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**Working Paper**

## The role of institutional infrastructures in financial inclusion-growth relations: Evidence from SSA

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# A G D I Working Paper

WP/20/043

## **The Role of Institutional Infrastructures in Financial Inclusion-Growth Relations: Evidence from SSA <sup>1</sup>**

Forthcoming: International Journal of Finance and Economics

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Research Department

**The Role of Institutional Infrastructures in Financial Inclusion-Growth Relations:  
Evidence from SSA**

**Kazeem B. Ajide, Ibrahim D. Raheem, Olorunfemi Y. Alimi & Simplice A. Asongu**

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**Abstract**

This paper investigates the role of institutional infrastructures in the financial inclusion-growth nexus for a panel of twenty countries in sub-Sahara Africa (SSA). Employing the System Generalized Method of Moments (GMM), the following insightful outcomes are established. First, while there is an unrestricted positive impact of physical access to ATMs and ICT measures of financial inclusion on SSA's growth but only the former was found significant. Second, the four institutional components via economic, political, institutional and general governances were also found to be growth-spurring. Lastly, countries with low levels of real per capita income are matching up with other countries with high levels of real income per capita. The empirical evidence of some negative net effects and insignificant marginal impacts are indication that imperfections in the financial markets are sometimes employed to the disadvantage of the poor. On the whole, we established positive effects on growth for the most part. The positive effects are evident because the governance indicators compliment financial inclusion in reducing pecuniary constraints hindering credit access and allocation to the poor that deteriorate growth.

**Keywords:** Financial Inclusion; Economic Growth; Governance; System Generalized Method of Moments (GMM)

**JEL Classification:** G20; I10; O40; P37

## 1.0 Introduction

The importance of finance as a driver of growth and other development-related prospects has been well articulated and documented in the economic literature (see Levine, 1997, 2005; Wachtel, 2001; Odhiambo, 2009; Pasali, 2013; Asongu, 2015 and Tchamyou and Asongu 2017 for detailed expositions). The mechanics as well as the channels through which the beneficial impacts of finance on growth are transmitted have crafted a new and emerging strand of literature on the one hand, and have continued to be subjected to further empirical scrutiny on the other hand. To date, the issue has and continue to witness torrents of empirical assessments culminating into unending controversies<sup>2</sup>. Nonetheless, the empirical regularity between causality running from finance and growth appears to predominate. Undeniably, the pathways towards achieving the positive impact of finance on growth are multidimensional in nature<sup>3</sup>. More recently, an emerging pathway has been likened to the concept of financial inclusion (FI). It is thus conceived as the process that ensures the ease of access, availability, and usage of the formal financial system for all members of an economy. Thus, on a positive note, it has been considered as an effective tool that helps reduce poverty, lowers income inequality and promote economic growth (See Burgess and Pande, 2005; Levine, 2005; Tchamyou, 2019, 2020; Asongu and Nwachukwu, 2018; Asongu and Odhiambo, 2019). It has further been conceived as having important implications for monetary and financial stability and that it aids in smoothing consumption and investment behaviour (Claessens, 2006; Mehrotra and Yetman, 2015; Smith, Scott and Shepherd, 2015). By and large, the accumulating body of evidence supports policy makers' assessments that developing inclusive financial systems is an important component for economic and social progress in the post-2015 sustainable development agenda (UNCTAD, Policy Brief, 2015; Ezazul, 2015). The crucial question remains: to what extent can we hold on to these claims?

Foregoing aside, the performance of most countries in Africa in general and sub-Saharan African in particular (with respect to inclusive financing) still leaves so much to be desired. This is typified by the low number of bank branches and automated teller machines (ATMs) (Beck,

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<sup>2</sup> Four different positions can be distilled thus far from various outcomes on the finance-growth nexus namely: financial-led growth hypothesis (supply leading Hypothesis); growth-led finance hypothesis (demand following hypothesis); demand and supply hypothesis (mutually causal) and mutually independent hypothesis.

<sup>3</sup> Among the pathways include issues of (efficiency, reliability, convenience, ease of getting access to funds, and technology and innovation) of financial development.

Demirguc-Kunt, and Martinez Peria, 2007; Asongu & Asongu, 2018)<sup>4</sup>, and also by very low figures of financial inclusion. According to FinMark (2009), most of the population in African countries rely on informal finance or is financially excluded (e.g. 88 percent of the population in Mozambique and 41 percent in Botswana in 2009). Andrianaivo and Kpodar (2011) further submitted that bank penetration is lower than 10 percent in some regions of Africa. The foregoing stylized accounts are suggestive of some missing links; of which is an institutional infrastructure gap. Arguably though, both theory and empirics have lent credence to the useful role of institutions in the financial intermediation. For instance, on the one hand, the theoretical analysis of economic growth and development has increasingly focused on the role of institutions. As Chang (2011) notes, “*from the late 1990s ....institutions have moved to the centre stage in the debate on economic development*” (Chang 2011 p. 473) and “*getting institutions right*” (Rodrik 2008a p. 100) has increasingly been emphasized in policy. Financial sector development policies have themselves been centrally influenced by this institutional focus with particular emphasis on the effectiveness of legal and regulatory frameworks as well as the wider institutional environments needed for financial sector development to support economic growth (Goodwin-Groen, 2012). The empirics on the other hand, also indicate that the positive growth impact from financial intermediation does not hold in economies with weak institutional frameworks (Demetriades and Law 2006), such as poor or non-existent financial regulation, or in extremely high-inflation environments (Rousseau and Wachtel 2002). Much of the evidence suggests that the main drivers of financial market depth are the policy and institutional environments in which these markets operate. Thus, achieving deep and efficient financial markets will likely be difficult in the absence of corresponding policies that promote economic stability and stimulate investor confidence. In this light, the present study seeks to examine if institutional infrastructure intermediates in FI-economic growth relations for a panel of countries within the sub-Saharan Africa (SSA) region.

The study’s contributions are therefore erected on the following standpoints: First, since the region is known to be plagued by institutional problems, the nexus between FI and economic growth is examined within the context of three broad governance dimensions. These are institutional, economic and political components. Second, for robustness purposes, the study

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<sup>4</sup> The average number of bank branches in sub-Saharan Africa was less than 700 in 2007, and the average number of ATMs was less than 1000.

employs five alternative measures of financial inclusion namely: Automatic Tellers' Machine (ATMs) per 1000 km<sup>2</sup>, Automatic Tellers' Machine (ATMs) per 100,000 adults, Automatic Tellers' Machine (ATMs) per 100,000 bank branches, mobile per households and subscription per households. Third, due to endogeneity issues and omitted variables' biases, a Dynamic System of Generalized Method of Moments is adopted.

As a foretaste and relying on dataset for 20 countries, the following results were obtained: (i) all the proxies of FI were found to be positive and significant determinants of growth; (ii) the three aggregated indices of governance confirm the strand of the literature which has conceived institutions as a propeller and enhancer of economic growth; and (iii) curiously, the interaction between proxies for institutions and FI constitute a growth drag to the region.

The rest of this paper is structured as follows: some stylised facts about FI and macroeconomic indicators are presented in the second section, while a brief exposition on empirical reviews are chronicled in the third section. In section four, model specification, data and methodological related issues are discussed. In section five, result interpretations were discussed, while section six wraps up the study with concluding remarks, and policy recommendations

## **2.0 Financial Inclusion and Macroeconomic Environment: Some Stylized Facts**

The section dwells on various measures of financial inclusion alongside the wider macroeconomic environment for a panel of countries in the sub-Saharan Africa (SSA) region. More importantly, the institutional environment under which all these activities are conducted is also portrayed.

Table 1 below, presents the banking sector outreach particularly Automatic Teller Machines (ATM) per 1,000km<sup>2</sup> which are shown to vary across the countries. Interestingly, Namibia stands tall among her peers in the ranking with 519.71 and is distantly seconded by Mauritius with 171.36 ATMs per square kilometres, while the countries which circumstance unavoidably destined to be at the bottom include Chad, the Central Africa Republic, Ethiopia and the Congo Democratic Republic with 0.01, 0.01, 0.04 and 0.07, respectively.

For another measure like the number of ATMs per 100,000 adults, is found to be lowest for Ethiopia, Burundi and Chad while countries such as South Africa, Mauritius and Cape Verde are

at the top of the ratings. A different picture however emerges through the adoption of bank accounts per 1000 adults for SSA countries. Of the countries under investigation, Cape Verde takes a lead with over 1000 bank accounts per a thousand adults while Swaziland and Botswana competing favourably for second and third positions in the precincts of 436.87 and 395.88 bank accounts, in that order. Apart from these front-runners, countries like Nigeria, Zimbabwe, Ghana, Kenya, Lesotho and Namibia also have also maintained over 200 bank accounts for the seven-year average. However, the least with respect to this measure are for countries like Chad, Burundi and Zambia in that order. In terms of bank branches per 100,000 adults, topmost on the list are Cape Verde and Mauritius with 23.16 and 19.09 and with Botswana, South Africa, Swaziland, Nigeria and Namibia maintaining over 5 bank branches per 100,000 adults. The least positions appear to be destined for countries like the Central Africa Republic, Chad and Comoros with less than one bank branch per 100,000 adults.

Apart from the banking sector outreach indicators, information and communication technology (ICT) has equally been acknowledged as vital means of promoting financial inclusion in the financial development literature. The promotion of ICT has been largely informed by the fact that Africa in general has remained challenged by a financial infrastructural gap (see Andrianaivo and Kpodar, 2011). This is underscored by the very low numbers of bank branches and automated teller machines (Beck, Demirguc-Kunt, and Martinez, 2007) and also by very low figures of financial inclusion. In specific terms, statistics have it that while the average number of bank branches in SSA was less 700 in 2007, on the one hand, that of the average number of ATMs was less a thousand on the other hand (see Andrianaivo and Kpodar, 2011).

Thus, looking at the mobile cellular subscriptions per 100 people, the averaged value between 2004 and 2010 is highest for South Africa with 79.89 and this is directly followed by Gabon with 74.38 having some marginal advantages over Mauritius with 72.70. It is interesting to note however that except for Burundi and Ethiopia with single digit figures of 2.62 and 6.16, all other countries in the region have double digit figures. Unlike the mobile cellular, the outlook of telephone lines per 100 people is generally poor as can be observed in the table. What this simply suggests is that the telephone far outlives its usefulness as ICT is currently witnessing some important transitions from telephone to mobile. Despite the relative paradigm shifts in ICT, Mauritius remains a forerunner in this respect with a value equalling to 29.93 with Cape Verde, South Africa, Botswana and Namibia having 14.88, 9.86, 7.12 and 6.79 in that order. Apart from

countries like Cameroun, Comoros, Gabon, Ghana, Kenya, Swaziland, Togo and Zimbabwe with negligible single digit values, the remaining countries on queue fall below the line of one.

**Table1:** Indicators of Financial Inclusion (2004-2013)

<b>Sub-Saharan Africa</b>	<b>ATMs per 1,000 km2</b>	<b>ATMs per 100,000 adults</b>	<b>Bank accounts per 1,000 adults</b>	<b>Bank branches per 100,000 adults</b>	<b>Mobile Cellular Subscriptions (per 100 people)</b>	<b>Telephone Lines (per 100 people)</b>	<b>Fixed Broad Band Internet Subscribers (per 100 people)</b>
Angola	0.46	5.99	n/a	4.92	26.88	0.85	0.06
Botswana	0.53	23.52	395.88	7.50	64.95	7.12	0.28
Burundi	0.27	0.14	17.29	1.74	6.16	0.36	0.00
Cameroun	0.23	0.83	44.90	1.23	24.97	1.27	0.01
Cape verde	21.20	31.79	1112.03	23.16	39.77	14.88	1.21
Central Africa Republic	0.01	0.36	32.92	0.50	10.21	0.15	0.00
Chad	0.01	0.18	10.81	0.46	10.79	0.30	0.00
Comoros	2.38	1.09	57.29	0.89	10.93	3.54	0.01
Congo	0.07	1.05	38.70	1.32	11.41	0.04	0.00
Democratic Ethiopia	0.04	0.08	82.19	1.09	2.62	0.95	0.00
Gabon	0.25	6.64	119.88	4.17	74.38	2.39	0.15
Ghana	2.46	3.83	231.14	4.17	37.82	1.31	0.08
Kenya	1.84	4.73	254.85	3.55	31.71	1.14	0.02
Lesotho	2.00	4.66	244.76	2.31	25.54	2.23	0.01
Liberia	0.31	1.38	n/a	2.02	17.64	0.08	0.00
Madagascar	0.18	1.00	25.57	1.34	16.17	0.66	0.01
Mauritius	171.36	36.08	n/a	19.09	72.70	29.93	3.11
Mozambique	0.56	3.58	n/a	2.40	15.77	0.35	0.03
Namibia	519.71	27.70	243.76	7.18	45.71	6.79	0.07
Nigeria	6.00	6.24	377.85	5.19	30.62	0.91	0.03
Rwanda	1.13	0.47	101.33	2.43	11.75	0.26	0.02
Sierra Leone	0.18	0.39	101.58	1.91	21.97	0.51	0.00
South Africa	10.55	38.08	n/a	7.55	79.89	9.86	0.74
Swaziland	6.02	16.71	436.87	6.38	35.81	4.02	0.05
Tanzania	0.51	1.89	n/a	1.51	23.47	0.38	0.00
Togo	1.91	n/a	112.46	2.65	21.37	1.67	0.02
Uganda	1.79	2.23	129.43	1.64	17.49	0.52	0.01
Zambia	0.32	3.57	22.00	3.43	21.76	0.79	0.04
Zimbabwe	1.34	6.87	302.55	3.73	18.22	2.72	0.14

Source: Authors' computation with underlying data from World Development Indicators (2015)



Lastly, the fixed broadband subscribers per 100 people leave so much to be desired. Going by the inclusive financing records, Mauritius still remains topmost on the list of countries in the region with 3.11 fixed broad band subscribers per 100 people while Cape Verde lies at the bottom chart with 1.21. Generally, all other countries apart from the two previously mentioned countries are in a bad shape with respect to fixed broadband subscriptions.

The storyline will assume perfection and plausibly meet a logical conclusion with the appreciation of the macroeconomic environment within which each country in the region operates. A critical exploit around macroeconomic environment reveals an illuminating picture of each of macro-indicator performances. In Table 2, looking at the measure of economic performance, we observe the highest per capita RGDP goes to Gabon with the seven year averaged value of \$6232.5 while countries like Botswana, Mauritius and South Africa with over \$5000 directly followed in that order. The lists of countries that are fared poorly include Burundi, Ethiopia, Liberia and Madagascar with per capita RGDP of \$148.1, 189.2, 195.5 and 282.5, respectively. In terms of credit extension to the private sector in the region, the first position is credited to South Africa with over 150 of ratio of credit to private sector to GDP while the second position is closely maintained by Mauritius with 78.6 at least over the coverage period. The worst positions are claimed by Chad, the Central Africa Republic, Congo Democratic, Gabon and Sierra Leone with single digit figures. In terms of macroeconomic stability, Zimbabwe is the most unstable at the macroeconomic level in the region with a well over 250% rate of inflation. The least rate of inflation goes to both Gabon with 2.3 while Cameroun and Cape Verde maintaining a tie with 2.6 each. In terms of the ratio of government expenditure to GDP, Lesotho average value is the highest (36.8) while the lowest is attracted to Zambia with 2.8. Cape Verde ranks highest with respect to gross capital formation as a ratio of GDP while Zimbabwe and Nigeria operate at the lowest bottom of the ladder with 8.4 and 9.7, respectively. It is noteworthy also that the average of labour participation rate is claimed by Tanzania with slightly over 90%, whereas the average of Nigeria stands at 55.2 % for the seven year period. Finally, the degree of openness seems to have favoured Lesotho with a slightly over 170 while Swaziland occupies a second place with 148.9 and the lowest is claimed by Central Africa Republic.

**Table 2:** Seven-Year Average (2004-2013) of Some Selected Macroeconomic Aggregates

	<b>Per Capita Real GDP in Dollars</b>	<b>Domestic credit to private sector (% of GDP)</b>	<b>Inflation</b>	<b>Government Expenditure as a % GDP</b>	<b>Gross Fixed Capital Formation as % of GDP</b>	<b>Labour Force Participation Rate</b>	<b>Trade Openness (Trade to GDP)</b>
Angola	2185.5	12.0	19.0	18.0	13.2	70.8	121.0
Botswana	5844.6	23.6	8.8	19.2	31.9	78.2	89.5
Burundi	148.1	25.7	10.6	25.2	22.7	83.3	44.9
Cameroun	921.9	10.6	2.6	10.5	18.3	70.3	43.3
Cape Verde	2362.0	46.7	2.6	17.7	47.4	69.5	96.3
Central Africa Republic	349.5	7.2	3.2	9.0	10.5	78.8	34.3
Chad	493.4	3.1	2.8	5.7	25.2	71.9	86.6
Comoros	623.1	11.9	3.5	14.6	13.6	57.2	58.1
Congo Democratic	1753.3	3.5	4.6	8.8	14.2	72.5	66.6
Ethiopia	189.2	20.7	15.2	13.8	30.7	86.0	45.6
Gabon	6232.5	9.6	2.3	5.0	25.1	61.1	91.3
Ghana	543.9	14.4	13.7	11.9	24.0	70.1	77.9
Kenya	547.1	28.5	12.2	15.6	19.1	66.2	56.5
Lesotho	773.0	10.3	6.3	36.8	25.4	68.2	170.1
Liberia	195.5	10.2	9.9	13.4	21.5	61.6	127.6
Madagascar	282.5	10.6	11.5	9.5	27.7	89.0	76.7
Mauritius	5536.7	78.6	6.1	13.8	24.7	63.4	119.3
Mozambique	338.5	16.8	9.6	14.8	17.0	85.3	72.8
Namibia	3835.5	48.5	6.0	22.0	23.6	63.7	101.6
Nigeria	867.0	23.1	11.9	9.1	9.7	55.2	56.8
Rwanda	306.0	11.0	9.6	15.3	19.6	86.7	38.0
Sierra Leone	340.8	5.2	13.1	10.0	13.1	67.9	44.0
South Africa	5539.3	151.6	5.6	19.8	19.8	57.0	60.4
Swaziland	2400.1	21.8	6.6	14.4	12.8	57.7	148.9
Tanzania	405.3	13.5	7.5	17.5	28.0	90.7	58.4
Togo	386.7	18.9	3.5	10.4	16.6	81.6	93.7
Uganda	350.7	11.4	7.8	12.3	22.0	79.0	47.6
Zambia	670.4	10.8	12.9	2.8	29.9	80.0	62.9
Zimbabwe	412.7	16.9	292.2	10.2	8.4	87.4	84.9

Source: Authors' computation with underlying data from World Development Indicators (2015)

**Table3:** Seven-Year Average (2004-2013) Of Governance Index

	Voice and Accoun- tability	Political Stability	Government Effectiveness	Regulatory quality	Rule of Law	Control of Corruption	Average Governance
Angola	-1.18	-0.59	-1.18	-1.12	-1.36	-1.31	-1.12
Botswana	0.52	0.97	0.56	0.53	0.63	0.97	0.69
Burundi	-0.83	-1.61	-1.16	-1.21	-1.18	-1.03	-1.17
Cameroun	-1.05	-0.42	-0.83	-0.78	-1.13	-1.01	-0.87
Cape verde	0.78	0.89	0.03	-0.16	0.45	0.63	0.44
Central Africa Republic	-1.07	-1.75	-1.46	-1.22	-1.45	-1.03	-1.33
Chad	-1.37	-1.68	-1.42	-1.07	-1.48	-1.35	-1.39
Comoros	-0.45	-0.60	-1.71	-1.49	-1.05	-0.75	-1.01
Congo	-1.45	-2.18	-1.65	-1.46	-1.61	-1.37	-1.62
Democratic Ethiopia	-1.22	-1.62	-0.55	-0.94	-0.73	-0.69	-0.96
Gabon	-0.90	0.26	-0.81	-0.51	-0.58	-0.86	-0.57
Ghana	0.37	0.03	-0.03	-0.06	-0.08	-0.07	0.03
Kenya	-0.23	-1.25	-0.57	-0.19	-0.95	-0.94	-0.69
Lesotho	-0.08	0.07	-0.33	-0.64	-0.24	0.00	-0.21
Liberia	-0.39	-1.16	-1.32	-1.37	-1.18	-0.70	-1.02
Madagascar	-0.35	-0.28	-0.60	-0.33	-0.48	-0.12	-0.36
Mauritius	0.85	0.81	0.72	0.64	0.94	0.50	0.74
Mozambique	-0.07	0.31	-0.53	-0.49	-0.59	-0.51	-0.31
Namibia	0.40	0.85	0.12	0.12	0.14	0.27	0.31
Nigeria	-0.78	-1.92	-1.02	-0.87	-1.19	-1.04	-1.14
Rwanda	-1.25	-0.59	-0.33	-0.55	-0.61	-0.09	-0.57
Sierra Leone	-0.30	-0.27	-1.20	-0.97	-1.04	-0.94	-0.79
South Africa	0.61	-0.02	0.53	0.55	0.10	0.30	0.35
Swaziland	-1.28	-0.10	-0.83	-0.61	-0.70	2.11	-0.24
Tanzania	-0.22	-0.29	-0.45	-0.43	-0.39	-0.46	-0.37
Togo	-1.15	-0.47	-1.49	-0.86	-0.95	-0.95	-0.98
Uganda	-0.51	-1.11	-0.50	-0.16	-0.44	-0.82	-0.59
Zambia	-0.29	0.34	-0.80	-0.54	-0.53	-0.62	-0.41
Zimbabwe	-1.55	-1.14	-1.33	-2.09	-1.78	-1.31	-1.54

Source: Authors' computation with underlying data from World Development Indicators (2015)

Generally speaking, virtually all the selected African countries are performing defectively in terms of governance indicators. This simply suggests that African institutional infrastructures are in deplorable conditions. On a dimension-by-dimension basis, Mauritius takes a lead in voice and accountability, government effectiveness, regulatory quality and rule of law with 0.85, 0.72, 0.64 and 0.94 respectively. While Zimbabwe lags behind specifically with respect to governance dimensions like voice and accountability, regulatory quality and rule of law. Toeing the same

line of backwardness, are countries like the Congo Democratic Republic and Nigeria whose dimensions of governance totally submerged in negative values ranging from -1.65, -1.37 and -1.92 in government effectiveness, control of corruption and political stability.

## **4.0 Data and Methodology**

### **4.1 Data**

This study used a sample of twenty (20) sub-Saharan Africa countries<sup>5</sup> over the period spanning 2004 to 2013 to investigate the role of institutional infrastructure in financial inclusion-economic growth relations. The countries selection as well as the coverage period is largely influenced by data availability consideration. In accordance with theory and previous studies like Beck *et al.* (2007), Honohan (2008), Sarma (2008), Ghosh (2011), Sarma and Pais (2011), and Inoue and Hamori (2013), financial inclusion (FI) has been conceived as all initiatives that make formal financial services available, accessible and affordable to all segments of the population. Hence, the paper utilizes three accessible measures for capturing financial inclusion. They are namely: Automatic Teller Machines (ATMs) per 100,000 adults<sup>6</sup>; Bank Branches per 100,000 adults<sup>7</sup> and ATMs per 1000km<sup>8</sup>. The usage of this measure is largely influenced by the data availability considerations. The corollary lies in the submission of Alliance for Financial Inclusion (AFI) that data on the level of service provision is more easily obtained than usage and quality data. In Africa, many countries are now at the level of collecting mostly access and some usage data. Apart from these measures, the study also employs information and communication technology measures namely: Mobile Cellular Subscription per 100 people as well as Telephone Lines per 100 people. The dependent variable is economic growth measured by real gross domestic product (GDP) per capita which indicates the average income per person in a country.

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<sup>5</sup>The selected countries are: Angola, Botswana, Burundi, Cameroun, Chad, Comoros, Ethiopia, Gabon, Kenya, Lesotho, Madagascar, Mauritius, Mozambique, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda and Zambia.

<sup>6</sup> Captures demographic penetration; this measure proxies physical outreach dimension

<sup>7</sup>Same as ATM per capita.

<sup>8</sup> Captures geographic penetration; this measure proxies physical outreach dimension.

Further, on institution data, the World Bank definition of institution developed by Kaufmann, Kraay and Mastruzzi (2010) comprises six indices<sup>9</sup>, which are: Voice and Accountability (VA), Regulatory Quality (RQ), Rule of Law (RL), Control of Corruption (CC), Government Effectiveness (GE) and Political Stability (PS). Each of these indices ranges from -2.5 to 2.5, with both extremes representing the worst and best institutional quality in that order. The six aggregate indicators are based on 30 underlying data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide. More inventively, the study further decomposes institutional variables into three major contexts<sup>10</sup>. First, we investigate how political governance (comprises of voice and accountability and political stability) affects FI-growth relations; that is, the process by which those in authority are selected and replaced could influence financial inclusion-growth relations. Second, we investigate how FI-growth nexus is modulated by economic governance (made up of regulatory quality and government effectiveness). Hence, this second dimension is concerned with how FI-growth relations are influenced by the capacity of governments to formulate and implement policies, as well as deliver public services. Third, the study also examines how institutional governance (consisting of the rule of law and corruption control) influences the effect of FI on economic prosperity. Institutional governance within this context is defined as the respect of citizens and state for institutions that govern interactions among them. The decomposition is considered crucial on two main counts: first, it will enable a particular governance dimension to be pin pointed rather than committing a fallacy of generalization. Second, it will assist in formulating a specific policy intervention rather than embarking and taking a general policy stance.

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<sup>9</sup> Each is conceptualized by Kaufmann et al., (2010) as follows: **Control of Corruption**(CC) captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. **Political Stability and Absence of Violence**(PS) measures the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism. **Government Effectiveness**(GE) captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. **Regulatory Quality**(RQ) captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. **Rule of Law**(RL) captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. **Voice and Accountability** (VA) captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media

<sup>10</sup> A cue is taken from Ajide and Raheem (2016).

The adopted control variables that also drive growth are inflation rate measured by growth rate of consumer price index indicating macroeconomic performance, government consumption, investment, labour force participation and trade openness. The sources of our data are from the World Bank's World Development Indicators (WDI), World Governance Indicators (WGI) and World Bank's Financial Structure Dataset (Cihak, 2012b). The details of our variables are presented in Appendix 1. The summary statistics and correlation matrix are presented in Table 4 and 5.

**Table 4: Summary Statistics**

<b>Variables</b>	<b>Mean</b>	<b>S.D.</b>	<b>Minimum</b>	<b>Maximum</b>
ATMs per 1000 Km <sup>2</sup>	11.186	38.549	0.0032	196.552
ATMs per 100,000 Adults	9.0886	13.180	0.0194	58.9933
Bank Branches per 100,000 Adults	4.2507	4.5261	0.3582	22.2358
Mobile Cellular Subscription per 100 people	40.822	36.419	0.2100	164.217
Telephone Lines per 100 people	3.3534	6.5551	0.0061	31.5034
GDP per capita (\$)	2408.7	2853.5	205.07	10359.5
Inflation	8.3404	6.5979	-8.9747	44.3913
Government Consumption	15.712	6.8997	4.1574	39.6450
Investment	21.721	7.0411	5.4590	40.3178
Labour Force Participation Rates	70.482	12.555	47.763	89.6400
Trade Openness	75.803	34.014	31.049	186.152
Regulatory quality	-5.4364	0.6113	-1.6837	0.9906
Government effectiveness	-0.6412	0.6631	-1.7755	0.9817
<b>Economic governance</b>	-0.5924	0.6256	-1.6609	0.9862
Voice and accountability	-0.5706	0.6863	-1.6971	0.9287
Political stability	-0.5700	0.9133	-2.5239	1.1040
<b>Political Governance</b>	-0.5703	0.7279	-2.0425	0.9367
Rule of law	-0.6393	0.6523	-1.7154	1.0292
Control of corruption	-0.5820	0.6580	-1.5252	1.1599
<b>Institutional Governance</b>	-0.6107	0.6381	-1.5848	0.8999
<b>Overall Average Governance</b>	-0.5911	0.6290	-1.7185	0.8505

**Note:** S.D. is standard deviation

From the table, the different measures of financial inclusion used are: ATMs per 1000 kilometre squares, ATMs per 100,000 adults, bank branches per 100,000 adults, mobile cellular subscription per 100 people and telephone lines per 100 people. Thus, for ATMs per 1000km<sup>2</sup>, it has the mean value of 11.19 with the maximum and minimum values of 196.55(for Mauritius in 2010) and 0.003 (for Chad from 2004 through 2007). The ATMs per 100,000 adults averaged 9.089 with a maximum value being 58.99 credited to South Africa in 2013 and a minimum value of 0.019 goes to Ethiopia in 2005. In terms of bank branches per 100,000 adults, the average

value stands at 4.251 while the Mauritius and Chad claimed the maximum and minimum values of 22.236 and 0.358 in 2013 and 2007. Gabon and Ethiopia obtained the extreme values of 164.217 and 0.21 in 2013 and 2004 with respect to mobile cellular subscription per 100 people, while Mauritius and the Democratic Republic Congo seat on top of 31.50 (being maximum) and 0.006 (being minimum) in 2010 and 2007. The variations of the financial inclusion measures are high as the standard deviation values are greater than their respective mean values. Of the measures, the dispersion from the mean for ATMs per 1000 Km<sup>2</sup> seemed to be the highest.

Also, the average value of per capita GDP is \$2,408.7 with maximum and minimum values standing at \$10,359.5 and \$205.07 for both Gabon and Burundi in 2010 and 2005, respectively. Aside this, it is important to mention that the average values of the three governance components are almost standing at par with one another albeit they all carry negative values. It is also instructive to state that Mauritius has the maximum of 0.9862 and 0.9367 in both economic and political governance components in 2012 and 2013 correspondingly while the least goes to Democratic Republic Congo in 2010 and 2004 with -1.6609 and -2.0425 respectively. Also, Mauritius and Democratic Republic Congo have 0.8505 and -1.7185 in 2012 and 2004 being the highest and lowest value in terms of distribution. The Democratic Republic Congo still has the least institutional governance with -1.5848 while Botswana (0.8999) has the highest. Given the negative mean values, it would not amount to overstatement that the distribution remains a pointer attesting to the poor and worsening conditions of institutional infrastructures in the sub-region. Furthermore, the inflation which measures macroeconomic instability averaged a single-digit rate of 8.3404 for all the sampled SSA countries but with extreme rates of -8.97 (Chad in 2007) and 44.39 (Ethiopia in 2008) standing far wide apart.

The correlation coefficients were presented in order to reveal if there will be chances of having the problems of multicollinearity and over-parameterization in the study. There is high level of association between our governance indicators, likewise financial inclusion which indicates that they have to be substituted in our empirical analysis with different model specification. The financial inclusion variables are further bundle into two composite series using the principal component analysis (PCA) in order to avert issues of conceptual conflation and multicollinearity. Accordingly, using the PCA serves twin purposes.(a) It avoids the problems of potential multicollinearity which often emanates when including more than one proxy in a given equation.(b) It allows much information to be extracted in all the indicators. The financial

inclusion series have positive relationship with both institution and growth. It implies that institutions have an important role to play in ensuring every individual/group benefits from all forms of financial services to achieve sustainable growth. This is just preliminary analysis that requires confirmation in section four as we include other factor determinants of growth. The net effects are also reported in the section.



**Table 5: Correlation Matrix**

	Financial Inclusion					Income	Control Variables					Institutional Quality								
	Physical Access			ICT Access								Economic Gov.			Political Gov.			Institutional Gov.		
	ATM1	ATM2	ATM3	ICT1	ICT2		PCGDP	INF	GOVCON	CAP	LP	OPEN	RQ	GE	EGOV	VA	PS	PGOV	RL	CC
ATM1	1																			
ATM2	0.585	1																		
ATM3	0.840	0.827	1																	
ICT1	0.338	0.736	0.661	1																
ICT2	0.935	0.749	0.883	0.464	1															
PCGDP	0.443	0.752	0.727	0.774	0.608	1														
INF	-0.106	-0.150	-0.108	-0.240	-0.161	-0.227	1													
GOVCON	-0.055	0.162	0.074	0.111	0.033	0.054	-0.016	1												
CAP	0.024	0.038	0.038	0.237	0.055	0.081	-0.051	0.176	1											
LP	-0.271	-0.513	-0.455	-0.458	-0.377	-0.620	0.249	-0.049	0.369	1										
OPEN	0.268	0.281	0.353	0.254	0.325	0.338	-0.085	0.509	0.098	-0.369	1									
RQ	0.511	0.725	0.686	0.587	0.645	0.592	-0.130	0.118	0.308	-0.106	0.166	1								
GE	0.517	0.706	0.673	0.506	0.653	0.536	-0.047	0.245	0.342	-0.030	0.182	0.928	1							
EGOV	0.524	0.729	0.692	0.555	0.661	0.573	-0.089	0.188	0.332	-0.068	0.178	0.980	0.983	1						
VA	0.498	0.655	0.579	0.459	0.642	0.443	-0.124	0.338	0.178	-0.154	0.231	0.770	0.735	0.766	1					
PS	0.364	0.531	0.538	0.522	0.518	0.591	-0.262	0.348	0.256	-0.150	0.472	0.671	0.673	0.684	0.650	1				
PGOV	0.463	0.642	0.610	0.544	0.628	0.580	-0.223	0.378	0.245	-0.166	0.405	0.784	0.769	0.791	0.879	0.934	1			
RL	0.573	0.699	0.694	0.544	0.721	0.578	-0.132	0.287	0.383	-0.092	0.291	0.891	0.924	0.925	0.813	0.781	0.873	1		
CCP	0.367	0.591	0.526	0.428	0.551	0.434	-0.120	0.366	0.339	-0.031	0.319	0.782	0.852	0.833	0.683	0.741	0.787	0.897	1	
IGOV	0.482	0.662	0.626	0.499	0.653	0.519	-0.130	0.336	0.371	-0.063	0.313	0.859	0.911	0.902	0.768	0.782	0.852	0.974	0.974	1
OGOV	0.515	0.713	0.676	0.563	0.682	0.589	-0.159	0.322	0.330	-0.108	0.321	0.918	0.931	0.942	0.853	0.851	0.936	0.973	0.909	0.966

**Note:** ATM1– automated teller machine per 1,000 km<sup>2</sup>; ATM2– automated teller machine per 100,000 Adult; ATM3– bank branches per 100,000 Adults; ICT– mobile cellular subscription per 100 people; ICT2– telephone lines per 100 people; PCGDP- per capita income; GOVCON- government consumption; CAP- capital; LP- labour force participation; OPEN- trade openness; RQ- regulatory governance; GE- government effectiveness; EGOV- economic governance; VA- voice and accountability; PS- political stability; PGOV- political governance; RL- rule of law; CC- control of corruption; IGOV- institutional governance; OGOV- overall governance index and Gov.- governance.

## 4.2 Construction of Financial Inclusion Indices using Principal Component Analysis

The principal component analysis (PCA) is used to construct composite financial inclusion indices tagged FINC1 and FINC2. The former comprises of ATMs per 1000km<sup>2</sup> (ATM1), ATMs per 100,000 adults (ATM2) and Bank Branches per 100,000 adults (ATM3) while the latter embodies both mobile cellular subscription per 100 people (ICT1) and telephone lines per 100 people respectively (ICT2) (Table 4). This method is used to reduce high correlated series into small units of uncorrelated identified as “Principal Components” while retaining the original information in the datasets. It has the potentials of avoiding high correlation among the different measures of financial inclusion. According to Sricharoen and Buchenrieder (2005: p.2), “PCA is an indicator reduction procedure to analyze observed variables that would result in a relatively small number of interpretable components (group of variables), which account for most of the variance in a set of observed variables”.

**Table 6:** Principal Component Analysis (PCA) for financial inclusion

Principal Components	Component Matrix					Proportion	Cumulative Proportion	Eigen Value
	ATM1	ATM2	ATM3	ICT1	ICT2			
1st PC (FINC1)	0.5589	-0.6962	0.4505	-	-	0.8358	0.8358	2.5075
2nd PC	0.5551	0.7177	0.4205	-	-	0.1383	0.9741	0.4149
3rd PC	0.6161	-0.0150	-0.7875	-	-	0.0259	1.0000	0.0776
1st PC (FINC2)	-	-	-	0.7071	0.7071	0.7318	0.7318	1.4636
2nd PC	-	-	-	0.7071	-0.7071	0.2682	1.0000	0.5364

**Note:** PC– Principal component; ATM1– automated teller machine per 1,000 km<sup>2</sup>; ATM2– automated teller machine per 100,000 Adult; ATM3– bank branches per 100,000 Adults; ICT– mobile cellular subscription per 100 people; ICT2– telephone lines per 100 people. FINC1 (physical access measure of financial inclusion)– First PC of ATM1, ATM2 & ATM3. FINC2 (ICT measure of financial inclusion)– First PC of ICT1 & ICT2.

The eigenvalues are calculated for each component using the criterion of Kaiser (1974) and Jolliffe (2002) to retain common factors. The size of an eigenvalue is greater than one, which indicates that the amount of variance in the principal component explained by each component should be retained. The results are reported in Table 6. The first index created from the first three principal components of physical access to banking services explains about 83.6% of the total variance in the original data with an eigenvalue of 2.5075. The second index created from the first two measures of information and communication technology (ICT) explains about 73.2% (eigenvalue of 1.4636) of the total variance in the data.

### 4.3 Model Specification and Estimation Strategy

Following Barro (1991), we specify the relationship between financial inclusion and economic growth using a standard endogenous growth model as follows:

$$y_{i,t} = \phi_0 + \phi_1 y_{i,t-1} + \phi_2 FINC_{i,t} + \sum_{h=1}^5 \theta_h X_{h,i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

This is a dynamic panel data model, with temporal and individual dimensions and a lagged variable. The variable  $y_{i,t}$  is the logarithm of real GDP per capita,  $FINC$  is a wide range of financial inclusion variables (including both physical access to banking services and information and communication services),  $X_{i,t}$  is a set of growth determinants other than lagged per capita GDP,  $\phi_0, \phi_1, \phi_2, \theta_h$  are parameters,  $\eta_i$  is an unobserved country-specific effect,  $\varepsilon_{i,t}$  is the error term, and  $i$  and  $t$  represent country and time period respectively. The following set of growth determining variables is considered: inflation, government consumption, investment, labour force participation rate and degree of openness. To test whether institutions is one of the channels through which financial inclusion impact on growth, the initial model specified in Equation (1) is retained and an institutional variable is added to the growth equation. The institutional variable is captured via three governance dimensions namely economic, political and institution governances. If the coefficient weakens, it can then be concluded that part of the beneficial impact of financial inclusion on growth is routed through institutions. We include institution and also its interaction with financial inclusion into Equation (1), and the model is re-stated as:

$$y_{i,t} = \phi_0 + \phi_1 y_{i,t-1} + \phi_2 FINC_{i,t} + \phi_3 GOV_{i,t} + \phi_4 (FINC \times GOV)_{i,t} + \sum_{h=1}^5 \theta_h X_{h,i,t} + \eta_i + \varepsilon_{i,t}, \quad (2)$$

where,  $INST$  is governance quality measures (economic, political and institutional governance);  $FINC \times GOV$  is the interaction between financial inclusion and governance measures;  $\phi_0, \phi_1, \phi_2, \phi_3, \phi_4, \theta_h$  are parameters;  $\eta_i$  is an unobserved country-specific effect,  $\varepsilon_{i,t}$  is the error term, and  $i$  and  $t$  represent country and time period respectively.

However, the covariates may not be strictly exogenous. By implication, they can be predetermined or endogenous. They are said to be predetermined when correlated with past observation-specific disturbances, while being endogenous when correlated with both past and current observation-specific disturbances. These problems can be circumvented using System

GMM estimator developed by Blundell and Bond (1998) and Henceforth, referred to as BB estimator. This study employs Blundell and Bond (1998) estimator because it performs better than Arellano and Bond's estimator when the autoregressive coefficient is relatively high, the number of periods is small. It has the ability to control for heteroskedasticity compared to the one-step which accounts for homokedasticity. More so, the approach is also good for addressing a dependent variable that is highly persistence. For instance, the level of association of per capita income and its lag of one is 0.9988 (correlation coefficient) which exceeds the threshold value of 0.800. Likewise, the number of countries is higher than the number of periods [ $T(10) < N(20)$ ] which also validate the suitability of the approach. We re-specify our empirical model in the standard estimation process of system GMM both in levels and first difference respectively as:

$$y_{i,t} = \vartheta_0 + \vartheta_1 y_{i,t-\tau} + \vartheta_2 FINC_{i,t} + \vartheta_3 GOV_{i,t} + \vartheta_4 (FINC \times GOV)_{i,t} + \sum_{h=1}^5 \rho_h X_{h,i,t-\tau} + \varpi_i + \pi_t + \mu_{i,t} \quad (3)$$

$$y_{i,t} - y_{i,t-\tau} = \vartheta_0 + \vartheta_1 (y_{i,t-\tau} - y_{i,t-2\tau}) + \vartheta_2 (FINC_{i,t} - FINC_{i,t-\tau}) + \vartheta_3 (GOV_{i,t} - GOV_{i,t-\tau}) + \vartheta_4 [(FINC \times GOV)_{i,t} - (FINC \times GOV)_{i,t-\tau}] + \sum_{h=1}^5 \rho_h (X_{h,i,t-\tau} - X_{h,i,t-2\tau}) + (\pi_t - \pi_{t-\tau}) + (\mu_{i,t} - \mu_{i,t-\tau}) \quad (4)$$

The parameters are  $\vartheta_0, \vartheta_{1-4}, \rho_h$ ; tau ( $\tau$ ) is the coefficient of autoregression that captures past information;  $\varpi_i$  denotes the country-specific effect;  $\pi_t$  represents the time specific constant; and the stochastic term is represented by  $\mu_{i,t}$ . The level equation is used to derive the difference equation. We take tau as one since the past exogenous information can be captured by one period. In addition, the validity of the internal instruments used must be checked to ensure correctness of the results. The use of System GMM must be cautiously checked and thus requires several checks before estimation results can be relied upon. This is considered important especially when T is small and the number of internally determined instruments is high. It has been argued that too many instruments can overfit instrumented variables-failing to remove their endogenous components and biasing the coefficient estimates (Roodman, 2009).

## 5.0 Empirical Results

This section presents and discusses the empirical results of the study. Tables 7 and 8 present the findings associated to the links between financial inclusion, institutional quality and economic growth in sub-Saharan Africa. The results presented in Table 7 show the extent to which the

relationship between physical access to ATMs and output growth has been strengthened respectively by economic governance, political governance, institutional governance and universal governance. The findings established that: (a) the effect of physical access to ATMs measures of financial inclusion is positive on economic growth only with the exception of the first and last growth model specifications controlling for economic governance and universal governance. (b) The interactions between physical access to ATMs and governance (economic, political, institutional and overall) exact negative marginal impact on output growth in SSA countries. (c) Most of the control variables have expected signs except for government consumption and labour force participation rate that constituted drags on economic growth. The dampen effect of government consumption appears to be significant while that of labour force is not pronounced. The marginal and indirect effect of government consumption is consistent with the findings of Andrianaivo and Kpodar (2011) for African countries which disclosed the reflection of homogeneous nature of the African society. A surrogate of capital investment enhances SSA growth potentials as indicated by the level of significance. Similarly, the coefficients of trade openness are positive and significant, whereas the parameter estimates of inflation (measuring macroeconomic stability) are insignificant. (e) The estimated coefficient corresponding to lagged dependent variable indicates that its dynamics are stationary and converging because the values ranges between zero and one. It implies that countries with lower level of real per capita income are emerging and converging with countries with higher real income per capita.

**Table 7:** Financial Inclusion (Physical Access Measures), Governance Dimensions and Economic Growth in SSA: Panel System GMM Estimates

Variables	Dependent Variable: Per Capita Income			
	1	2	3	4
LOG(PCGDP(-1))	<b>0.9810</b> (0.0092)***	<b>0.9880</b> (0.0059)***	<b>0.9842</b> (0.0097)***	<b>0.9825</b> (0.0092)***
FINC1	0.00329 (0.0035)	<b>0.0089</b> (0.0041)**	<b>0.0059</b> (0.0034)*	0.0061 (0.0043)
EGOV	<b>0.0232</b> (0.0116)**			
FINC1 ×EGOV	<b>-0.0068</b> (0.0034)**			
PGOV		0.00325 (0.0094)		
FINC1 ×PGOV		<b>-0.0077</b> (0.0038)**		
IGOV			0.0151 (0.0123)	
FINC1*IGOV			<b>-0.0093</b> (0.0047)**	
OGOV				<b>0.01743</b> (0.01046)*
FINC1*OGOV				<b>-0.0088</b> (0.00423)**
INF	0.00049 (0.00045)	0.00067 (0.0005)	0.00057 (0.00051)	0.00061 (0.00048)
GOVCON	<b>-0.0016</b> (0.00073)**	<b>-0.00146</b> (0.00084)*	<b>-0.0017</b> (0.0009)*	<b>-0.0018</b> (0.00083)**
CAP	<b>0.00023</b> (0.00013)*	<b>0.00032</b> (0.00016)**	<b>0.00019</b> (0.00011)*	<b>0.00025</b> (0.00011)**
LF	-0.00041 (0.00097)	0.00028 (0.00083)	-0.00011 (0.00097)	-0.00020 (0.00097)
OPEN	<b>0.000396</b> (0.00019)**	<b>0.00038</b> (0.00022)*	0.00037 (0.00024)	<b>0.00038</b> (0.00023)*
CONSTANT	0.1935 (0.1264)	0.0806 (0.0909)	0.1508 (0.1379)	0.16902 (0.1293)
Fisher	<b>4484.63***</b>	<b>3276.56***</b>	<b>4369.05***</b>	<b>3159.98***</b>
AR(-1)	(0.003)	(0.002)	(0.005)	(0.003)
AR(-2)	(0.214)	(0.232)	(0.279)	(0.223)
Sargan OIR	(0.814)	(0.632)	(0.679)	(0.723)
Hansen OIR	(0.108)	(0.191)	(0.186)	(0.112)
Instruments	13	13	13	13
Countries	20	20	20	20
Obs.	180	180	180	180

**Note:** Standard errors clustered at the country level are reported in parentheses; \*, \*\* & \*\*\* indicate 10%, 5% and 1% significance level respectively. FINC1-Financial Inclusion (FI) Index 1 generated through Principal Component Analysis (PC) comprising ATMs per 1000km<sup>2</sup>, ATMs per 100,000 Adults and Bank Branches per 100,000 Adults;

PCGDP is Gross Domestic Product per capita; EGOV (Economic Governance): average of Regulatory Quality (RQ) and Government Effectiveness (GE); PGOV (Political Governance): average of Voice and Accountability (VA) and Political Stability (PS); IGOV (Institutional Governance): average of Rule of Law (RL) and Control of Corruption (CC); OGOV(overall governance index): average of RQ, GE, VA, PS, RL & CC; FINC×EGOV is interaction between physical access to FI and economic governance; FINC1×PGOV is interaction between physical access measure of FI and political governance; FINC1×IGOV is interaction between physical access measure of FI and institutional governance; FINC1×OGOVS is interaction between physical access measure of FI and overall governance index. INF is the rate of inflation; GOVCON is the government consumption; CAP is capital investment; LF is labour force participation rate and OPEN is trade openness. OIR is Over-Identifying Restrictions Test. The significance of bold values is in three ways: (a) The probability values of the estimated coefficients and the Fisher. (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.

From Table 8, the following findings established were: (a) with the exception of first and last columns, the positive effects of ICT measures of financial inclusion are consistent but were insignificant at the conventional level. On the unexpected significance level of the indicator, it is important to note that the larger proportion of the population living in SSA is mostly in the rural areas with limited or no access to ICT. Moreover, even those with the limited access still find it very difficult to use financial transactions such payments, transfers, and other related activities. One of the reasons might be because the number of people with access to telephone lines in the region is low as the average value indicates 3.35 per 100 people. Although, the mean value of its counterpart (mobile cellular subscription per 100 people, 40.82) is reasonable for the region, however, majority of these people constrained themselves from using ICT gadgets for financial transaction purposes because of the increasing cyber frauds and other cyber-related crimes. (b) The coefficients of governance are positive and significant but their interaction with ICT measures of financial inclusion have negative marginal estimates with the exception of controlling for political governance. The indirect effects imply decreasing returns to growth from ICT measure of financial inclusion in the midst of weak institutional settings in the region. (c) The findings pertaining to the control variables are consistent with what we have established in Table 7. (e) The assertion of convergence still holds as the estimated lagged dependent variable consistently ranges from 0 to 1.

**Table 8:** Financial Inclusion (ICT Measures), Governance Dimensions and Economic Growth in SSA:Panel System GMM Estimates

Variables	Dependent Variable: Per Capita Income			
	1	2	3	4
<b>LOG(PCGDP(-1))</b>	<b>0.9481</b> (0.0115)***	<b>0.9911</b> (0.0087)***	<b>0.9863</b> (0.0115)***	<b>0.9864</b> (0.1129)***
<b>FINC2</b>	-0.0023 (0.0058)	0.0016 (0.0061)	0.00081 (0. 0043)	-0.0020 (0.0055)
<b>EGOV</b>	<b>0.0268</b> (0.0103)***			
<b>FINC2 ×EGOV</b>	<b>-0.00301</b> (0.00177)*			
<b>PGOV</b>		<b>0.0077</b> (0.0044)*		
<b>FINC2 ×PGOV</b>		<b>0.0047</b> (0.0028)*		
<b>IGOV</b>			<b>0.0197</b> (0. 0101)**	
<b>FINC2*IGOV</b>			<b>-0.0038</b> (0. 0019)**	
<b>OGOV</b>				<b>0.0233</b> (0.0118)**
<b>FINC2*OGOV</b>				<b>-0.0018</b> (0.00101)*
<b>INF</b>	0.000481 (0.00043)	0.00065 (0.00045)	0.00058 (0.00046)	0.00061 (0.00043)
<b>GOVCON</b>	<b>-0.00137</b> (0.00074)*	<b>-0.000976</b> (0.000495)**	<b>-0.00141</b> (0.00081)*	<b>-0.00144</b> (0.00084)*
<b>CAP</b>	<b>0.00026</b> (0.00015)*	<b>0.00032</b> (0.00018)*	0.00022 (0. 000138)	<b>0.00035</b> (0.00020)**
<b>LF</b>	-0.00045 (0.00093)	-0.00041 (0.00086)	-0.000296 (0.000996)	-0.00035 (0.00095)
<b>OPEN</b>	<b>0.000359</b> (0.00019)*	<b>0.00025</b> (0.00013)*	<b>0.00028</b> (0.00014)**	<b>0.00029</b> (0.00011)**
<b>CONSTANT</b>	0.17295 (0.1394)	0.0797 (0.1106)	0.1490 (0.1510)	0.1506 (0.1403)
<b>Fisher</b>	<b>4402.19***</b>	<b>2111.21***</b>	<b>2369.34***</b>	<b>2472.07***</b>
<b>AR(-1)</b>	(0.005)	(0.006)	(0.003)	(0.004)
<b>AR(-2)</b>	<b>(0.262)</b>	<b>(0.217)</b>	<b>(0.238)</b>	<b>(0.270)</b>
<b>Sargan OIR</b>	<b>(0.762)</b>	<b>(0.617)</b>	<b>(0.638)</b>	<b>(0.670)</b>
<b>Hansen OIR</b>	<b>(0.150)</b>	<b>(0.128)</b>	<b>(0.127)</b>	<b>(0.149)</b>
<b>Instruments</b>	13	13	13	13
<b>Countries</b>	20	20	20	20
<b>Obs.</b>	180	180	180	180

**Note:**Standard errors clustered at the country level are reported in parentheses;\*, \*\* & \*\*\* indicate 10%, 5% and 1% significance level respectively.FINC2-Financial Inclusion (FI) Index 2 generated through PC comprising of Mobile Cellular Subscriptions per 100 people and Telephone lines per 100 people;PCGDP is Gross Domestic



Product per capita; EGOV (Economic Governance): average of Regulatory Quality (RQ) and Government Effectiveness (GE); PGOV (Political Governance): average of Voice and Accountability (VA) and Political Stability (PS); IGOV (Institutional Governance): average of Rule of Law (RL) and Control of Corruption (CC); OGOV(overall governance index): average of RQ, GE, VA, PS, RL & CC; FINC×EGOV is interaction between physical access to FI and economic governance; FINC2×PGOV is interaction between ICT measure of FI and political governance; FINC2×IGOV is interaction between ICT measure of FI and institutional governance; FINC2×OGOV is interaction between ICT measure of FI and overall governance index. INF is the rate of inflation; GOVCON is the government consumption; CAP is capital investment; LF is labour force participation rate and OPEN is trade openness. OIR is Over-Identifying Restrictions Test. The significance of bold values is in three ways: (a) The probability values of the estimated coefficients and the Fisher. (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.

The post estimation tests conducted are the Arellano and Bond test for autocorrelation and Sargan test, which is helpful for examining over-identification restrictions. The results of the autocorrelation test show that in most cases, there is no autocorrelation in the model. The results of the Sargan tests show that the instruments are not correlated with the error term; hence, they are exogenous as a group. In addition to these tests, we equally conducted the Fisher tests for the joint significance of the series in the model. The results posit that the estimated models, in most cases, are jointly significant.

For robustness purposes, the study went further to split our sample size into two regimes: the low regime (where each indicator is lower than its median values) and the high regime (where each indicator is equal to or greater than its median value). The result of this exercise is presented in Table 9. It could be summarily stated that the higher the institutional quality of a country, the greater the economic growth and financial inclusion.

**Table 9:** Sample Splitting Regression Results for the Six Governance Indicators

Variables	Political Governance Component				Economic Governance Component				Institutional Governance Component			
	VA>M	VA<M	PS>M	PS<M	GE>M	GE<M	RQ>M	RQ<M	RL>M	RL<M	CC>M	CC<M
PCGDP(-1)	<b>0.906</b> (0.136)***	<b>0.589</b> (0.246)**	<b>0.781</b> (0.135)***	<b>0.294</b> (0.131)**	<b>1.989</b> (0.120)***	<b>0.655</b> (0.207)**	<b>0.494</b> (0.210)***	<b>0.028</b> (0.252)**	<b>1.491</b> (0.185)***	0.335 (0.243)	<b>0.281</b> (0.251)***	0.901 (0.159)
FINC 1	<b>0.007</b> (0.004)*	<b>-0.111</b> (0.039)**	0.001 (0.001)	-0.001 (0.029)	<b>0.004</b> (0.001)**	<b>-0.087</b> (0.041)**	<b>0.006</b> (0.002)***	-0.001 (0.033)	<b>0.008</b> (0.002)***	0.018 (0.031)	<b>0.065</b> (0.038)***	<b>-0.006</b> (0.002)***
FINC2	<b>0.002</b> (0.012)**	0.221 (0.009)	<b>0.030</b> (0.011)***	0.021 (0.011)	<b>0.012</b> (0.001)***	<b>-0.031</b> (0.051)**	0.001 (0.011)	<b>0.002</b> (0.053)**	<b>0.005</b> (0.001)**	-0.032 (0.071)	<b>0.005</b> (0.008)**	<b>-0.016</b> (0.022)***
INF	-0.019 (0.012)	-0.001 (0.010)	<b>0.047</b> (0.011)***	-0.008 (0.008)	-0.011 (0.008)	0.002 (0.014)	<b>-0.051</b> (0.013)***	-0.006 (0.008)	<b>-0.034</b> (0.017)***	-0.004 (0.007)	-0.012 (0.009)	0.019 (0.025)
GOVCON	-0.004 (0.013)	-0.00906 (0.024)	<b>-0.018</b> (0.009)**	-0.035 (0.011)	<b>-0.019</b> (0.011)**	<b>-0.045</b> (0.018)**	<b>0.060</b> (0.019)***	<b>-0.035</b> (0.009)***	<b>-0.048</b> (0.011)***	<b>0.034</b> (0.012)**	<b>-0.030</b> (0.014)**	<b>0.034</b> (0.016)***
CAP	<b>0.058</b> (0.010)***	-0.000 (0.015)	<b>0.049</b> (0.011)***	<b>-0.033</b> (0.013)**	0.013 (0.008)	0.002 (0.017)	<b>0.039</b> (0.013)**	<b>-0.056</b> (0.013)***	<b>0.031</b> (0.013)***	<b>-0.052</b> (0.014)***	0.002 (0.012)	<b>-0.089</b> (0.013)**
LF	<b>-0.041</b> (0.005)***	<b>-0.083</b> (0.021)***	<b>-0.099</b> (0.007)***	<b>-0.023</b> (0.011)***	-0.034 (0.006)	<b>-0.044</b> (0.015)**	<b>-0.064</b> (0.007)***	-0.004 (0.012)	<b>-0.078</b> (0.007)**	-0.004 (0.012)	<b>-0.046</b> (0.009)***	-0.080 (0.015)
OPEN	<b>-0.005</b> (0.003)*	<b>0.008</b> (0.004)*	<b>0.005</b> (0.002)**	0.007 (0.005)	<b>0.005</b> (0.002)**	<b>0.013</b> (0.003)***	<b>0.026</b> (0.004)***	<b>0.013</b> (0.002)***	0.001 (0.002)	<b>0.013</b> (0.002)***	<b>0.020</b> (0.003)***	<b>-0.007</b> (0.003)***
Constant	<b>9.081*</b> (0.390)	<b>11.679</b> (1.013)***	<b>13.781</b> (0.494)***	<b>8.092</b> (0.746)***	<b>9.444</b> (0.468)***	<b>10.292</b> (1.017)***	<b>8.693</b> (0.583)***	<b>7.460</b> (0.849)***	<b>13.623</b> (0.506)***	<b>6.961</b> (0.724)***	<b>9.195</b> (0.733)***	<b>11.132</b> (0.858)***
R <sup>2</sup>	0.91	0.71	0.84	0.73	0.93	0.60	0.90	0.72	0.90	0.75	0.66	0.87
Hansen Test	(0.741)	(0.636)	(0.525)	(0.563)	(0.787)	(0.861)	(0.780)	(0.821)	(0.901)	(0.783)	(0.899)	(0.657)
AR(2) Test	(0.435)	(0.378)	(0.662)	(0.712)	(0.554)	(0.616)	(0.911)	(0.276)	(0.624)	(0.376)	(0.256)	(0.411)

**Note:**Standard errors clustered at the country level are reported in parentheses,\* , \*\* & \*\*\* indicate 10%, 5% and 1% significance level respectively.

Regulatory Quality (RQ), Government Effectiveness (GE), Voice and Accountability (VA), Political Stability (PS), Rule of Law (RL),and Control of Corruption (CC); FINC1-Financial Inclusion (FI) Index 1 generated through Principal Component Analysis (PC) comprising ATMs per 1000km<sup>2</sup>, ATMs per 100,000 Adults and Bank Branches per 100,000 Adults;FINC2-Financial Inclusion (FI) Index 2 generated through PC comprising of Mobile Cellular Subscriptions per 100 people and Telephone lines per 100 people;PCGDP is Gross Domestic Product per capita; INF is the rate of inflation; GOVCON is the government consumption; CAP is capital investment; LF is labour force participation rate and OPEN is trade openness.The significance of bold values is in three ways: (a) The probability values of the estimated coefficients. (b) The failure to reject the null hypotheses of: (i) no autocorrelation in the AR(2) tests and; (ii) the validity of the instruments in the Hansen test.

## **6.0 Concluding Discussion and Directions for Future Studies**

The study uncovers the causal relationship between financial inclusion and economic growth via the intermediating role of institutional infrastructure for a panel of twenty sub-Saharan African countries between 2004 and 2013. Owing to the limitations that characterized the use of pooled OLS, fixed and random effect models, we employ the System Generalized Method of Moment (GMM), to investigate the impact of financial inclusion with good institutional settings for sustainable growth in SSA. The empirical findings are based on two financial inclusion indicators (access to ATMs and ICT measures) and four governance variables (economic, political, institutional and general). The five insightful outcomes emanate from the study, and they are: (a) on average, the unrestricted positive impact of physical access to ATMs and ICT measures of financial inclusion on SSA growth is established but the former is found to be significant at 0.05 critical value; (b) the both unbundled and bundled institutional variables viz: economic, political, institutional and general governances are established to be growth-spurring; (c) the effects on output growth associated with the interaction of financial inclusion and governance are positive for physical access measures but mostly otherwise for ICT measures; (d) countries with low levels of real per capita income are matching up with other countries with high levels of real income per capita; and (e) other factors that significantly influence output growth are capital investment, openness to trade and government consumption.

The findings are consistent with past studies like Andrianaivo and Kpodar (2011), Lundqvist and Erlandsson (2014) who have investigated the importance of financial inclusiveness of the poor through ICT penetration to the overall growth in sub-Saharan African countries. We further established that physical access to ATMs as a means of making financial services easy, cost-effective and inclusive to the less privileged, contributes to SSA's growth. The study reveals that the relevance of financial inclusion to growth was enhanced by the prevailing institutional framework in the region. The empirical evidence of some insignificant marginal impacts are indications that imperfections in the financial markets are sometimes employed to the disadvantage of the poor. Some of the reasons were noted by FinMark (2009) that many Africans rely on informal financing because they were not financially included. On the whole, we established positive effects on growth for the most part. The positive effects are evident because the governance indicators compliment financial inclusion in reducing pecuniary constraints hindering credit access and allocation to the poor that deteriorate growth. This is consistent with Goodwin-Groen (2012) in the viewpoint that

financial sector policies have been influenced by quality institutional settings to support economic growth. The findings equally show that countries with low income are moving-up with other SSA countries with high level of income. Hence, supporting income convergence theory. These are in accordance with previous studies (like Solow, 1956; Swan, 1956; Baumol, 1986; Mankiw, Romer, & Weil, 1992; Barro & Sala-i-Martin, 1995; Fung, 2009; Narayan, Mishra and Narayan, 2011; Bruno, De Bonis, and Silvestrini, 2012; among others) that have documented same within the framework of neoclassical growth models.

In light of these emanating outcomes, a few policy prescriptions are advanced. First, efforts should be intensified towards promoting inclusive financing. This can possibly be achieved by easing access to banking services, which can be availed through electronic banking services and via other internet-related services. Second, well thought-out institutional reforms should be strengthened via different governance dimensions earlier identified. More specifically, economic and institutional governance structures should be further enhanced as their magnitudes of impacts are more visibly pronounced. The growth recipes (that is financial inclusion and institutional infrastructure) should be independently pursued as synergy between the duo may help in discounting growth-enhancing potentials inherent in such region like SSA.

Beyond this, future efforts should be geared towards unveiling other means of capturing financial inclusion and institutional infrastructure as there is no general agreement as to the correctness of the measures used since they have come under severe criticisms. There is room for future studies to extend empirical literature by focusing on country-specific trends on how institutions tend to reinforce the relationship between financial inclusion and growth.

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### Appendix 1: Variable Definitions

Variables	Signs	Variable Measurement	Data Sources
Physical access measure of financial inclusion	ATM1	ATMs per 1000 Km <sup>2</sup>	World Bank's Financial Structure Dataset
	ATM2	ATMs per 100,000 Adults	World Bank's Financial Structure Dataset
	ATM3	Commercial Bank Branches per 100,000 Adults	World Bank's Financial Structure Dataset
ICT measure of financial inclusion	ICT1	Mobile Cellular Subscription per 100 people	World Development Indicators
	ICT2	Telephone Lines per 100 people	World Development Indicators
Economic growth	PCGDP	GDP per capita (\$) (log)	World Development Indicators
Inflation rate	INF	Inflation (growth rate of consumer price index)	World Development Indicators
Government consumption	GOVCON	General government final consumption (% of GDP)	World Development Indicators
Investment	CAP	Gross fixed capital formation (% of GDP)	World Development Indicators
Labour force participation	LP	Labour Force Participation Rates, total (% of ages 15 and above)	World Development Indicators
Trade openness	OPEN	Total trade (% of GDP)	World Development Indicators
Economic governance	EGOV	<b>Economic Governance</b>	Computed
		Regulatory Quality	World Governance Indicators
Political governance	PGOV	Government Effectiveness	World Governance Indicators
		<b>Political Governance</b>	Computed
		Voice and Accountability	World Governance Indicators
Institutional governance	IGOV	Political Stability	World Governance Indicators
		<b>Institutional Governance</b>	Computed
		Rule of Law	World Governance Indicators
		Control of Corruption	World Governance Indicators