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THE IMPACT OF FINANCIAL INCLUSION ON ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

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Abstract

This paper examines the impact of financial inclusion on economic growth using a panel of 25 Sub-Saharan African countries, each observed over six years from 2009 - 2014. It tests whether an increase in the level of financial inclusion, controlling for gross savings and gross primary school enrollment leads to economic growth. The findings based on a two-way random effects estimation reveal the impact of financial inclusion on economic growth. Gross savings lead to economic growth, but gross primary school enrollment has an unexpected negative impact. Since the individual dimensions used in the construction of the financial inclusion index are built from limited sub-components, the financial inclusion index should be treated as a rough representation. This finding implies that Sub-Saharan African countries can increase economic growth by enhancing financial inclusion by leveraging financial technology.

Keywords: *Financial inclusion; Economic growth; Sub-Saharan Africa.*

INTRODUCTION

Sub-Saharan African (SSA) countries have achieved milestones in financial inclusion, particularly on penetration, access, and usage dimensions. This outcome has been driven mainly by mobile money services as a platform for financial services delivery. Substantial increase in usage of formal non-bank financial services is notable, especially in the middle-income countries (like: Mauritius, Seychelles, South Africa, Namibia and Morocco. This achievement has been enhanced by financial technology innovation, which has bridged geographical barriers, especially in sparsely populated rural areas where costs have declined significantly. Likewise, financial technology innovation has softened the constraints (like: Know Your Customer' (KYC) regulations, the cumbersome paperwork associated with opening banking accounts, mandatory deposits, bank charges, and the distance from villages to towns) associated with access to financial

services in the traditional brick and mortar model. Inadequate geographical connectivity constrains the feasibility of the brick and mortar model, particularly in those areas characterized by less-developed physical infrastructure and low population densities. Moreover, significant achievements in access to financial services are notable in middle-income countries (like: Seychelles, Morocco, Tunisia, Mauritius, and South Africa). Through the mobile money services platform, technology innovation is expected to continue making strides in SSA countries' financial services.

Notwithstanding the bright outlook of financial inclusion derived from financial technology adoption, several challenges still ringer. These include limited outreach of the brick and mortar model, especially in rural areas, high and sticky levels of financial illiteracy, high lending rates leading to significant spread between lending and deposit rates, and low saving and poor loan repayment culture. The banking infrastructure is still less developed in most SSA countries, with most of the banking services concentrated in urban areas. Other challenges include the predominance of cash-based economy (Adam et al., 2010), default risk attributed by absence of collateral registry for registration of movable assets, and higher degree of informal sector (Scheneider et al., (2010) identify Mozambique, Tanzania, and Nigeria as countries with the highest proportion of shadow economy, that is 58.3%, 56.4%, and 55.2%, respectively. Dell'Annoet al., (2018) found that the Tanzanian shadow economy ranged between 50% and 61% during 2004-2014). All these factors exert friction on the speed of financial inclusion in SSA despite the adoption of financial technology.

Despite the overwhelming consensus on the role of financial inclusion on economic growth (Aker et al., 2011; Andrianaivo & Kpodar, 2011; Bruce et al., 2013; Harihanan & Marktanner, 2012), the literature on the economic growth impact of financial inclusion is still scanty. Moreover, the role of financial inclusion on economic growth tends to be overemphasized relative to prevailing empirical evidence. The scanty empirical literature on the subject and overemphasis on the economic growth impact of financial inclusion motivate this study.

This study fills the observed empirical gap by examining the impact of financial inclusion on economic growth for twenty-five SSA countries (List of countries included in the appendix) by testing the supply-leading hypothesis that an increase in the level of financial inclusion has a positive impact on economic growth. The study also tests whether gross national savings as a percentage of GDP and gross primary school enrollment ratio have a positive impact on economic growth. Specifically, the study tests two hypotheses:

(i) An increase in the level of financial inclusion has a positive impact on economic growth, and

(ii) Gross national savings as a percentage of GDP and gross primary school enrollment ratio[1] have a positive impact on economic growth.

LITERATURE REVIEW

Introduction

We review the literature focusing on the link between financial inclusion and economic growth, motivated by the hypothesis that financial inclusion has a positive impact on economic growth. On the one hand, several studies in the literature establish a positive relationship between economic growth and financial development (King & Levine, 1993; Levine & Zervos, 1998; Rajan & Zingales, 1998). On the other hand, some contemporary studies provide evidence of the impact of financial inclusion on growth (Bruce et al., 2013; Harihanan & Marktanner, 2012).

This literature review builds on several arguments about the role of financial inclusion on economic growth. Financial inclusion enhances savings mobilization, which provides resources for investment. It enhances savings accumulation for investors' borrowing to finance economic activities, leading to an increase in output (Norris et al., 2015). Financial inclusion also enhances growth by increasing savings and diversifying a pool of resources which is channeled efficiently among economic agents.

In addition to enhancing savings, financial inclusion boosts firms' and households' productivity, which consequently increases the productivity of aggregate output. This increase in aggregate output happens through smooth and timely financing of consumption, investment, and insurance against shocks. Timely transfers of funds increase efficiency by minimizing resource distortions caused by financial frictions due to constraints to penetration, access, and usage of financial services (Norris et al., 2015).

Further, technology-driven financial inclusion reduces transaction costs, leading to an increase in the usage of financial services. Consequently, it facilitates efficient allocation of funds among sectors and consequently reduces intermediation costs, which stimulates investment. Moreover, it enables small and medium-sized enterprises to use external financing rather than relying on their limited sources or formal local financing mechanisms (Karpowicz, 2014).

[1] Total enrollment in primary education, irrespective of age, expressed as a percentage of the population of official primary education age.

Relevant empirical literature review

Jack and Suri (2014) investigate the impact of lowering transaction costs of mobile money on risk-sharing using Kenyan panel data. Their findings show that mobile money transfers (M-pesa) mitigate adverse income shocks at a lower consumption loss relative to those who do not access such services.

Bruce et al., (2013) examine two primary treatments in a randomized experiment. The first treatment involves households holding ordinary accounts. The second treatment involves a combination of households with ordinary and commitment accounts. The commitment accounts allow customers to limit access to their funds until their preferred future date. The control group held no account but monitored against the treatment groups. The findings show a positive impact of financial inclusion on economic growth. Specifically, commitment treatment leads to an increase in deposits at the partner bank, agricultural input use, crop sales, and household expenditures in the subsequent agricultural year.

Norris et al., (2015) use a micro-founded general equilibrium model among others to evaluate the impact of relaxing financial inclusion constraints, particularly on participation, borrowing, and intermediation costs on GDP and inequality, separately and in combination for low-income countries. The study covered Uganda, Kenya, and Mozambique and three emerging economies, namely Malaysia, the Philippines and Egypt. Their findings show that a reduction in the specified financial inclusion constraints increases the level of financial inclusion, which consequently increases the level of output.

Aker et al., (2011) examine the impact of mobile money transfer programs in Niger using a randomized approach for households. The experiment involves targeted villages that received monthly cash transfers as part of a social protection program in Niger. The experiment is subdivided into three equal sub-group in which the first one-third are those who received cash transfers through mobile money transfer. The second one-third involves those who received manual cash transfers, and the final third are those who received manual transfers as well as mobile phone money transfers. Their findings show that reduced distribution costs for both the implementing and transfer agencies enhance economic growth. That is, economic growth happens through expenditures diversification, reduced assets depletion, and expansion in the crops varieties, particularly cash crops by women.

Financial inclusion reduces constraints to penetration, access, and usage of financial services. Levine et al., (2000) investigate whether the exogenous components of financial

intermediary development[2] influence economic growth. The analysis employs a generalized method of moments dynamic panel estimators and cross-sectional instrumental variable estimator for 71 countries. Their findings show a strong link between the exogenous component of financial intermediary development (i.e. private credit, commercial-central bank, and liquid-liquidities) and long-run economic growth in which each of the three financial intermediary development indicators is significantly correlated with economic growth.

Andrianaivo and Kpodar (2011) investigate the impact of a range of information and communication technology (ICT) indicators on economic growth in African countries during 1988-2007. In their analysis, financial inclusion is captured through measures of access to financial services. Their findings confirm that ICT, including mobile phones, has a significant contribution to economic growth.

Hariharan and Marktanner (2012) estimate the impact of financial inclusion on economic growth across the world using a simple Solow growth model. Their findings show that a 10% increase in financial inclusion has the potential to increase the average income per worker by 1.34%.

Swamy (2012) establishes the growth-enhancing role of bank-based financial intermediation by examining the impact of financial inclusion efforts on inclusive growth for India during 1975-2007. From these findings, the author concludes that the bank-led financial inclusion has definite advantages for inclusive growth in India.

Yorulmaz (2016) constructs a financial inclusion index for the European Union member and candidate countries to measure the extent of financial inclusion across countries over time. Further, the author tests the association between financial inclusion index and selected macroeconomic variables (i.e. GDP per capita, adult literacy rates, rural populations, unemployment rates, Gini coefficients, and human development index) according to the demand-following hypothesis. The findings show a positive and significant correlation between financial inclusion index and income, and between financial inclusion and human development index but negative correlation with unemployment rate and Gini coefficient.

[2] Measures of financial development intermediary used: the overall size of the banking institution; whether commercial banking institution or central bank is conducting financial intermediation; and the extent to which financial institution funnel credit to private sector activities.

The above empirical literature review provides evidence of the impact of financial inclusion on economic growth. In addition to the reviewed papers, three general observations are notable from the literature:

First, low-income groups generally face limited access to financial services, while high-income countries experience moderate financial access levels (Cannoly & Hajaj, 2001);

Second, rural populations are more financially excluded (Kempson & Whyley, 2001; Leyshon & Thrift, 1995).

Third, countries with low-income inequality levels have high levels of financial access (Buckland et al., 2005; Kempton & Whyley, 1998).

This study extends the prevailing literature on the economic growth impact of financial inclusion using country-level data for twenty-five countries spanning from 2009-2014. The study examines the growth impact of financial inclusion using the overall financial inclusion index in one specification and the components of the overall financial inclusion in a different specification. In both specifications, gross national savings and primary school enrollment are the control variables. The individual components of financial inclusion are used notably to enrich the analysis of the impact of financial inclusion on economic growth as well as to provide a detailed analysis of the impact of financial inclusion on growth.

ESTIMATION METHODOLOGY

Variables and data sources

All the empirical data used in this study were obtained from the World Development Indicators (WDI) of the World Bank. Economic growth and financial inclusion are growth in per capita real GDP and log of the financial inclusion index, respectively. The real GDP per capita is in the United States dollar at purchasing power parity to allow comparison across countries and to eliminate the effect of exchange rate movement. The other variables are logarithms of financial inclusion dimensions of penetration, access, and usage. The remaining variables (i.e. gross primary school enrollment ratio and gross national savings) are in percentage form and are therefore not subjected to log transformation.

Construction of the financial inclusion index

Since countries are heterogeneous, the individual financial inclusion dimensions (i.e. penetration, access, and usage) may not provide comparable outcomes across countries. That is, a country can perform better in one of the dimensions but not in others, and vice

versa. To address this challenge, we construct an overall financial inclusion index Sarma[3] which allows for comparison within and across countries (Sarma, 2008 and 2010; Sarma & Pais, 2011).

We use the financial inclusion dimensions, namely penetration, access, and usage from the individual sub-dimensions to construct the overall financial inclusion index. Due to data limitations, we generate each dimmension from only two sub-dimensions. Specifically, we generate financial penetration from Automated Teller Machine per 100,000 adults and the number of commercial bank branches per 100,000 adults. To generating the financial access variable, we use internet users per 100 people and mobile cellular subscriptions per 100 people. Having a bank account is not sufficient for inclusive financial services because costs related to distance and fees can limit utilization. Financial usage is an important dimension in determining the country's level of financial inclusion. We construct the financial services utilization dimension from credit to the private sector as a percentage of GDP and deposits to GDP ratio. Let,

$$d_i = \frac{A_i - m_i}{M_i - m_i} \tag{1}$$

where, d_i is the dimension index for country i (for i=1,2, …,25); A_i is the actual value of dimension for country i; m_i is the minimum value of dimension for country i over 6 years observed across all 25 countries, and M_i is the maximum value of dimension for country i over 6 years observed across all 25 countries.

In a three dimensional cartesian space, country i is identified by a point (p_i, a_i, u_i), where p_i is penetration in country i; a_i is access in country i; and u_i is usage in country i. The financial inclusion index is measured by the normalized inverse Euclidean distance of the point (p_i, a_i, u_i) from the ideal maximum point (1,1,1), (Sarma, 2008; Yorulmaz, 2016). Further, let,

$$fii_i = 1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + \cdots + (1-d_n)^2}}{\sqrt{n}} \tag{2}$$

where fii_i is the financial inclusion index for country i and n is the number of dimensions included in the index for country i, which is 3 in this study, that is, penetration, access, and usage.

[3]Proposed by Sarma (2008, 2012). In this paper, referred financial inclusion is the gross term with more focus on growth-driving components of the traditional brick and mortar approach of financial intermediation activities of deposits and lending, supported by financial technology-driven financial services.

The model

We adopt the supply-leading hypothesis in building the endogenous growth model of this study. The hypothesis[4] posits that the financial sector (financial inclusion in this study) causes the real sector (King & Levine, 1993; Levine & Zavros, 1998; Levine et al., 2000). Further, Pasali (2013) argues that the degree of financial intermediation is not only positively correlated with growth and employment but also generally assumed to causal growth. These arguments form the base of the endogenous growth model of this study, augmented by gross savings and primary school enrollment as drivers of growth. According to empirical evidence, gross saving has a positive impact on economic growth (Anoruo & Ahmad, 2001; Mphuka, 2010). Synonymously, school education has a positive impact on economic growth (Hanif & Arshed, 2016; Keller, 2006). Therefore, the general model becomes,

$$y_{i,t} = \beta_0 + \beta_1 lfii_{i,t} + \beta_2 gpser_{i,t} + \beta_3 gsr_{i,t} + \eta_i + \varepsilon_{i,t} \quad (3)$$

where, $y_{i,t}$ is the real GDP per capita growth in country i at time t; $lfii_{i,t}$ is the log of financial inclusion index in country i at time t; $gpser_{i,t}$ is the gross primary school enrollment rate in country i at time t; $gsr_{i,t}$ is the gross saving rate in country i at time "t"; η_i is the unobserved country-specific effect in country i at time t, and $\varepsilon_{i,t}$ is the error term in country i at time t.

The parameters β_1, β_2, and β_3 are coefficients of financial inclusion, gross primary school enrollment, and gross national savings, respectively.

Estimation technique

A micro-panel of twenty-five SSA countries observed over six years is estimated using pooled least squares (POLS), fixed effects (FE), and random effects (RE) models. We re-estimate the model in equation (3) by replacing the financial inclusion index variable with its three dimensions (i.e. log financial penetration (lf_p), log of financial access (lf_a), and log of financial usage (lf_u)) to examine the impact of the individual dimensions on economic growth.

We run two regressions of growth in real GDP per capita on, among other drivers: the log of the overall financial inclusion index in the first model and the logs of the three individual dimensions of the overall financial inclusion (i.e. financial penetration, financial access, and financial usage) in the second model. The second regression is

[4]Other theoretical explanations of the linkage between finance (financial inclusion in this study) and economic growth are: demand-following hypothesis in which economic growth leads to financial development through increased demand for financial services; bi-directional causality hypothesis which is a combination of both supply-leading and demand following hypotheses; and independent hypothesis in which there is no causation between financial inclusion and economic growth.

intended to enrich the analysis with details of the individual components of the financial inclusion index and to examine which of the components has a stronger impact on the economy and perhaps why.

EMPIRICAL RESULTS

Financial inclusion index results

In comparing the level of financial inclusion, we rank the countries in the sample using the constructed financial inclusion index obtained from the specification in equation (2). However, it should be noted that the index provides a rough estimation of the level of financial inclusion due to data limitations, with bias on financial services usage. The index attaches relatively more weight on traditional banking services like lending and deposits. Traditional banking services have a direct impact on economic growth compared to technology-derived financial services like mobile money services, which have not only an indirect but limited effect on economic growth.

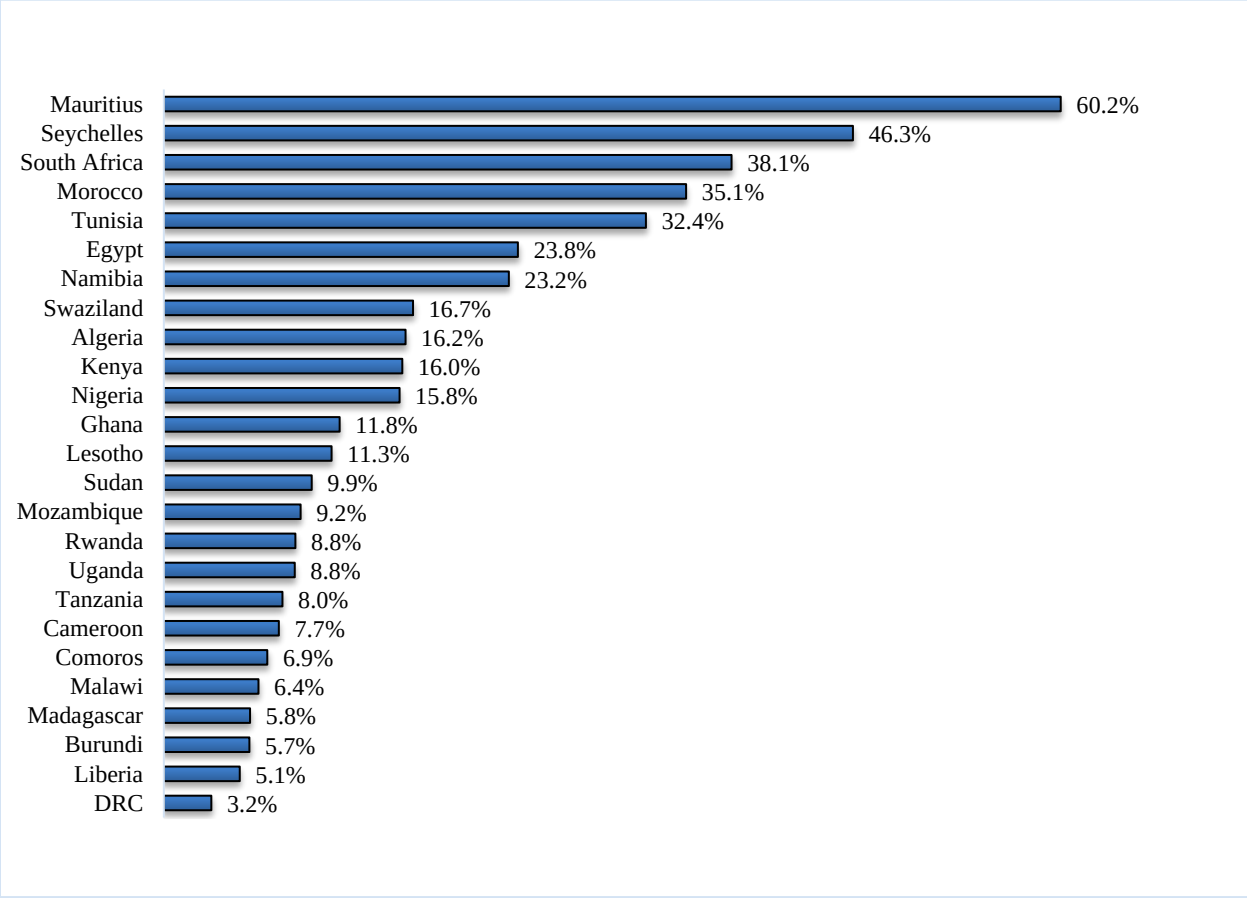

FIGURE 1. RANKING OF AVERAGE FINANCIAL INCLUSION INDEX AMONG SSA
Source: Author's computation according to equation (2)

Among the twenty-five SSA countries under study, Mauritius, Seychelles, Morocco, South Africa, and Tunisia rank highest (top-five) with the highest level of financial inclusion according to the constructed financial inclusion index. These are reported in Figure (1) and Table (1) in column 2. On the lower end, DRC, Liberia, Burundi, Madagascar, and Malawi are the least financial inclusive countries in the sample. For the East African Community (EAC) region (comprised of: Burundi, Kenya, Rwanda, Tanzania, and Uganda), Kenya is the most financially inclusive, followed by Rwanda and Uganda in the same position, Tanzania, and Burundi, respectively.

Further, a substantial increase in usage of technology-related formal non-bank financial services is notable in middle-income countries such as Mauritius, South Africa, Morocco, Tunisia, and Egypt (Table 1). Furthermore, significant achievements in access to financial services are notable in middle-income countries like Seychelles, Morocco, Tunisia, \Mauritius, and South Africa. In terms of penetration, considerable achievements are notable in Mauritius, Seychelles, South Africa, Namibia, and Morocco.

TABLE 1. THE TOP-FIVE RANKED COUNTRIES IN FINANCIAL INCLUSION

Rank	Overall financial inclusion index	Penetration	Access	Usage
1st	Mauritius	Mauritius	Seychelles	Mauritius
2nd	Seychelles	Seychelles	Morocco	South Africa
3rd	South Africa	South Africa	Tunisia	Morocco
4th	Morocco	Namibia	Mauritius	Tunisia
5th	Tunisia	Morocco	South Africa	Egypt

The individual financial inclusion dimensions do not provide comparable outcomes and therefore are not suitable for cross country comparisons. For instance, while Mauritius ranks first in overall financial inclusion index, which is also the case for penetration and usage, it ranks fourth in access (Table 1, column 2). Moreover, despite Seychelles ranking second in the overall financial inclusion index, penetration, and first in access, it is not among the top five countries in usage (Table 1).

Synonymously, Liberia ranks second from bottom in the overall financial inclusion index, penetration, and usage. However, it is not among the least-five countries in terms of access. Further, Malawi ranks among the least-five countries in access, but not among the least-five countries in terms of the overall penetration and usage (Table 2). Finally, among the least-five countries according to the financial inclusion index, Uganda appears only under usage but not in overall financial inclusion index, penetration, and access (Table 2).

TABLE 2. THE LEAST–FIVE RANKED COUNTRIES IN FINANCIAL INCLUSION

Rank	Overall financial inclusion index	Penetration	Access	Usage
25th	DRC	DRC	Burundi	DRC
24th	Liberia	Liberia	DRC	Liberia
23rd	Burundi	Madagascar	Malawi	Sudan
22nd	Madagascar	Cameroon	Madagascar	Cameroon
21st	Malawi	Sudan	Morocco	Uganda

According to the overall financial inclusion index and penetration for EAC countries, Kenya leads, followed by Rwanda, Uganda, Tanzania, and Burundi, in that order (Table 3). Based on the access dimension, the order changes slightly with Rwanda and Uganda switching positions. In terms of the usage dimension, the order is maintained except that Burundi and Uganda switch positions.

TABLE 3. RANKING OF EAC COUNTRIES IN FINANCIAL INCLUSION

Rank	Overall financial inclusion index	Penetration	Access	Usage
1st	Kenya	Kenya	Kenya	Kenya
2nd	Rwanda	Rwanda	Uganda	Burundi
3rd	Uganda	Uganda	Rwanda	Rwanda
4th	Tanzania	Tanzania	Tanzania	Tanzania
5th	Burundi	Burundi	Burundi	Uganda

Econometric results

The financial inclusion index (fii) used in this study is a composite variable, built from three sub-components which are also constructed from several financial inclusion dimensions (d_i). Individually, the three main components are inadequate in comparing levels of financial inclusion across countries or within a country over time. Therefore, the constructed financial inclusion index is used as the overall level of financial inclusion, relevant for comparison. It is imperative to note that the values of the financial inclusion index in Figure (1) are rough estimates as they involve limited dimensions due to data limitations.

The POLS in the model with the financial inclusion index (Table 4) shows that all the estimates are statistically significant at the 1% level. All the coefficients have the expected positive sign, except the coefficient of gross primary school enrollment, which is negative. There is no change in the results when a one-way FE model is estimated as all the coefficients are statistically significant with the expected positive sign except the coefficient of gross primary school enrollment. The statistically significant p-value level

on the null hypothesis that the groups have a common intercept provides no evidence to reject the POLS model. Based on this outcome, a RE model is estimated.

TABLE 4. POLS, FE, AND RE REGRESSION RESULTS BASED ON FINANCIAL INCLUSION INDEX

Variable	POLS	FE	RE
constant	6.07***	6.10***	5.30***
	(0.0001)	(0.0001)	(0.0001)
lfii	0.91***	0.89***	0.87***
	(0.0001)	(0.0001)	(0.0001)
gpser	−0.01***	−0.01***	−0.01***
	(0.0001)	(0.0001)	(0.0001)
gsr	0.02***	0.02***	0.02***
	(0.0001)	(0.0001)	(0.0001)
dt_2			0.45***
			(0.0001)
dt_3			0.12
			(0.4627)
dt_4			-0.05***
			(0.0001)
dt_5			0.13
			(0.4385)
dt_6			0.11
			(0.5125)
Diagnostic tests and goodness of fit			
No. of observations	150	150	150
Breusch-Pagan LM test for RE (χ^2)			5.65609**
			(0.0174)
Hausman specific test (χ^2)			3.87585
			(0.992442)
Wald test for joint significance of dummies (χ^2)			59.8653***
			(0.0000)

In brackets are p-values; *** significant at 1% level, ** significant at 5%, and *significant at 10%.

According to the one-way RE model, the coefficients are statistically significant at the 1% level with the expected positive sign except the coefficient of primary school enrollment which bears a negative sign. The p-value on the Breusch-Pagan test on POLS model against the RE model is statistically significant at the 5% level, suggesting rejection of the POLS model in favor of the RE model. However, the Hausman test for the RE against FE model is not statistically significant, providing no evidence to reject the RE model against the FE model.

Based on these test results, a two-way RE model is estimated. The results show that all the coefficients are statistically significant at the 1% level with the expected positive sign except the coefficient on primary school enrollment, which bears unexpected negative sign. Less than half of the coefficients of the time dummies are statistically significant at

the conventional significance levels. The p-value on the Wald test for the joint significance of time dummies is statistically significant at the 1% level, indicating the existence of time RE. Comparing the findings from POLS, one-way FE, and two-way RE, the two-way RE model is the best model specification with the overall financial inclusion index.

Despite the advantages of using the financial inclusion index, which allows comparison within and across countries, it provides no detailed analysis of the impact of financial inclusion on GDP. Therefore, individual components of the financial inclusion index (penetration, access, and usage) are used in the alternative specification instead of the financial inclusion index variable.

The model is re-estimated using the individual components of the financial inclusion index instead of the financial inclusion index itself to enrich the analysis. The findings (Table 5) show that all the estimates in the POLS model are statistically significant at the 1% level with the expected positive sign, except the coefficient of the gross primary school enrollment, which bears unexpected negative sign. The same findings remain unchanged when a one-way FE model is estimated; that is, all the coefficients are statistically significant at the 1% level with the expected positive sign except the coefficient on gross primary school enrollment, which bears unexpected negative sign. Like in the first specifications in Table (4), the p-value for the POLS against FE model is not statistically significant, providing no evidence to reject the POLS model.

Based on these findings, a one-way RE model is estimated in which all the coefficients are statistically significant at the 1% level with the expected positive sign except the coefficient of primary school enrollment, which bears unexpected negative sign. The p-value on the Breusch-Pagan test POLS model against the RE model is statistically significant at the 5% level, providing evidence to reject the POLS model in favor of the RE model. The p-value on the Hausman test for RE versus the FE model is not statistically significant, providing no evidence to reject the RE model. These findings suggest estimation of a two- way random-effects model.

The findings on the two-way RE model in the last column of Table (5) show that all the estimates are statistically significant at the 1% level with the expected positive sign, except the coefficient on gross primary school enrollment, which bears unexpected negative sign. Less than 50% of the coefficients of the time dummies are statistically significant at the conventional significance levels, with positive sign. The Wald test for the joint significance of time dummies is statistically significant at the 1% level, which is evidence for the existence of time RE. Comparing the results from the various model

specifications, the two-way RE is the best model in both specifications (i.e. with financial inclusion index and with individual components).

TABLE 5. REGRESSION ESTIMATES USING INDIVIDUAL DIMENSIONS OF FINANCIAL INCLUSION INDEX

Variable	POLS	FE	RE
constant	6.48***	6.48***	5.21***
	(0.0001)	(0.0001)	(0.0001)
lf_a	0.20***	0.20***	0.17***
	(0.0001)	(0.0001)	(0.0001)
lf_p	0.17***	0.17***	0.13***
	(0.0001)	(0.0001)	(0.0001)
lf_u	0.53***	0.53***	0.68***
	(0.0001)	(0.0001)	(0.0001)
gpser	−0.02***	−0.02***	−0.01***
	(0.0001)	(0.0001)	(0.0001)
grs	0.02***	0.02***	0.02***
	(0.0001)	(0.0001)	(0.0001)
dt_2			0.70***
			(0.0001)
dt_3			0.18
			0.2432
dt_4			0.6012
dt_5			0.33*
			0.0506
dt_6			0.8537
Diagnostic tests and goodness of fit			
No. of observations	150	150	150
Breusch-Pagan LM test for RE (χ^2)			56.0258**
			(0.0141)
Hausman specific test (χ^2)			4.14579
			(0.99722)
Wald test for joint significance of dummies (χ^2)			89.7983***
			(0.0000)

In brackets are p-values; *** significant at 1% level, ** significant at 5%, and *significant at 10%.

The RE coefficients of the individual components of financial inclusion (Table 5) sum to 0.98. This sum is slightly above the coefficient of the financial inclusion index of 0.87 (Table 4). The marginal difference between the two provides a robust conclusion on the significant impact of financial inclusion on economic growth. The results further show that usage has a stronger impact on GDP (0.68), followed by access (0.17), and lastly, by penetration (0.13). This finding is intuitive given that usage of financial services is expected to impact more than access on economic activities and consequently on economic growth. The difference in the growth impact between usage and access of finacial services can be explained by the fact that some agents who access financial

services face cost constraints, which hinder usage of such financial services. This renders access to have a relatively small impact on GDP compared to usage. At the same time, access is expected to impact more on economic activities than penetration because it implies relatively fewer constraints compared to those who cannot access financial services at all despite the penetration of financial services in such localities.

According to the constructed financial inclusion index, a 10% increase in financial inclusion is associated with 8.7% increase in per capita GDP, holding other factors constant. The same 10% increase in each of the financial inclusion components is accompanied by a cumulative[5] increase of 9.8% in per capita income. This is enhanced by the multipliers of financial services attributed to financial efficiency. In both model specifications, the impact of gross savings on per capita GDP is weak. A 10% increase in the gross saving rate is associated with only 0.1% increase in per capita GDP. The weak impact outcome is explained by the fact that gross national saving does not necessarily equal investment; hence, part of it does not contribute directly to GDP. For future studies, investment can be considered instead of gross savings.

CONCLUSION AND POLICY IMPLICATIONS

We assess the impact of financial inclusion on economic growth in a panel of twenty-five SSA countries by estimating an endogenous growth model. The model includes gross primary school enrollment and gross national savings as control variables. The findings reveal evidence of the impact of financial inclusion on economic growth. Despite the milestones achieved in terms of penetration of financial services, mainly through mobile money banking, the observed strong impact of usage on GDP per capita relative to access and penetration suggests the need for broadening usage and access dimensions of financial services. Usage and access to financial services can be achieved through policy measures to improve peoples' incomes. There is a need to ensure that the costs of finance (i.e. interest rates) are not prohibitive, especially to the lower and middle-income groups. Further, governments need to create environments that lower the charges related to the provision of financial services in order to enhance access to financial services. The use of national identities and the development of national switches to minimize transaction costs to users of mobile phones, especially in the EAC region where the platform is predominant, is paramount.

There is a need for governments' policy measures to focus on addressing frictions to financial inclusion in order to realize a significant economic growth impact of financial

[5]Sum of the coefficients of the individual components of the financial inclusion index.

inclusion. Such frictions to penetration, access, and usage of financial services can addressed through establishment of favorable regulatory environments for financial intermediation, mainly through reduced operational costs, especially those related to taxes and fees; reduce default risk by facilitating the use of credit reference bureaus and national identities; minimize the size of the informal economy. The findings on the impact of the individual components of financial inclusion index on economic growth corroborate those existing in the literature.

The finding of a weak impact of gross saving is consistent with empirical facts in the literature. Governments need not only to embark on income enhancing policies but also must nurture a saving culture that would help in financing investment at the national level. Specifically, governments need to implement policy measures envisioned to improve productivity among various sectors of the economy alongside measures to promote savings. The outcome of the negative impact of gross primary school enrolment does not convey any meaningful policy implication but can be explained by noises in data and the dependency nature of the primary school population cohort. In the future, studies on growth should consider secondary school enrollment as a driver rather than primary school enrollment.

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APPENDIX: List of countries

Algeria	Liberia	Seychelles
Burundi	Madagascar	South Africa
Cameroon	Malawi	Sudan
Comoros	Mauritius	Swaziland
Democratic Republic of Congo	Morocco	Tanzania
Egypt	Mozambique	Tunisia
Ghana	Namibia	Uganda
Kenya	Nigeria	
Lesotho	Rwanda	