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Financial inclusion in sub-Saharan Africa: Benchmarking against peer developing countries

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Abstract. *This paper empirically investigates the financial inclusion gap in sub-Saharan Africa (SSA) relative to peer developing countries using the two-stage instrumental variable estimation over the period 2011-2017. The results are two-fold. First, there are positive and significant gaps in bank account, mobile money and savings in SSA, and insignificant gaps in loans. The magnitudes of the gaps vary between 0.6 ~ 0.7, 1.3 ~ 1.7 and 9.1 ~ 17.1 percentage points, respectively. Second, private credit, real GDP per capita, population density, inflation and government effectiveness appear to be the driving factors of financial inclusion in the full sample of developing countries. Whilst, oil rents, education and bank concentration are the most important factors explaining financial inclusion in SSA.*

Keywords: benchmark model, financial inclusion gap, SSA, developing countries.

JEL Classification: G21, O1.

1. Introduction

Financial inclusion is the process of bringing the vulnerable and excluded people to the mainstream of formal financial system. Access to formal finance helps them to invest in human capital, start-up small businesses or sustain the existing ones, smooth consumption and manage financial risks (Demirgüç-Kunt et al., 2017). The Global Findex (2017) report indicates that whereas worldwide account ownership increased from 51% in 2011 to 69% in 2017, about 1.7 billion people remain excluded from formal financial systems, the majority of whom reside in developing countries. Many countries endorsed the Maya declaration in 2013 and implemented national strategies for financial inclusion that consist of raising financial literacy, creating an enabling regulatory environment and removing other hurdles to financial inclusion.

Over the past two decades, financial and institutional reforms undertaken led to improvements of financial indicators in Africa as documented by Beck et al. (2014). Moreover, the emergence of cross-border banking has fueled competition and deepened financial systems in Africa (Beck, 2014; Léon, 2016). Consequently, access to formal finance has recently improved in SSA as the account penetration increased by 8.4 percentage points between 2014-2017 (Global Findex, 2017).

Nevertheless, financial systems in SSA remain undeveloped and less inclusive even relative to peer developing countries (Allen et al., 2014; Beck, 2015). Whereas account penetration is nearly universal in high-income countries (94%), 63% in developing countries, only 43% of adults reported having a formal account in SSA in 2017 (Global Findex, 2017). Similarly, the use of formal finance is low in SSA and varies between and within countries. Financially excluded people therefore rely on their limited savings or resort to the informal sectors, which provide costly, riskier and limited financial products and services, to meet their day-to-day financial needs.

However, the recent development of digital finance through mobile phone is accelerating financial inclusion as the region becomes the hub of mobile money. Sub-Saharan Africa represents 45.6% of the worldwide registered mobile money accounts and drives 65.7% of the global mobile money transactions (GSMA, 2019). The aim of the paper is to investigate through a benchmarking exercise the average financial inclusion gap in SSA relative to peer developing countries and to assess whether there are differences in the macroeconomic driving factors of financial inclusion.

The paper contributes to existing literature in several ways. Using new datasets, we construct a novel benchmark model using countries' structural characteristics including economic and financial development levels. Second, given that some variables in the benchmark model are policy target, we use a two-stage instrumental variable (IV) estimator to assess the financial inclusion gap in SSA by drawing causal relationships rather than simple correlations.

Third, we add relevant financial inclusion variables for SSA (mobile money and savings) in the new benchmark model and control for the effect of bank characteristics on financial inclusion. Expanding the sets of variables makes the benchmark model more reliable and accurate in measuring financial inclusion in the region. Fourth, we provide a first study to

our best of knowledge that assesses the dynamic of financial inclusion gap in SSA. Finally, we identify plausible explanations for variations of financial inclusion in SSA and in other developing countries.

The remainder of the paper is organized as follows. Section 2 reviews relevant literature. Section 3 presents the data and discusses the empirical strategy. Section 4 presents results and discussions, whereas Section 5 concludes.

2. Literature review

The large gap between the size of the bankable and the banked population (Beck and De La Torre, 2007) on the one hand, and the vital role that financial inclusion plays in promoting inclusive development (Demirgüç-Kunt et al., 2017) on the other hand, motivated policy circles to set financial inclusion as a global development agenda. This study draws from the neoclassical economics theory, the new institutional economics theory and the New-Keynesian theory as theoretical foundations for financial inclusion.

The consumer choice model (Gossen, 1854) under the classical assumptions postulates that markets clear at equilibrium and any exclusions that may arise are the voluntary ones. However, in practice, disequilibrium could be caused by several reasons such as the shortage of supply and/or demand, or the presence of price barriers (i.e. costs of opening, maintaining and using of financial services) leading to involuntary financial exclusion. The new institutional economics departs from the neoclassical economics by relaxing the assumption of rationality (Coase, 1937; Williamson, 1975; North, 1990). It put emphases on the influence of norms/culture/religion and the emergence of institutions in explaining individuals' behaviours toward financial inclusion.

In the new-Keynesian theory, Stiglitz and Weiss (1981) establish the role of information asymmetry in distorting the well-functioning of credit markets leading to credit rationing (financial exclusion) even in equilibrium conditions. Principal-agent problems, adverse selection and moral hazard, make it difficult for banks to assess unambiguously the creditworthiness of its potential borrowers. Thus, above the optimal interest rate, banks deny credits even to those who are willing to pay higher interest rates since the expected rate of return of loans will increase at a slower pace than the interest rate.

On the empirical ground, there is a growing body of literature on financial inclusion. Some studies used micro-data to explore the determinants of financial inclusion (proxied by account, frequency of use, savings and borrowing). Fungáčová and Weill (2015) identified income, gender, education and age as driving factors for financial inclusion in China. Soumaré et al. (2016) examined the determinants of financial inclusion in Central and West Africa and found that factors driving financial inclusion in these two sub-regions are different from those in the entire sample of Africa.

Allen et al. (2014) assessed the African financial development and inclusion gaps using a benchmark model based on countries' income level on data from the Global Findex (2011). They found a 6-percentage points gap in loans in Africa relative to peer developing countries but there was no significant gap in account ownership. Rojas-Suarez and Amado

(2014) explored individual and country-level financial inclusion gaps in Latin America relative to its comparators. However, they adopted a straightforward approach by directly comparing the average financial inclusion in Latin America with the corresponding average of peer countries.

Yontcheva and Alter (2016) through a benchmarking exercise analysed the financial development and inclusion gaps in CEMAC countries compared to other SSA countries. Financial inclusion and development were measured by the number of commercial bank branches per 100000 adults and the ratio of private credit to GDP, respectively. They found that access to finance was limited and lacking in CEMAC relative to peer SSA countries.

This brief review shows that available literature used limited indicators in tracking the progress of financial inclusion. Allen et al. (2014) measured financial inclusion by account ownership at financial institutions and loans, whereas Yontcheva and Alter (2016) used a country-level indicator, commercial bank branch. Extant literature also disregards the role of mobile money and savings in promoting financial inclusion in SSA (Dupas and Robinson, 2013; Suri and Jack, 2016).

Further, despite the important role of financial development to harnessing financial inclusion (Hlophe, 2018), to the best of our knowledge, no study has controlled for countries' financial development in benchmarking SSA financial inclusion. Neither have any study established causal relationships, nor examine some dynamics of the financial inclusion gaps across time. Moreover, given that countries followed different paths to expanding access to finance, and even among developing countries differences in financial inclusion drivers are likely to arise (Soumaré et al., 2016), this study constructs a new benchmark model that allows to assess whether determinants of financial inclusion in SSA are different from those identified in other developing countries.

3. Benchmark model for financial inclusion in sub-Saharan Africa

A first and straightforward approach to analyse a country's financial system performance is to compare it directly relative to peer countries. However, this approach disregards the role of structural and policy factors put in place that affect financial systems performance. Therefore, we adopt an approach that controls for these factors to analyse financial systems performance in terms of inclusiveness in developing countries.

If we assume that financial systems in developing countries face similar challenges, the level of financial inclusion should be comparable after controlling for countries' structural characteristics. After isolating the effects of factors that can be taken as given in the short-run, any observed differences in a country's financial system performance relative to other countries is imputable to its policy environment and institutional quality.

3.1. The average financial inclusion gap in sub-Saharan Africa

To investigate the average financial inclusion gap in SSA, we construct a benchmark model and regress it on a sample of comparable developing countries (low and lower-middle-income). We exclude upper middle-income SSA African countries(1) from the sample

because these countries exhibit different financial inclusion patterns (Allen et al., 2014). The specification of the benchmark model given by Equation (1) is an extension of models of financial development found in the literature (Allen et al., 2014; Beck et al., 2007; Levine, 2005; Love and Martínez Pería, 2014; Owen and Pereira, 2018).

$$FI_{it} = \alpha_0 + \alpha_1 GDPpc_{it} + \alpha_2 FD_{it} + \alpha_3 POP_{it} + \alpha_4 OIL_{it} + \lambda SSA + \sum \gamma' X + \varepsilon_{it} \qquad (1)$$

The dependent variable, FI_{it}, is financial inclusion for country i at time t (t=2011; 2014; 2017) and measured by financial institutions account, mobile money account, formal loans and savings. $GPDpc_{it}$ refers to the level of economic development measured by real GDP per capita. FD_{it} is the level of financial development measured by the ratio of domestic credit to the private sector to nominal GDP.

SSA is a dummy variable that takes 1 for SSA countries and 0 otherwise, and a positive/negative sign of its coefficient indicates an over/under performance of SSA financial systems relative to peer developing countries. POP_{it} is population density an indicator of demographic concentration. OIL_{it} is the oil rents representing natural resources endowment. ε_{it} are the error terms. In the full model, the vector X includes some policy variables measured by education (*Educ*), bank concentration (*Conc_C3*), inflation (*Infl*) and the quality of institutions (*Gov_eff*).

Financial inclusion data obtained from the World Bank's Global Findex are available for the periods (2011, 2014 and 2017). Because of the potential endogeneity of per capita GDP, the use of traditional panel data estimators such as pooled OLS, fixed effects and random effects is discarded. Hence, for this study where T=3 (short) and N=101 (large), to extract the exogenous component of economic development, we adopt a two-stage instrumental variable (IV) estimator. The estimator draws good inferences in this case because dynamic panel estimators (system and difference GMM) perform worse when the time dimension is very small (for more discussions see Santos and Barrios (2011)).

3.2. Driving factors of financial inclusion in developing countries

Countries have followed different paths to promote financial inclusion. Therefore, some factors might be more or less important in explaining variations of financial inclusion in SSA than elsewhere in developing countries. We regress Equation (1) without a SSA dummy variable on an exclusive sample of SSA countries to provide determinants of financial inclusion in SSA and compared the results to those from the estimation of Equation (1) on a sample of developing countries excluding SSA.

3.3. Data sources

The study used data from different sources (Global Findex, WDI, WGI, and GFDD) on a sample of hundred and one (101) developing countries including thirty-six (36) SSA countries over the period 2011-2017. The time span and the sample composition were chosen based on data availability. The study uses four (04) financial inclusion indicators pertaining to access and use of formal financial services, namely financial institutions account ownership, mobile money account ownership, savings at and borrowing from financial institutions.

These indicators are measured as the proportion of adults (above 15) having a financial institutions account, mobile money account, saved at and borrowed from financial institutions, respectively. However, data for mobile money are available only the periods 2014 and 2017 in the Global Findex. The other control variables were collected from the WDI (World Development Indicators), WGI (World Governance Indicators), and the GFDD (Global Financial Development Databases). Table A1 in the appendix presents the definitions, sources, and expected signs of variables, followed by the list of countries included in this study.

4. Empirical results and discussions

4.1. Descriptive statistics

Table 1 provides summary statistics for developing countries (low and middle-income) excluding SSA and SSA countries. Over the study period 2011-2017, on average 42% and 12% of adults in other developing countries respectively owned a financial institutions account and borrowed from a financial institution compared to 25% and 6% in SSA. Similarly, whereas, the ratio of credit to the private sector to GDP averaged 48% in developing countries, in SSA the share remains low (27%), and per capita income in the latter is as lower as twice as in the former. SSA countries also have more concentrated banking markets (70%) than other developing countries (58%). However, in terms of mobile money penetration, SSA outperformed low- and middle-income countries as on average 18% and 5% of adults in the two regions owned a mobile money account, respectively. The two sub-samples have however comparable average levels of savings, oil rents, inflation and education.

Table 1. *Summary statistics*

Variables	N	mean	sd	N	mean	sd
	Developing excluding SSA			SSA countries		
Accnt_fin	178	42.051	22.269	100	25.308	18.68
Mob_mny	75	4.593	5.856	64	17.888	15.917
Savings	184	12.386	9.206	101	11.956	8.364
Brwngs	178	11.829	6.605	100	5.922	3.606
Priv_cred	173	47.79	29.924	102	26.456	33.026
GDP_pc	188	4712.087	3229.423	111	2017.905	2486.876
Pop_dens	192	140.844	188.4	111	92.377	130.724
Oil_rents	188	3.581	7.812	111	3.866	9.266
Inflation	178	6.227	7.234	107	7.105	7.285
Education	153	104.243	10.514	86	105.336	20.337
Gov_eff	192	-0.396	0.552	111	-0.741	0.588
Concentration	182	58.454	18.483	97	69.667	19.129

Source: Authors' calculation using World Bank databases for the period 2011-2017.

4.2. Estimating the average financial inclusion gap in sub-Saharan Africa

Literature shows that geographical factors affect economic performance (Gallup et al., 1999; Hall and Jones, 1999; Sachs and Warner, 1997). Following Ferrant (2015), we use landlock, a dummy variable obtained from the CEPII database, to instrument GDP per capita. Its effect on financial inclusion is only through economic development making it a plausible good instrument. Table 2 reports the two-stage instrumental variable (IV)

estimations of the baseline model (Equation 1) on a sample of low- and lower-middle-income countries, robust to heteroskedasticity. The first-stage regression results (reported in columns 1, 3, 5 and 7) show that whereas financial development and natural resources positively affect economic development, demographic concentration, being a SSA country and a landlocked country reduce per capita income in the sample over the study period. The significant coefficients of landlock proves its validity as an instrument for per capita GDP in the second-stage regressions.

Models in the second-stage regression results (reported in columns 2, 4, 6 and 8) are correctly specified as indicated by F-tests. The coefficients of the SSA dummy that are positive and significant at 5%, 1%, and 1% in columns 2, 4 and 6, respectively suggest an over performance of SSA relative to peer developing countries in account ownership, mobile money and savings at financial institutions. The magnitudes of the gaps calculated using the Halvorsen and Palmquist (1980) correction are respectively 0.68, 17.10, and 1.29 percentage points (pp) respectively. Thus, over the period 2011-2017, an average SSA country has 0.7, 17.1, and 1.3 percentage points greater proportions of adults accessing a financial institutions account, mobile money and savings, respectively than an average peer developing country. Thus, the magnitudes of the gaps are economically meaningful. The dynamic of the average financial inclusion gap in SSA indicates substantial achievements in financial inclusion between 2011-2017 in the region. Allen et al. (2014) using the Global Findex data for 2011 found however no significant gap in account ownership in SSA and claimed that the digital revolution through mobile money may have helped SSA countries to expand financial inclusion.

The table shows however no significant average loans gap in SSA relative to peer developing countries. This could be interpreted as either SSA countries have been catching up peer developing countries over the period 2011-2017 in formal borrowings or it simply indicates the predominance of informal borrowings in the region. The latter is more plausible as Demirguc-Kunt et al. (2018) show that whereas 45.7% of SSA adults borrowed any money during the year prior to 2017, 31% did so from family or friends and only 8.7% from financial institutions. Finally, per capita GDP, private credit and population density have a positive effect on financial inclusion in low and lower-middle income countries whereas, the effect of oil rents is negative in concordance with available literature (Allen et al., 2014; Bhattacharyya and Hodler, 2014; Datta and Singh, 2019; Rojas-Suarez and Amado, 2014; Sha'ban et al., 2019).

Table 2. *IV estimations of financial inclusion gap in sub-Saharan Africa*

Variables	Financial institution account		Mobile money account		Savings		Borrowings	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP_pc		0.885***		1.684**		0.632*		0.371
		(0.227)		(0.810)		(0.321)		(0.252)
Priv_cred	0.351***	0.243*	0.365***	-0.204	0.351***	0.193	0.35***	0.209*
	(0.059)	(0.145)	(0.078)	(0.417)	(0.058)	(0.179)	(0.059)	(0.114)
Pop_dens	-0.094***	0.142*	-0.096**	0.046	-0.090***	0.177*	-0.09***	0.001
	(0.033)	(0.082)	(0.043)	(0.164)	(0.033)	(0.104)	(0.033)	(0.074)
Oil_rents	0.030***	-0.024**	0.040***	-0.138**	0.031***	-0.015	0.03***	-0.016
	(0.006)	(0.010)	(0.011)	(0.055)	(0.006)	(0.013)	(0.006)	(0.014)
SSA	-0.511***	0.521**	-0.484***	2.896***	-0.526***	0.83***	-0.51***	-0.260

Variables	Financial institution account		Mobile money account		Savings		Borrowings	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(0.090)	(0.207)	(0.120)	(0.525)	(0.090)	(0.289)	(0.090)	(0.225)
Landlock	-0.431***		-0.332***		-0.419***		-0.43***	
	(0.089)		(0.117)		(0.089)		(0.089)	
Constant	6.787***	-4.929***	6.714***	-11.368**	6.769***	-4.256*	6.79***	-1.327
	(0.279)	(1.597)	(0.374)	(4.933)	(0.279)	(2.185)	(0.279)	(1.737)
Observations	152	152	86	86	155	155	152	152
R-squared	0.572	0.447	0.574	0.232	0.578	0.266	0.572	0.368
Number of Id		57		48		57		57
F-test		12.94		7.845		4.914		7.589
Prob > F		0.000		0.000		0.000		0.000

Source: Authors' calculation on data from World Bank and CEPII databases. Note: Per capita GDP and financial inclusion are the respective dependent variables in the first and second-stage regressions. All variables are in logarithm except oil rents, SSA and landlock. Standard errors in parentheses are corrected for heteroskedasticity. ***, **, * stand for 1%, 5% and 10%, respectively.

To assess the robustness of the results, we use two-stage IV estimations on an alternative sample (using baseline model) and alternative specifications (full benchmark model). The second-stage regression results of the estimations on alternative sample and specifications are reported in Table 3. Their first-stage counterparts are reported in Table A2 (available from authors upon request). In the alternative sample, some countries with high financial inclusion identified in the dataset (India, Mongolia, and Sri Lanka) were treated as potential outliers and excluded from the estimations. The results show that the coefficients of SSA are positive and significant (at 1%) for financial institutions account, mobile money and savings. The magnitudes of the coefficients that are closer to those reported in Table 3 for financial institutions account (0.70pp against 0.68pp) and savings (1.61pp against 1.29pp), but much lower for mobile money account (14.64pp against 17.10pp), remain however economically meaningful.

For the alternative specifications, the baseline benchmark model was expanded by including additional control variables (education, bank concentration, inflation and government effectiveness). The findings confirm the presence of average positive financial institutions account, mobile money and savings gaps in SSA. The magnitudes of the gaps are 0.62pp for financial institutions account, 1.39pp for savings and 9.59pp for mobile money. The drop in the magnitude of mobile money may suggest that some of the added policy variables constitute a challenge to financial inclusion in SSA. The issue will be further investigated when examining factors explaining differences in financial inclusion in developing countries.

Table 3. *Financial inclusion gap in sub-Saharan Africa: Robustness test*

	Estimation on an alternative sample				Estimation on alternative specifications			
Variables	Fin_Accnt	Mob_mny	Saving	Brwng	Fin_Accnt	Mob_mny	Saving	Brwng
GDP_pc	0.730***	1.544**	0.599*	0.366	1.024***	0.717	0.580	0.623**
	(0.214)	(0.759)	(0.301)	(0.244)	(0.260)	(0.793)	(0.495)	(0.256)
Priv_cred	0.241*	-0.213	0.177	0.202*	0.145	-0.079	0.180	0.146
	(0.135)	(0.399)	(0.164)	(0.109)	(0.125)	(0.289)	(0.213)	(0.104)
Pop_dens	0.188***	0.181	0.255***	0.060	0.027	-0.244	0.011	-0.138**
	(0.061)	(0.186)	(0.090)	(0.075)	(0.083)	(0.240)	(0.114)	(0.057)
Oil_Rents	-0.020**	-0.123**	-0.012	-0.015	-0.029**	-0.328***	-0.010	-0.029**
	(0.010)	(0.052)	(0.013)	(0.014)	(0.012)	(0.119)	(0.022)	(0.012)
SSA	0.531***	2.750***	0.959***	-0.181	0.483**	2.360***	0.871**	-0.113
					(0.235)	(0.543)	(0.351)	(0.209)

	Estimation on an alternative sample				Estimation on alternative specifications			
Variables	Fin_Accnt	Mob_mny	Saving	Brwng	Fin_Accnt	Mob_mny	Saving	Brwng
Educ					1.240**	-0.579	1.214*	1.096**
					(0.506)	(1.125)	(0.632)	(0.449)
Conc_C3					-0.577***	-1.688***	-0.748***	-0.343**
					(0.188)	(0.582)	(0.161)	(0.151)
Infl					-0.015	0.013	-0.014	-0.000
					(0.013)	(0.013)	(0.014)	(0.006)
Gov_eff					-0.310	-0.075	-0.075	-0.163
					(0.245)	(0.641)	(0.381)	(0.228)
Constant	-4.069***	-10.806**	-4.435**	-1.580	-8.625**	6.236	-5.777	-6.193*
	(1.473)	(4.723)	(2.011)	(1.660)	(3.662)	(6.393)	(5.953)	(3.459)
Observations	144	81	147	144	115	64	118	115
Number of Id	54	45	54	54	51	41	51	51
F-test	12.38	7.868	5.796	6.845	8.697	5.407	8.459	7.214
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculation on data from World Bank and CEPII databases. Note: All regressions are second-stage estimations of financial inclusion. All variables are in logarithm except oil rents, SSA and landlock. Standard errors in parentheses are corrected for heteroskedasticity. ***, **, * stand for 1%, 5% and 10%, respectively.

The last robustness test is an estimation of the full benchmark model using an alternative method of estimation assuming strict exogeneity of per capita GDP. The results of the random effect (RE) estimations are reported in Table 4. The RE estimator is preferred to the pooled OLS and fixed effects (FE) estimators as the first assumes homogeneity among countries and the time pattern is not important whereas, the use of the FE comes at the cost of eliminating all time invariant variables in the model including our variable of interest, the SSA dummy. In Table 4, all models have significant p-values associated with the Wald Chi2. The coefficients of the SSA dummy (magnitudes) are positive and significant for financial institutions account (0.58pp), mobile money (9.07pp) and savings (1.68pp).

The overall estimation results (initial sample in Table 2, alternative sample and specifications in Table 3 and the random effects in Table 4) suggest the presence of a positive average financial inclusion gap in SSA over the period 2011-2017. The magnitudes of the gaps vary between (0.6pp ~ 0.7pp), (1.3pp ~ 1.7pp) and (9.1pp ~ 17.1pp) for financial institutions account, mobile money and savings, respectively.

Table 4. *Random effect estimations of financial inclusion gap in sub-Saharan Africa*

Variables	Fin_Accnt	Mob_mny	Saving	Brwng
GDP_pc	0.945***	0.511	0.807***	0.399**
	(0.125)	(0.414)	(0.176)	(0.165)
Priv_cred	0.156	-0.058	0.131	0.177
	(0.116)	(0.291)	(0.161)	(0.112)
Pop_dens	0.02	-0.267	0.024	-0.144**
	(0.078)	(0.235)	(0.103)	(0.058)
Oil_rents	-0.026***	-0.313***	-0.018*	-0.022**
	(0.007)	(0.091)	(0.011)	(0.01)
SSA	0.46**	2.31***	0.987***	-0.174
	(0.188)	(0.465)	(0.252)	(0.212)
Educ	1.261***	-0.664	1.359***	0.906**
	(0.461)	(1.202)	(0.477)	(0.459)
Conc_C3	-0.6***	-1.704***	-0.758***	-0.38**
	(0.183)	(0.603)	(0.158)	(0.164)
Infl	-0.015	0.014	-0.014	-0.001
	(0.013)	(0.013)	(0.012)	(0.007)

Variables	Fin_Accnt	Mob_mny	Saving	Brwng
Gov_eff	-0.258	0.03	-0.204	-0.046
	(0.172)	(0.41)	(0.323)	(0.177)
Constant	-8.03***	8.276*	-8.06***	-3.526
	(2.446)	(4.494)	(2.771)	(2.903)
Observations	115	64	118	115
Wald chi2	98.322	50.428	99.135	57.346
Prob > chi2	0.000	0.000	0.000	0.000
Rho	0.64	0.678	0.616	0.78

Source: Authors' calculation on data from World Bank databases. Note: All regressions are second-stage estimations of financial inclusion. All variables are in logarithm except oil rents, SSA and landlock. Standard errors in parentheses are corrected for heteroskedasticity. ***, **, * stand for 1%, 5% and 10%, respectively.

4.3. What matter the most for financial inclusion in sub-Saharan Africa?

To explore factors underlying differences in financial inclusion in developing countries, we estimate the full benchmark model without a SSA dummy on two sub-samples: a sample of non-SSA countries (other developing countries) and a sample of SSA countries. Table 5 reports the second-stage regression results of the estimations whereas their first-stage counterparts are reported in Table A3 (available from authors upon request). For the sample of non-SSA countries, per capita GDP increases financial institutions account ownership and savings. Similarly, private credit positively affects the proportions of adults having accounts, saved at and borrowed from financial institutions. However, oil rents and inflation negatively affect the proportions of adults in non-SSA developing countries having financial institutions account and formal savings. Similarly, higher bank concentration constraints the adoption of mobile money by adults in non-SSA.

In SSA countries, the table shows that per capita GDP, population density, oil rents, education, bank concentration, inflation and the quality of institutions affect financial inclusion. More economically developed SSA countries have greater percentage of adults with financial institutions account, savings at and borrowing from financial institutions. However, the effect of economic development on mobile money adoption in SSA is not significant, results that could be explained by the relative lower costs of accessing and using mobile money services than the traditional banking services in the region. Population density has a positive effect on financial institutions account indicating that densely populated areas in SSA attract financial institutions, thus increasing account penetration (Allen et al., 2014). Similarly, SSA countries with greater share of educated people have higher proportions of adults having financial institutions account, having saved and borrowed formally. The non-significant effect of education on mobile money penetration could stem from the relatively easy use of these platforms as users can make financial transactions by sending just text messages.

Conversely, oil rich SSA countries have lower proportions of adults having financial institutions account, having saved at and borrowed from financial institutions. The crowding out effect of oil rents on finance through the natural resource curse is well documented in literature. Natural resource revenues deteriorate law enforcement reducing financial development (Bhattacharyya and Hodler, 2014), thus hindering financial inclusion. Similarly, more concentrated banking market negates financial inclusion through financial institutions account, mobile money account, savings and borrowing. This suggests

that larger bank scope is detrimental to financial inclusion (Chauvet and Jacolin, 2017) in SSA as banks could engage in cherry picking behaviour (Azmeh, 2018).

Table 5. *Macroeconomic determinants of financial inclusion in developing countries*

	Other Developing Countries				Sub-Saharan African Countries			
Variables	Fin_Accnt	Mob_mny	Saving	Brwng	Fin_Accnt	Mob_mny	Saving	Brwng
GDP_pc	0.608***	1.419	0.568*	-0.350	1.099***	1.361	0.439*	0.607**
	(0.195)	(0.854)	(0.301)	(0.272)	(0.239)	(1.241)	(0.244)	(0.262)
Priv_cred	0.402***	0.245	0.507***	0.474***	-0.004	-0.427	-0.025	0.018
	(0.113)	(0.422)	(0.175)	(0.145)	(0.115)	(0.587)	(0.123)	(0.128)
Pop_dens	-0.027	-0.271	0.001	-0.178	0.177*	-0.053	0.062	0.028
	(0.069)	(0.237)	(0.106)	(0.115)	(0.099)	(0.268)	(0.095)	(0.097)
Oil_rents	-0.022*	-0.203	-0.032*	-0.012	-0.034***	-0.527**	-0.004	-0.027*
	(0.011)	(0.129)	(0.018)	(0.013)	(0.013)	(0.231)	(0.013)	(0.014)
Educ	0.167	-1.016	0.444	-0.761	1.414**	-1.731	1.188**	0.950*
	(0.540)	(2.248)	(0.844)	(0.637)	(0.537)	(1.882)	(0.528)	(0.538)
Conc_C3	-0.194	-1.871*	-0.273	0.113	-1.090***	-1.838**	-0.84***	-0.82***
	(0.171)	(0.933)	(0.270)	(0.191)	(0.256)	(0.765)	(0.270)	(0.278)
Infl	-0.014**	-0.011	-0.024**	0.001	-0.030***	0.049	-0.026**	-0.014
	(0.006)	(0.043)	(0.010)	(0.006)	(0.010)	(0.046)	(0.011)	(0.011)
Gov_eff	-0.191	-1.413	-0.384	0.344	-0.739**	-1.955	0.216	-0.338
	(0.225)	(1.125)	(0.353)	(0.239)	(0.302)	(1.550)	(0.310)	(0.334)
Constant	-2.733	1.744	-5.190	7.356*	-7.737**	8.891	-2.760	-3.875
	(3.534)	(14.524)	(5.502)	(4.436)	(3.191)	(7.744)	(3.209)	(3.318)
Observ	127	54	131	127	65	38	66	65
N° of Id	49	32	50	49	32	26	32	32
F-test	11.50	1.164	5.827	2.899	11.53	2.484	6.795	4.814
Prob > F	0.000	0.341	0.000	0.006	0.000	0.034	0.000	0.000

Source: Authors' calculation on data from World Bank and CEPII databases. Note: All regressions are second-stage estimations of financial inclusion using a sample of non-SSA and SSA countries. All variables are in logarithm except oil rents, SSA and landlock. Standard errors in parentheses are corrected for heteroskedasticity. ***, **, * stand for 1%, 5% and 10%, respectively.

Furthermore, inflation has a negative and significant effect on account ownership and savings. However, the quality of institutions measured by government effectiveness has a negative (unexpected) and significant effect on financial institutions account. This unexpected effect may be due to the weak quality of institutions in SSA shown in descriptive statistics (Table 1). Similarly, private credit is not a significant predictor for financial inclusion in SSA. Owen and Pereira (2018) found private credit negatively affects mobile money indicating the crucial role of mobile money in less financially developed countries. Nevertheless, the role of financial development on financial inclusion cannot be overlooked. It could be the low-level of financial development in the region that dissipated its effect on financial inclusion. Descriptive statistics in Table 1 show that the ratio of private credit to GDP over the study period was around 27% of GDP in SSA (with large standard deviations 33%) against 48% in non-SSA developing countries.

To summarize, Table 5 reveals that per capita GDP, private credit, population, oil rents, education, bank concentration, inflation and government effectiveness affect financial inclusion in developing countries in general. However, the distinguishing features between the samples of non-SSA developing countries and SSA countries are the ratio of private credit to GDP which matters the most for the former and oil rents, education and bank concentration for the latter.

We re-estimate the model on an alternative sample (including entire developing countries) to assess the robustness of these findings. We interact a SSA dummy and a LMC dummy (taking 1 for non-SSA and 0 otherwise) with all variables to identify determinants of financial inclusion in SSA and the non-SSA developing countries, respectively. Table 6 reports the second-stage results of the estimations and their first-stage counterparts are reported in Table A4 (available from authors upon request).

For the sample of non-SSA countries, the findings indicate that per capita GDP and private credit interacted with a LMC dummy have a positive and significant effect on three financial inclusion indicators. Whereas, the interaction term with oil rents has a negative significant effect on two financial inclusion indicators. However, the LMC dummy is not statistically significant indicating that relative to the entire sample of developing countries, non-SSA developing countries do not exhibit a significant average financial inclusion gap.

For the sample of SSA countries, per capita GDP and education interacted a SSA dummy positively and significantly affect account, savings and borrowing as in Table 5. Population density interacted with a SSA dummy positively affects account. Conversely, oil rents interacted with a SSA dummy has a significant negative effect on account, mobile money and borrowing as above. Similarly, the interaction term with bank concentration has a negative and significant effect on all four financial inclusion indicators. The interaction with inflation has a negative significant effect on borrowing in addition to account and savings as in Table 5. Similarly, government effectiveness interacted with a SSA dummy has a negative unexpected effect on financial institutions account. The interaction of private credit with a SSA dummy has no statistically significant effect on financial inclusion in SSA as above. Overall, the robustness test does not alter the findings of Table 5.

However, the coefficients of the SSA dummy on its own are negative and significant across all specifications except for mobile money in which it is positive but not significant. This means an average SSA country falls short in the corresponding indicators of financial inclusion compared to an average developing country. This evidence does not however, contradict the previous findings of a positive average SSA financial inclusion gap (in account, mobile money and formal savings) reported in Table 2. Because the sample used for the robustness test included upper-middle-income developing countries that have different experiences than SSA countries in terms of financial inclusion. For example, financial inclusion in China or Malaysia included in the sample cannot be compared with financial inclusion in Guinea or Central African Republic.

Table 6. *Determinants of financial inclusion in developing countries: Robustness test*

	Other developing countries				Sub-Saharan African Countries			
Variables	Fin_Accn	Mob_mny	Saving	Brwng	Fin_Accn	Mob_mny	Saving	Brwng
GDP_pc*LMC	0.63***	1.421**	0.574*	-0.296				
	(0.187)	(0.555)	(0.344)	(0.246)				
Priv_cred*LMC	0.391***	0.327	0.512***	0.456***				
	(0.124)	(0.327)	(0.188)	(0.136)				
Pop_dens*LMC	-0.022	-0.280	0.003	-0.176*				
	(0.086)	(0.257)	(0.122)	(0.092)				
Oil_rent*LMC	-0.022**	-0.206***	-0.031	-0.013				
	(0.011)	(0.073)	(0.019)	(0.019)				
LMC	-3.960	-5.705	-6.555	6.827				
	(3.562)	(10.510)	(6.332)	(4.772)				

	Other developing countries				Sub-Saharan African Countries			
Variables	Fin_Accn	Mob_mny	Saving	Brwng	Fin_Accn	Mob_mny	Saving	Brwng
Educ*LMC	0.267	-0.653	0.550	-0.643				
	(0.565)	(2.074)	(0.868)	(0.756)				
Conc_C3*LMC	-0.003	-0.036***	-0.005	0.001				
	(0.003)	(0.012)	(0.006)	(0.003)				
Infl*LMC	-0.013	-0.007	-0.025**	0.001				
	(0.010)	(0.023)	(0.010)	(0.004)				
Gov_eff*LMC	-0.231	-1.559*	-0.428	0.310				
	(0.248)	(0.917)	(0.382)	(0.191)				
GDP_pc*SSA					1.14***	1.376	0.459*	0.63***
					(0.147)	(1.319)	(0.247)	(0.215)
Priv_cred*SSA					-0.027	-0.494	-0.038	0.006
					(0.059)	(0.474)	(0.115)	(0.068)
Pop_dens*SSA					0.202***	-0.032	0.078	0.042
					(0.069)	(0.280)	(0.081)	(0.073)
Oil_rent*SSA					-0.035***	-0.489*	-0.004	-0.028*
					(0.009)	(0.287)	(0.011)	(0.015)
SSA					-11.4***	1.358	-5.53**	-6.575**
					(2.532)	(6.679)	(2.527)	(2.635)
Educ*SSA					1.391***	-1.296	1.16**	0.919*
					(0.506)	(1.701)	(0.471)	(0.472)
Conc_C3*SSA					-0.016***	-0.030*	-0.01***	-0.012***
					(0.004)	(0.016)	(0.004)	(0.003)
Infl*SSA					-0.030***	0.033	-0.03**	-0.013*
					(0.011)	(0.048)	(0.013)	(0.007)
Gov_eff*SSA					-0.774***	-1.911	0.202	-0.362
					(0.225)	(1.982)	(0.239)	(0.262)
Constant	-0.007	-0.008	-0.001	-0.022	0.002	0.005	0.003	-0.000
	(0.007)	(0.014)	(0.007)	(0.015)	(0.006)	(0.010)	(0.004)	(0.005)
Observations	192	92	197	192	192	92	197	192
Number of Id	81	58	82	81	81	58	82	81
F-test	625.5	7.370	95.86	155.4	148.8	33	97.96	88.10
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculation on data from World Bank and CEPII databases. Note: All regressions are second-stage estimations of financial inclusion using a sample of all developing countries. All variables are in logarithm except oil rents, SSA and landlock. Standard errors in parentheses are corrected for heteroskedasticity. ***, **, * stand for 1%, 5% and 10%, respectively.

5. Conclusion and policy implications

The paper examines the dynamics of financial inclusion in SSA relative to peer developing countries over the period 2011-2017. To this end, the study uses country-level data from the Global Findex, WDI, WGI and GFDD databases for 101 developing countries. More specifically, the study constructs a new benchmark model by controlling for countries' structural characteristics including economic and financial development to investigate the average financial inclusion gap in SSA relative to peer developing countries. It adopts a two-stage instrumental variable estimation to draw causal relationships. The findings suggest that there is a positive and significant average financial inclusion gap in SSA and the magnitudes of gaps vary between 0.6 ~ 0.7, 1.3 ~ 1.7 and 9.1 ~ 17.1 percentage points, respectively for financial institutions account, mobile money and formal savings. However, the study does not find evidence of a significant average gap in loans in SSA. Overall, the

study documents substantial achievements in financial inclusion in SSA over the period 2011-2017 and quantifies the importance of mobile money in expanding financial inclusion in the region.

The analysis is taken a step further to examine the macroeconomic determinants of financial inclusion in developing countries over the study period. The findings reveal that per capita GDP, private credit, population density, oil rents, education, bank concentration, inflation and government effectiveness significantly affect financial inclusion in developing countries in general. However, natural resources, education and bank concentration are more important for financial inclusion in SSA than elsewhere in developing countries. The findings of the paper pass several robustness tests: alternative samples, methods of estimation and specifications.

Therefore, promoting the adoption of mobile money constitutes a levier to accelerating financial inclusion in the region. Among the policy variables, the analysis reveals that high bank concentration holds back financial inclusion in SSA whereas education acts an enabler to financial inclusion. Therefore, there is a room to accelerate financial inclusion in the region by improving the banking regulatory environment (reducing banking concentration). Further, education installs basic knowledge on people that improves their financial capability and fosters financial inclusion. Therefore, policy makers can leverage education to improve financial inclusion in SSA by formulating appropriate policy interventions to improve financial literacy.

Note

(1) Five countries fall into this income group: Botswana, Gabon, Mauritius, Namibia and South Africa.

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Appendices

Table A1. *Definitions, sources, and expected signs of the variables*

Variable	Definition	Source	Expected sign
Dependent variables			
Acc_fin	Percentage of people who have an account at a bank or another type of financial institution.	Findex (2011; 2014; 2017)	
Saving	Percentage of people who saved money formally in the past 12 months.	Findex (2011; 2014; 2017)	
Brwng	Percentage of people who borrowed money formally in the past 12 months.	Findex (2011; 2014; 2017)	
Mob_mny	Percentage of people who personally used a mobile money service in the past 12 months.	Findex (2011; 2014; 2017)	
Explanatory variables			
Priv_cred	Domestic credit to private sector refers to financial repayable resources provided to the private sector by financial corporations.	WDI	+
GDP_pc	GDP (constant 2010 U.S. dollars) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products per midyear population.	WDI	+
Pop_dens	Population density is midyear population divided by land area (a country's total area) in square kilometers	WDI	+
Oil_rent	Oil rents are the difference between the value of crude oil production at world prices and total costs of production.	WDI	-
Infl	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	WDI	-
Educ	The ratio of total enrollment to the population of the age group that officially corresponds to the level of education shown. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music.	WDI	+
Conc_C3	A measure of the degree of competition based on profit-efficiency in the banking market. It is calculated as the elasticity of profits to marginal costs. An increase in the Boone indicator implies a deterioration of the competitive conduct of financial intermediaries.	GFDD	+/-
Gov_eff	Government Effectiveness 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. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	WGI	+
Instrument			
Landlock	A dummy variable taking 1 if the country is a landlocked and 0 otherwise.	CEPII	

Source: Global Findex, GFDD, WDI, WGI and CEPII.

List of countries included in the analysis of the benchmark model (101)

Afghanistan, Albania, Algeria, Angola, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, China, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Ethiopia, Gabon, Georgia, Ghana, Guatemala, Guinea, Haiti, Honduras, India, Indonesia, Iran, Islamic Rep., Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kosovo, Kyrgyz Republic, Lao PDR, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, North Macedonia, Pakistan, Paraguay, Peru, Philippines, Romania, Russian Federation, Rwanda, Senegal, Serbia, Sierra Leone, South Africa, Sri Lanka, Sudan, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uzbekistan, Venezuela, RB, Vietnam, West Bank and Gaza, Yemen, Rep., Zambia, Zimbabwe.