	6	7	8
Cameroon	-8	-8	-4
Cape Verde	-4	8	10
Central African Republic	-7	-6	-1
Chad	-7	-5	-2
Comoros	5	4	9
Congo Kinshasa	-9	-8	5
Congo Brazzaville	-7	-1	-4
Djibouti*		-8	2
Equatorial Guinea	-7	-7	-5
Eritrea*			-7
Ethiopia	-7	0	1
Gabon	-9	-4	3
Gambia	8	8	-5
Ghana	-7	-4	8
Guinea-Bissau	-7	-6	6
Guinea	-9	-5	5
Ivory Coast	-9	-7	0
Kenya	-7	-5	8
Liberia	-6	0	6
Lesotho	-7	-7	8
Mauritania	-7	-6	-2
Madagascar	-6	2	0
Mauritius	9	10	10
Malawi	-9	-9	6
Mali	-7	0	7
Mozambique	-8	-6	5

Namibia*		6	6
Nigeria	-7	-5	4
Niger	-7	1	3
Rwanda	-7	-7	-4
South Africa	4	5	9
Senegal	-6	-1	7
Sierra Leone	-6	-6	7
Somalia	-7	0	0
Sudan	-7	-7	-2
Swaziland	-10	10	-9
Tanzania	-6	-6	-1
Togo	-7	-5	-2
Uganda	-7	-7	-1
Zambia	-9	6	7
Zimbabwe	4	-6	1

* Countries with no values had not yet attained independence at that period.

There is also evidence of reversal of political regimes in the SSA region as shown in the individual graphs below. Zimbabwe's polity score has declined given the political tension between incumbent ruling party ZANU and opposition MDC. Wars in Eritrea and Somalia have pushed their polity scores down, while Swaziland remains an autocratic state to date under the Mswati monarch.

Graph 4: Individual Polity Score



Appendix B

For panel models with contemporaneously correlated and panel heteroskedastic errors, the covariance matrix of the errors Ω is an $NTxNT$ block diagonal matrix with an NxN matrix of the contemporaneous covariances, Ɛ, along the diagonal. Thus, to estimate equation (4) we need a consistent estimate of Ɛ. Since the OLS estimates of equation (4) are consistent, we can use the OLS residuals from that estimation to provide a consistent estimate of Ɛ. Therefore if E denotes the TxN matrix of the OLS residuals, we can then estimate Ɛ by:

$$\hat{\varepsilon} = \frac{(E'E)}{T} \qquad (4.2)$$

And hence estimate Ω by:

$$\hat{\Omega} = \frac{(E'E)}{T} \otimes I_T \qquad (4.3)$$

where ⊗ is the Kronecker product. Panel-corrected standard errors are thus computed by taking the square root of the diagonal elements of:

$$(X'X)^{-1}X'\left(\frac{E'E}{T} \otimes I_T\right)X(X'X)^{-1} \qquad (4.4)$$

As the number of time points increase $\hat{\varepsilon}$ becomes an increasingly better estimator of Ɛ (Beck & Katz, 1995). Monte Carlo analysis shows that these estimates of sampling variability are very accurate, even in the presence of complicated panel error structures and are robust to heteroskedasticity and correlation across cross-sections or periods (Beck & Katz, 1995).