# Economic Development and Democracy: The Modernization Hypothesis in sub-Saharan Africa*

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**Highlights**

• Lipset's (1959) modernization hypothesis advances that economic development supports democratic institutions.
• Income per capita is a narrow definition of economic development in empirical analysis for hypothesis testing.
• We use principle component analysis for a composite measure for economic development.
• We find the results for the modernization hypothesis to be more consistent with the economic development index than with income per capita.

**Abstract**

Previous empirical literature focuses on income per capita as a measure for economic development. Using Lipset's modernization hypothesis as our theoretical framework, we contend that this measure does not capture the fundamental quality of economic development and as such may disadvantage low income regions when conducting empirical analysis. Our initial results using income per capita highlight this, showing a negative relationship between income per capita and democracy for sub-Saharan Africa between 1960 and 2010. However when we create a composite measure for economic development by employing the principle component analysis on the indicators that are suggested by Lipset, we obtain positive and significant results for democracy. This evidence suggests that we need to be wary of income per capita as a measure for economic development as the two are not synonymous. Income per capita may not capture other factors that also encompass development in a country.

**Keywords:** Economic development; Democracy; Sub-Saharan Africa; Principle component

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# 1 Introduction

In this study, we argue that the concept of income per capita in representing economic development in empirical analyses may be a narrow definition that can bring into question inferences drawn from the measure. For example, while Lipset (1959) highlighted economic development as a dynamic complex comprising wealth, education, urbanization and industrialization as necessary conditions to support democracy, the existing empirical studies have focused mainly on income per capita as a preferred measure for economic development. As such, most of the literature reviewed either rejects or fails to reject the modernization hypothesis based on the causal results they obtain between income per capita and democracy (Acemoglu, Johnson, Robinson, & Yared, 2008; Benhabib, Corvalan, & Spiegel, 2013; Cervellati, Jung, Sunde, & Vischer, 2014; Heid, Langer, & Larch, 2012).

However, Lipset (1959) highlights that the modernization hypothesis cannot be rejected or accepted solely on the premises of one measure of economic development, such as wealth or education, but that these various indices are interrelated under the process of economic development. In regions, such as sub-Saharan Africa, where the average income per capita may be low but other fundamental aspects of economic development, such as education, urbanization and industrialization are on the rise, measuring economic development through income per capita may disadvantage such regions by understating the effects of development and making it difficult to draw conclusions for the modernization hypothesis[1].

Based on the above argument, we diverge from the existing literature by refining the measurement approach through principle component analysis. In so doing, we create a composite measure for economic development from income per capita, education, urbanization and industrialization which provides a closer representation of Lipset's (1959) modernization process. To the best of our knowledge, this approach is not common practice in the previous studies reviewed. The principle component approach minimizes the issue of potential measurement bias by assigning relatively even weights to the different variables such that the overall combined indicator does not rely solely

[1] Post-independence literacy rates have improved in the region in line with the Sustainable Development Goals (SDG4 - inclusive and quality education for all). According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Statistics, between 2000 and 2012, the percentage of children not in school among primary school children has declined from 40% to 22% in sub-Saharan Africa (http://www.un.org/sustainabledevelopment/wp-content/uploads/2017/02/ENGLISH_Why_it_Matters_Goal_4_QualityEducation.pdf).

or heavily on income per capita or any of the other variables.

Furthermore, the existing studies mainly use global samples with sub-Saharan Africa represented by the few countries that meet the data criteria or included as a regional dummy. Grouping sub-Saharan African countries with other global regions such as Western Europe or North America may bring in sample selection bias as these regions are already developed and democratic, more so during the time period 1960 to 2010 (Papaioannou & Siourounis, 2008a; Boix, 2011). We therefore confine our sample to sub-Saharan Africa so that we can give an unbiased reflection of the effects of income per capita on democracy compared to the effects of economic development on democracy.

Using Lipset's (1959) modernization hypothesis as our theoretical framework, we show that previous findings for or against democracy using the income per capita measure may be misleading. To illustrate our argument, we initially test for the modernization hypothesis following previous literature that economic development, measured by income per capita, increases democracy. We use dynamic panel data analysis for 46 sub-Saharan African countries[2] between 1960 and 2010, namely the fixed effects model, the mean group estimator and the system-generalised method of moments (sys-gmm) to allow for unobserved heterogeneity and endogeneity.

The results with income per capita indicate little evidence supporting democracy suggesting that the modernization hypothesis does not hold in the region. However, the results with the composite index for economic development tell a different story. We find a positive and significant relationship with democracy. This evidence suggests that we need to be wary of attributing too much emphasis on income per capita as a measure for economic development as it may be too narrow a definition and may not capture other factors that also encompass development in a country.

Figures 1 and 2 support our argument. Figure 1 shows a comparison between democracy scores and incomes per capita for sub-Saharan Africa. There is evidence of significant improvements in democracy from 1990 to 2010, but during the same 10 year period there has been slow progress in accumulation of income. The changes in income per capita alone are not sufficient to explain the changes in democracy, other factors must also be at play simultaneously.

[2] *Sample of countries:* Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic), Congo (Republic), Cote d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

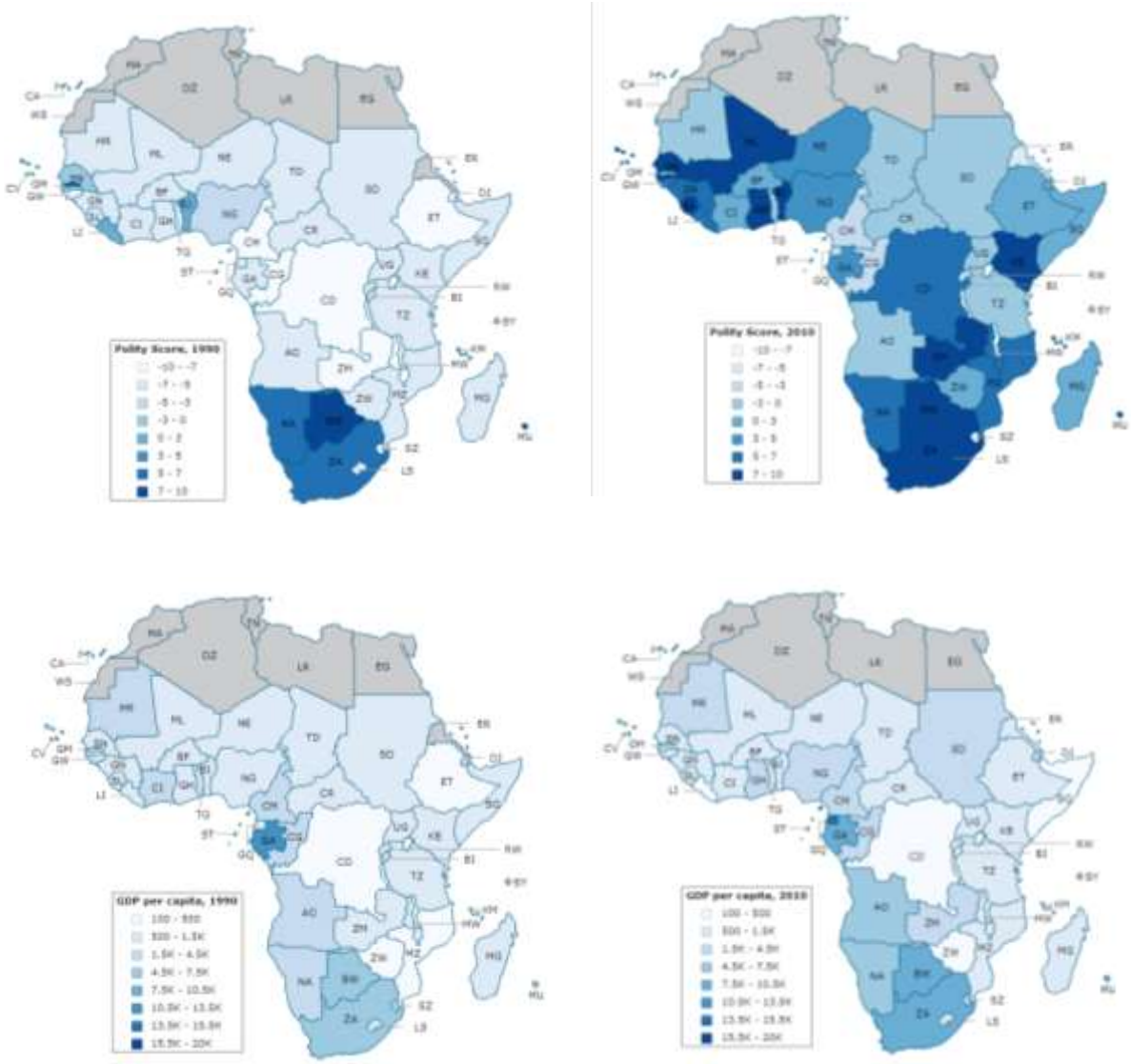


**Figure 1:** Changes in income and democracy between 1990 and 2010 (Notes: This figure shows the changes in income per capita and democracy for 46 countries in 1990 and 2010. Democracy is measured using the polity score and income per capita is the real gross domestic product per capita. Source: Polity IV Project, Penn World Tables 7.1)

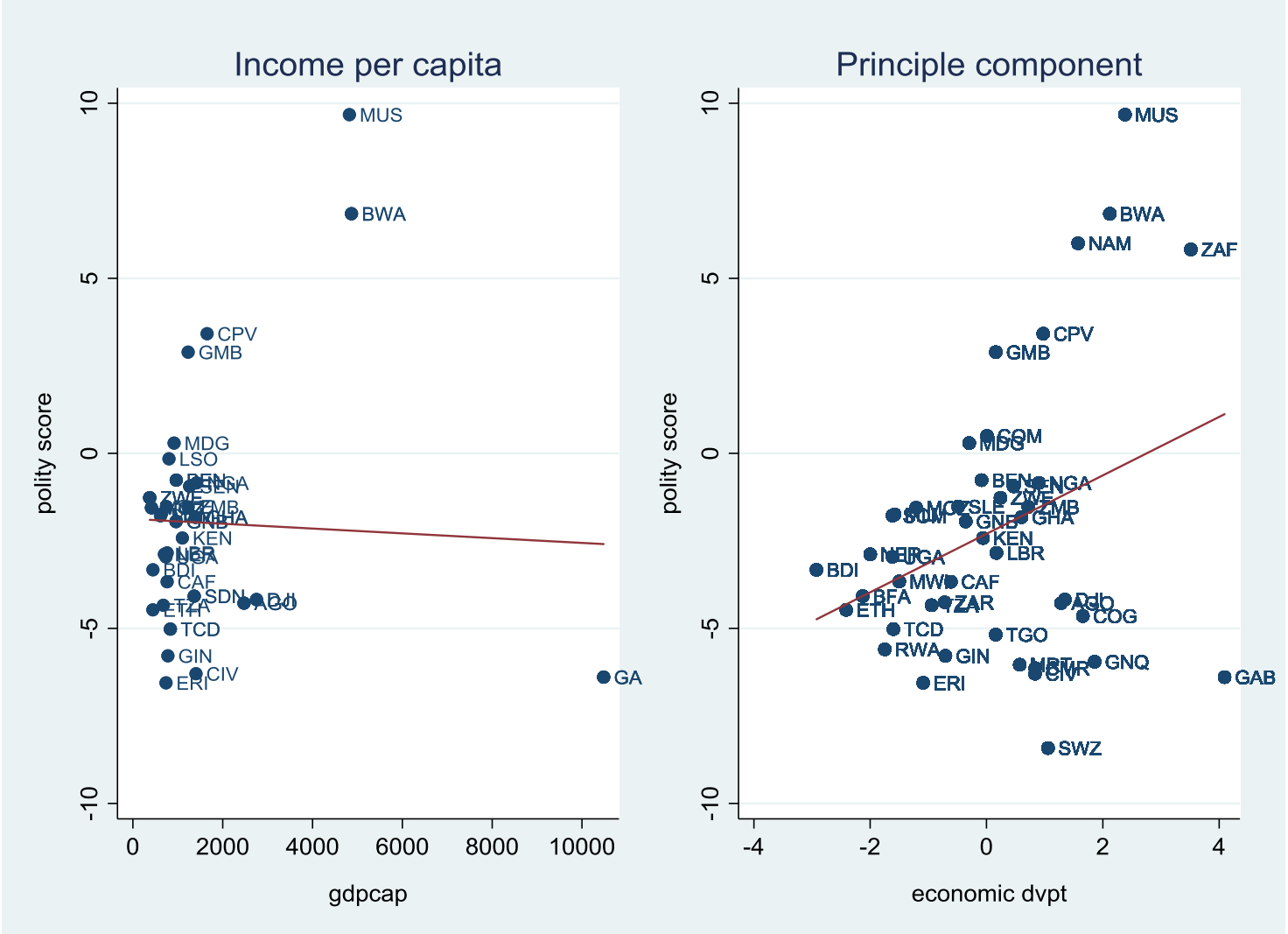


**Figure 2:** Income and democracy vs economic development and democracy in sub-Saharan African (Notes: This figure shows the comparison between income per capita and the generated principle component for 46 sub-Saharan African countries in 1960-2010. The principle component comprises income per capita, education, urbanization and industrialization. Source: Penn World Tables 7.1, Polity IV Project, World Development Indicators).

Furthermore, Figure 2 substantiates the evidence observed in Figure 1. The correlation between income per capita and democracy is relatively flat, suggesting insignificance, while the correlation between economic development as a composite measure and democracy is significantly positive.

## 2 Previous related literature

In 1959 Lipset published a seminal paper that became the backbone of modernization 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, urbanization, education and industrialization. He further states that democracy stabilizes 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 ability to survive.

Analysis by Barro (1996) uses cross-country evidence to examine the modernization hypothesis and he finds that prosperity stimulates democracy and that countries at low levels of economic development fail to sustain democracy, as may be the case in sub-Saharan Africa. Further evidence by Barro (1999; 2015) using income per capita and education reports similar findings in favour of the modernization theory, while allowing for fixed effects and taking into account different measures for democracy.

Other studies that report a positive relationship between democracy and economic development include Benhabib et al. (2013), 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. Moreover, Bittencourt (2013) finds positive evidence for the modernization hypothesis in the Latin American region, while Epstein, Bates, Goldstone, Kristensen and O'Halloran (2006) confirm that higher per capita incomes increase the likelihood of movement away from autocracy. This result is in line with Glaeser, La Porta, Lopez-De-Silaneset and Shleifer (2004) who find 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.

In addition, Gundlach and Paldam (2009) find a large long-run positive causal effect of income on the degree of democracy, while analysis by Heid et al. (2012) finds a statistically significant positive relationship between income and democracy after accounting for the dynamic nature and high persistence of the two variables. Furthermore, Inglehart and Welzel (2009) confirm that causality runs mainly from economic development to democratization and also suggest that beyond a certain level of economic development, democracy becomes increasingly likely to emerge and survive. This however is in contradiction to results obtained by Bates, Block, Fayad and Hoeffler (2013) who find that causality runs from democracy to economic development, but for sub-Saharan African region only.

Other studies use education as a measure for economic development instead of income per capita and find a positive education-democracy relationship. Glaeser, Ponzetto and Shleifer (2007) find that not only are richer countries more likely to improve their institutions, but stable democracies are more common in countries with high levels of education. Furthermore, Murtin and Wacziarg (2014) provide empirical support for the modernization hypothesis, particularly that the level of primary schooling is a more robust determinant of democracy than per capita income. However their Arellano-Bond GMM estimator may have been subject to small sample bias. Barro (1996; 1999) also finds that income per capita, primary schooling, urbanization and life expectancy tend to generate a gradual rise in democracy. Similar conclusions are drawn by Papaioannou and Siourounis (2008a) who find that democratization is more likely to emerge in both rich and educated societies.

One of Lipset's (1959) main critics is Acemoglu et al. (2008; 2009). They fail to find any significant relationship between income and democracy, and dispute studies that find such a relationship. They argue that these studies do not 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. Moreover, Acemoglu et al. (2005) dispute that education is likely to make countries more democratic. However, several papers contest their argument and find a robust and positive relationship between education and democracy (Barro, 1999; Glaeser et al., 2004). In addition, Faria, Montesinos-Yufa and Morales (2014) find that once they account for weak instruments and endogeneity bias, their initial results for income and education, which were similar to Acemoglu et al. (2005; 2008; 2009), are in fact positively associated with democracy.

On the other hand, Fayad, Bates and Hoeffler (2012) decompose income per capita into re-

source and non-resource component. They discover that the nations whose income is not dependent on resources validate the modernization hypothesis, while resource rich nations, such as Angola, the Democratic Republic of Congo, Sierra Leone and Nigeria hinder democracy. Cervellati et al. (2014) also find a negative relationship between income and democracy in countries that are former colonies. However, Faria and Montesinos-Yufa (2017) find contrasting results. They find a positive and significant effect of income on democracy for both colonies and non-colonies, once they apply the system-gmm estimator.

Other studies that find a negative association with income and democracy include Burke and Leigh (2010) who find that more rapid growth reduces the short run likelihood of change towards democracy. This negative effect was driven mainly by output contractions caused by adverse weather conditions rather than by commodity price shocks. Countries are more likely to democratize after a recession than a boom because citizens are frustrated and want a change. Hence one needs a catalyst, and an economic crisis may serve as that catalyst. This work is supported by Bruckner and Ciccone (2011) who find that economic shocks in income per capita generated by poor rainfall are followed by significant improvement in democratic institutions. The negative economic shocks open a window of opportunity for citizens to voice their concerns against an autocratic regime as the opportunity cost for them is relatively low.

While Lipset (1959) is primarily concerned with explaining the internal social conditions which serve to support a democratic political system, a parallel literature highlights the role that external conditions also play in the formation and sustainability of democracy, especially in developing regions like sub-Saharan Africa. 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 the 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 modernization hypothesis. Though their evidence finds a negative relationship between democracy and economic development, Przerworski and Limongi (1997) do not dispute the fact that once established, democracies are more likely to survive in wealthier countries than in poor ones. They however use a dichotomous classification of political systems which may ignore the possibility

of partial democracies in their categorization. We, on the other hand, use a continuous variable which captures all categories of democracy from autocracies, partial and full democracies obtained from the Polity IV dataset.

Several papers also verify the influence of external factors in the democratization processes of third world countries (Easterly, Satyanath, & Berger, 2008; Huntington, 1991; Gleditsch & Ward, 2006; 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 democratization. While Pevehouse (2002) confirms that pressure from international and regional organizations can influence the dynamics of political liberalization, Huntington (1991) contends that even though external influences are significant causes of third wave democratizations, the processes themselves are 'overwhelmingly indigenous'. In addition, Easterly et al. (2008) find that superpower interventions are followed by significant declines in democracy. They find that both the United States and the former Soviet Union have equally negative effects on the subsequent level of democracy suggesting that it does not matter whether the intervening power is a democracy or a dictatorship. For example, 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 recovering economically and level of democracy is minimal.

While the evidence from the reviewed literature is mixed, the inferences drawn on the modernization hypothesis are all based on a similar causal relationship between income per capita and democracy, and sometimes education. According to Lipset (1959), wealth, education, urbanization and industrialization are "so closely interrelated as to form one common factor". In light of this, we contribute to the debate by creating a composite measure from these indices to capture the complexity of economic development, as described by Lipset (1959).

# 3 Empirical Analysis

## 3.1 Data

Democracy is defined as political or social equality where the power is vested in the people of the country and exercised by them through a free electoral system (Lipset, 1959). The dependent variable used to measure democracy is obtained from the Polity IV Project and captures these characteristics in a quantitative analysis. The variable (*polity*) 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 autocratic) to +10 (strongly democratic). A decrease/increase in the polity score will indicate a decrease/increase in democracy. We linearly standardized the variable so that it ranges from zero to one[3]. We use the log of the dependent variable to account for the variation in the distribution of the polity score across the countries. we. To avoid losing observations that have a rescaled polity score of zero, we add a constant of one to the rescaled polity index, and then we log the variable (Michalopoulos & Papaioannou, 2013).

Different variables for democracy have been used in previous literature, such as the Freedom House Index and constraints on the executive (Acemoglu et al., 2008; Benhabib et al., 2013; Burke & Leigh, 2010; Cervellati et al., 2014). We choose a variable which captures the dynamics of democratic rule present in the sample. Some countries remained autocratic between 1960 and 2010 (for example Angola, Sudan, Swaziland). Other countries were classified as anocracies (partial democracies) because they abandoned autocracy during the period under review but experienced delays in achieving full democracies (for example Lesotho, Mozambique and Nigeria). Others experienced full reversals from stable democracies to autocratic rule (for example Gambia and Zimbabwe), while other countries became full democracies during the period under review (for example Cape Verde, Ghana and South Africa)[4].

These levels of political status such as anocratic rule may not be captured in binary type variables. According to Cheibub et al. (2009), 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. For the purpose of this research, the polity score variable is a suitable and comprehensive measure with data available for all countries under review.

Following Lipset (1959) and others (Barro, 1999; Benhabib et al., 2013; Bittencourt, 2013; Epstein et al., 2006) the explanatory variable used to measure economic development is the purchasing power parity converted gross domestic product (GDP) per capita at 2005 constant prices (*gdpcap*) obtained from the Penn World Tables 7.1[5]. A positive and significant coefficient for income per capita would confirm the modernization hypothesis that richer countries tend to

[3] Other papers that rescale democracy indices include Acemoglu et al. (2008), Barro (1999), Murtin (2013).

[4] See Papaioannou and Siourounis (2008b) for the country classification of democracy.

[5] According to Pinkovskiy and Sala-i-Martin (2016), the Penn World Table (PWT) version 7.1 chain-based GDP series outperforms the constant-price series in the more recent PWT versions.

be more democratic.

The hypothesis also highlights the importance of education, urbanization and industrialization in supporting democracy. Lipset (1959) finds that the countries in Europe with a high literate population also turn out to be more democratic compared to those countries with low literacy rates. The education (*educ*) variable is obtained from World Development Indicators (WDIs) and measures the gross primary enrollment rates. Education encourages people to interact with others and raises the benefits of citizen participation including voting and organizing. This raises the support for more democratic regimes relative to dictatorships (Glaeser et al., 2007). We therefore expect education to be positively related to democracy.

The urbanization variable (*urban*) is obtained from the WDIs and measures urban population as a percentage of total population. Urban areas are more developed than rural ones and people migrate to cities seeking better opportunities. Urban areas also indicate a society with a large middle class which according to Lipset (1959) plays an important role in advancing democratic parties and suppressing kleptocracy. We expect urbanization to have a positive effect on democracy.

The industrialization variable (*industrialization*) measures the carbon dioxide emissions in metric tons per capita and is obtained from the WDIs. Carbon emissions are seen as a consequence of industrialization, particularly in the early stages of economic development as indicated by the Environmental Kuznets Curve hypothesis. Given that sub-Saharan Africa's economic development is on the rise, we expect the carbon emissions to be initially high. In addition, the measure is commonly used in the environmental economics literature where more carbon dioxide emissions indicate an expansion in the industrialization activities (Narayan & Narayan, 2010; Saidi & Hammami, 2015). According to the modernization hypothesis, industrialization improves productivity and is therefore expected to have a positive effect on democracy. Lipset (1959) uses percentage of males in agriculture and per capita energy consumed as his industrialization indices. However since data availability for sub-Saharan African countries poses a limitation, we find that the carbon dioxide emissions variable is a suitable alternative measure for industrialization as it has more data coverage for the 46 countries under review.

Table 1 gives a brief overview of the data. The descriptive statistics indicate significant heterogeneity across the variables in the sample. The mean income per capita is relatively low at US$1669.23, while the mean polity score of 0.36 suggests a region which has low levels of democracy. The signs of the correlation coefficients for the democracy variable are in line with

**Table 1:** Descriptive Statistics and Correlation Matrix

| Variable | Obs | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| Polity | 2122 | 0.362 | 0.281 | 0 | 0.952 |
| Gdpcap | 2253 | 1669.23 | 2141.70 | 160.93 | 19395.44 |
| Educ | 1543 | 78.66 | 32.57 | 7.86 | 207.82 |
| Urban | 2346 | 27.29 | 15.75 | 2.04 | 85.84 |
| Industrialisation | 2154 | 0.63 | 1.56 | -0.02 | 11.72 |

| | Polity | Gdpcap | Educ | Urban | Industrialisation |
|---|---|---|---|---|---|
| Polity | 1.00 | | | | |
| Gdpcap | 0.15* | 1.00 | | | |
| Educ | 0.26* | 0.37* | 1.00 | | |
| Urban | 0.26* | 0.52* | 0.29* | 1.00 | |
| Industrialisation | 0.17* | 0.72* | 0.30* | 0.40* | 1.00 |

Notes: The polity variable has been linearly standardized to range between 0 and 1.

Sources: Polity IV Project, Penn World Tables 7.1, World Development Indicators

*significant at 5%

expectations discussed above.

### 3.2 Methodology

We use a sample of 46 sub-Saharan African countries and annual data from 1960 to 2010 with the following specification:

$$\ln polity_{it} = \alpha_i + \beta_1 \ln gdpcap_{it-1} + \beta_2 \ln educ_{it-1} + \beta_3 \ln urban_{it-1} + \beta_4 \ln industrialisation_{it-1} + \beta_5 \ln polity_{it-1} + \mu_{it} \quad (1)$$

We lag the explanatory variables to allow for delays in the changes of the observed variables on democracy (Acemoglu et al., 2008; 2009; Barro, 1996; Cervellati et al., 2014). Democratic transitions take time as evidenced by Persson and Tabellini (2009) who find that past experience with democracy is beneficial for maintaining democracy and how well current institutions work. This is consistent with Guiliano and Nunn (2013) who find that past experience with local democracy is associated with more supportive beliefs of national democracy today such as stronger rule of law. We allow for this persistence by including the lagged dependent variable in the specification. The dynamic specification also accounts for time-varying unobserved heterogeneity.

In the baseline analysis we use alternative methods that have been suggested in literature for estimating dynamic heterogeneous panels that are large in cross section and large in time series. The first method is fixed effects (FE) $\alpha_i$ which allows for unobserved country differences such as historical and colonial background, ethnic and religious composition. The second method is the Pesaran and Smith (1995) Mean Group estimator (MG) which estimates equation (1) for each country separately and calculates an average of the coefficients. While the FE method pools the time-series data for each group and allows only the intercepts to differ across the groups, the MG estimator allows the intercepts, slope coefficients and error variances to differ across groups such that the results are more consistent in the presence of heterogeneity. The third method is system-gmm (sys-gmm) by Blundell and Bond (1998) which is used to reduce the potential bias that may come from both heterogeneity and economic endogeneity in the form of reverse causality. Other empirical works that use system-gmm include Acemoglu et al. (2009), Faria et al. (2014), Faria and Montesinos-Yufa (2017), Heid et al. (2012) and Murtin and Wacziarg (2014).

Reverse causality is evident in the related literature. More democratic countries may increase

income per capita by encouraging economic reforms, investment and reducing social unrest (Acemoglu et al., 2014). Evidence by Tavares and Wacziarg (2001) finds that democratic institutions are more responsive to the demands of the poor by increasing access to education and lowering income inequality. This relationship is confirmed by Fosu (2013) who finds that greater prevalence of democratic regimes improves overall growth of African economies[6]. More democratic countries may also invest more in public goods, such as widening access to education (Bittencourt, 2014), improved infrastructure and industrialization. Moreover, Brown and Hunter (2004) find that democracies devote a higher percentage of their educational resources to primary education in Latin America, while Stasavage (2005) provides evidence that democratic governments have greater incentive than authoritarian states to provide primary education.

System-gmm is particularly suitable for dealing with possible endogeneity when all the explanatory variables may be correlated with the error term, as well as identification tasks where variables are highly persistent, such as democracy (Faria et al., 2014). It also allows for consistent estimation in large samples. A study by Hayakawa (2015) finds results that support the use of the system-gmm estimator in large $N$ and long $T$ contexts even though it was originally developed for large $N$ and short $T$ panels. System-gmm estimates parameters of interest by using a set of moment conditions as instruments. It uses 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. To reduce the possibility of instrument proliferation which may overfit endogenous variables and fail to expunge their endogeneity, we specify the number of lags instead of using all available lags for the instruments (Roodman, 2009). We use the second lag up to the third lag for the explanatory variables. The further distant lags allow for the time persistence of democracy. System-gmm also takes care of serial correlation which is likely to be present in the lagged dependent variable. We include the two-step robust procedure which uses the Windmeijer's (2005) finite-sample correction for downward-biased standard errors and makes it a more efficient estimator than the one-step robust specification.

[6] More empirical support for democracy causing economic growth can be found in Barro (1996), Bates et al. (2013) and Papaioannou and Siourounis (2008b).

# 4 Results

## 4.1 Baseline Analysis

Panel A in Table 2 compares the results for income per capita and economic development. The results with income per capita (columns 1 to 3) are not consistent across the estimators. Income per capita indicates inconclusive and negligible effects on democracy, as does education and industrialization. Urbanization, on the other hand, appears to be the driver for increased democracy in this case given by the positive and significant coefficients. The sometimes negative and insignificant association between income and democracy lends credence to evidence by Cervellati et al. (2014) who find that the effect of income on democracy is negative in former colonies, more so in those countries that were subject to extractive colonization strategies and historically displayed lower constraints on the executive (Acemoglu et al., 2001). These characteristics are common to sub-Saharan Africa as all the countries are former colonies (except Ethiopia) with weak institutions that have persisted over time.

These initial results make it diffi cult to draw an overall conclusion on the modernization hypothesis in sub-Saharan Africa. According to the results, the hypothesis does not hold based on income per capita, but holds based on urbanization in the region. The results suggest that beyond the impact of income per capita on democracy, we may want to consider economic development as a joint process of factors taking place simultaneously. In light of this, we create an index for economic development (ecdvpt) using principle component analysis. This approach allows us to reduce the set of explanatory variables, i.e. income, education, urbanization and industrializa- tion, into one composite variable. Principle component accounts for most of the variance in the observed variables as it extracts the common factors amongst them and combines these factors into a variable that can be used as a predictor in subsequent analyses. This method is a closer representation of Lipset' s(1959:80) economic development process.

We use the first principle component which accounts for over sixty percent of the variation in the explanatory variables. Two commonly used criteria for deciding which components to keep are i) the eigenvalue-one which retains any component with an eigenvalue greater than one as it is accounting for a greater amount of variance (Kaiser, 1960), and ii) the scree test which plots the eigenvalues associated with each component and looks for a "break" between the components with relatively large eigenvalues and those with small eigenvalues (Cattell, 1966). The components

**Table 2:** Results

| **Panel A** | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| POLITY | FE | MG | SYS-GMM | FE | MG | SYS-GMM |
| $\text{Ecdvpt}_{t-1}$ | | | | 0.007** | 0.010** | 0.016** |
| | | | | (0.003) | (0.005) | (0.007) |
| $\text{Gdpcap}_{t-1}$ | -0.013 | -0.016 | 0.004 | | | |
| | (0.008) | (0.023) | (0.020) | | | |
| $\text{Educ}_{t-1}$ | -0.010 | -0.002 | 0.022 | | | |
| | (0.007) | (0.017) | (0.019) | | | |
| $\text{Urban}_{t-1}$ | 0.054*** | 0.078*** | 0.033* | | | |
| | (0.012) | (0.030) | (0.017) | | | |
| $\text{Industrialisation}_{t-1}$ | -0.005 | 0.004 | -0.027* | | | |
| | (0.003) | (0.008) | (0.015) | | | |
| $\text{Polity}_{t-1}$ | 0.894*** | 0.688*** | 0.922*** | 0.920*** | 0.858*** | 0.947*** |
| | (0.017) | (0.035) | (0.029) | (0.012) | (0.021) | (0.021) |
| Observations | 1,434 | 1,434 | 1,434 | 1,434 | 1,434 | 1,434 |
| R-squared | 0.848 | | | 0.844 | | |
| F / Wald test | 1573.84*** | 393.40*** | 682.48*** | 4008.94*** | 1730.15*** | 2146.38*** |
| Hansen J test p-value | | | 0.845 | | | 0.490 |
| AR (2) p-value | | | 0.171 | | | 0.130 |
| Number of i | 44 | 44 | 44 | 44 | 44 | 44 |
| Country FE | YES | YES | YES | YES | YES | YES |

| **Panel B: Principle Components Analysis** | | | | |
|---|---|---|---|---|
| Component | Eigenvalue | Difference | Proportion | Cumulative |
| PC1 | 2.57 | 1.83 | 0.64 | 0.64 |
| PC2 | 0.74 | 0.28 | 0.18 | 0.83 |
| PC3 | 0.46 | 0.23 | 0.11 | 0.94 |
| PC4 | 0.23 | - | 0.06 | 1.00 |

| **Principle Components (eigenvectors)** | | | | |
|---|---|---|---|---|
| Variable | PC1 | PC2 | PC3 | PC4 |
| Gdpcap | 0.54 | -0.27 | -0.43 | 0.67 |
| Educ | 0.38 | 0.92 | -0.07 | 0.01 |
| Urban | 0.50 | -0.14 | 0.85 | 0.07 |
| Industrialisation | 0.55 | -0.24 | -0.31 | -0.74 |

Notes: In Panel A, the coefficients are reported and the robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Ecdvpt is the principle component which comprises income per capita (PWT 7.1), gross primary enrollment rates, urban population (% of total population) and CO2 emissions (metric tons per capita).

In Panel B, we report the linear combination of the vector (gdpcap, educ, urban and industrialisation) that make up the principle components. The first principle explains 64% of the variation in the explanatory variables. The weights of the variables are also positive for the first principle component.

Sources: Polity IV Project, Penn World Tables 7.1, World Development Indicators.

that appear before the break are assumed to be meaningful and are retained.

Panel B in Table 2 shows results for the principle components. The results show that the first principle component has an eigenvalue of 2.6 which accounts for twice as much variance compared to the other components. According to the eigenvectors, the weights of the original variables are positive and load relatively evenly on the first principle component, indicating that the component is explaining most of the variance across the variables. Although the second principle component explains a significant part of education based on the weighting of the variable, the other variables are negative and overall the second principle only explains eighteen percent of the variation in the variables. The third and fourth principles also explain very minimal variation[7].

A correlation test between the principle components and the variables corroborates the results obtained from the eigenvalue-one criteria and the scree test. The first principle is highly correlated with all four variables compared to the other components.

We re-estimate our dynamic regressions with the composite variable in Table 2, Panel A. We now find a positive and significant association between economic development and democracy across the estimators in columns 4 to 6. The consistent positive coefficients are more in line with explaining the improvement in average democracy that we observe in Figure 3, suggesting that more countries have been transitioning out of autocracies into democracies. The results for income per capita, on the other hand, are unable to explain the changes from autocratic to democratic regimes during this period.

For example, Table 4 shows that several countries (in bold) are moving from negative polity scores (autocracy) to positive scores (democracies), yet the changes in the associated initial incomes per capita during the same period are small and sometimes negative. We also observe that only 5 countries (with asterix) out of the sample transition out of democracy despite the positive changes in their initial incomes per capita.

These results indicate that the modernization hypothesis holds in the region once we account for the combined changes in the development indicators. Income per capita alone may fail to

[7]Results for the scree test validate the use of the first principle component. The other three components fall below the break and are therefore assumed to explain an insignificant proportion of our variables in relation to the first component. The results are available on request.

**Table 3:** Correlation between principle components and variables

| | Gdpcap | Educ | Urban | Industrialisation |
|---|---|---|---|---|
| PC1 | 0.87 | 0.61 | 0.81 | 0.89 |
| PC2 | -0.23 | 0.79 | -0.12 | -0.21 |
| PC3 | -0.29 | -0.05 | 0.58 | -0.21 |
| PC4 | 0.32 | 0.001 | 0.03 | -0.36 |

Sources: Polity IV Project, Penn World Tables 7.1, World Development Indicators

**Table 4:** Comparative analysis

| Country | initial gdpcap | gdpcap (2010) | initial polity | polity (2010) |
|---|---|---|---|---|
| Angola | 2313.20 | 5107.54 | -7 | -2 |
| Benin | 745.336 | 1176.87 | 2 | 7 |
| Botswana | 674.1 | 9675.35 | 6 | 8 |
| Burkina Faso | 512.48 | 929.93 | -7 | 0 |
| **Burundi** | **343.34** | **396.17** | **0** | **6** |
| Cameroon | 1415.79 | 1748.11 | -6 | -4 |
| Cape Verde | 856.23 | 3916.61 | -4 | 10 |
| **Central African Republic** | **967.75** | **588.78** | **-7** | **-1** |
| Chad | 793.57 | 1330.64 | -9 | -2 |
| Comoros | 740.77 | 856.22 | 5 | 9 |
| **Congo, Dem. Rep.** | **696.49** | **240.55** | **0** | **5** |
| Congo, Rep.* | 996.67 | 2253.75 | 4 | -4 |
| Cote d'Ivoire | 953.523 | 1283.67 | -9 | 0 |
| **Djibouti** | **4691.66** | **2410.88** | **-8** | **2** |
| Equatorial Guinea* | 610.729 | 13958.30 | 2 | -5 |
| Eritrea | 624.45 | 588.00 | -6 | -7 |
| Ethiopia | 386.539 | 680.43 | -9 | 1 |
| Gabon | 4877.97 | 9895.86 | -7 | 3 |
| Gambia, The* | 1123.56 | 1271.47 | 8 | -5 |
| Ghana | 1286.11 | 2094.28 | -8 | 8 |
| **Guinea** | **914.01** | **787.70** | **-9** | **5** |
| **Guinea-Bissau** | **784.03** | **798.41** | **-7** | **6** |
| **Kenya** | **1020.03** | **1246.76** | **2** | **8** |

Source: Polity IV Project, Penn World Tables 7.1

Notes: Countries in bold have transitioned from autocracies to democracies.

Countries with * have regressed in terms of democracy.

**Table 4 contd:** Comparative analysis

| Country | initial gdpcap | gdpcap (2010) | initial polity | polity (2010) |
|---|---|---|---|---|
| Lesotho | 389.456 | 1394.74 | 9 | 8 |
| **Liberia** | **1300.43** | **458.74** | **-6** | **6** |
| **Madagascar** | **1051.39** | **702.58** | **-1** | **0** |
| **Malawi** | **330.157** | **655.61** | **-9** | **6** |
| Mali | 527.07 | 997.97 | -7 | 7 |
| Mauritania | 634.34 | 1938.58 | -4 | 2 |
| Mauritius | 2305.80 | 10164.10 | 9 | 10 |
| Mozambique | 306.92 | 781.26 | -8 | 5 |
| Namibia | 2754.10 | 4810.41 | 6 | 6 |
| **Niger** | **860.94** | **521.99** | **-7** | **3** |
| Nigeria | 1551.95 | 1695.45 | 8 | 4 |
| Rwanda | 759.96 | 1025.22 | -5 | -4 |
| **Senegal** | **1405.46** | **1469.31** | **-1** | **7** |
| Sierra Leone | 430.84 | 933.54 | 6 | 7 |
| Somalia | 740.05 | 461.75 | 7 | 0 |
| South Africa | 3932.53 | 7513.19 | 4 | 9 |
| Sudan | 1114.21 | 2288.22 | -7 | -2 |
| Swaziland | 1392.92 | 3692.33 | 0 | -9 |
| Tanzania | 383.557 | 1178.49 | -6 | -1 |
| Togo | 713.568 | 732.85 | -6 | -2 |
| Uganda* | 657.45 | 1101.75 | 7 | -1 |
| Zambia | 1351.01 | 1517.24 | 2 | 7 |
| Zimbabwe* | 284.50 | 319.04 | 4 | 1 |

Source: Polity IV Project, Penn World Tables 7.1

Notes: Countries in bold have transitioned from autocracies to democracies.

Countries with * have regressed in terms of democracy.

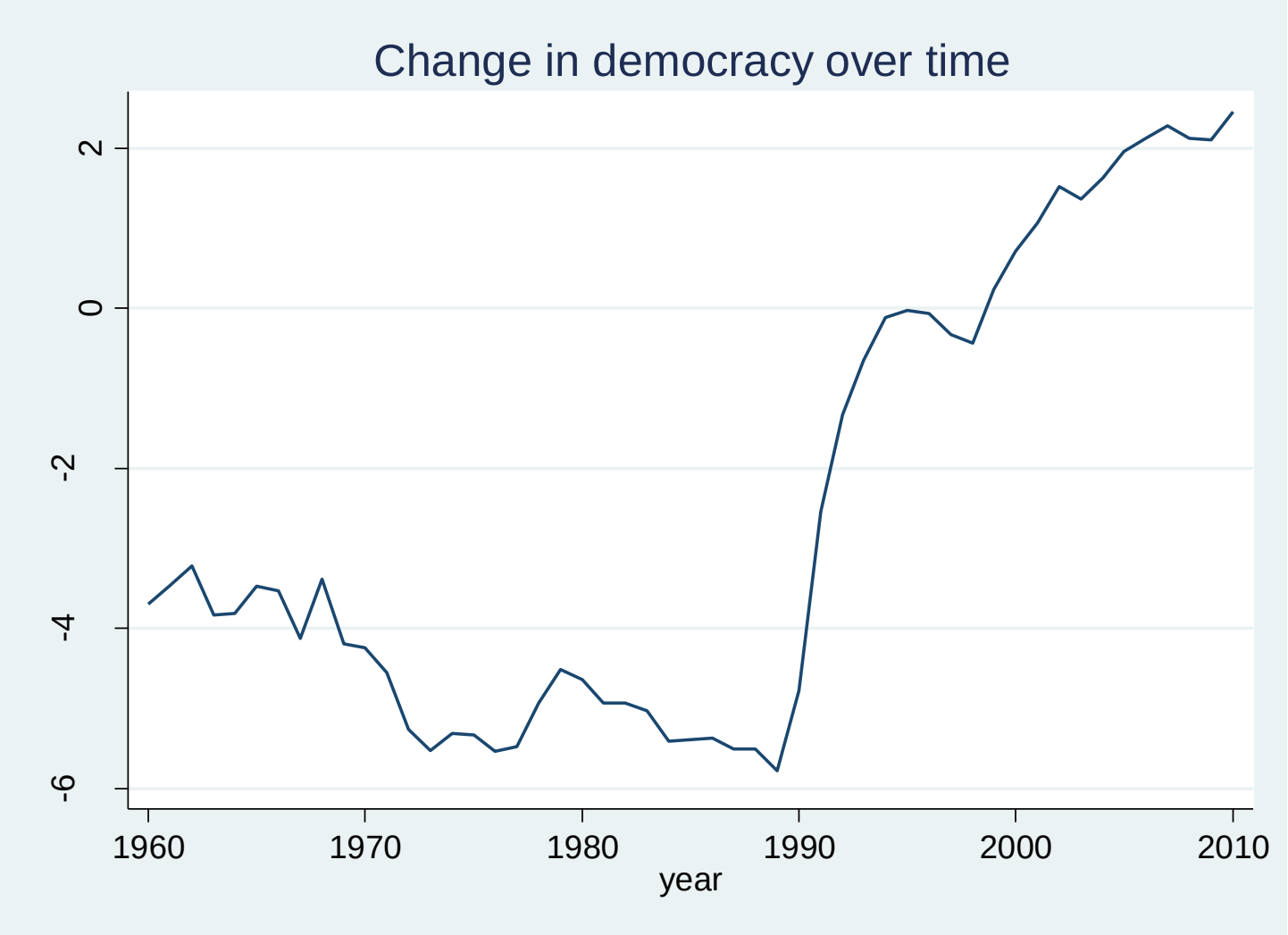


**Figure 3:** Average polity score. (Notes: This figure shows the changes in the democracy score over the period 1960 to 2010. Source: Polity IV Project).

capture other aspects of economic development found in education, urbanization and industrialization. This oversight in the previous literature may weaken the conclusions drawn for the modernization hypothesis.

The lagged dependent variable is positive and significant, supporting evidence for the persistence of democratic institutions. Under the system-gmm estimation, we fail to reject the null of the Hansen J test for exogeneity of instruments and conclude that the instruments are valid. We also fail to reject the Arellano Bond (2) test for no second order serial correlation in the first differences and conclude that there is no second order serial correlation.

### 4.2 Additional Analysis

We check if the economic development measure remains robust when we include other variables that may be considered as omitted variables given the sample of countries. These include rents from resources (*resourcerents*) as most African countries are resource rich, conflict which is relatively persistent in parts of the region, and agriculture as a share of GDP given that Africa is still relatively reliant on agriculture. Countries that rely on income from resources hinder democratic processes (Fayad et al., 2012; Mehlum, Moene & Torvik, 2006). Adverse weather conditions or commodity price shocks in the agricultural sector can also have differing effects on democracies (Burke & Leigh, 2010; Bruckner & Ciccone, 2011). Conflict is a good indicator of the break down of democratic institutions within a country, as citizens sometimes voice their dissatisfaction with the incumbent government through uprisings (for example, the Soweto uprising in South Africa, the Rwanda genocide, the recent protests in Burundi, Burkina Faso, the Democratic Republic of Congo and Zimbabwe against presidents extending their terms of service). The variables for resource rents and agriculture are taken from the World Development Indicators. The conflict variable is taken from the Major Episodes of Political Violence (MEPV) and Conflict Regions (Marshall, 2013) and measures the intensity of civil violence during an episode.

We also check the robustness of the economic development measure when we use it in conjunction with a different democracy variable, namely constraints on the executive (*xconst*). The constraints on the executive is obtained from the Polity IV Project. It measures the checks and balances on the executive or the extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. A seven-category scale is used: 1 (unlimited authority of the decision-making body) to 7 (executive parity, i.e. the accountability of the executive i.e. groups have effective control over the executive).

**Table 5:** Robustness checks

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Polity / Xconst | FE | MG | SYS-GMM | FE | MG | SYS-GMM |
| $\text{Ecdvpt}_{t-1}$ | 0.010** | 0.006 | 0.000 | 0.014*** | 0.009* | 0.023** |
| | (0.004) | (0.007) | (0.012) | (0.005) | (0.005) | (0.009) |
| $\text{Resourcerents}_{t-1}$ | 0.004 | 0.014*** | 0.004 | | | |
| | (0.004) | (0.005) | (0.007) | | | |
| $\text{Conflict}_{t-1}$ | 0.002 | -0.001 | 0.187** | | | |
| | (0.017) | (0.004) | (0.072) | | | |
| $\text{Agriculture}_{t-1}$ | 0.011 | 0.016 | -0.035 | | | |
| | (0.007) | (0.013) | (0.021) | | | |
| $\text{Polity}_{t-1}$ | 0.918*** | 0.783*** | 0.961*** | | | |
| | (0.012) | (0.024) | (0.031) | | | |
| $\text{Xconst}_{t-1}$ | | | | 0.835*** | 0.716*** | 0.922*** |
| | | | | (0.025) | (0.047) | (0.036) |
| Observations | 1,281 | 1,276 | 1,281 | 1,436 | 1,436 | 1,436 |
| R-squared | 0.844 | | | 0.688 | | |
| F / Wald test | 1957.19*** | 1090.54*** | 494.20*** | 816.17*** | 231.24*** | 798.78*** |
| Hansen J test p-value | | | 0.873 | | | 0.623 |
| AR (2) p-value | | | 0.096 | | | 0.866 |
| Number of i | 44 | 43 | 44 | 44 | 44 | 44 |
| Country FE | YES | YES | YES | YES | YES | YES |

Coefficients reported. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Notes: Columns 1 to 3 include other controls. Columns 4 to 6 use constraints on the executive for democracy measure.

Ecdvpt is the principle component which comprises income per capita (PWT 7.1), gross primary enrollment rates, urban population (% of total population) and CO2 emissions (metric tons per capita).

Source: Polity IV Project, Penn World Tables 7.1, World Development Indicators

The economic development measure continues to have a positive and significant effect with a different democracy variable, while it remains positive with the inclusion of other controls. The results are robust in supporting our argument that economic development, when it is made up of the combined effects of wealth, education, urbanization and industrialization, stands a better chance of improving democratic institutions[8].

# 5 Conclusion

This study raises the question about the suitability of income per capita as a measure for economic development. Using an existing hypothesis by Lipset (1959), we argue that income per capita and economic development are not synonymous. As such income per capita may not be a suitable measure for capturing economic development as this can result in biased inferences. While previous studies use income per capita as a measure for economic development to test the modernization hypothesis, we combine income per capita, education, urbanization and industrialization to form a composite measure for economic development, which also reflects Lipset's modernization process more closely. The initial results with the individual variables are inconclusive making it difficult to draw any conclusions on the modernization hypothesis. Income per capita is negatively related with democracy suggesting that the modernization hypothesis does not hold in sub-Saharan Africa. However urbanization is positively related with democracy suggesting that the modernization hypothesis holds.

The results become more conclusive with our composite measure and remain relatively consistent with different robustness checks. The evidence presented here highlights that economic development is a complex modernization process which encompasses more than just income per capita contributing to democracy.

[8] Other robustness checks we undertake include substituting Penn World income per capita with World Bank income per capita, replacing primary enrollment rates with secondary enrollment rates, urbanization with telephone lines per 100 people, and carbon dioxide emissions with the share of industry as a percentage of GDP. All variables are taken from the World Development Indicators. The economic interpretation of the generated composite measures remain consistent, although we lose significance in some of the regressions. Results are available on request.

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