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# What Does Recent Survey Data Say About the Effect of Corruption on Poverty in Africa?

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Author JE designed the study, performed the statistical analysis, managed the analyses of the study and wrote the first draft of the manuscript. Author JAB wrote the protocol and managed the literature searches. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

Poverty is perpetuated by increased levels of corruption. It diverts resources, which denies the poor masses their right to enjoy necessities to improve their living standards. To estimate the impact of corruption on poverty, the study relied on the random effect, fixed effects and the instrumental variable regression techniques. The estimates from the instrumental variable regression show that OLS underestimates the effect of corruption on poverty levels in Africa. That's, it shows that the OLS estimates are biased downwards due to inconsistencies as a result of the endogeneity of the levels of corruption. While the instrumental variable technique produces an estimated effect ranging from .805-1.073 increased levels of corruption on lived poverty index, the OLS estimates an impact within a range of approximately .058-.168. This paper confirms the governance model of the effect of corruption on poverty through its effects on reducing the credibility of public institutions. The study thus recommends that public institutions must be strengthened, financed and be equipped to be able to apply the rule of law, thereby helping reduce corruption.

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## 1. INTRODUCTION

It is without doubts that Africa is one of the poorest continents on earth. In the study of poverty in a rising Africa, Beegle, Luc, Andrew and Isis [1], points out that even though there was a decline in the African population living in extreme poverty from 1990 to 2012, the continent still had an increased number of people living in extreme poverty due to a rapid population growth. This is indeed surprising, given that the continent has seen sustained growth levels. For instance, Zamfir [2], noted that, there has been a sustained economic growth for the African continent for the past two decades, and which has been possible especially since the turn of the millennium. In light of this contrast, it is more natural to investigate some of the causes of high poverty growth on the African continent. Specifically, this paper concentrates on the effect of corruption on the high poverty levels in Africa. Generally, poverty measures the deprivation of necessities required by people for basic living standards. The measure of poverty employed in this paper and that has widely been employed in several studies is the lived poverty index (LPI). The LPI is an experimental measure of how people frequently live without necessities. It measures how frequent people live without food, clean water, cash income, fuel to cook and medical care. The LPI is captured by the Afrobarometer survey, which asks respondents: Over the past year, how often, if ever, have you or anyone in your family: Gone without enough food to eat? Gone without enough clean water for home use? Gone without medicines or medical treatment? Gone without enough fuel to cook your food? Gone without a cash income? The LPI ranges from 0-4 reflecting nonexistent poverty levels to the extreme where people do not have access to necessities such as food, cash income, fuel to cook, medical care and clean water. According to Mattes and Bratton [3], this scale has been proved to have an impressive internal validity and reliability and consistency as well across all country samples and across all rounds of surveys. The LPI has also been heavily relied on due to the difficulty to measure material poverty in Africa based on the absence of reliable household data on income Bratton, Mattes and Gyimah-Boadi [4].

## 2. LITERATURE REVIEW

This paper adopts the two models explaining poverty levels and corruption. These two models are similar in a way they predict the effect of corruption on poverty levels. However, they differ in ways they link corruption to poverty levels. While the economic model links poverty and corruption through economic growth, the governance model links corruption and poverty through governance factors.

### 2.1 The Economic Model of Corruption and Poverty

Proponents of this model argue that corruption is detrimental to the health of economies through its influence on the distortion of income and economic growth which ultimately affects poverty Chetwynd, Chetwynd and Spector [5]. They argue that increased corruption has the effect of lowering investment (both foreign and local), decreases tax revenues, discouraging business due to increased cost, dampens entrepreneurship, and also reduces the quality of public infrastructure which lowers economic growth thereby increasing poverty. This negative relationship between corruption and economic growth has been confirmed by several empirical studies. These are summary of the views expressed in the available literature: reduces economic growth Ugur [6], reduces private sector investment Cieřlik and Goczek [7], reduces FDI in developing countries Gossel [8], increases inflation Ben Ali and Sassi [9], intensifies income inequality and poverty Gupta, Davoodi and Alonso-Terme [10], lowers expenditure on health and education Ben, Cockx and Francken [11] and more generally hampers economic development Poveda, Carvajal and Pulido [12]. Gupta, Davoodi and Alonso-Terme [10], employed both the OLS and instrumental variable regression techniques. The study shows that no matter the estimation method used, corruption has the effect of increasing income inequality. The study reveals that, for every one standard deviation increase in corruption, income inequality subsequently falls by about 11 points. Moreover, the study shows that increased corruption lowers the income growth of the poor. They show that, for every one standard deviation increase in corruption, income growth of the poor declines by about 5% points. Furthermore,

Asiedu and Freeman [13], points out that, in transition economies, corruption had a significantly negative effect on investment growth for firms but had no significant impact for firms in Sub Saharan African countries and Latin American countries. The paper relied on firm-level data on both investment and measures of corruption at firm and country level. Moreover, the study clearly states that, in transition economies, corruption is the most important determinant of investment growth. Similarly, relying on a cross-country of total 59 countries and using the WB/UB data Campos, Lien, and Pradhan [14] pointed out that, low predictability and the overall level of corruption has the effect of lowering the ratio of investment to GDP while controlling for GDP per head and secondary school enrolment.

## **2.2 The Governance Model of Corruption and Poverty**

This model holds that corruption affects poverty levels through its effects on governance capacity. Thus, increased corruption has the effect of lowering governance capacity, which ultimately leads to increased poverty levels. Proponents of this model explain that increased corruption has the effect of reducing trust in public institutions, which therefore lowers the productive capacity of people, thus leading to increased poverty. Chetwynd, Chetwynd and Spector [5] show that in countries such as Ghana, Latvia, Honduras, Indonesia and Bosnia-Herzegovina, provision of lesser quality services was due to government institutions being plagued with higher corruption levels. The case was however not true in Romania where less corrupt practices were related to better or improved public systems. Pillay [15] undertook a qualitative analysis of the impact of corruption on good governance and the institutional responses to those challenges, which she found to be inadequate and characterized by a lack of public information and a lack of impact by explicit anti-corruption institutions such as the Public Prosecutor, which is the main anti-corruption watchdog. Hoffman [16] outlined an excellent overview of the state of play of corruption in South Africa focusing on possible legal and policy changes that could be affected to stem the negative impact of corruption on poverty. He opined that Corruption weakens state institutions and gradually eradicates an economy's potential. One key proponent for the measure of the extent of corruption is the Corruption Perceptions Index of Transparency International [17]. According to this

report, for example, South Africa slide from a ranking of 38 in 2001 to 73 in 2018. It could be observed that the implementation of pro-globalisation and other pro-poor policies and their subsequent effects on poverty are undermined by rising corruption. Therefore, it would be interesting to simultaneously assess the effects of corruption on poverty using more recent and robust measures of these variables. A poverty-increasing effect of corruption is a priori expectation. A set of control variables are included in order to examine the effects corruption on poverty taking into consideration other factors such as globalization and technology.

## **2.3 The Effects of Growth and Governance on Poverty**

In this section, the study reviews the empirical studies connecting growth and governance indicators with poverty. There is insufficient empirical literature that deals with the direct effect of corruption on poverty. The available ones such as Justesen and Bjørnskov [18] used survey data from Afrobarometer to study the effect of corruption on poverty, using a multilevel regression for 18 African countries. Poor people suffer more from corruption as they are more exposed to paying bribes for basic services. This was confirmed by Adebayo [19] who found that corruption intensified poverty in Nigeria. Rahayu and Widodo [20] after using data for a panel of nine ASEAN countries between 2005 and 2009 analysed the empirical relationship between corruption and poverty. They applied a two-step Generalised Method of Moments (GMM) model and concluded that corruption affects poverty. Similarly, Negin, Rashid and Nikopour [21] assessed the impact of corruption using panel data for 97 developing countries using the corruption perception index from Transparency International and the Human Development Index to measure poverty. They found a bi-directional causality between corruption and poverty. Dincer and Gunalp [22] examined the impact of corruption on income inequality and poverty in the United States using both time series and cross-sectional data. The study found out that an increase in corruption was accompanied by a rise in inequality and poverty. The results were robust across different measures of variables and different econometric specifications. Adam Jr [23], used new data for 50 developing countries and observed that increased growth reduces poverty. The study further adds that growth has a stronger statistical effect of lowering poverty

**Table 1. Definition of variables**

| <b>Variables</b>            | <b>Definition</b>  |
|-----------------------------|--|
| Lived Poverty Index (LPI)   | The LPI is an experimental measure of how people frequently live without basic necessities. It's a continuous variable which measures how frequent people live without food, clean water, cash income, fuel to cook and medical care. The Afrobarometer survey ask respondents: Over the past year, how often, if ever, have you or anyone in your family: Gone without enough food to eat? Gone without enough clean water for home use? Gone without medicines or medical treatment? Gone without enough fuel to cook your food? Gone without a cash income? |
| Corruption                  | Corruption has widely been explained as the misuse of public office for private gains.   |
| Urbanization                | This is measured by the percent of urban population which looks at the percent of percent of population residing in the urban areas in these selected African countries.   |
| Globalization               | Globalization is measured by the KOF Gobalization Index which captures the political, economic and social globalization dimensions. Globalization measures how countries depend on world economies.  |
| Human Development Index     | The UNDP explains HDI as a measure of the average achievement in the key dimensions of human development. It concerns individuals being knowledgeable, living long and healthy life and have decent healthy lives.   |
| Secondary School Enrollment | Secondary School enrollment as a percent of all eligible children. This is a proxy for human capital investment.   |
| Extent of Democracy         | The study used the extent of democracy as instrumental variable. Information on the extent of democracy was gathered by the survey by asking: In your opinion how much of a democracy is today?  |
| Trust in Institutions       | Trust in institutions measures whether the survey respondents placed their trust in public institutions including the police, the army, courts, the president, national assembly and the national electoral commission   |
| Savings                     | This is measured by savings as a percent of GDP. It measures country's national and public savings as a ratio of GDP.  |

*Source 1: Afrobarometer Survey and Data from The Global Economy Database*

when mean survey income is used relative to when GDP per capita is used as a proxy for economic growth. It shows that, for every 10% increase in mean survey income (growth), the proportion of people living in poverty subsequently declines by 25.9 points. With respect to the effects of governance factors and poverty, Kaufmann and Kraay [24], for instance, confirms that good governance is crucial for economic development. The study focused on 175 countries for the 2000-2001 period, relying on a new set of updated worldwide governance indicators. Lastly, Hasan, Mitra, and Ulubasoglu [25], also measured good governance using a strong commitment to the rule of law and other things and observed that poverty alleviation was possible with good governance. They show that the effect of good governance on poverty alleviation was possible through its effect on economic growth. The study also establishes a negative relation between the size of the public sector and poverty alleviation.

### 3. DATA AND METHODOLOGY

This study sourced its data from the Afrobarometer survey including the most recent round which was conducted from September 13, 2016 to September 10, 2018. The other Afrobarometer round data that was used in the paper is the round 6 data collected from March 1, 2014 to November 22, 2015. The study relied on data for a total of 34 countries in Africa captured by the rounds 6 and 7 over the periods. The Afrobarometer is a pan-African, non-partisan research network that conducts public attitude surveys on governance, democracy, economic conditions and its related issues across more than 30 African countries Mattes, Dulani, and Gyimah-Boadi [26]. There are currently seven rounds of the survey, with the latest round (round 7) done in 2018. The study further relied on data obtained from the Global economy. To accurately estimate the impact of increased corruption on poverty levels on the continent, this study first

relied on the simple linear framework specified below;

$$Pov_{ijt} = \beta_0 + \beta_1 Corri_{jt} + U_{ijt}$$

$Pov_{ijt}$  denotes the Lived Poverty Index (LPI) of individual  $i$  in country  $j$  at interview date  $t$ ;  $j = 1, \dots, 3$ ,

$t = \text{March 1, 2014 to September 10, 2018}$ .  $Corri_{jt}$  denote the corruption level reported by individual  $i$  in country  $j$  at interview date  $t$ .  $U_{ijt}$  is the stochastic error term which captures all other factors that have not otherwise been captured by the model above.  $\beta_0$  and  $\beta_1$  are the intercept and slope on corruption respectively, where  $\beta_1$  reflects the effect of increased corruption on fluctuations in poverty levels.

The model above is expanded to include a set of controls to correct for inconsistencies of the coefficient on corruption due to omitted variable bias. To establish this, a set of control variables that are relevant in explaining poverty such as urbanization, globalization, human development index, secondary school enrolment and national savings are included in the above model. Thus;

$$Pov_{ijt} = \beta_0 + \beta_1 Corri_{jt} + \beta_{k+1} V_{jt} + U_{ijt}$$

$\beta_{k+1}$  is the vector of coefficients on the control variables,  $V_{jt}$ , where  $k = 1, \dots, 5$ ,  $V_{jt}$  is the vector of control variables including urbanization, globalization, human development index, secondary school enrolment and national savings. Both the economic and the governance models of corruption and poverty predict a positive effect of corruption levels on fluctuations on poverty. Thus,  $\beta_1$  is expected to be positive.

Moreover, the study relied on fixed effects including individual, country and time-fixed effects to correct for the endogeneity problems due to omitted variable bias. This is done to account for the unobserved factors that affects poverty and are correlated with corruption. The individual and country fixed effects accounts for those unobserved factors that affects poverty levels that fluctuates across individuals and countries but are constant over time. The time effects capture factors such as the various initiatives and policies that various governments and stakeholders put in place to tackle poverty levels. For instance, longer term educational policies such as the Free Senior High School and the Free Compulsory Universal Basic Education in Ghana as well as the Health Insurance policy.

Such policies vary with time but are fixed throughout countries. Time fixed effect regressions therefore controls for these factors.

To control for these factors, the study relied on the fixed effect model below;

$$Pov_{ijt} = \beta_0 + \beta_1 Corri_{jt} + \beta_{k+1} V_{jt} + \vartheta_i + \gamma_t + U_{ijt}$$

$\vartheta_i$  takes care of the individual and country effects while  $\gamma_t$  reflects the time effects. All other variables and parameters have their usual interpretation from the previous equations specified above. To make the estimated coefficient more robust, the study corrects for a possible endogeneity problem that might arise due to simultaneous causality between poverty levels and corruption. Throughout this paper, we have assumed that, the level of corruption affects poverty level. What if poverty levels influence the corrupt decisions of people? This paper corrects this problem by relying on instrumental variable regression in panel data. This required a Two Stage Least Square (TSLS) regression. To establish this, the study used the extent of democracy as well as trust in institutions measured by trust in the army, police, the courts, the president, the national electoral commission and the national assembly as valid instrumental variables. The study relied on the linear probability regression model to estimate the impact of the instrumental variables on corruption. The model is specified below;

$$Corri_{jt} = \alpha_0 + \alpha_1 ExtentofDemocracy_{ijt} + \alpha_2 TrustinInstitutions_{ijt} + \alpha_{k+2} V_{ct} + U_{ijt}$$

$Corri_{jt}$  denote the corruption level reported by individual  $i$  in country  $j$  at interview date  $t$ .  $ExtentofDemocracy_{ijt}$  and  $TrustinInstitutions_{ijt}$  are the instrumental variables reported by individual  $i$  in the  $j$ th country at interview date  $t$ .  $V_{ct}$  reflects the vector of controls including urbanization, globalization, human development index, secondary school enrolment and national savings. Are these instruments valid?  $ExtentofDemocracy_{ijt}$  and  $TrustinInstitutions_{ijt}$  serve as valid instruments only if they are relevant and exogenous. Relevant instruments are those that correlate with the included endogenous explanatory variable (Corruption levels). That is,

$$corr((ExtentofDemocracy_{ijt}, TrustinInstitutions_{ijt}), Corri_{jt}) \neq 0$$

Note that, in countries where people place their ultimate trust in public institutions, corruption is expected to reduce since the people expect the institutions to function effectively in the administration of the rule of law. With respect to democracy and corruption, [27] and [28] found that levels of corruption falls with contemporary democracy. Thus,  $\alpha_1$  and  $\alpha_2$  are expected to be negative. With regards to instrument exogeneity,  $ExtentofDemocracy_{ijt}$  and  $TrustinInstitutions_{ijt}$  are exogenous only if they do not affect poverty levels directly. They however do so, only through the levels of corruption.

## 4. RESULTS AND DISCUSSION

### 4.1 Results

The LPI is an experimental measure of how people frequently live without basic necessities. It measures how frequent people live without food, clean water, cash income, fuel to cook and medical care. The LPI ranges from 0-4 reflecting nonexistent poverty levels to the extreme where people do not have access to basic necessities such as food, cash income, fuel to cook, medical care and clean water. Out of a total of 89,518 respondents interviewed from the 34 countries over the 2014-2018 period, Lived Poverty Index (LPI) averaged 1.1429 of the 5 poverty items. Implying that, average poverty level on the continent is quite low. That is, on the average, the survey respondents have good access to basic necessities. The Corruption is a dummy which equal 1 for increased levels of corruption but otherwise equal 0 for reduced corruption level. Moreover, the study also reveals that, urbanization in these selected countries continues to be on the rise as people continuously move from the rural areas in Africa to the urban areas in search of virtually nonexistent greener pastures. Percent of urban population ranges from as low as 16.13% to as high as 89.37%. The Globalization index by the KOF reveals that African countries have considerably opened up to the rest of the world and which has been a contributing factor to the increased economic growth in the region. The globalization index shows an increase in globalization from 42.46 to 72.66 representing approximately 71% increase. The study relied on the human development index to measure the wellbeing of individuals in African countries in terms of education, life expectancy and per capita income indicators. The index ranges from 0 (denoting low human welfare) to 1

(reflecting increased human welfare). The index therefore shows that, some of the selected countries have one of the least human development in the world with a least HDI of .353. Moreover, trust in institutions and extent of democracies prevailing in respective countries has been used as valid instruments in this paper. Trust in institutions has been measured by trust in public institutions including the police, the army, courts, the president, national assembly and the national electoral commission and which equal 1 if respondents reported that they trusted these public institutions but otherwise equal 0. Extent of democracy has also been coded to equal 1 for countries with democracy, however equal 0 if they reported absolutely no level of democracy in their countries. With respect to national savings, the study shows that, there has been an increased savings from 2014 to 2018 given that savings (% of GDP) has increased significantly from -64.1% to 42.38%. This is one of the contributing factors to the increased level of growth in the region. Lastly, investment in human capita is also on the rise which is shown by the study due to increased secondary school (% of all eligible children) enrolment from as low as 18.2% to 109.44%.

### 4.2 Discussion

The fixed effect regressions reveal an important observation, that, the traditional OLS approach of regressing poverty levels on corruption leads to the estimation of a biased estimator. This study reveals an upward biasedness of the coefficient on corruption, implying that, fixed effect regressions show that, the traditional OLS approach overestimates the impact of corruption on poverty levels. Interestingly, both the random effect and the fixed effect models predict similar findings, that increased corruption levels have an adverse impact on the lives of the people. It reveals that, as people or public officials become more corrupt, the ordinary person is being denied the access to basic necessities. And these results are significant at 1% level. The column 1 in Table 3 reports the results from the regression of poverty levels on corruption as a single explanatory variable. The model reports that, increased corruption levels have the effect of increasing poverty by approximately .10 units. This is not difficult to understand. As people misuse public offices for their own gains, enough hospitals will not be built implying an increase in the frequency with which people do not have access to medical care, jobs will not be created resulting in less cash income, there wouldn't be

enough cleaner drinking water and resources will be allocated to only a few people. As the ordinary person is denied the opportunity to enjoy these necessities, poverty levels increase. Column 2 reports the results of the random effect model with five (5) control variables to correct for omitted variable bias. The results show that, increased levels of corruption expands lived poverty index by approximately .06 units. The implication is that, the regression in column 1 overestimates the impact of corruption on poverty levels due to endogeneity problems caused by omitted variable bias. Additionally, column 3 reveals the fixed effect regression of the lived poverty index on corruption controlling for the other included exogenous explanatory variables as well as individual factors affecting poverty. It is therefore essential to note that, individual factors that vary from one person to the next but constant with time such as the quality of education people receive and their family backgrounds have significant impact on poverty levels. This model also reveals that, increased level of corruption increases poverty by approximately 0.121 units. The model produces an r square of 1.3% implying that, changes poverty levels are 1.3% explained by fluctuations in the included independent variables as well as individual effects. Similarly, country effects such as natural resources discovery have tremendous effects on fluctuations in poverty levels. The model predicts that, increased corruption levels are associated with an approximately 0.175 units increase in poverty levels. Table 4, column 1 similarly reports the time fixed effect regression results, which also confirms the positive impact of corruption on economic poverty. The study reveals that, fluctuations in time effects such as national policies are essential in explaining fluctuations in poverty levels. Such time effect also reflects the extent to which various governments and stakeholder are willing to combat high poverty levels in their respective countries. It is revealed that, after controlling for time effects, increased corruption levels are associated with an approximately 0.117 units of expansion in frequency with which people live without basic necessities in Africa. In column 2 of Table 4, the study controlled both individual and country effects together and estimated the impact of corruption on poverty. The coefficient is similar to the other results presented so far. It is shown that, poverty on the continent is expanded by approximately 0.155 points due to increased corruption levels. Thus, after controlling for factors such as the extent to which various

governments and stakeholder are willing to combat high poverty levels in their respective countries as well as individual factors including family backgrounds and the quality of education, the model predicts that corruption has a direct effect on poverty levels. This model also produces a relatively stronger case since it predicts 13.3% fluctuations in poverty levels. That is, after controlling for both individual and country effects plus the other included explanatory variables, the model reveals that, approximately 1.9% of changes in poverty is due to changes in these variables. In column 3 of Table 4, the study also control for both individual and time effects together. This model explains 9.9% of the fluctuations in poverty fluctuations, an improvement in the model reported in the previous column. The estimated coefficient obtained using this model is also similar to the previously estimated coefficients as it also report the positive effect of corruption on poverty. The model predicts that, approximately, 0.133 poverty points on the continent is due to increased corruption. After controlling for country and time effect, the study reveals the positive effect of corruption on poverty levels. Lastly, the study controlled for both individual, country and time effects and realized a slight improvement in the r squared from the previous regressions. The model reports an increased r squared to 9.9% from 1.9%. It is predicted that, increased levels of corruption are associated with an approximately 0.133 units increase in poverty levels. The implication is that, no matter how the estimation method is, corruption has a positive effect on poverty. These results are not surprising since they are exactly in line with both the economic and governance models of corruption and poverty which predicts positive links between the two variables. Gupta, Davoodi and Alonso-Terme [10], provides evidence of an increased effect of corruption on poverty relying on both OLS estimates and instrumental variable estimates across several countries. The study further reveals interesting findings about poverty and urbanization. The observation is that, most of the estimation techniques reveal that urbanization has the effect of lowering poverty from a range of .003 to .025 units. The implication is that, as people move to the big cities, they face improvement in the frequency at which they live with basic necessities such as food, medical care, fuel for cooking, cash income and clean water. With regards to which globalization and poverty, the study reveals that, economic growth, emanating from globalization leads to reduced poverty levels. Additionally, poverty has been

found to decline as the welfare of individuals increase. The study shows that, an increase in HDI has the effect of reducing poverty within a range of .46 to .40.37 units. However, investment in human capital (secondary school enrolment) increases poverty. Lastly, the effect of national savings on poverty yields inconclusive results as findings produce conflicting results.

### 4.3 Instrumental Variable Regressions

In this section, the study discusses the estimates from instrumental variable regressions. However, instruments can only be employed in the estimation process only if such instruments are valid. That is, they are both relevant and exogenous. The column 1 in Table 5 obviously shows that the chosen instruments are indeed relevant and corresponds to prior expectations. The linear probability model shows that, indeed, corruption levels are negatively affected by trust in public institutions and the extent of democracy. The model reveals that, corruption levels in Africa are lower in countries with democratic practices relative to those with either no democracy or less democratic practices. Thus, democratic countries have 0.11 probability of corruption decline relative to those without democracy. This finding is supported by, Hill [27] and Chowdhury [28] who found that levels of corruption falls with contemporary democracy. The model also shows that, as trust in public institutions measured by trust in the police, trust in the army, trust in the president, trust in the courts, trust in the national assembly (parliament) and trust in the national electoral commission corruption is expected to reduce since the people expect the institutions to function effectively in the administration of the

rule of law. The model reveals that, corrupt practices are likely to reduce by approximately 0.17 points when people place their trust in public institutions. This confirms the governance model of the effect of corruption on poverty through its effects on reducing the credibility of public institutions. The first stage F statistic estimated from the first stage IV regression further proves that, the chosen instruments are indeed strong enough to be employed in the instrumental variable regression. That is, following the rule of thumb, Stock & Watson [29], the F statistic produces an estimate of 1035.37 which is far greater than 10. Thus, the chosen instruments (the extent of democracy and trust in institutions) are sufficient in explaining variations in corruption levels and can thus serve as valid IV's. To proceed with the instrumental variable regression, the study tested whether corruption is indeed endogenous or rather not the case. To establish this, the study regressed lived poverty index on corruption as well as the included exogenous explanatory variables and the residual predicted from the first stage IV regression. Interestingly, the study confirms the endogeneity (that is,  $corr(Corr_{ijt}, U_{ijt}) \neq 0$ ) of corruption which therefore needed to be corrected with an instrumental variable regression. That is, it can be seen that the residual in the regression model in column 2 of Table 5 is significant at 1% level, implying that, there is the need to reject the null hypothesis of instrument exogeneity as against the alternative hypothesis that corruption is indeed endogenous. Thus, the study proceeded with the estimation of the effect of corruption on poverty levels relying on instrumental variable regression, with the extent of democracy and trust in institutions serving as valid IV's.

**Table 2. Summary statistics**

| Variables                   | Number of observations | Mean    | Standard deviation | Minimum | Maximum |
|-----------------------------|------------------------|---------|--------------------|---------|---------|
| Lived Poverty Index         | 89,518                 | 1.1429  | .9264              | 0       | 4       |
| Corruption                  | 70,987                 | .7094   | .4540              | 0       | 1       |
| Percent of Urban Population | 90,405                 | 44.0757 | 16.6038            | 16.13   | 89.37   |
| Globalization               | 74,263                 | 54.4543 | 7.5266             | 42.46   | 72.66   |
| Human Development Index     | 90,405                 | .5519   | .1023              | .353    | .796    |
| Trust in Institutions       | 89,724                 | .5308   | .4991              | 0       | 1       |
| Extent of Democracy         | 90,308                 | .8569   | .3502              | 0       | 1       |
| Savings (% GDP)             | 83,217                 | 14.1453 | 16.09095           | -64.1   | 42.38   |
| Secondary School Enrolment  | 55,864                 | 56.4144 | 23.7417            | 18.2    | 109.44  |

Source 3: Authors' Computation based on Afrobarometer Survey and data from The Global Economy



**Table 3. Random effect and fixed effect regression estimates of corruption levels on poverty: data from Afrobarometer survey and The Global Economy Database**

|                             | (1)                        | (2)                        | (3)                        | (4)                        |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| <b>Variables</b>            | <b>Lived poverty index</b> | <b>Lived poverty index</b> | <b>Lived poverty index</b> | <b>Lived poverty index</b> |
| corruption                  | 0.104***<br>(0.00743)      | 0.0583***<br>(0.0105)      | 0.121***<br>(0.0228)       | 0.175***<br>(0.0105)       |
| Urbanization                |                            | -0.00241***<br>(0.000439)  | -0.00236**<br>(0.00112)    | 0.315***<br>(0.0165)       |
| Globalization Index         |                            | -0.00290***<br>(0.00101)   | -0.0172***<br>(0.00417)    | 0.0604***<br>(0.0128)      |
| Human Development Index     |                            | -0.456***<br>(0.119)       | 0.685***<br>(0.260)        | -40.37***<br>(1.770)       |
| Secondary School Enrollment |                            | 0.00495***<br>(0.000482)   | 0.00298*<br>(0.00177)      | 0.000365<br>(0.00487)      |
| Savings (% of GDP)          |                            | -0.00190***<br>(0.000327)  | 0.00221***<br>(0.000780)   | 0.0573***<br>(0.00318)     |
| Individual effects          | NO                         | NO                         | YES                        | NO                         |
| Country effects             | NO                         | NO                         | NO                         | YES                        |
| Time effects                | NO                         | NO                         | NO                         | NO                         |
| Constant                    | 1.084***<br>(0.00625)      | 1.380***<br>(0.0380)       | 1.559***<br>(0.165)        | 3.212***<br>(0.639)        |
| Observations                | 70,401                     | 38,493                     | 38,493                     | 38,493                     |
| Number of Respondents       | 47,797                     | 31,744                     | 31,744                     | 31,744                     |
| R-squared                   |                            |                            | 0.013                      |                            |

Source 4: Authors' Computation based on Afrobarometer Survey Data from Global Economy; Robust standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 4. Fixed effect regressions continued

| Variables                   | (1)<br>Lived poverty index | (2)<br>Lived poverty index | (3)<br>Lived poverty index | (4)<br>Lived poverty index | (5)<br>Lived poverty index |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Corruption                  | 0.117***<br>(0.0106)       | 0.155***<br>(0.0238)       | 0.133***<br>(0.0242)       | 0.168***<br>(0.0105)       | 0.133***<br>(0.0242)       |
| Urbanization                | -0.0252***<br>(0.00164)    | 0.0146<br>(0.0272)         | 0.0736<br>(2,763)          | 0.548***<br>(0.0550)       | 0.0736<br>(2,763)          |
| Globalization Index         | 0.0168***<br>(0.00349)     | -0.0342<br>(0.0247)        | 0.153<br>(3,389)           | -0.585***<br>(0.0539)      | 0.153<br>(3,389)           |
| Human Development Index     | -2.337***<br>(0.363)       | -6.564<br>(8.212)          | -12.35<br>(146,866)        | -20.80***<br>(4.003)       | -12.35<br>(146,866)        |
| Secondary School Enrollment | 0.0201***<br>(0.00121)     | 0.0295<br>(0.0251)         | 0.0201<br>(511.3)          | -0.229***<br>(0.0202)      | 0.0201<br>(511.3)          |
| Savings (% of GDP)          | -0.00816***<br>(0.000802)  | 0.0297<br>(0.0250)         | -0.0496<br>(163.2)         | 0.185***<br>(0.0246)       | -0.0496<br>(163.2)         |
| Individual effects          | NO                         | YES                        | YES                        | NO                         | YES                        |
| Country effects             | NO                         | YES                        | NO                         | YES                        | YES                        |
| Time effects                | YES                        | NO                         | YES                        | YES                        | YES                        |
| Constant                    | 1.284***<br>(0.332)        | 3.942<br>(2.671)           | -3.349<br>(68,472)         | 28.66***<br>(3.157)        | -3.349<br>(68,472)         |
| Observations                | 38,493                     | 38,493                     | 38,493                     | 38,493                     | 38,493                     |
| R-squared                   |                            | 0.019                      | 0.099                      |                            | 0.099                      |
| Number of respondents       | 31,744                     | 31,744                     | 31,744                     | 31,744                     | 31,744                     |

Source 5: Authors' Computation based on Afrobarometer Survey and Data from Global Economy; Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Table 5. Test of instrument validity and Endogeneity test**

| Variables                   | (1)<br>Corruption         | (2)<br>Lived poverty index |
|-----------------------------|---------------------------|----------------------------|
| Extent of Democracy         | -0.113***<br>(0.00565)    |                            |
| Trust in Institutions       | -0.172***<br>(0.00451)    |                            |
| Urbanization                | -0.00437***<br>(0.000202) | 0.00223***<br>(0.000514)   |
| Globalization Index         | 0.00570***<br>(0.000457)  | -0.00795***<br>(0.00108)   |
| Human Development Index     | -0.931***<br>(0.0589)     | 0.345***<br>(0.126)        |
| Secondary School Enrollment | 0.00556***<br>(0.000244)  | -0.000279<br>(0.000552)    |
| Savings (% of GDP)          | -0.00266***<br>(0.000150) | 0.00105***<br>(0.000359)   |
| Corruption                  |                           | 0.936***<br>(0.0490)       |
| Residual                    |                           | -0.921***<br>(0.0499)      |
| Constant                    | 0.984***<br>(0.0172)      | 0.667***<br>(0.0533)       |
| Observations                | 38,633                    | 38,359                     |
| R-squared                   | 0.081                     |                            |
| First Stage F Statistic     |                           |                            |
| Number of respondents       | 1035.37                   | 31,647                     |

Source 6: Authors' Computation based on Afrobarometer Survey and Data from The Global Economy; Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Table 6. Instrumental variable fixed effect regression estimates of corruption levels on poverty: Data from afrobarometer survey**

| Variables                   | (1)<br>Lived poverty index | (2)<br>Lived poverty index | (3)<br>Lived poverty index | (4)<br>Lived poverty index |
|-----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Corruption                  | 0.894***<br>(0.140)        | 0.805***<br>(0.0548)       | 1.073***<br>(0.0659)       | 0.844***<br>(0.148)        |
| Urbanization                | 0.00123<br>(0.00137)       | 0.382***<br>(0.0181)       | -0.0307***<br>(0.00185)    | -0.00963<br>(0.0269)       |
| Globalization Index         | 0.00300<br>(0.00574)       | -0.0291*<br>(0.0158)       | 0.0170***<br>(0.00384)     | 0.00347<br>(0.0712)        |
| Human Development Index     | 2.847***<br>(0.480)        | -40.22***<br>(1.852)       | -4.857***<br>(0.434)       |                            |
| Secondary School Enrollment | -0.0182***<br>(0.00423)    | 0.0160***<br>(0.00534)     | 0.0338***<br>(0.00162)     | -0.000415<br>(0.0204)      |
| Savings (% of GDP)          | 0.00837***<br>(0.00139)    | 0.0638***<br>(0.00332)     | -0.00862***<br>(0.000883)  | 0.00495<br>(0.0162)        |
| Individual effects          | Yes                        | NO                         | NO                         | YES                        |
| Country effects             | NO                         | YES                        | NO                         | YES                        |
| Time effects                | NO                         | NO                         | YES                        | YES                        |
| Constant                    | -0.314<br>(0.377)          | 3.243***<br>(0.670)        | 1.213***<br>(0.387)        | 0.524<br>(2.916)           |
| Observations                | 38,359                     | 38,359                     | 38,359                     | 38,359                     |
| Number of respondents       | 31,647                     | 31,647                     | 31,647                     | 31,647                     |

Source 7: Authors' Computation based on Afrobarometer Survey and Data from Global Economy; Standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The Two Stage Least Square (TSLS) estimates from instrumental variable regression show that, the OLS estimates on corruption underestimate the effect of corruption on poverty levels in Africa. The model shows that, corruption has the effects of decreasing the frequency at which people live with basic necessities. It is shown in the Table 6 that, increased corruption levels are associated with approximately .805-1.073 increase in lived poverty index. These estimates points out how detrimental increased level of corruption affect the health of economies through its negative impact on the lives of the ordinary people. A similar observation was found by Gupta, Davoodi and Alonso-Terme [10] who used income growth of the bottom 20 percent as a proxy for poverty and found that, both OLS and instrumental variable estimates had the same signs. But the instrumental variable estimates were higher than the OLS estimates. Their study reveals that, corruption increases with poverty, and that, for every one standard deviation growth in corruption, income growth of the bottom 20 percent was expected to decline by 7.8% points. However, all control variables have estimates that are very close to the estimates produced by the OLS estimation method and with same signs as well.

## 5. CONCLUSION AND RECOMMENDATIONS

Poverty is perpetuated by increased levels of corruption. It diverts resources, which denies the poor masses their right to enjoy basic necessities to improve their living standards. To estimate the impact of corruption on poverty, the study relied on the random effect, fixed effects and the instrumental variable regression techniques. The study shows that, no matter the estimation technique employed, increased levels of corruption has resource reallocation effect which ultimately increases the frequency at which people have not access to basic necessities. However, the instrumental variable regressions produced larger estimates compared to the OLS estimates. Note that, as corrupt public officials misuse public resources for their personal benefits, the ordinary people are denied their right to enjoy basic necessities since fewer hospitals will be built, fewer jobs created, fewer schools being built, no clean water and no electricity. The study offers two possible solutions to address increased levels of corruption on the continent. It is revealed that, countries with some extent of democracy and less likely to be corrupt and as such, it is

recommended that various governments should deepen the level of democracies in their respective countries. Moreover, corruption reduces with increased trust in public institutions. Such institutions must be financed and be equipped to be able to apply the rule of law, thereby helping reduce corruption. Individuals must also engage in the fight of corruption. Future studies should consider using more relevant exogenous variables such as the education level of respondents as well as their employment status. Other relevant variables such as technology should be considered. The issue of nonlinearity in the data should also be considered since varying levels of corruption are expected to have varying effects on poverty.

## CONSENT

As per international standard or university standard written participant consent has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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