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**Working Paper**

## Ethnic diversity and inequality in sub-Saharan Africa: Do institutions reduce the noise?

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# A G D I Working Paper

WP/19/018

## **Ethnic Diversity and Inequality in sub-Saharan Africa: Do Institutions Reduce the Noise? <sup>1</sup>**

Forthcoming: Social Indicators Research

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## Research Department

**Ethnic Diversity and Inequality in sub-Saharan Africa: Do Institutions Reduce the Noise?****Kazeem B. Ajide, Olorunfemi Y. Alimi & Simplice A. Asongu**

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**Abstract**

Studies on the causes of income differences between the rich and the poor have received an extensive attention in the inequality empirics. While ethnic diversity has also been identified as one of the fundamental causes of income inequality, the role of institutions as a mediating factor in the ethnicity-inequality nexus has not received the scholarly attention it deserves. To this end, this study complements the existing literature by investigating the extent to which institutional framework corrects the noisy influence originating from the nexus between “ethnic diversity” and inequality in 26 sub-Saharan African countries for the period 1996-2015. The empirical evidence is based on pooled OLS, fixed effects and system GMM estimators. The main findings reveal that the mediating influences of institutional settings are defective, thus making it extremely difficult to modulate the noisy impacts of ethno-linguistic and religious heterogeneity on inequality. In addition, the negative influences orchestrated by ethno-linguistic and religious diversities on inequality fail to attenuate the impact of income disparity even when interacted with institutions. On the policy front, institutional reforms tailored toward economic, political and institutional governance should be targeted.

**Keywords:** Linguistic, religious, ethnicity, inequality, Institutions, Kuznets curve.

**JEL Classification:** C23, D02, D63, E02.

## 1.0 Introduction

For many decades, researchers, policy pundits and other stakeholders alike have had, and still continue to contend with the mind-boggling questions that center on: what causes income differentials between the rich and the poor? What explains the nature of unequal societies in terms of outcomes and opportunities? Why are the rich countries continue getting richer and the poor countries also getting poorer? Does inequality concern ideologically-inclined or locational specific in nature? How do we measure inequality? These and many more questions continue to trail the phenomenon of inequality in the empirical literature. While many factors such as: level of economic development (Kuznets, 1955; Alderson and Nielsen, 2002; Dincer and Gunalp, 2012), demographic variables (Deaton and Paxson, 1997; Liu and Lawell, 2015), human capital development (Crenshaw and Ameen, 1994; Barro, 2000; Dabla-Norris *et al.*, 2015), natural resources (Buccellatto and Alessandrini, 2009; Mallaye *et al.*, 2014), size of government (Odedokun and Round, 2004; Anyanwu, 2011; Claus *et al.*, 2012), globalization (Stolper and Samuelson, 1941; IMF, 2007; Sturm and De Haan, 2015), among others, have been offered as proximate causes, on the one hand, there are still some other salient factors whose impacts have, either been taken for granted, or inadvertently omitted in the empirical literature but deserve to be accorded due consideration, on the other hand. One such factor is the role of ethnic diversity which has been grossly undermined, or at best, given scanty research attention. Ethnic diversity was not accorded any formal recognition until seminal contribution of Easterly and Levine (1997). Thus, underrating the supposed ramifying impacts of ethnic diversity can be costly as it has been documented to have widespread implications for socioeconomic and political outcomes. Some of the associated, documented impacts include: causing political instability and conflict (Easterly 2001; Buhaug, 2006); leading to low provision of public goods (Miguel and Gugerty 2005; Kimenyi, 2006); engendering high inequality (Barr and Oduro 2002; Milanovic, 2003); and more importantly, it has been held responsible for Africa's low economic growth (Easterly and Levine 1997; Posner 2004a). Hence, it is not surprising that the centrality of the phenomenon on the continent has been aptly summarized in the words of Meles Zenawi (the former Ethiopian Prime Minister) as follows:

*“-----ethnic, religious and other sources of diversity are the hallmarks of African societies and rent seeking in our economies is not a more or less important phenomenon as would be the case in most economies. It is the centerpiece of our economies”*

Following the above quotation, it is doubtless that ethnic heterogeneity<sup>2</sup> has a profound impact on the African continent. Specifically, it has been argued to limit the tendency to redistribute income (See, Glaeser, 2005). The assertion has been further buttressed by Alesina and Glaeser (2004) who averred that individuals who belong to one ethnic group are less willing to support redistribution helping other ethnic groups. This is particularly so, as members of different ethnic groups simply view one another as direct competitors for scarce economic resources (Bobo and Kluegel, 1993; Bobo and Hutchings, 1996). Alesina and Ferrara's (2005) hypothesis also stressed that the members of the non-majority ethnic groups tend to derive positive utility from interacting with the members of the same ethnic group and negative utility from interacting with the members of the majority ethnic group. Going forward, other forms of diversity like language, race and religion have equally been documented to exacerbating inequality problems as recent research have suggested. Desmet *et al.* (2012) have attributed cross-country differences in income redistribution to ethno-linguistic and religious fractionalization. According to Becker (1957), individuals tend to have stronger feelings of empathy toward their own group. This implicatively suggests countries with strong fractionalization often exhibit lower levels of redistribution.

In another strand of literature, Acemoglu (2003) have specially crafted roles for geography and institutions as fundamental causes of differences in prosperity between countries. While the import of the former has been floored on the ground of not necessarily suggesting causation in spite of its higher correlational value with country's prosperity on the one hand, the latter factor is considered as having a critical causal relation with country's prosperity on the other hand. This, he defended by arguing that having good institutions encourage investment in machinery, human capital, and better technologies, which could consequently launch countries on the trajectory of prosperity. As a consequence, sound institutions that give legal protection to minorities, guarantee freedom from expropriation, grant freedom from repudiation of contracts, and facilitate cooperation for public services might possibly constrain the amount of damage that one ethnic group<sup>3</sup> or diversity of any form could do to another. In this light, institutions offer an environment that helps facilitate effective interaction between ethno-linguistic and religious fractionalization and inequality if well structured. It is startling, however, to note that while studies still exist in the empirical literature on the ethnic diversity-inequality linkage, on the one hand (Milanovic, 2003;

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<sup>2</sup> Ethnic diversity and ethnic heterogeneity is being used interchangeably.

<sup>3</sup> This is well explicated in Easterly (2001).

Glaeser, 2005; and Dincer and Lambert, 2006), the moderating role of a sound institutional framework on its identified adverse consequences has hardly been given the priority it deserves on the other hand. To this end, the pertinent questions then remain: To what extent can institutional infrastructure corrects the noisy influence originating from ethnic diversity-inequality nexus for a developing region like the sub-Saharan Africa (SSA)? Are there causal connections in their relationship? Proffering answers to foregoing questions remain the focal targets the paper seeks to unveil.

This paper specifically focuses on SSA as a candidate region based on the following considerations. (i) Many of the countries in the region are ethnically heterogeneous in nature. For instance, Nigeria alone has over 250 ethnic groups. It is instructive to state that empirical findings have shown an African dummy variable regarding ethnic diversity to be statistically significant (see Michalopoulos 2008; Ahlerup and Olsson 2009). It has been further confirmed that Africa's standard deviation in the number of ethnic groups per country is more than 35% higher than any other region. (ii) The region has been confirmed as having the highest levels of inequality both in terms of income and gender (see, Regional Economic Outlook: sub-Saharan Africa, 2016<sup>4</sup>). (iii) The sub-region is also largely characterized by dysfunctional institutions (Ajide and Raheem, 2016). This has largely manifested on the negative values of each component of institutional index at least for the region as noted in World Governance Indicators' Database.

In the light of the above apparent policy syndrome of inequality and the established role of institutions in reducing poverty, income inequality and ethnic inequality, it is policy relevant to complement existing literature by assessing how institutions modulate the effect ethnic diversity on inequality. The position of the study departs from recent literature on inclusive development which has focused on *inter alia*: wage inequality and employment protection (Perugini and Pompei, 2016); views on sustainable and inclusive development in emerging markets (Stiglitz, 2016); optimal redistribution and economic inequality via taxation (Yunker, 2016); gender equality (Baliamoune-Lutz and McGillivray, 2009; Anyanwu, 2013a; Elu and Loubert, 2013; Baliamoune-Lutz, 2007; Anyanwu, 2014a), the redistributive effect of regulation in developing nations (Atsu and Adams, 2015); rural-urban inequality (Baliamoune-Lutz and Lutz, 2005), poverty nexuses (Anyanwu, 2013b, 2014b), relationships between finance, poverty, employment and economic growth (Odhiambo, 2009, 2011),

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<sup>4</sup> Regional Economic Outlook: Sub-Saharan Africa (REO) was prepared by a team led by Céline Allard under the direction of Abebe Aemro Selassie.

nexus between human development, information technology and inclusive development (Gosavi, 2017; Minkoua Nzie *et al.*, 2017; Asongu and Nwachukwu, 2018) and the relevance of finance in poverty mitigation (Odhiambo, 2010a, 2010b, 2013).

Apart from the introductory section in one, the remaining sections are structured as follows. Section 2 covers stylized facts on ethnic diversity and inequality, while Section 3 discusses the relevant literature. The data and methodology are presented in Section 4. The results are disclosed and discussed in Section 5 while Section 6 concludes with implications and future research directions.

## **2.0 Conceptual Relationship Between Ethnic Diversity and Inequality**

This section focuses on the interrelationships in ethnic diversity-inequality and institutional infrastructure discourse for ease of appreciation of the conceptual linkages underlying the trio. It also discusses the key indices of ethnic diversity as well as the measure of inequality (Gini coefficients) of countries within the SSA region.

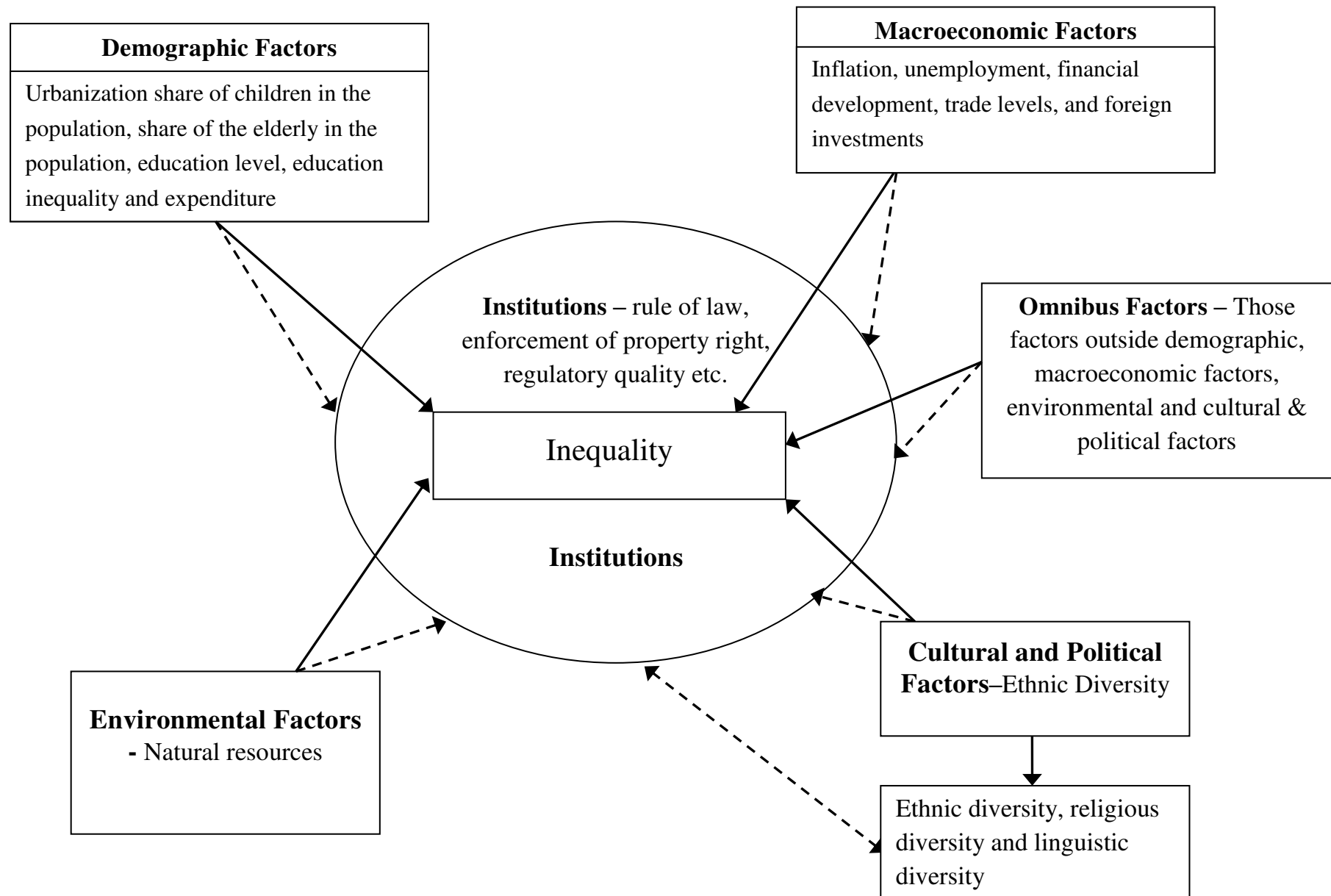
### **2.1 Conceptual Framework for analyzing linkages between Ethnic Diversity, Inequality and Institutions**

The flowchart below (Figure 1) depicts conceptual linkages underpinning ethnic diversity-inequality and institutional framework relationships in a typical economic system. From the chart, it can be discerned that various factors seemed to affect inequality but in somewhat varying degrees. These factors include: demographic factors (e.g. like urbanization share of children in the population, share of elderly in the population, education levels, education inequality etc); macroeconomic factors (inflation, unemployment, financial development, foreign investments etc); environmental factors (natural resources); cultural and political factors (ethnic diversity, racial diversity, language and religious diversity) as well as omnibus factors (those of other factors outside the earlier mentioned ones). As indicated by solid and broken lines, while the impact of the former can directly impact on inequality on the one hand, the effect of the latter can be transmitted indirectly via institutions thus justifying the useful role of institutions as a modulator in the set-up, on the other hand.

Of a particular concern however, is the impact of ethnic diversity—a byproduct of cultural and political factors- on inequality. As can be observed from the diagram, diversity is capable of influencing the distribution of income among the various competitors, who are, often time, divided along racial, ethnic, language and religion dimensions. However, the question of who

gets what or how the pie is being shared and distributed appeared to be largely moderated by the institutional framework in existence. On the diagram, the institutional framework occupies the center stage where all other originating arrows from other sources are indirectly impacted. The inequality might end up skewing toward one direction than the other if the quality of institutions appears to be weak or poor as the case may be. Conversely, a sound institutional infrastructure generates less resentments among the competing ethnic groups if fairness and equity are allowed to thrive in such a multiethnic setting.

A reverse situation may equally apply or envisage as indicated by the bi-directional arrows moving from institutions to ethnic diversity. The simple interpretation is that institutions may as well exacerbate inequality concerns if such institutions are constituted by individuals who have stronger empathy toward his/her group only. This sounds plausible as institutions in an ethnically diverse society comprising of people who may have come from majority or minority group that are being marginalized. The need to recognize and taking account of this type of concern underpin the use of an estimator like a system GMM estimator that is specifically designed to addressing any simultaneity biases and endogeneity issues that are known to characterize the ordinary least squares (OLS) method.



**Figure 1:** Conceptual Linkages between Institutions, Ethnic Diversity and Inequality

**Note:** The solid and broken lines indicate direct and indirect effects respectively

## 2.2 Stylized Information on Key Diversity Indices and Measures of Inequality

Table 1 presents the ethnic fractionalization index (Ethnic) for the most and least diverse countries within the sub-Saharan Africa region. Apart from this, it also details the decomposition of the ethnic fractionalization index into linguistic and religious components, respectively. From the table, Uganda appears to be the most ethnically fragmented country with an Ethnic index of 0.93 while Liberia and Madagascar occupy second and third positions with 0.91 and 0.88 respectively. In Uganda alone, there are eight different groups: Ganda (17.80 percent), Teso (8.90 percent), Nkole (8.20 percent), Soga (8.20 percent), Gisu (7.20 percent), Chiga (6.80 percent), Lango (6.00 percent) and Rwanda (5.80 percent). It is worth mentioning that over 70% of countries within SSA region are ethnically diverse. The least ethnically diverse country is Comoros with ethnic fractionalization index of 0.000, suggesting that the country is highly homogeneous. Thus, in Comoros, Comorian takes 100 percent. With respect to linguistic diversity, Uganda also takes a lead with 0.92 and the last goes to Comoros as well. The most diverse in terms of religion is South Africa with a 0.86 while the last is claimed by Somalia with 0.002. The most prominent religion in South Africa is Christianity with 27.97 percent, directly followed by Protestant (13.79percent), Black Independent Church (9.35 percent), other protestant (8.84 percent) and other black independent (7.29 percent) in that order. In Somalia, Sunni Muslim alone takes almost 100 percent of the religious landscape, thus contrasting sharply with that of South Africa with over thirty religious sects.

**Table 1:** Ethnic Diversity and Components in SSA Countries

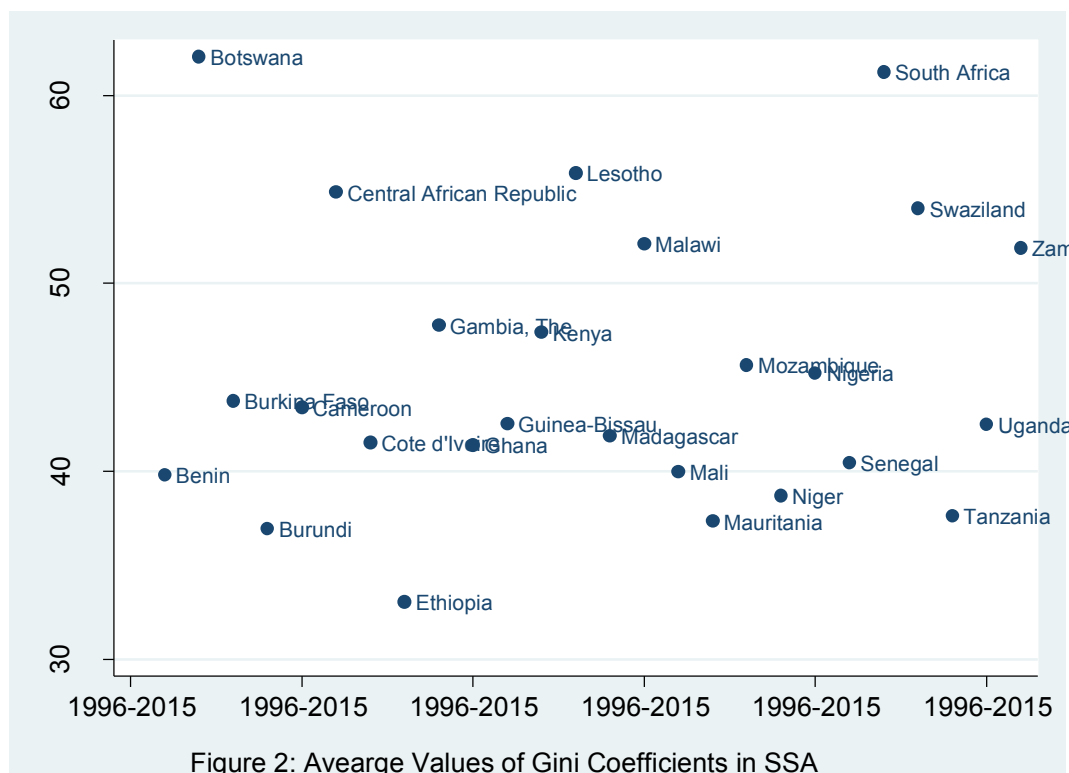
	Countries	Ethnic	Linguistic	Religious
1.	Angola	0.79	0.79	0.63
2.	Benin	0.79	0.79	0.55
3	Botswana	0.41	0.41	0.60
4.	Burkina Faso	0.74	0.72	0.58
5.	Burundi	0.30	0.30	0.52
6.	Cameroun	0.86	0.89	0.73
7.	Cape Verde	0.42	-	0.08
8.	Central Africa Republic	0.83	0.83	0.79
9.	Chad	0.86	0.86	0.64
10.	Comoros	0.00	0.01	0.01
11.	Congo	0.87	0.69	0.66
12.	Cote d'Ivoire	0.82	0.78	0.76
13.	Democratic Republic of Congo	0.87	0.87	0.70
14.	Equatorial Guinea	0.35	0.32	0.12
15.	Eritrea	0.65	0.65	0.43
16	Ethiopia	0.72	0.81	0.62
17.	Gabon	0.77	0.78	0.67
18.	Gambia	0.78	0.81	0.10

19.	Ghana	0.67	0.67	0.80
20.	Guinea	0.74	0.77	0.26
21.	Guinea Bisau	0.81	0.81	0.61
22.	Kenya	0.86	0.89	0.78
23.	Lesotho	0.26	0.25	0.72
24.	Liberia	0.91	0.90	0.49
25.	Madagascar	0.88	0.02	0.52
26.	Malawi	0.67	0.60	0.82
27.	Mali	0.69	0.84	0.18
28.	Mozambique	0.69	0.81	0.68
29.	Namibia	0.63	0.70	0.66
30.	Niger	0.65	0.65	0.20
31.	Nigeria	0.85	0.85	0.74
32.	Rwanda	0.32	-	0.51
33.	Sao Tome and Principe	-	0.23	0.19
34.	Senegal	0.69	0.70	0.15
35.	Seychelles	0.20	0.16	0.23
36.	Sierra Leone	0.82	0.76	0.54
37.	Somalia	0.81	0.03	0.002
38.	South Africa	0.75	0.87	0.86
39.	Swaziland	0.06	0.17	0.44
40.	Togo	0.71	0.90	0.66
41.	Uganda	0.93	0.92	0.63
42.	Tanzania	0.74	0.90	0.63
43.	Zambia	0.78	0.87	0.74
44.	Zimbabwe	0.39	0.45	0.74

**Source:**EncyclopediaBritannica

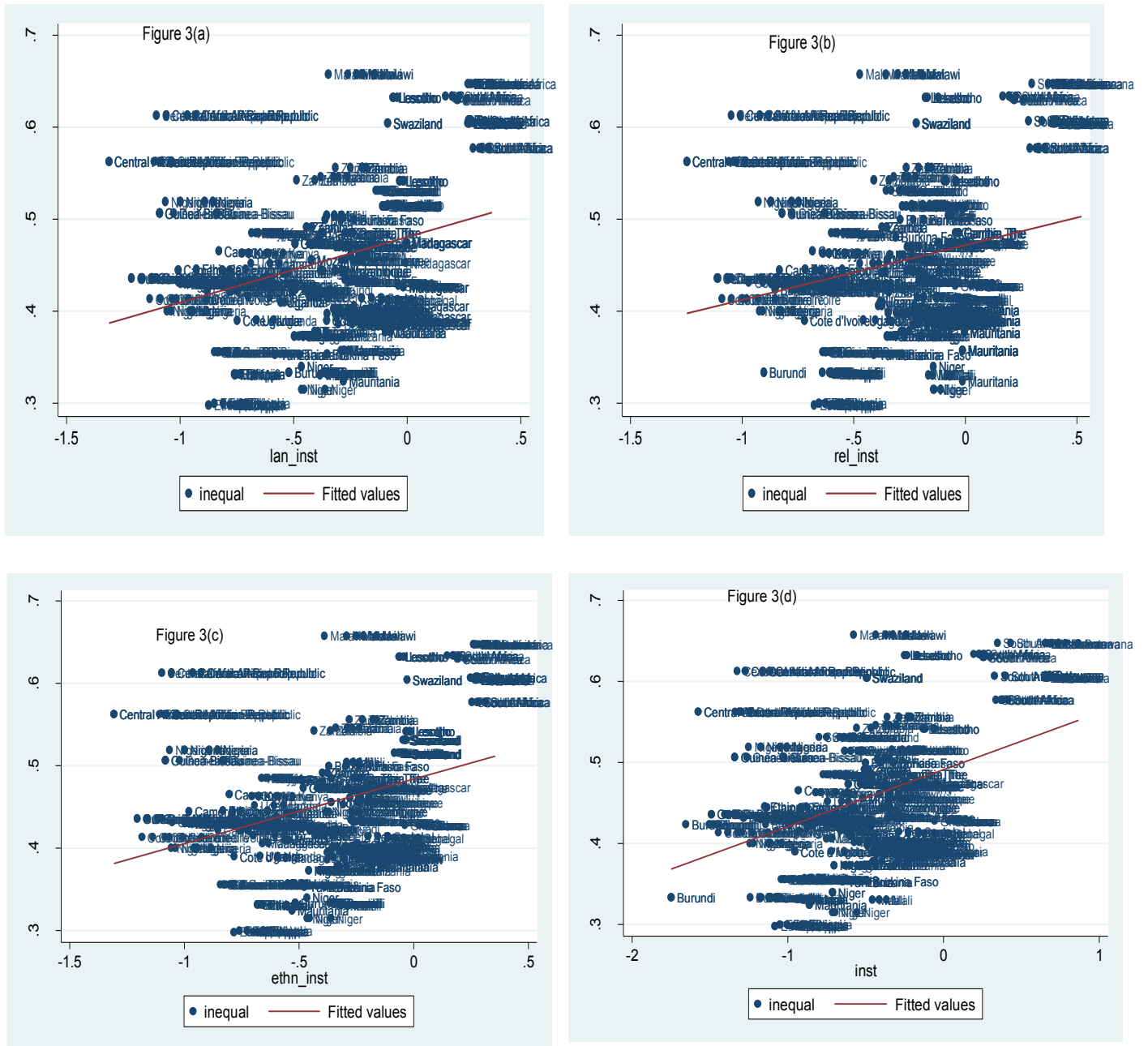
Figure 2 shows a scatter plot of the average Gini coefficients for SSA countries. From the diagram, it can be seen that income inequality appears to be higher among the Southern Africa countries like South Africa, Botswana and Lesotho. We also provide the scatter plots of income inequality for the four regions of SSA countries in Figure 2a-d (see Appendix). The lowest seems to go to countries like Ethiopia, Burundi, Mauritania and Tanzania. Apart from the Figure 2 above, the scatter plots of income inequality (y-axis) on interaction of ethnic diversity (linguistic, religious and ethnic) and institutions variables (x-axis) are presented in Figures 3(a) to 3(c). The visual evidence of the nature of their relationships revealed a positive association between inequality and the interactive terms. It implies that institution settings in the region do not possibly mediate the adverse effect of ethnic diversity on income equality. From the scatter plot in Figure 3(d), a direct relation is also reported between institution and income inequality. From the scatter diagrams, the parameter estimates using the simple linear regression of religious diversity, linguistic diversity, ethnic diversity and institutional quality are 0.0597, 0.0714, 0.0784 and 0.0703 respectively when

the regressand is inequality<sup>5</sup>. These are just preliminary analysis subject to confirmation in Section 5 after adding other factor determinants of inequality. The outcomes can be further supported in the words of Easterly which reads as follows: “*Ethnolinguistic fractionalization in the cross-country sample adversely affects income, growth, and economic policies, which is one explanation for Africa’s poor growth performance*” Easterly (2001, p. 690). The foregoing, however, represents preliminary analysis which is subject to further empirical scrutiny in the subsequent sections.



**Source:** Graphed with underlying data from World Development Indicator (WDI, 2016).

<sup>5</sup> All the parameter estimates are significant at 5% level but their explanatory powers are low.



**Figure 3(a-d):** Scatter plots of Inequality and Ethnic Diversity and Components and Institution

### 3.0 Literature Review

This section undertakes a brief survey of the previously conducted empirical studies on ethnic diversity and inequality across different regions so as to provide compelling context for subsequent empirical analysis.

#### 3.1 A Brief Empirical Exposition

Undeniably, a large body of empirical research has probed into causal linkages between ethnic diversity and its associated inequalities within the space of socio-economic and political spheres of an economy. Prior to documenting some of these empirical counts with

respect to ethnic diversity-inequality relations, attempt will be made to x-ray the groundwork for the theoretical arguments into the issue. Gary Becker (1957) was one of the pioneer researchers who laid out the argument concerning ethnic diversity and inequality around racial prejudice and discrimination. According to him, if a person has a “taste for discrimination” he must act as if he were willing to forfeit income in order to be associated with some persons or groups instead of others. As a means of validating Becker’s analysis, a substantial body of empirical research has trailed the theoretical conjectures of racial prejudice in a wide variety of contexts. Such studies like Alesina and La Ferrara (2000, 2002), Alesina and Glaeser (2004), and Luttmer (2001) have lent credence to the arguments. Using a model of group participation, Alesina and La Ferrara (2000) found that the members of non-majority group derive positive utility from interacting with the members of the same group and negative utility from interactions with members of the majority group. A similar conclusion was reached by the same authors when they submitted that the level of trust seemed higher in racially homogeneous communities (see, Alesina & La Ferrara, 2002).

We commence an overview of the empirical literature with Dincer and Lambert (2006) who set out to analyze both the direct and indirect effects of ethnic and religious heterogeneity on income inequality and on welfare programs across US states using a seemingly unrelated regression (SUR) method. They employed two measures of ethnic diversity, namely the polarization index (PI) and the fractionalization index (FI) and they assessed the relationship between ethnic diversity and income inequality as captured by the Gini coefficient. For PI, they are able to establish a positive and linear relationship between ethnic and religious heterogeneity and Gini coefficient on the one hand, with a negative and linear relationship between ethnic and religious heterogeneity and AFDC/TANF<sup>6</sup> payments on the other hand. The results appear to chart a different path with the use of fractionalization index. With FI, an inverse-U shaped relationship is obtained between ethnic and religious heterogeneity and the Gini coefficient and a U-shaped relationship between ethnic and religious heterogeneity and AFDC/TANF payments. Statistically speaking, the ethnic and religious polarization index explained about 37% of the variation in the Gini coefficient across states in the US (increases to about 75% when control variables are well accounted for) and close to 10% in AFDC/TANF (up to 65% when other explanatory variables are included). Similarly, FI explains almost 40% of the variation in Gini coefficients (about 80% with the inclusion of other control variables) and almost 20% in AFDC/TANF payments (rises to about 65% when

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<sup>6</sup> Refers to Aid to the Families with Dependent Children/Temporary Assistance to Needy Families.

other conditioning variables are taken into consideration). The outcomes of the follow up research by Dincer and Hotard (2011) do not significantly differ from the above reported results. In their study, they explore the relationship between ethnic and religious diversity and income inequality spanning over a 10-year period for 58 countries. In the final analysis, they discovered a positive relationship between ethnic and religious polarization and income inequality and an inverse U-shaped relationship between ethnic and religious fractionalization and income inequality. They also established that transiting from homogeneous position (that is, polarization index of zero) with respect to ethnic (religion) to heterogeneous stance (polarization index of one) would increase the Gini coefficient by almost 6 for ethnic and 3 percentage points for religious fractionalization respectively. Using a pooled ordinary least squares (OLS), Hotard (2008) tested the relationship between income inequality and ethnic heterogeneity on a panel of 58 countries. His results showed that ethnic polarization exerts a positive and significant effect on income inequality, even after controlling for country characteristics and regional differences. Similar in spirit with the present inquiry were studies by Easterly (2001) and Madni (2018). Easterly (2001) was able to establish that ethnic diversity exerts a more adverse effect on economic policy and growth when institutions are poor. Conversely, in countries with sufficiently good institutions, ethnic diversity does not seem to lower growth or worsen economic policies. More recently was a study by Madni (2018) that probed into institutional quality through ethnic diversity, income inequality and public spending for Pakistan over the period, 1984-2015. Using ARDL approach, he found out that ethnic diversity and income inequality caused deterioration to institutional structures of the country at one end, while public spending improved the quality on the other end.

In light of the brief expositions, it is apparent that the particular literature that crafts a role for institutions in ethnic diversity-inequality relation is still at its infancy. It is in recognition of this fact that the present study draws its strength.

## **4.0 Methodology, Empirical Modelling and Data**

### **4.1 Methodology**

The paper employs a panel data analysis since it allows for the control of variables that are unobservable as well as immensurable. Basically, the panel OLS, fixed effects (FE) and system generalized method of moments (GMM) estimation methods are adopted in this study. The panel OLS combines the subscript of time series ( $t$ ) and cross-sectional unit ( $i$ ) to

accommodate the properties of both time series and cross-section data. This is summarily given as:

$$y_{i,t} = \alpha + X'_{i,t}\beta + \mu_{i,t} \quad i = 1, \dots, N; \quad t = 1, \dots, T \quad (1)$$

The cross-section dimension such as country is represented by  $i$  subscript and the time series dimension denoted by  $t$  subscript. More so,  $\alpha$  is a scalar;  $\beta$  is a row vector  $K \times 1$ ;  $X'_{i,t}$  is the  $i$ th observation on  $K$  explanatory variables;  $\mu_{i,t}$  is the stochastic term. The one-way error component panel fixed effect split the error term ( $\mu_{i,t}$ ) into two components as:

$$\mu_{i,t} = u_{it} + v_{i,t} \quad i = 1, \dots, N; \quad t = 1, \dots, T \quad (2)$$

where  $u_{it}$  is the unobservable individual specific effect accounting for any individual-specific effect that is not included in the regression; and  $v_{i,t}$  is idiosyncratic disturbance varying with individuals and time (Baltagi, 2008). Using the fixed effects method,  $\mu_{i,t}$  denotes fixed parameters that is estimated;  $v_{i,t}$  is independent and identically distributed  $[IID(0, \sigma_v^2)]$  (the normality and heteroskedasticity assumption); and  $X'_{i,t}$  is assumed to be independent of  $v_{i,t}$  for all country ( $i$ ) and time ( $t$ ) (endogeneity assumption). In addition, we assume the unobserved effects vary between countries (i.e. heterogeneous) rather than a random term that assumes usage of the random effects technique. We further used the cross section weights (a feasible Generalized Least Squares (GLS) specification assuming the presence of cross-section heteroskedasticity) to correct for cross-section heteroskedasticity and autocorrelation of idiosyncratic disturbance. The reason for employing the cross section weights is to ensure that the fixed estimator is efficient and consistent for our analyses as used by earlier studies such as Hammoris and Kai (2004); Guordon, Maystre and Melo (2006); and Heinrich (2009). The Hausman test result is also computed to confirm the efficiency of the fixed effects estimator.

We further applied the system GMM method to establish the relationship among our variables based on five motivational reasons in its use as documented in Asongu and De Moor (2017). These reasons are: (a) The estimation process is a good fit for addressing the issue of high persistence in the dependent variable. The result of correlation coefficient of income inequality and its lagged of one value is 0.956 which supersedes the value of the rule of thumb threshold (0.800) (Tchamyou, 2019a). (b) The process is good for a study that has

lower number of years per country (T) than the number of countries (N), thus, our  $T(20) < N(26)$ . (c) It is capable of controlling for potential endogeneity in all regressors. (d) The approach does not eliminate cross-country variation (e) Based on the fourth merit, Bond, Hoeffler and Tample (2001) suggested the system GMM estimator by Arellano and Bover(1995) and Blundell and Bond (1998) as a better fit compared to the difference estimator by Arellano and Bond (1991). The requirements for adopting the approach is based on the first-two reasons (Tchamyou & Asongu, 2017) while the last three stressed the associated merits for its adoption (Tchamyou, 2019b).

The study used the forward orthogonal deviations instead of first differences adopted by Roodman (2009a,b) which is an extension of Arellano and Bover (1995). According to Love and Zicchino (2006) and Baltagi (2008), the estimation method can control for cross-country dependence and check over identification and control the proliferation of instruments. The two-step approach is employed in the specification since it controls for heteroskedasticity as against the one-step that is consistent with homoskedasticity. Equations (3) and (4) in levels and first difference respectively summarize the standard system GMM estimation process in line with our baseline model (Equation 1).

$$\begin{aligned} Inequal_{i,t} = & \theta_0 + \theta_1 Inequal_{i,t-\tau} + \theta_2 EthnDiv_{i,t} + \theta_3 Inst_{i,t} + \theta_4 (EthnDiv \times Inst)_{i,t} \\ & + \sum_{h=1}^8 \theta_h Control var_{h,i,t-\tau} + \pi_i + \varpi_t + \varepsilon_{i,t} \end{aligned} \quad (3)$$

$$\begin{aligned} Inequal_{i,t} - Inequal_{i,t-\tau} = & \theta_0 + \theta_1 (Inequal_{i,t-\tau} - Inequal_{i,t-2\tau}) + \theta_2 (EthnDiv_{i,t} - EthnDiv_{i,t-\tau}) \\ & + \theta_3 (Inst_{i,t} - Inst_{i,t-\tau}) + \theta_4 [(EthnDiv \times Inst)_{i,t} - (EthnDiv \times Inst)_{i,t-\tau}] + \\ & \sum_{h=1}^8 \theta_h (Control var_{h,i,t-\tau} - Control var_{h,i,t-2\tau}) + (\varpi_t - \varpi_{t-\tau}) + \varepsilon_{i,t-\tau} \end{aligned} \quad (4)$$

Where: *Inequal* stands for inequality; *EthnDiv* represents ethnic diversity; *EthnDiv\*Inst* is the interaction between ethnic diversity and institution; *Inst* equals institution and *Controlvar* proxies a set of control variables.  $\theta_0, \theta_{1-4}, \theta_h$  are parameter estimates;  $\tau$  represents tau;  $\pi_i$  is the country-specific effect,  $\varpi_t$  is the time specific constant; and  $\varepsilon_{i,t}$  is the stochastic term. The difference equation is derived from the level equation and tau is defined as the autoregressive order, which is one in the analysis because one period can comprehensively capture past exogenous information. It is also imperative to discuss briefly some drawbacks identified by Brambor, Clark and Golder (2006) following the use of interactive regressions. The authors further note that in the model specifications, all constitutive variables should be absorbed.

The estimated coefficients should be interpreted as conditional marginal impacts for them to make economic sense (Asongu and Nwachukwu, 2016c).

We further conducted some post-estimation diagnostic tests to establish the consistency of the system GMM coefficients. The presence of second-order serial correlation is confirmed based on the value of AR (2) which denotes the absence of autocorrelation in the error terms should not be rejected. If the probability value is not rejected, therefore, the problem of second-order autocorrelation exists. Furthermore, the null hypotheses of the Sargan and Hansen over-identification restriction test should not also be rejected, implying that the instruments are valid that is that are not correlated with the error terms. Summary, the Sargan (Hansen) over-identification restriction tests implies not robust but not weakened by instruments (is robust but weakened by instruments). We address this conflict by prioritizing the Hansen test and ensuring that the number of instruments in each specification is less than the corresponding number of countries in order to avoid instrument proliferation. The jointly validity of our estimated parameters was confirmed from the statistical value of Fisher test.

## 4.2 Empirical Modeling

The empirical model for estimating the causal linkage between ethnic diversity and inequality together with interaction terms duly aligns with other previously conducted studies on modulating policy syndromes with policy variables to achieve favorable macroeconomic outcomes (Asongu and Nwachukwu, 2016b, 2017b; Asongu *et al.*, 2017). The model specification is stated as follows:

$$Inequal_{i,t} = \alpha_0 + \alpha_1 EthnDiv_{i,t} + \alpha_2 Inst_{i,t} + \alpha_3 (EthnDiv \times Inst)_{i,t} + \alpha_4 Control\ var_{i,t} + \mu_{i,t} \quad (5)$$

In a more explicit form, the above equation (1) can be rewritten as thus:

$$Inequal_{i,t} = \alpha_0 + \alpha_1 EthnDiv_{i,t} + \alpha_2 Inst_{i,t} + \alpha_3 (EthnDiv \times Inst)_{i,t} + \beta_1 GDPPC_{i,t} + \beta_2 LITR_{i,t} + \beta_3 GLOB_{i,t} + \beta_4 URB_{i,t} + \beta_5 FDEV_{i,t} + \beta_6 INF_{i,t} + \beta_7 LFC_{i,t} + \beta_8 POLITY\_IV_{i,t} + \mu_{i,t}, \quad (6)$$

where *Inequal* represents a surrogate for inequality is captured by the Gini coefficient, *EthnDiv* stands for the measures of ethnic diversity which in this case are two, namely language and religious diversity, *Inst* denotes institutional index and the variable comprises of six indices, which are Control of Corruption, Voice and Accountability, Rule of Law, Government Effectiveness, Regulatory Quality and Political Stability. This is one of the most carefully constructed indicators. The indices ranged from -2.5 (being the weakest) to 2.5 (being the

strongest), while the percentile ranking ranged from 0(weakest) to 100(strongest).  $i$  is country,  $t$  is time and  $\mu$  is the error or disturbance term with expected mean zero and constant variance. In addition, the error term is both identically and independently distributed.  $EthnicDiv \times Inst$  constitutes the interactive term between ethnic diversity and institution and  $Controlvar$  is an omnibus variable for a set of control variables capable of influencing inequality. These are carefully selected variables in the inequality literature (see Asongu & Asongu, 2018; Asongu & Odhiambo, 2018). The variables include gross domestic product per capita ( $GDPPC$ ), literacy rates ( $LITR$ ), globalization ( $GLOB$ ), urbanization rates ( $URB$ ), financial development ( $FDEV$ ), inflation ( $INF$ ), labour force participation rates ( $LFC$ ) and political regime types ( $POLITY\_IV$ ) respectively.

In terms of *a priori* expectations, irrespective of ethnic diversity measures (whether linguistic or religious as the case may be) used, a positive relationship is hypothesized between ethnic diversity and inequality. By implication, the higher the ethnic diversity, the higher the incidence of inequality. Many studies (e.g. like Alesina & Glaeser, 2004; Dincer & Lambert, 2006; Dincer & Hotard, 2011) have offered empirical support to this. A reverse outcome is expected between institutions and inequality. That is, an inverse relationship is posited in the sense that a sound institutional framework is expected to mitigate the impacts of inequality. Conversely, a bad institutional infrastructure may help deepen the effects of inequality on the economy. The interactive term is also expected to be inversely correlated with a measure of inequality. Thus, an ethnically fractionalized country that is being adorned with sound institutions would help minimize the effects of inequality and vice versa. This explains why a developed country like the US has a comparatively high level of income inequality, though having a high racial and religious heterogeneous society.

Apart from the core variables of interest, the control variables also have some theoretical relationships with inequality. For instance, the relationship between per capita GDP and income inequality is conjectured to be ambiguous according to the Simon Kuznets hypothesis. This is confirmed to be true given the level and stage of development of the country concerned. According to Kuznets, a country's level of income inequality is affected by the state of economic development. That is, as an economy develops, market forces first increase then decrease the overall economic inequality. Hence, the existence of an inverted U-shaped relationship between income inequality and economic growth. In terms of educational variables, literacy rates are also assumed to have a negative causal relationship with ethnic diversity. This can be explained to mean that increased literacy rates tend to narrow down the

extent of ethnic diversity. A reduced level of literacy might end up widening inequality. The effect of globalization forces on inequality can be said to be ambiguous. On the one hand, the level of integration of a country can help lift people of that country from poverty due to exposure to state-of-the-art technology, thus reducing inequality; it can also be argued, on the other hand, that globalization may end up enriching the few privileged individuals thereby widening the gap between them and the poor. The degree of urbanization is hypothesized to bear a negative relationship with inequality. The higher the urbanization rate, the lower the level of inequality. The more a country's financial system deepens, the better the financial services become, with the overall consequence being reduction in inequality. Thus, a negative causal relationship is envisaged. Macroeconomic stability (surrogated by inflation rates) equally goes along way in determining the level of inequality in an economy. Inequality worsens in an environment that is macroeconomically unstable. In this case, a positive relationship is posited. The variable of labour force participation is expected to have a negative correlation with inequality. Hence, the higher the labour force participation rates, the lower the inequality level and vice versa. Lastly, the type of political regime is another determinant of inequality in the empirical literature. If a democratic system of governance prevails, reduced inequality is expected to manifest, while a reverse condition will be envisaged in case of an autocratic governance type. Hence, the use of polity IV (that is the difference between the two regimes) and the coefficient is assumed to be negative under an autocratic system while it becomes positive for a democratic rule.

### **4.3 Data Source**

The data spanning from 1996 to 2015 were obtained from the following sources: Easterly and Levine (1997), The Ethnic Power Relations (EPR) core dataset 2015, World Governance Indicators (WGI) CD-ROM and World Development Indicators (WDI). The 26 Sub-Saharan African countries are Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Nigeria, Senegal, South Africa, Swaziland, Tanzania, Uganda and Zambia. The sources of our data as well as their definitions are presented in Table 2. The choice of the periodicity and sampled countries is motivated by data availability constraints. Moreover, data on institutions from WGI is only available from 1996.

**Table 2: Variables' Definitions**

<b>Variables</b>	<b>Signs</b>	<b>Variable measurements</b>	<b>Sources</b>
Income inequality	INEQUAL	Gini Coefficient measure the disparity of income earn by residents in a country.	Easterly and Levine, 1997
Linguistic diversity	LIN	It measures differences in language among groups in a country ranging from 0 to 1.	Encyclopedia Britannica
Religious diversity	REL	It measures differences in religious activities among people of a country ranging from 0 to 1.	Encyclopedia Britannica
Ethnic diversity	ETHN	It measures differences in ethnical values and beliefs among groups in a country ranging from 0 to 1.	Encyclopedia Britannica
Institution	INST	It comprises of six institutional components, control of corruption, voice and accountability, rule of law, government effectiveness, regulatory quality, and political stability. It ranges from -2.5 (beingthe weakest) to 2.5 (being the strongest).	World governance Indicators (2016)
GDP per capita	GDPPC	Gross Domestic Product per capital (Constant 2010 US\$)	World Development Indicators (2016)
GDPPC square root	GDPPC_SQD	Square values of Gross Domestic Product per capital (Constant 2010 US\$)	World Development Indicators (2016)
Literacy (adult total)	LITR	The percentage of literate people within the ages 15 and above.	World Development Indicators (2016)
Globalization rate	GLOB	This measures the rate of globalization in countries around the world which is measured in three dimensions, economic, social and political.	Dreher, Gatsonand Martens (2008)
Urban population growth	URB	The annual growth of people living in urban area.	World Development Indicators (2016)
Domestic credit to private sector	FDEV	The ratio of domestic credit to private sector by bank to GDP.	World Development Indicators (2016)
Inflation rate	INF	The annual rate of consumer price index	World Development Indicators (2016)
Labour force, total	LFC	The percentage of total population within ages 15+ (national estimate) who are eligible to work in a country.	World Development Indicators (2016)
Democratic rule	PRTY_1	The political regime of democratic rules ranging from 0 to +10	Polity IV (2015)
Autocratic rule	PRTY_2	The political regime of autocratic rules which ranges between - 1 to -10	Polity IV (2015)

## 5.0 Empirical Result and Discussion

### 5.1 Analysis of Preliminary Statistics

The descriptive statistics of the panel datasets is presented in Table 3. The mean value of income inequality is 0.4534. The average values of linguistic, religion and ethnic diversities are 0.673, 0.568 and 0.687 respectively. This indicates high heterogeneous nature of religion, linguistic and ethnicity in the region. The negative mean values of institutional index of -0.536<sup>7</sup> further accentuates the level of the region's infrastructure decadence. The average value of domestic credit to the private sector by financial institutions to the size of the SSA economy stand at 19.0%. The democratic system of governance has the highest mean value of 3.725 compared to the average value of the autocratic rule which is 1.383 making the mean value of polity IV index to be 2.3423. By implication this is suggestive that most of the countries in the region have embraced democracy as their system of governance. The region also has an average labour force size and literacy level of 65.23% and 54.74% respectively, representing those that are within the age bracket of 15 years and above, while the urban population grows at an annual rate of 3.98%. The average value of GDP per capita of the region is US\$1,277 indicating that the region falls within the lower middle-income economies according to the recent classification of the World Bank Atlas method.

**Table 3:** Descriptive statistics

Variables	Mean	Max.	Min.	Std. Dev.
Income inequality	0.4534	0.6576	0.2981	0.0860
Linguistic diversity	0.6732	0.9226	0.0204	0.2529
Religion diversity	0.5682	0.8603	0.0149	0.2383
Ethnic diversity	0.6867	0.9302	0.0582	0.2054
Institution	-0.5357	0.8677	-1.7500	0.4864
GDP per capita	1277	7611	187	1605
GDP per capita (ln)	6.7007	8.9373	5.2307	0.8598
GDPPC square root (ln)	45.637	79.876	27.360	12.189
Literacy (adult total)	54.738	94.598	12.848	20.846
Globalization rate (ln)	3.7230	4.1784	3.0559	0.2094
Urban population growth	3.9794	6.7261	-0.0466	1.1988
Domestic credit to private sector by banks	19.003	160.13	0.4104	24.625
Inflation rate	7.7397	50.734	-9.6162	8.1734
Labour force, total	65.226	92.700	6.1700	16.852
Democratic rule (A)	3.7250	9.0000	-8.0000	3.9221
Autocratic rule (B)	1.3837	9.0000	-8.0000	3.0754
Political regime types (A–B)	2.3423	9.0000	-9.0000	5.0860

<sup>7</sup> The high value of this variable could have been due to perception-based nature of the institutional variables obtained from World Governance Indicators database.

Number of observation is 520. STD. DEV. is standard deviation.

The correlation coefficients of the relationship between the measures of ethnic diversities (linguistic, religion and ethnic), institutions, other covariates and income inequality are presented in Table 4. The measures of linguistic and ethnic diversities are found to be negatively correlated with income inequality while religious diversity has a contrary sign. Of the diversity measures, religion has the highest correlation coefficient followed by ethnic diversity and linguistic diversity. From the table, institutional variable appears to be moderately and positively correlated with income inequality. The results are in tandem with the directions of the scatter plots presented in Figures 2(a-d). All other variables convey positive correlation coefficients with the exception of urban population growth and labour force. Literacy rate is negatively correlated with linguistic diversity while urban population growth is indirectly correlated with religion diversity. Conversely, literacy rate, GDP per capita and its squared value are very much correlated with ethnic diversity. The interactive terms of institution and the diversity measures are inversely correlated with ethnic, religion and language diversities. Thus, other correlation coefficients of the indicators are further reported in the table at varying degrees and magnitudes.

**Table 4:** Correlation between Ethnic Diversity, income inequality and its determinants

	INEQUAL	LAN	REL	ETHN	INST	LAN×INST	REL×INST	ETHN×INST	GDPPC	GDPPC_SQD	LITR	GLOB	URB	FDEV	INF	LFC
LAN	-0.1002	1														
REL	0.3408	0.2577	1													
ETHN	-0.2407	0.6770	0.1740	1												
INST	0.3979	-0.1500	-0.0307	-0.1914	1											
LAN_INST	0.3073	-0.4895	-0.1658	-0.4438	0.8804	1										
REL_INST	0.2415	-0.2580	-0.3465	-0.2824	0.9199	0.9067	1									
ETHN_INST	0.3284	-0.3682	-0.1371	-0.5034	0.8993	0.9645	0.9076	1								
GDPPC	0.5296	-0.0773	0.1718	-0.2425	0.5292	0.4264	0.4333	0.4453	1							
GDPPC_SQD	0.5452	-0.0919	0.1795	-0.2650	0.5370	0.4440	0.4442	0.4637	0.9969	1						
LITR	0.4457	-0.2999	0.4572	-0.3123	0.2751	0.3291	0.1367	0.3152	0.5283	0.5357	1					
GLOB	0.2926	0.1245	0.0573	-0.0024	0.4749	0.3505	0.4212	0.3592	0.6928	0.6767	0.3196	1				
URB	-0.5205	0.1774	-0.2101	0.3311	-0.2034	-0.1834	-0.1113	-0.2073	-0.5487	-0.5588	0.3833	-0.2835	1			
FDEV	0.3457	0.1070	0.1867	0.0080	0.3831	0.3914	0.3740	0.3876	0.5555	0.5888	0.3414	0.4676	-0.2787	1		
INF	0.0771	-0.0544	0.2784	-0.0428	-0.0108	0.0182	-0.0784	0.0232	-0.0493	-0.0458	0.2131	0.0100	-0.0204	-0.0724	1	
LFC	-0.1839	0.0843	0.2452	0.1790	-0.1006	-0.0480	-0.1714	-0.0613	-0.4189	-0.4110	-0.1005	-0.2263	0.3348	-0.0959	0.0847	1
POLITY_IV	0.1786	0.0258	0.2614	0.0965	0.4037	0.3244	0.2910	0.3040	0.1065	0.1180	0.1097	0.1837	0.0017	0.2684	0.0691	0.1261

**Notes:** INEQUAL is income inequality, LAN is linguistic diversity, REL is religious diversity, ETHN is ethnic diversity, INST is institutional quality, LAN×INST is interaction between linguistic diversity and institutional quality, REL×INST is the interaction between religious diversity and institutional quality, ETHN×INST is the interaction between ethnic diversity and institutional quality, GDPPC is gross domestic product per capita, GDPPC\_SQD is gross domestic product per capita squared, LITR is literacy rates, GLOB is globalization, URB is urbanization rates, FDEV is financial development, INF is inflation rate, LFC is labour force participation rates and POLITY\_IV is political regime types.

## 5.2 Empirical Estimates of the Panel Regression Models

The discussion of empirical results for income inequality is presented in Tables 5 and 6.

### 5.2.1 Baseline Pooled and Fixed Effects Regressions<sup>8</sup>

Table 5 reports the results of pooled OLS and panel fixed effects which controls for unobserved country characteristics. The Hausman test statistics presented in the table reveal the appropriateness of the panel fixed effects as the results reject the null hypotheses for all the considered models at 5% significance levels based on the calculated Chi-Square values. The models are first estimated without the interactive terms of institutions and ethnic diversity composition, and these are shown in the first six columns. The last six columns present the estimated regression results with the interactive terms of the key variables of interest. The results of our coefficients are not consistent in terms of signs with respect to the two baseline estimators, namely OLS and fixed effects. The findings from the pooled OLS established that: (a) linguistic, religious and ethnic diversity increase the level of inequality in the region and (b) the interaction terms of institutional quality and linguistic, religious and ethnic diversity reduce inequality, while institutions still maintain a direct relationship with inequality. From panel fixed effects, the results reveal that (a) an inverse relationships exist between linguistic, religious and ethnic diversity and income inequality and (b) the impact of the interactive terms of institutional quality, together with linguistic, religious and ethnic diversity respectively on inequality are insignificant at their conventional levels. A system GMM is equally deployed to increase the bite on endogeneity, notably by: (a) controlling for time invariant omitted variables in order to further account for the unobserved heterogeneity and cross sectional dependence and (b) accounting for simultaneity or reverse causation by means of the instrumentation process. This is discussed in what follows.

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<sup>8</sup> Much efforts are not expended expantiating on these baseline regression results because of their inherent econometrical problems. Hence, justify our spending more time and space explaining in details the results of the system GMM.

**Table 5:** Pooled and Fixed Effects Estimation Results

Variables	Dependent Variable: Income Inequality											
	Pooled OLS			Fixed Effect <sup>a</sup>			Pooled OLS			Fixed Effect <sup>a</sup>		
	Linguistic	Religion	Ethnic	Linguistic	Religion	Ethnic	Linguistic	Religion	Ethnic	Linguistic	Religion	Ethnic
<i>Constant</i>	<b>1.1362</b> (0.177)***	<b>1.0438</b> (0.167)***	<b>1.0913</b> (0.186)***	<b>1.4461</b> (0.513)***	<b>1.245</b> (0.434)***	<b>1.4744</b> (0.624)***	<b>1.1350</b> (0.174)***	<b>1.1887</b> (0.172)***	<b>0.9783</b> (0.179)***	<b>1.4512</b> (0.511)***	<b>1.2445</b> (0.434)***	<b>1.4707</b> (0.531)***
<i>LAN</i>	<b>0.0372</b> (0.013)***			<b>-0.02148</b> (0.008)***			<b>-0.0411</b> (0.0230)*			<b>-0.0216</b> (0.076)***		
<i>REL</i>		<b>0.085</b> (0.016)***			<b>-0.0219</b> (0.008)***			0.0195 (0.0258)			<b>-0.0219</b> (0.0076)***	
<i>ETHN</i>			0.0216 (0.0175)			<b>-0.02146</b> (0.008)***			<b>-0.1650</b> (0.0032)***			<b>-0.2141</b> (0.0774)***
<i>INST</i>	<b>0.0323</b> (0.0079)***	<b>0.042</b> (0.008)***	<b>0.0294</b> (0.008)***	-0.0157 (0.0140)	-0.0159 (0.014)	-0.0157 (0.0140)	<b>0.1130</b> (0.021)***	<b>0.1230</b> (0.027)***	<b>0.1938</b> (0.0255)***	-0.0412 (0.0300)	-0.0145 (0.0272)	-0.0181 (0.055)
<i>LAN×INST</i>							<b>-0.1275</b> (0.031)***			0.0426 (0.044)		
<i>REL×INST</i>								<b>-0.1289</b> (0.040)***			-0.0281 (0.0468)	
<i>ETHN×INST</i>									<b>-0.2520</b> (0.0372)***			0.0033 (0.0754)
<i>lnGDPPC</i>	<b>-0.1721</b> (0.057)***	<b>-0.0154</b> (0.054)***	<b>-0.1635</b> (0.061)***	-0.0943 (0.1018)	-0.00997 (0.1038)	-0.0094 (0.1038)	<b>-0.1623</b> (0.056)***	<b>-0.1867</b> (0.055)***	<b>-0.0815</b> (0.049)*	-0.0091 (0.104)	-0.01001 (0.1039)	-0.0098 (0.1043)
<i>lnGDPPC_SQD</i>	<b>0.0142</b> (0.0041)***	<b>0.013</b> (0.004)***	<b>0.0137</b> (0.004)***	0.0034 (0.007)	0.004 (0.008)	0.00034 (0.0080)	<b>0.0130</b> (0.004)***	<b>0.0146</b> (0.004)***	0.0064 (0.0043)	0.000077 (0.008)	0.00044 (0.008)	0.00035 (0.0080)
<i>LITR</i>	<b>0.00077</b> (0.0002)***	0.00027 (0.0002)	<b>0.00066</b> (0.0002)***	-0.00019 (0.00031)	-0.00018 (0.00031)	-0.00019 (0.0003)	<b>0.00074</b> (0.0002)***	<b>0.00035</b> (0.0002)**	<b>0.00065</b> (0.0002)***	-0.000096 (0.00033)	-0.00019 (0.00032)	-0.00018 (0.00032)
<i>LNGLOB</i>	<b>-0.0395</b> (0.0215)*	-0.019 (0.021)	-0.0330 (0.0214)	<b>-0.0551</b> (0.028)**	<b>-0.0541</b> (0.0282)*	<b>-0.0551</b> (0.0282)**	-0.0329 (0.0212)	-0.0174 (0.0208)	<b>-0.0399</b> (0.021)**	<b>-0.0575</b> (0.028)**	<b>-0.0540</b> (0.0282)*	<b>-0.0551</b> (0.0282)**
<i>URB</i>	<b>-0.0217</b> (0.003)***	<b>-0.0189</b> (0.003)***	<b>-0.0217</b> (0.003)***	<b>-0.0135</b> (0.004)***	<b>-0.0135</b> (0.0041)***	<b>-0.0135</b> (0.004)***	<b>-0.0205</b> (0.003)***	<b>-0.0178</b> (0.003)***	<b>-0.0186</b> (0.003)***	<b>-0.0133</b> (0.004)***	<b>-0.0135</b> (0.0042)***	<b>-0.0135</b> (0.0042)***
<i>FDEV</i>	-0.000295 (0.00019)	-0.00019 (0.00018)	-0.00023 (0.00002)	<b>0.0018(0.005)***</b>	<b>0.0018</b> (0.0005)***	<b>0.0018</b> (0.0005)***	0.00015 (0.0002)	-0.000012 (0.00018)	<b>0.00064</b> (0.00023)***	<b>0.0019</b> (0.0005)***	<b>0.0018</b> (0.0005)***	<b>0.0018</b> (0.00046)***
<i>INF</i>	0.00038 (0.00037)	0.000012 (0.0004)	0.00042 (0.00037)	-0.00018 (0.00029)	-0.00019 (0.00028)	-0.00018 (0.00029)	0.00049 (0.00036)	0.00015 (0.00037)	<b>0.00071</b> (0.00036)**	-0.00016 (0.00029)	-0.00019 (0.0003)	-0.00018 (0.00029)
<i>LFC</i>	0.000066	-0.00029	0.000089	-0.00012	-	-	0.00016(0.	<b>-0.000033</b>	0.00028(0.	-0.00012	-	-

	(0.000197)	(0.0002)	(0.0002)	(0.00022)	0.00011(0.00022)	0.00012(0.00022)	0.0002	<b>(0.0002)*</b>	0.00019	(0.00022)	0.00011(0.00022)	0.00012(0.00022)
<b>POLITY_IV</b>	<b>0.00107</b>	0.000007	<b>0.0011</b>	-0.00011	0.0011	0.0011	0.00059	-0.000066	0.00026	0.0012	0.0011	0.000112
	<b>(0.00064)*</b>	(0.00066)	<b>(0.00065)*</b>	(0.00085)	(0.00085)	(0.00085)	(0.00064)	(0.000656)	(0.00064)	(0.00086)	(0.0009)	(0.00086)
<b>Net Effects</b>	-	-	-	-	-	-	0.0272	0.0886	-0.0300	n.a	n.a	n.a
<b>Adj. R<sup>2</sup></b>	0.433	0.456	0.426	0.121 <sup>b</sup>	0.121 <sup>b</sup>	0.1208 <sup>b</sup>	0.463	0.466	0.473	0.122 <sup>b</sup>	0.121 <sup>b</sup>	0.1209 <sup>b</sup>
<b>F-Statistics</b>	<b>37.08***</b>	<b>40.56***</b>	<b>36.05***</b>	<b>29.99***</b>	<b>28.01***</b>	<b>30.61***</b>	<b>36.48***</b>	<b>38.71***</b>	<b>39.78***</b>	28.42***	27.02***	26.41***
<b>Hansen Test</b>	-	-	-	<b>7.38***</b>	<b>7.42***</b>	<b>7.37***</b>	-	-	-	<b>7.40***</b>	<b>7.43***</b>	<b>7.14***</b>
<b>Countries</b>	26	26	26	26	26	26	26	26	26	26	26	26
<b>Obs.</b>	520	520	520	520	520	520	520	520	520	520	520	520

**Notes:**Standard errors clustered at the country level are reported in parentheses; \*, \*\* & \*\*\* indicate 10%, 5% and 1% significance level respectively. INEQUAL is income inequality, LAN is linguistic diversity, REL is religious diversity, ETHN is ethnic diversity, INST is institutional quality, LAN×INST is interaction between linguistic diversity and institutional quality, REL×INST is the interaction between religious diversity and institutional quality, ETHN×INST is the interaction between ethnic diversity and institutional quality, GDPPC is gross domestic product per capita, GDPPC\_SQD is gross domestic product per capita squared, LITR is literacy rates, GLOB is globalization, URB is urbanization rates, FDEV is financial development, INF is inflation rate, LFC is labour force participation rates and POLITY\_IV is political regime types. (a)- one-way fixed effect (b)- adjusted R<sup>2</sup> (within). The significance of estimated parameters, F-statistics and Hausman test. *na* implies not applicable due to the insignificance of marginal effects.

### 5.2.2 Empirical Discussion of the System GMM Results

Table 6 presents the results of the linkages between ethnolinguistic and religion diversities, institutions and inequality. From the table, it can be seen that different forms of diversity play contributory roles in worsening income inequality in the region. Statistically speaking, a one standard deviation increase in language, religion and ethnic diversities increases income inequality by 0.0045, 0.00637 and 0.0115 respectively. This further accentuates the damaging impacts of ethnolinguistic and religious fractionalization on income inequality. The magnitude of statistical impacts is weighty for religion diversity judging by 5% conventional level. That is, the impact of religious diversity on inequality appears to be more acute as compared to others. Thus, the result has lent credence to the fact that ethnolinguistic and religious diversity had severe implications for causing income inequality in the region. This is plausibly logical as people who speak the same language, belong to the same ethnic and religion sects tend to discriminate against those who do not belong to them both in terms of employment allocation and job placements. It is startling also to note that interacting each of the diversity measures does not change the status quo either. For instance, with the inclusion of interaction terms in columns 4, 5 and 6, we equally observe that a one standard deviation increase in language, religion and ethnic diversity increases income disparity by 0.0027, 0.0087 and 0.058 respectively. This simply confirms the level of institutional decadence confronting the region. The results further reveal that the effects of ethnolinguistic and religion fractionalization refuse to disappear even when interactive terms of the variables with institutions are controlled for. The coefficients on religious and ethnic diversities indicate the severity of inequality generated seemed more damaging than that of language diversity.

The coefficient on institutional quality indicates that institution is directly related to income inequality implying that the institutional framework in this region is not good enough to lessen the inequality brought by ethnolinguistic and religious diversities. All together, this result appears counterintuitive as institutions are expected to play a mitigating role than acting contrariwisely.

**Table 6:** Panel System GMM Estimation Regression Results

Variables	Dependent Variable: Income Inequality					
	Linguistic	Religion	Ethnic	Linguistic	Religion	Ethnic
<i>Constant</i>	<b>-0.1098</b> (0.060)***	<b>-0.1201</b> (0.055)**	<b>-0.0904</b> (0.0634)	<b>-0.1046</b> (0.050)**	<b>-0.1250</b> (0.052)***	<b>-0.0843</b> (0.052)*
<i>INEQUAL(-1)</i>	<b>1.0113</b> (0.030)***	<b>1.0089</b> (0.029)***	<b>1.0061</b> (0.030)***	<b>1.0151</b> (0.026)***	<b>1.0116</b> (0.030)***	1.0109 (0.0221)
<i>LAN</i>	0.00470 (0.0031)			<b>0.0045</b> (0.0027)*		
<i>REL</i>		0.00639 (0.0067)			<b>0.00637</b> (0.0031)**	
<i>ETHN</i>			<b>0.0094</b> (0.0050)*			<b>0.0115</b> (0.0126)*
<i>INST</i>	<b>0.0024</b> (0.0011)**	<b>0.0027</b> (0.0014)**	<b>0.0029</b> (0.0014)**	0.0035 (0.0114)	<b>0.00201</b> (0.0011)*	-0.0019 (0.00151)
<i>LAN×INST</i>				<b>0.0027</b> (0.0016)*		
<i>REL×INST</i>					<b>0.0087</b> (0.0016)**	
<i>ETHN×INST</i>						<b>0.0058</b> (0.0031)*
<i>lnGDPPC</i>	<b>0.0289</b> (0.016)*	<b>0.0293</b> (0.017)*	<b>0.0230</b> (0.0107)**	<b>0.0259</b> (0.0148)*	0.0298 (0.0179)	<b>0.0172</b> (0.0103)*
<i>lnGDPPC_SQD</i>	<b>-0.0025</b> (0.0013)*	<b>-0.0021</b> (0.0013)*	<b>-0.00173</b> (0.00101)*	<b>-0.0018</b> (0.0013)	<b>-0.0021</b> (0.0011)*	<b>-0.00182</b> (0.0011)*
<i>LITR</i>	0.000019 (0.00007)	-0.000016 (0.00006)	0.000019 (0.000073)	0.000023 (0.000072)	-0.000016 (0.00006)	0.000021 (0.000076)
<i>lnGLOB</i>	-0.0012 (0.0110)	0.0033 (0.0119)	-0.0011 (0.0109)	-0.0013 (0.0102)	-0.0032 (0.0115)	0.00088 (0.0106)
<i>URB</i>	<b>-0.0071</b> (0.0016)***	<b>-0.0053</b> (0.0016)***	<b>-0.0011</b> (0.0018)	<b>-0.0025</b> (0.0014)*	<b>-0.0026</b> (0.0015)*	<b>-0.0069</b> (0.0014)***
<i>FDEV</i>	-0.00034 (0.00053)	-0.00039 (0.0005)	-0.00019 (0.00066)	-0.0022 (0.00086)	-0.00036 (0.00061)	-0.000054 (0.00093)
<i>INF</i>	-0.00051 (0.00034)	<b>-0.00056</b> (0.00030)*	-0.00049 (0.00036)	-0.00049 (0.00038)	<b>-0.00054</b> (0.00032)*	-0.00044 (0.00038)
<i>LFC</i>	-0.000138 (0.00091)	0.00011 (0.0001)	-0.00013 (0.000094)	-0.000141 (0.00009)	0.00010 (0.000095)	-0.00013 (0.000093)
<i>POLITY_IV</i>	0.00015 (0.0002)	0.00021 (0.00022)	0.00019 (0.0634)	0.00011 (0.00022)	0.00019 (0.00023)	0.00014 (0.00023)
<i>Net Effects<sup>9</sup></i>	-	-	-	0.00305	0.00171	0.00839
<b>Fisher</b>	2831.19***	6776.3***	3125.91***	3658.06***	7343.50***	4012.65***
<b>AR(-1)</b>	(0.003)	(0.002)	<b>(0.003)</b>	(0.002)	(0.002)	<b>(0.003)</b>
<b>AR(-2)</b>	<b>(0.208)</b>	<b>(0.205)</b>	<b>(0.207)</b>	<b>(0.206)</b>	<b>(0.206)</b>	<b>(0.210)</b>
<b>Sargan OIR</b>	<b>(0.790)</b>	<b>(0.796)</b>	<b>(0.789)</b>	<b>(0.800)</b>	<b>(0.796)</b>	<b>(0.799)</b>
<b>Hansen OIR</b>	<b>(0.101)</b>	<b>(0.133)</b>	<b>(0.098)</b>	<b>(0.098)</b>	<b>(0.141)</b>	<b>(0.108)</b>
<b>Instruments</b>	15	15	15	16	16	16
<b>Countries</b>	26	26	26	26	26	26
<b>Obs.</b>	494	494	494	494	494	494

*Notes:* Standard errors clustered at the country level are reported in parentheses; \*, \*\* & \*\*\* indicate 10%, 5% and 1% significance level respectively. INEQUAL is income inequality, LAN is linguistic diversity, REL is religious diversity, ETHN is ethnic diversity, INST is institutional quality, LAN×INST is interaction between

<sup>9</sup> According to Brambor, Clark and Golder (2006), pitfalls are inherently associated with interactive regressions, hence there is need to include all constitutive variables in the specifications. Further, the estimated parameters will make more economic sense if only interpreted as conditional marginal impacts.

linguistic diversity and institutional quality, REL×INST is the interaction between religious diversity and institutional quality, ETHN×INST is the interaction between ethnic diversity and institutional quality, GDPPC is gross domestic product per capita, GDPPC\_SQD is gross domestic product per capita squared, LITR is literacy rates, GLOB is globalization, URB is urbanization rates, FDEV is financial development, INF is inflation rate, LFC is labour force participation rates and POLITY\_IV is political regime types. OIR is Over-identifying Restrictions Test. The significance of bold values is in three ways: (a) The probability values of estimated coefficients and the Fisher statistics. (b) The failure to reject the null hypotheses of: (i) no autocorrelation in the AR(1) and AR(2) tests and; (ii) the validity of the instruments in the Sargan OIR test.

For other covariates, to start with, the importance of inequality persistence is well stressed across the models except for the last column in Table 6 under ethnic. By implication, the previous experience in income disparity remains a formidable driving force for the current income inequality episode. In fact, a one standard deviation increase in linguistic, religion and ethnic increases income inequality by well over 100 percent as suggested by their coefficients. This broadly reflects in their levels of statistical significance across the models. Further, the parameter estimates of GDP per capita reveal a positive and direct connection between income levels and inequality in the region. This suggests that wide disparity indeed exists between the rich and the poor. It is also important to state that Kuznets hypothesis remains valid across the models. The coefficient on urbanization rate has a negative effect on income inequality in the region thus authenticating the assertion of the influx of people from rural to urban centres. This is not unexpected as there are wide gaps between the rural and urban dwellers. It is worth noting that the statistical relevance between urbanization rate and income inequality fluctuates are particularly noticeable given the 1% statistical level. Financial development, globalization index and labour force participation rate are negatively associated to inequality but they are found to be insignificant at their conventional levels. This implies that better financial services, high force participation rates and the level of countries' integration into the global world tend to lower inequality level but exerting no significant influence. On average, the rate of literacy is unable to narrow inequality gap while macroeconomic instability is able to marginally close the gap. Their coefficient values are not statistically significant. The parameter estimates of polity IV values depict prevalence of democratic system in the region. The levels of statistical insignificance on the coefficients of polity IV further authenticates nascent nature of the continent's democratic dispensation, and thus making it difficult reducing the level of income inequality confronting the region. This is not surprising as African democratic structures are riddled with corruption and other allied corrupt practices

Our main findings, however, emerge from the bottom part of Table 6 in the row named "*Net Effects*". This reveals the impact of ethnic diversity on inequality when the model includes

the interactive institution terms. The net impact from the various regression models with

interactive institution variable is calculated as:  $\left[ \frac{\% \Delta \text{ in } inequal}{\% \Delta \text{ in } EthnInst} = \theta_2 + \theta_4 Inst \theta_{i,t} \right]$ . The

result shows that the elasticity of income inequality obtained from the system GMM regression approach are 0.0031, 0.0017 and 0.0084 for linguistic, religious and ethnic diversity respectively, when they were evaluated at an average institutional index level of -0.5357. Correspondingly, the elasticity of inequality becomes 0.0017, -0.0025 and 0.0056 evaluated at one standard deviation below the mean value of institution (-1.0021) while at one standard deviation above the mean value (-0.0493), inequality elasticity turns out to be 0.0044, 0.0059 and 0.0112.

## 7.0 Concluding Implication and Future Research Direction

Studies on the causes of income differences between the rich and the poor have received an extensive attention in the inequality empirics. While ethnic diversity has also been identified as one of the fundamental causes of income inequality, the role of institutions as a mediating factor in the ethnicity-inequality nexus has not received the scholarly attention it deserves. Accordingly, it is of policy relevance to assess how a policy variable (i.e. institutional quality) can be employed to modulate the effect of ethnicity on inequality. This study complements the existing literature by investigating the extent to which institutional framework corrects the noisy influence originating from the nexus between “ethnic diversity” and inequality in twenty-six SSA countries for the period 1996-2015. The empirical evidence is based on pooled OLS, fixed effects and system GMM estimation techniques.

The study discovered that the direct influences of linguistic, religious and ethnic diversity on inequality are inevitable in the region. Religion and ethnic diversity were found to be statistically significant at their conventional levels. The findings also revealed that the indirect influence fail to attenuate the level of income disparity within an interactive regression framework. By implication, the adverse effects of the three components of diversity remain intact when institution index and its interaction with diversity measures are added. Two main policy implications can be inferred from the findings: (a) the institutional infrastructures in the region have not been able to solve inequality problems orchestrated by ethnic diversity. Therefore, there is need for the region to restructure the institutional settings to tackle the byproducts of ethnic differences that are politically motivated by selfish individuals or groups which threaten national unity. (b) Meaningful

gains from liberalization within and across the region, financial supports to the less-privileged, high literacy and guaranteeing fair playing ground to all citizens will go a long way to dampen uneven wealth distribution in the region.

It may not be surprising if institutions in SSA cannot effectively modulate the effect of ethnic diversity on inequality. This is essentially because institutions instead of playing the role of policy variables may reflect policy syndromes. In other words, institutions may reflect negative signals instead of positive signals. This is essentially the case when the institutional variables are negatively skewed. This narrative on the assimilation of negative skewness to a policy syndrome is consistent with Asongu and Nwachukwu (2016d) who have predicted the occurrence of the 2011 Arab Spring from institutional indicators in Africa that are negatively skewed. In the light of this clarification, the role of institutions in modulating the effect of ethnicity on inequality can be tailored to effectively reduce inequality by improving the following factors that are not mutually exclusive: (a) the election and replacement of political leaders (i.e. voice & accountability and political stability); (b) the formulation and implementation of sound policies that deliver public commodities (i.e. government effectiveness and regulation quality) and (c) the respect by the State and citizens of institutions that govern interactions between them (i.e. corruption-control and the rule of law).

Future studies can use alternative measures of the variables of interest (i.e. institutional quality, inequality and ethnic diversity) to assess whether the established findings withstand further empirical scrutiny. Moreover, comparative studies within an intercontinental framework would provide lessons from best performers to their least-performing counterparts. Country-specific studies are also worthwhile for more targeted policy implications.

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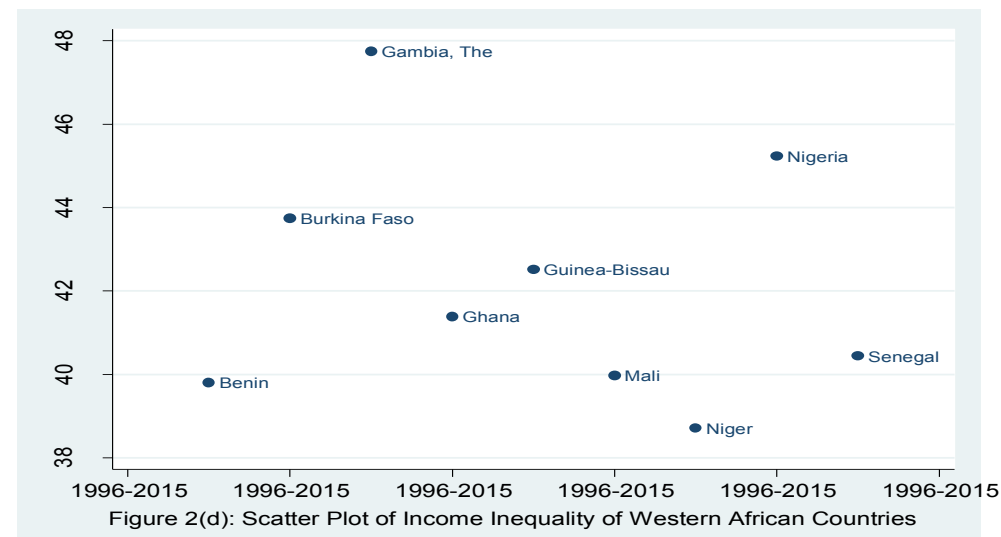
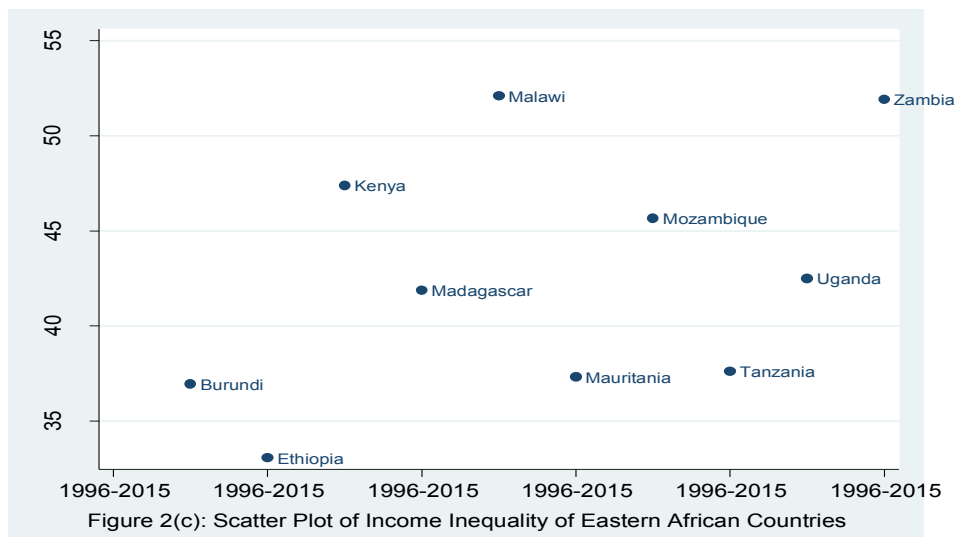
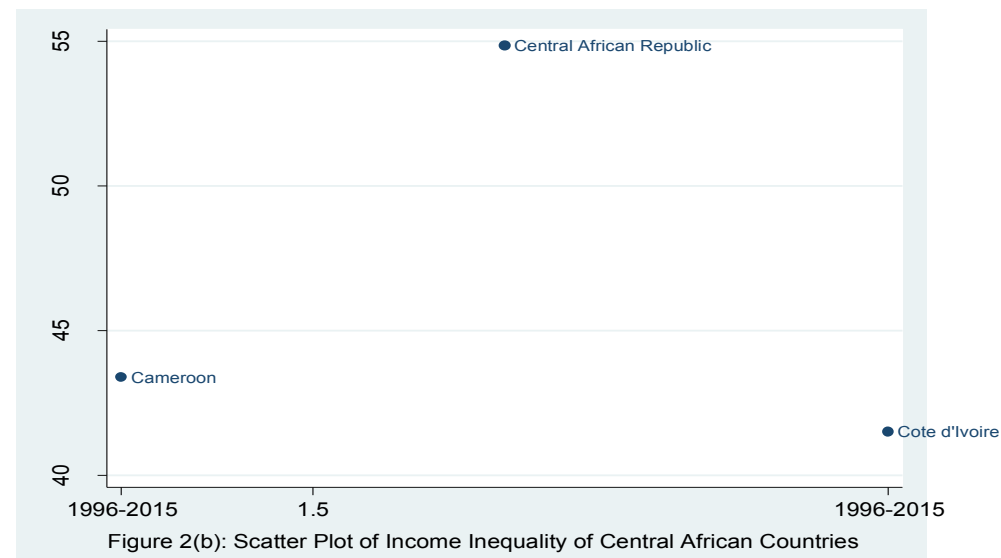
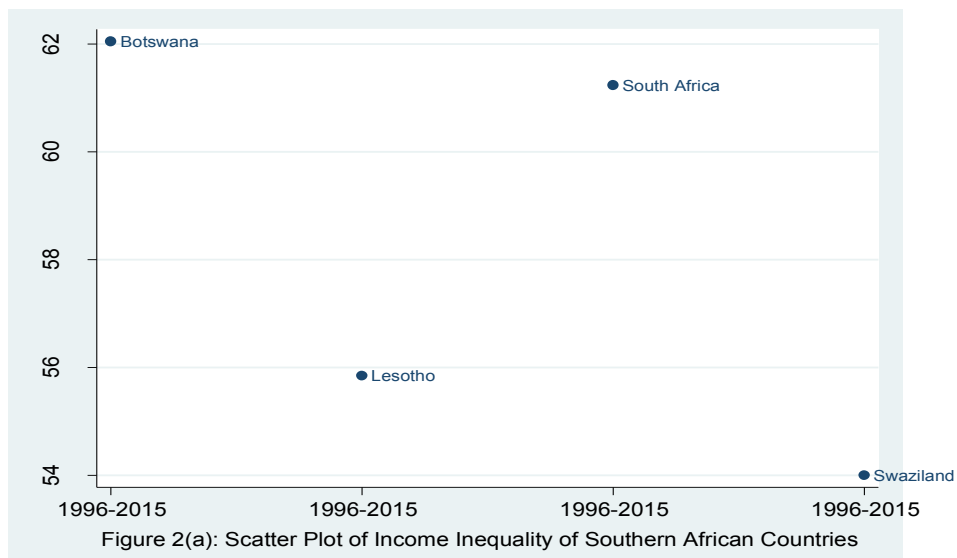
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## Appendix



**Figure 2(a-d):** Scatter plots of Income Inequality of the four Regions of SSA Countries.