

Financial Inclusion, Bank Competition, and Informal Employment in Sub-Saharan Africa

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INTRODUCTION

Economists have discussed for decades the importance of the financial sector to economic growth and development (Levine 2005). Well-developed financial systems that provide individuals with valuable and affordable financial products are key to channeling funds between savers and investors, facilitating payments and money transactions, and helping manage risks in the economy. Despite much debate still on which specific channels connect the financial system to economic growth, broad consensus indicates that countries with more financial development tend to grow more rapidly. Hence, the issue of financial inclusion in low- and middle-income countries has captured the interest of academics and policymakers.

In this chapter, we study how competition and financial soundness in the financial industry affect financial inclusion in sub-Saharan Africa. We use detailed individual-level survey data, combined with key country-level indicators of bank competition and financial soundness, to study the effect of competition and various bank balance sheet variables on access to key financial products (bank accounts, credit and debit cards, and bank loans), by adult individuals and by individuals in the informal economy.

In our empirical model, we use the World Bank Global Findex, a large individual-level database that consistently measures adults' use of financial services across countries and over time. In our empirical model, we include a rich set of individual-level demographic variables, various country-level competition and bank balance sheet variables, and other country-level variables for sub-Saharan Africa for 2011, 2014, and 2017. Contrary to other studies that consider financial inclusion at a more aggregate level, the Global Findex enables a more granular analysis at an individual level so that we can control for individual demographic characteristics. The database also allows us to identify individuals who are part of the informal economy, that is, individuals who do not receive a formal salary from employers. By focusing on sub-Saharan Africa only, we use a homogeneous sample of countries that share common characteristics.

We first study the effect of competition on financial inclusion. The industrial organization literature, through various game-theoretic models, shows that more concentration typically reduces competition, which increases prices and reduces output or welfare (Tirole 1988). In recent decades, bank competition across countries has significantly changed after a gradual deregulation (Vives 2011). More competition increases the supply of financial products, reduces the rates and fees paid, expands the number of financial providers and the network of bank branches, and increases the quality and variety of products offered (Vives 2016), with a positive effect on financial inclusion. The effect of bank concentration in Africa has frequently been studied by researchers and policymakers (Love and Peria 2012; Beck and Cull 2014; Mecagni, Marchettini, and Maino 2015).

We measure financial inclusion by considering individual-level indicators of adoption of bank accounts, debit cards, or credit cards. To measure competition, we use four well-known indicators used broadly in the banking literature: the C5 indicator, the H-statistic, the Lerner index, and the Boone indicator.¹

Which variables are appropriate to measure competition in an industry is a well-known question in the empirical literature. The degree of competition in an industry is related to the “conduct” of firms in the market, but not necessarily to the degree of concentration in the industry. A market with a single firm could still be “contestable” because the mere presence of potential entrants is enough to reduce the monopoly power of the incumbent (Baumol, Panzar, and Willig 1988). Furthermore, high costs in the provision of financial products, as shown in Allen and others (2016), could simply be caused by other factors not directly related to competition (such as higher input costs or lower economies of scale). Which variables are appropriate to measure competition is therefore a relevant question to characterize the conduct of firms.

In our empirical results, we generally find that competition has a statistically significant effect on the adoption of accounts, debit cards, and credit cards by individuals in sub-Saharan Africa. We combine analysis of the simple C5 indicator with the other competition indicators, which have a more direct behavioral interpretation in terms of competitive behavior and the conduct of firms. We also find a significant relationship between individuals who do not have a bank account because they think it is expensive and the degree of competition. This result suggests that the high cost of bank accounts may be attributed to a lack of competition instead of to other exogenous factors. We also find similar results when we consider only individuals who are part of the informal economy, which tends to be important in sub-Saharan Africa. Our results are robust when controlling for detailed individual-level variables and using other variables related to financial inclusion, such as GDP or financial depth, as well as country and year fixed effects.

¹ For a review of measures of competition used in banking, see Degryse, Morales Acevedo, and Ongena 2014.

We also study the relationship between key bank balance sheet variables and borrowing by individuals. Balance sheet weaknesses may affect the ability of banks to supply credit, restricting individuals' borrowing capacity.² One dimension of balance sheet strength is measured through the level of regulatory capital. There is not clear consensus about the implications of higher capital ratios on the supply of credit (Admati and others 2011; Hanson, Kashyap, and Stein, 2011). Banks can increase their capital ratios by increasing their levels of regulatory capital, which increases their resiliency and their ability to take risks and supply credit. Banks, conversely, may decide to increase their capital ratios by restricting credit. The effect of liquidity on lending is also debatable. Although banks with more liquid assets are more resilient against shocks, they may hold liquid assets to the detriment of lending (Cornett and others 2011).

The effect of changes in bank capital on bank credit supply greatly determines the link between the financial system and real activity. Quantifying this relationship has therefore been an important research question (Berrospide and Edge 2010; Gambacorta and Marques-Ibanez 2011; Kapan and Minoiu 2013; Bridges and others 2014; Gropp and others 2016; Brun, Fraisse, and Thesmar 2017). Most of the literature has focused on the effect of bank capital requirements on lending to the corporate sector. Few studies have considered consumer lending, but these studies typically found that higher capital reduces consumer lending less than corporate lending (Bridges and others 2014) and even increases the probability that banks accept mortgage applications (Michelangeli and Sette 2016). This chapter contributes to our understanding of the effect of bank balance sheet variables on individuals' borrowing, a key determinant of financial inclusion in Africa.

In a second set of results, we find a statistically significant relationship between key bank balance sheet variables and borrowing by individuals, although this relationship is not robust when considering country fixed effects or when considering informally employed individuals only. Without country fixed effects, we find that borrowing by individuals is positively affected in countries with higher Tier 1 capital ratios and more liquid financial systems. We also find that more liquid financial systems are more procyclical (that is, more positively affected by larger GDP growth). We find a similar procyclical effect when considering financial systems with higher Tier 1 capital ratios. In other words, stronger financial systems (in terms of higher capital or liquidity) are more procyclical (give more credit when GDP growth is larger). However, once we add country fixed effects, some procyclical effects disappear. We therefore conclude that the effect of higher Tier 1 capital ratios and more liquid financial systems on borrowing is not undisputed. Tier 1 capital ratios tend to be higher in sub-Saharan Africa compared with

² This "bank-lending" channel is part of a broader concept called the "credit channel of monetary policy" (Bernanke and Gertler 1987, 1995; Bernanke and Blinder 1988; Kashyap and Stein 2000; Bernanke 2007; Jiménez and others 2012, 2014).

other regions, which may solely be a result of buffers constructed to prevent losses in highly unstable financial systems (Beck and others 2011). In sub-Saharan Africa, where it is costly for banks to raise capital, capital ratios may be raised by constraining lending (Bernanke and Lown 1991).

This chapter contributes to the empirical literature that links financial sector development and economic growth (King and Levine 1993). Financial inclusion can help reduce poverty and inequality by helping people invest, smooth their consumption, and manage financial risks; however, the relationship between financial inclusion and economic growth is not yet well understood, and research on the topic has been limited (Demirgüç-Kunt, Klapper, and Singer 2017). It is important to understand that financial depth and financial inclusion are two different concepts. In general, financial depth concerns aggregate variables, such as the volume of loans or deposits relative to GDP. Meanwhile, financial inclusion refers to how accessible the financial sector is to various population segments, depending on their income, race, gender, age, and so on.

For example, a financial sector could be considered to be developed from the standpoint of the ratio of loans to GDP but negatively ranked in inclusion because a few individuals borrow most of the loans.³ Allen and others (2016) is the closest reference to our analysis and uses a similar individual-level database from 123 countries for 2011 to find a significant relationship between political stability, legal rights, and other institutional variables on financial inclusion. Deléchat and others (2018) uses a similar database to show the effect of institutional factors on women's financial inclusion.

In this chapter, we describe our data sources, study the relationship between competition and financial inclusion, study the relationship between balance sheet variables and financial inclusion, and conclude with a summary and consider policy implications.

DATA SOURCES

Our analysis relies on the World Bank Global Findex database for 2011, 2014, and 2017; the IMF Financial Soundness Indicators; and the World Bank Global Financial Development database.

Global Financial Inclusion Database

We use the Global Findex database (Demirgüç-Kunt and Klapper 2013), launched by the World Bank in 2011 and updated in 2014 and 2017. The Global Findex covers more than 140 economies, representing more than 97 percent of the world's population. Global Findex data are collected at the individual level,

³ Studies on financial inclusion in sub-Saharan Africa include Karlan and Morduch 2009, Ahokpossi and others 2013, Allen and others 2013, Mlachila and Moheput 2014, and Yontcheva and Alter 2016.

through a survey by Gallup, covering approximately 150,000 nationally representative and randomly selected individuals ages 15 years and older (Demirgüç-Kunt and others 2015).

The focus of our analysis is sub-Saharan African countries, so we restrict our sample to this region. Observations total nearly 105,000, with approximately 35,000 in each year. Table 12.1 shows summary statistics that suggest Findex respondents vary greatly. Respondents' ages range from 15 to 99 years. The average age is 34.3 years old, and the median is 30 years old. The median person in the sample has completed primary education, and the female-to-male ratio is 1.5. For income distribution, the poorest 20 percent constitute 15 percent of the sample and the richest 5 percent constitute 28 percent of the sample (not shown).

To measure informal employment, we use a wage variable indicator equal to 1 if the adult individual does not receive a wage from an employer. This definition of informal employment is consistent with guidelines provided by the International Labour Organization (2013). When we use this definition, approximately 85 percent of individuals in the sample are informal workers. The informal employment variable is only available for 2014 and 2017 in the sample.

In our database, 36 percent of individuals have a bank account. Those with a debit card are 18 percent of the sample, and 5 percent have a credit card. Among the people who do not have bank account, 21 percent report not having an account because it is too expensive. Also, 7 percent report having borrowed money from a financial institution in the past year.

Although the Global Findex includes variables related to mobile payments and other new financial technologies (fintech), we do not consider these services in our study. First, these services are still in development, mainly used for sending money, and have a limited use as saving or credit instruments (Maino and others 2019). Second, measuring competition in the fintech industry is difficult, and limited data are available. Last, with the exception of several countries in eastern and southern Africa, most of these new services are not successful in the continent. Therefore, we limit our study to more traditional banking products, such as bank accounts, cards, and loans.

Financial Soundness Indicators Database

We use the IMF Financial Soundness Indicators database at the country level, combined with the Findex, to obtain insight on the financial soundness of banking institutions in sub-Saharan Africa. Financial soundness indicators are compiled to monitor the health and soundness of financial institutions and markets and of their corporate and household counterparts. However, the database suffers from missing data, because it only contains 24 countries from sub-Saharan Africa. The main variables available are institutions that take deposits, asset quality, non-performing loans to total gross loans, earnings and profitability of the banking sector, return on assets and equity, capital adequacy, and liquidity ratios. Table 12.2 shows the complete list of variables.

TABLE 12.1.

Selected Summary Statistics of Data Sources								
Variable	Mean	Minimum	P1	P25	P50	P75	P99	Maximum
Demographic Variables								
Age	34.3	15	15	23	30	42	79	99
Education	1.53	1	1	1	1	2	3	5
Female	1.50	1	1	1	1	2	2	2
Income quantile	3.26	1	1	2	3	5	5	5
Informality indicator	0.85	0	0	1	1	1	1	1
Financial Inclusion Indicators								
Has bank account	0.36	0	0	0	0	1	1	1
Has debit card	0.18	0	0	0	0	0	1	1
Has credit card	0.05	0	0	0	0	0	1	1
Does not have account because it is expensive	0.21	0	0	0	0	0	1	1
Borrowed last year	0.07	0	0	0	0	0	1	1
Competition Indicators								
Boone indicator	-0.06	-0.5	-0.5	-0.11	-0.05	-0.01	0.2	0.2
C5 indicator	81.39	52.08	52.08	69.16	83.73	92.52	100	100
H-statistic	0.49	0.06	0.06	0.39	0.49	0.6	0.83	0.83
Lerner index	0.28	0.1	0.1	0.23	0.28	0.32	0.48	0.48
Bank Indicators and Growth								
Liquidity coverage ratio	29.34	10.61	10.61	21.84	29.14	36.66	53.71	53.71
Tier 1 ratio	15.82	2.18	2.18	13.4	16.19	18.57	30.77	30.77
GDP growth	4.77	-6.43	-6.43	3.19	4.7	6.36	13.6	13.6

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

TABLE 12.2.

Financial Soundness Indicators	
Variable	Description
Deposit takers	Deposit-taker institutions
Asset quality	Asset quality
Nonperforming loans to total gross loans	Calculated by using the value of nonperforming loans as the numerator and the total value of the loan portfolio (including nonperforming loans and before the deduction of specific loan loss provisions) as the denominator
Earnings and profitability	Earnings and profitability
Return to assets	Calculated by dividing net income before extraordinary items and taxes by the average value of total assets over the same period
Return to equity	Calculated by dividing net income before extraordinary items and taxes by the average value of capital over the same period
Capital adequacy	Capital adequacy
Capital to risk-weighted assets	Calculated using total regulatory capital as the numerator and risk-weighted assets as the denominator

Source: IMF, Financial Soundness Indicators database.

Note: For each variable, type is percent and format is numeric.

Global Financial Development Database

The World Bank Global Financial Development database provides extensive data on financial system characteristics for 206 economies (Čihák and others 2012). Table 12.3 shows some variables included. The main explanatory variables of interest here measure bank competition. We use the C5 indicator (higher C5, less competition), the H-statistic (higher H, more competition), the Lerner index (higher, less competition), and the Boone indicator (higher, more competition).

The Global Financial Development database also contains variables that measure access to banking, such as bank accounts per 1,000 adults and bank branches per 100,000 adults. The indicators that measure the depth of the banking sector include the ratios of private credit to deposit money banks, deposit money banks' assets to GDP, and central bank assets to GDP. The resilience and stability of banks are indicated by variables related to the ratios of nonperforming loans to gross loans, bank capital to total assets, and bank credit to bank deposits. Macroeconomic variables, including GDP and GDP per capita, are the other variables we control for and are included in the database.

We now describe in detail the four indices that measure the level of bank competition, which are our main explanatory variables related to competition. Degryse, Morales Acevedo, and Ongena (2014) provide more detailed information about the use of various competition variables in the financial industry.

C5 Indicator

The C5 indicator is equal to the combined market share of the five largest financial institutions in the country. It is the simplest indicator of competition. The industrial organization literature shows, through game-theoretic models of collusion, that more concentration tends to increase prices and reduce output or welfare (Tirole 1988). Concentration, however, is an imperfect measure of competitive behavior. For example, the Bertrand model without differentiated goods or the contestable market theory (Baumol, Panzar, and Willig 1988) shows that it is possible to have a perfectly competitive market in which price is equal to marginal cost, even with a monopolistic or a duopolistic market structure. Other measures of competition more related to the conduct of firms are therefore necessary to complement the C5 indicator.

Panzar-Rosse H-Statistic

The H-statistic captures the elasticity of bank interest revenues to input prices, where input prices include the price of deposits, personnel, equipment, and fixed capital.⁴ As proposed originally by Panzar and Rosse (1987), the H-statistic is defined such that the higher its value, the more competitive the banking system.

⁴ For more information, see “Banking Competition” in the World Bank’s *Global Financial Development Report 2019/2020* (<https://www.worldbank.org/en/publication/gfdr/gfdr-2016/background/banking-competition/>).

TABLE 12.3.

Selected Explanatory Variables in the Global Financial Development Database	
Variable	Description
Bank accounts per 1,000 adults	Number of depositors with commercial banks per 1,000 adults
Bank branches per 100,000 adults	Number of commercial bank branches per 100,000 adults
Loans requiring collateral	Percentage of loans where a formal financial institution requires collateral to provide the financing
Value of collateral needed for a loan (% of the loan amount)	Value of collateral needed by a formal financial institution for a loan or line of credit as a percentage of the loan value or the value of the line of credit
Private credit by deposit money banks to GDP (%)	Financial resources provided to the private sector by domestic money banks as a share of GDP
Deposit money banks' assets to GDP (%)	Total assets held by deposit money banks as a share of GDP
Central bank assets to GDP (%)	Total assets held by deposit money banks as a share of GDP
Bank net interest margin (%)	Accounting value of bank's net interest revenue as a share of its average interest-bearing (total earning) assets
Bank lending-deposit spread	Difference between lending rate and deposit rate; lending rate is the rate charged by banks on loans to the private sector, and deposit interest rate is the rate offered by commercial banks on three-month deposits
Bank concentration (%)	Assets of three largest commercial banks as a share of total commercial banking assets
Bank deposits to GDP (%)	Total value of demand, time, and saving deposits at domestic deposit money banks as a share of GDP
H-statistic	Measure of the degree of competition in the banking market; higher H-statistic means more competition
Lerner index	Measure of market power in the banking market; higher Lerner means less competition
Boone indicator	Measure of degree of competition based on profit-efficiency in the banking market; higher value (less negative) means less competition
Bank z-score	Captures the probability of default of a country's commercial banking system
Bank nonperforming loans to gross loans (%)	Ratio of defaulting loans (payments of interest and principal past due by 90 days or more) to total gross loans (total value of loan portfolio)
Bank capital to total assets (%)	Ratio of bank capital and reserves to total assets
Bank credit to bank deposits (%)	Financial resources provided to the private sector by domestic money banks as a share of total deposits
Bank regulatory capital to risk-weighted assets (%)	Capital adequacy of deposit takers; ratio of total regulatory capital to its assets held, weighted according to risk of those assets
Liquid assets to deposits and short-term funding (%)	Ratio of the value of liquid assets (easily converted to cash) to short-term funding plus total deposits
Provisions to nonperforming loans (%)	Provisions to nonperforming loans
Stock price volatility	Stock price volatility is the average of the 360-day volatility of the national stock market index
GDP (current US dollars)	GDP (current US dollars)
GDP per capita (constant 2005 US dollars)	GDP per capita (constant 2000 US dollars)
Population (total)	Population, total

Source: World Bank, Global Financial Development database.

Note: For each variable, type is continuous and format is numeric.

A monopoly situation yields an H-statistic that can be negative or zero, whereas monopolistic competition yields values between 0 and 1, and perfect competition is greater than 1 (Bikker and Haaf 2002; Claessens and Laeven 2004).

Lerner Index

The Lerner index is defined as the difference between output prices and marginal costs (relative to prices) and is equal to the inverse of the elasticity of demand for the case of a perfect monopoly and equal to zero for a perfect competitive market. Higher values of the Lerner index therefore indicate less bank competition. For industry structures between competition and monopoly, the value of the Lerner index depends on the reaction of a bank to competitors' strategic choices. The stronger this reaction, the lower the degree of competition and the higher the Lerner index (Shaffer 1993).

Boone Indicator

The Boone indicator (Boone 2008) reflects the effect of efficiency on profits, calculated as the elasticity of profits to marginal costs. The indicator mainly measures that more efficient banks achieve higher profits. The more negative the Boone indicator, therefore, the greater the competition in the market. The Boone indicator ranges from -0.5 to 0.2 , and the average value for our sample countries is close to zero at -0.06 .

Our sample demonstrates that the H-statistic and Lerner indices show average statistics indicating low bank competition among the sub-Saharan African countries represented in our database.

When compared with other simpler measures (such as C5), the H-statistic, the Lerner index, and the Boone indicator provide a step forward in measuring competition. Calculating these three competition indicators, however, requires large amounts of data; all use input prices or costs of production at the bank level, which may not be available for researchers in nonadvanced economies, especially the sub-Saharan Africa region.

Financial Access and Bank Competition in Sub-Saharan Africa

Table 12.4 shows summary statistics of variables measuring financial access by global region. Financial account ownership in sub-Saharan Africa is significantly lower compared with more advanced economies. In sub-Saharan Africa, there are 346 bank accounts per 1,000 adults, compared with 1,522 accounts in advanced economies and 591 in emerging markets and low-income developing countries. Other measures of financial access, such as number of bank branches or ownership of credit or debit cards, are also lower in sub-Saharan Africa.

Table 12.4 shows that sub-Saharan Africa does comparatively better in mobile payment use. In the region, 25 percent of adults use a mobile bank account, compared with 85 percent of adults in advanced economies and 29 percent in nonadvanced economies.

TABLE 12.4.

Selected Summary Indicators					
Indicator	Sub-Saharan Africa	Africa	Advanced Economies	Nonadvanced Economies	Descriptor
Bank accounts (per 1,000 adults)	345.8	346.0	1,522.2	590.9	
Credit cards (percent of adults with)	3.7	3.7	46.5	9.2	
Debit cards (percent of adults with)	14.4	14.3	78.3	26.2	
Mobile payments (percent of adults using)	24.9	23.2	85.0	29.2	
Bank branches (per 100,000 adults)	7.5	7.8	35.7	14.3	
Boone indicator	-0.08	-0.05	-1.27	-0.05	Higher value (less negative), less competition
H-statistic	0.46	0.49	0.63	0.55	Higher H, more competition
Lerner index	0.32	0.32	0.28	0.32	Higher Lerner, less competition
C5 indicator	82.12	82.21	83.99	76.6	Higher C5, less competition

Source: World Bank, Global Findex database.

When comparing competition indicators measured using the Boone indicator, the H-statistic, and the Lerner index, we find that the degree of competition in the sub-Saharan African banking sector is lower (than in advanced economies). Yet, if we measure competition using C5, the two world regions are similar.

COMPETITION AND FINANCIAL INCLUSION

The objective of our analysis is to use the detailed panel of individuals provided by Findex to focus on two separate research issues. First, we want to understand how various country-level bank competition indicators affect having an account, a debit card, or a credit card. Second, we want to understand how measures of financial soundness at country level affect borrowing by individuals.

Empirical Model

To estimate the effect of competition, we consider a simple probit model where $y_{i,c,t} = 1$ is an indicator that individual i in country c and year t adopted a certain financial product. We further assume that $Pr(y_{i,c,t} = 1) = Pr(y_{i,c,t}^* > 0)$, where

$$y_{i,c,t}^* = \alpha_1 \text{compet}_{c,t-1} + \alpha_2 X_{i,c,t} + \alpha_3 Z_{c,t} + \alpha_t + \alpha_c + \varepsilon_{i,c,t}, \quad (1)$$

where the term $\text{compet}_{c,t-1}$ is a lagged variable of competition constructed using the C5, the Boone indicator, the H-statistic, or the Lerner index; $X_{i,c,t}$ is a vector of

individual-level variables; Z_{ct} is a vector of country-level variables; α_t is year fixed effects; and α_c is country fixed effects. We also use model (1) to determine how competition affects the costs of bank accounts. Whether the expense is the reason individuals do not have a bank account is a question in the Findex survey.

From this model, we can test the validity of the market power hypothesis by considering the sign of parameter α_1 in model (1), with Hypothesis 1 as $\alpha_1 > 0$ (greater competition increases the probability of having a financial product).

Country and year fixed effects play a relevant role in identifying the parameters of interest in model (1). Country fixed effects allow control of time-invariant, country-level variables that may influence an individual's decision to adopt a financial product. We estimate a short panel (two years) with approximately 1,000 individuals per country-year. Our individual-level data include rich demographic variables that may affect the decision to buy a financial product or obtain access to credit.

Results for the Full Sample of Individuals

We present results related to the estimation of model (1) that show the effect of bank competition variables on individuals' adoption of bank accounts, debit cards, and credit cards by individuals in sub-Saharan Africa. We first present the results when using the full sample (formally and informally employed individuals). Table 12.5 shows the effect of competition variables on individuals' adoption of bank accounts. Given the definition of every competition indicator, a positive effect of competition on the adoption of bank accounts (that is, if competition in the market increases, adoption increases) would imply that the estimated parameter is negative for the C5 indicator, negative for the Boone indicator, positive for the H-statistic, and negative for the Lerner index. In all regressions we use three country-level indicators: the ratio of private credit to GDP, the GDP in US dollars, and GDP per capita. The three indicators should be positively related to financial depth, which could be related to financial inclusion because financial inclusion tends to be higher in more advanced economies with more developed financial systems.⁵ These variables also help control for other factors not included in the other regressors.

We start our econometric analysis with the simplest competition indicator, the C5 indicator of concentration, and we find an intuitive negative coefficient for C5 in column (1). In column (2), we find that the effect of the C5 indicator in countries with a more developed financial system (measured as the ratio of credit to GDP) is positive. This is an interesting result, because it shows that competition indicators for financial inclusion tend to be less important in countries with more financial depth.

In columns (3) to (5), we add additional variables to better measure competition (the Boone indicator, the H-statistic, and the Lerner index), and we interact

⁵ Financial inclusion tends to be higher in more advanced economies with more developed financial systems, although this may not always be the case (Karlan and Morduch 2009).

TABLE 12.5.

Individuals Who Have a Bank Account and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C5 indicator	-1.084*** (0.0341)	-1.380*** (0.0745)	-1.633*** (0.0629)	-0.257** (0.122)	-1.324*** (0.169)	-1.531*** (0.133)	-1.224*** (0.268)	-1.703*** (0.298)	-4.742*** (0.560)	-3.782*** (0.507)
C5 Indicator × Credit/GDP		0.00955*** (0.00217)					-0.0146 (0.0109)			
Boone indicator			32.57*** (2.428)					-22.74*** (6.633)		
C5 Indicator × Boone Indicator			-7.708*** (0.571)					5.286*** (1.567)		
H-statistic				9.006*** (1.464)					-23.68*** (5.503)	
C5 Indicator × H-Statistic				-2.090*** (0.331)					5.805*** (1.269)	
Lerner index					-4.823* (2.601)					-39.42*** (7.575)
C5 Indicator × Lerner Index					1.197** (0.601)					9.202*** (1.789)
Credit/GDP	0.0147*** (0.000421)	-0.0271*** (0.00952)	0.0175*** (0.000542)	0.0153*** (0.000581)	0.0177*** (0.000617)	0.00332 (0.00307)	0.0670 (0.0478)	-0.00168 (0.00427)	-0.00496 (0.00400)	-0.00600 (0.00492)
GDP per capita	0.143*** (0.00859)	0.146*** (0.00862)	0.0632*** (0.0113)	0.189*** (0.0131)	-0.0118 (0.0168)	-1.593*** (0.204)	-1.625*** (0.205)	-2.445*** (0.298)	-2.496*** (0.324)	-3.455*** (0.359)
GDP	-0.0394*** (0.00616)	-0.0591*** (0.00741)	0.00624 (0.00805)	-0.0446*** (0.00859)	0.0243*** (0.00936)	0.791*** (0.0748)	0.801*** (0.0752)	0.645*** (0.113)	0.340*** (0.108)	1.145*** (0.186)
Respondent age		0.00929*** (0.000384)	0.0106*** (0.000493)	0.0106*** (0.000505)	0.0110*** (0.000531)	0.00999*** (0.000396)	0.01000*** (0.000396)	0.0118*** (0.000507)	0.0120*** (0.000523)	0.0118*** (0.000549)
Female		0.123*** (0.0111)	0.112*** (0.0143)	0.102*** (0.0146)	0.114*** (0.0153)	0.148*** (0.0114)	0.148*** (0.0114)	0.116*** (0.0146)	0.113*** (0.0150)	0.125*** (0.0157)

(continued)

TABLE 12.5. (continued)

Individuals Who Have a Bank Account and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Primary education or less		-0.181 (0.118)	-0.381*** (0.145)	-0.224 (0.141)	-0.324** (0.157)	-0.271** (0.120)	-0.271** (0.120)	-0.341** (0.148)	-0.204 (0.145)	-0.271* (0.158)
Secondary education		0.432*** (0.118)	0.277* (0.145)	0.408*** (0.140)	0.335** (0.156)	0.386*** (0.120)	0.386*** (0.120)	0.349** (0.148)	0.491*** (0.145)	0.410*** (0.158)
Tertiary education or more		1.119*** (0.122)	1.189*** (0.151)	1.104*** (0.144)	1.277*** (0.163)	1.222*** (0.125)	1.222*** (0.124)	1.291*** (0.154)	1.360*** (0.149)	1.351*** (0.166)
Education: missing		-0.238 (0.164)	-0.0980 (0.241)	-0.161 (0.234)	-0.111 (0.393)	-0.296* (0.171)	-0.297* (0.171)	-0.420* (0.248)	-0.264 (0.245)	-0.192 (0.391)
Poorest 20%		-0.772*** (0.0184)	-0.834*** (0.0240)	-0.817*** (0.0244)	-0.802*** (0.0256)	-0.803*** (0.0188)	-0.803*** (0.0188)	-0.875*** (0.0245)	-0.857*** (0.0251)	-0.862*** (0.0263)
Second 20%		-0.606*** (0.0175)	-0.697*** (0.0229)	-0.690*** (0.0232)	-0.694*** (0.0245)	-0.625*** (0.0179)	-0.625*** (0.0179)	-0.726*** (0.0233)	-0.717*** (0.0239)	-0.739*** (0.0252)
Middle 20%		-0.467*** (0.0166)	-0.506*** (0.0212)	-0.496*** (0.0216)	-0.491*** (0.0227)	-0.485*** (0.0170)	-0.484*** (0.0170)	-0.531*** (0.0217)	-0.525*** (0.0222)	-0.529*** (0.0234)
Fourth 20%		-0.298*** (0.0157)	-0.313*** (0.0198)	-0.306*** (0.0201)	-0.307*** (0.0212)	-0.305*** (0.0160)	-0.305*** (0.0160)	-0.324*** (0.0202)	-0.317*** (0.0207)	-0.328*** (0.0217)
No. of observations	62,863	62,863	38,992	37,987	33,989	62,863	62,863	38,992	37,987	33,989
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Expected sign: C5 indicator	-	-	-	-	-	-	-	-	-	-
Expected sign: Boone indicator			-					-		
Expected sign: H-statistic				+					+	
Expected sign: Lerner index					-					-

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

them with the simple C5 indicator. Again, bank concentration may not be a strong indicator of competitive behavior.⁶ The Boone indicator, H-statistic, and Lerner index have a stronger behavioral interpretation related to the competitive behavior of the industry. In column (4), we find that adoption of accounts increases in markets that are more competitive (higher H-statistic indicator) for a given level of concentration of C5. In addition, the interaction of the two indicators has a negative effect on adoption.

In columns (3) and (5), respectively, we consider the Boone and Lerner indicators. In all columns, the effect of the C5 indicator is negative, and the effect of the Lerner indicator in column (5) is consistent with hypothesis 1. We do not find an intuitive effect of the Boone indicator consistent with our hypothesis in column (3).

The effect of the credit-to-GDP ratio (financial depth) and other economic development (GDP) variables on financial inclusion is positive and statistically significant in most specifications. This suggests a link between financial inclusion and financial depth.

In columns (6) to (10), we repeat the analysis and include country fixed effects. Some results change considerably, probably because we use a short panel with country-level variables and country fixed effects, which may add collinearity effects if the country-level variables vary slightly. With country fixed effects, the estimated effect of ratio of credit to GDP on adoption becomes statistically insignificant, the effect of GDP per capita becomes negative, and the effect of GDP becomes positive and significant. In all cases, the effect of concentration has an intuitive negative sign. When including the effect of the Boone and Lerner indicators, we find intuitive effects consistent with hypothesis 1, whereas the effect of the H-statistic has the expected opposite sign.

Several intuitive results are discovered regarding the effect of individual-level variables (education, gender, age, and so on) on the probability of having a bank account. In all specifications, older individuals, female individuals, and well-educated individuals (secondary education or higher) are more likely to have a bank account. Also, poor individuals (the poorest 20 percent) are less likely to have a bank account. The results are also robust for other products (debit and credit cards), which we present in the following tables.

Table 12.6 shows the estimated parameters for a probit regression where the endogenous variable is an indicator equal to 1 if the individual responds in the survey that he or she does not have an account because accounts are too expensive. We use this probit model to understand whether there is a statistical relationship between accounts being expensive and the banking industry being uncompetitive. This relationship is not obvious. Industries that are more competitive do not necessarily have lower prices for the products offered because other exogenous

⁶ For example, a simple duopoly market can be competitive if the two firms compete on prices (Bertrand competition). Also, a monopoly can set a perfectly competitive price if the market is “contestable” (Baumol, Panzar, and Willig 1988).

TABLE 12.6.

Individuals Who Do Not Have Accounts Because They Are Too Expensive										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C5 indicator	0.222*** (0.0372)	-0.213*** (0.0756)	-0.218*** (0.0665)	-0.723*** (0.124)	-0.0645 (0.181)	0.494*** (0.137)	1.535*** (0.329)	0.798*** (0.295)	0.876 (0.594)	3.708*** (0.563)
C5 Indicator × Credit/GDP		0.0154*** (0.00234)					-0.0459*** (0.0131)			
Boone indicator			19.43*** (2.624)					32.26*** (7.322)		
C5 Indicator × Boone Indicator			-4.510*** (0.615)					-7.861*** (1.728)		
H-statistic				-10.39*** (1.526)					-13.48** (6.004)	
C5 Indicator × H-Statistic				2.425*** (0.345)					2.991** (1.381)	
Lerner index					-1.750 (2.792)					31.67*** (8.426)
C5 Indicator × Lerner Index					0.0806 (0.644)					-7.787*** (1.977)
Credit/GDP	-0.00938*** (0.000460)	-0.0768*** (0.0103)	-0.0110*** (0.000548)	-0.00948*** (0.000614)	-0.00861*** (0.000653)	0.0182*** (0.00358)	0.222*** (0.0583)	-0.00826 (0.00573)	0.00551 (0.00532)	0.0110* (0.00629)
GDP per capita	-0.0795*** (0.0100)	-0.0751*** (0.00998)	-0.0386*** (0.0125)	-0.117*** (0.0154)	-0.0861*** (0.0183)	-0.421** (0.208)	-0.544*** (0.210)	-0.980*** (0.297)	-1.213*** (0.327)	-1.320*** (0.356)
GDP	0.0289*** (0.00710)	0.00180 (0.00800)	0.0392*** (0.00899)	0.0233** (0.00959)	0.00362 (0.0106)	0.0324 (0.0797)	0.0582 (0.0802)	0.0424 (0.115)	0.231** (0.115)	0.0620 (0.195)
Respondent age	-0.00272*** (0.000407)	-0.00267*** (0.000408)	-0.00229*** (0.000515)	-0.00253*** (0.000528)	-0.00241*** (0.000560)	-0.00316*** (0.000420)	-0.00313*** (0.000420)	-0.00269*** (0.000529)	-0.00271*** (0.000542)	-0.00245*** (0.000572)
Female	0.0152 (0.0118)	0.0155 (0.0118)	0.0202 (0.0149)	0.0123 (0.0151)	0.0178 (0.0159)	0.0173 (0.0121)	0.0171 (0.0121)	0.0187 (0.0152)	0.00844 (0.0154)	0.0188 (0.0162)

(continued)

TABLE 12.6. (continued)

Individuals Who Do Not Have Accounts Because They Are Too Expensive										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Primary education or less	0.513*** (0.146)	0.512*** (0.146)	0.332* (0.174)	0.420** (0.168)	0.330* (0.194)	0.472*** (0.150)	0.474*** (0.150)	0.258 (0.178)	0.353** (0.173)	0.323 (0.201)
Secondary education	0.238 (0.146)	0.235 (0.146)	0.0654 (0.173)	0.142 (0.168)	0.0532 (0.194)	0.169 (0.150)	0.172 (0.150)	-0.0555 (0.178)	0.0422 (0.173)	0.00486 (0.201)
Tertiary education or more	-0.299** (0.151)	-0.306** (0.152)	-0.523*** (0.182)	-0.429** (0.174)	-0.592*** (0.204)	-0.389** (0.155)	-0.388** (0.155)	-0.668*** (0.187)	-0.544*** (0.180)	-0.689*** (0.211)
Education: missing	0.384** (0.190)	0.359* (0.190)	0.297 (0.285)	0.487* (0.249)	-0.442 (0.551)	0.402** (0.196)	0.400** (0.196)	0.243 (0.290)	0.434* (0.257)	-0.483 (0.571)
Poorest 20%	0.329*** (0.0190)	0.329*** (0.0190)	0.371*** (0.0240)	0.347*** (0.0243)	0.350*** (0.0258)	0.337*** (0.0193)	0.338*** (0.0193)	0.380*** (0.0245)	0.358*** (0.0247)	0.353*** (0.0262)
Second 20%	0.265*** (0.0188)	0.265*** (0.0188)	0.314*** (0.0238)	0.267*** (0.0241)	0.315*** (0.0254)	0.269*** (0.0191)	0.269*** (0.0191)	0.317*** (0.0243)	0.271*** (0.0245)	0.313*** (0.0259)
Middle 20%	0.227*** (0.0183)	0.228*** (0.0183)	0.272*** (0.0232)	0.252*** (0.0234)	0.277*** (0.0247)	0.230*** (0.0187)	0.230*** (0.0187)	0.277*** (0.0236)	0.262*** (0.0238)	0.280*** (0.0252)
Fourth 20%	0.165*** (0.0177)	0.165*** (0.0177)	0.211*** (0.0223)	0.184*** (0.0225)	0.205*** (0.0238)	0.162*** (0.0180)	0.163*** (0.0180)	0.209*** (0.0227)	0.183*** (0.0229)	0.200*** (0.0242)
No. of observations	62,863	62,863	38,992	37,987	33,989	62,863	62,863	38,992	37,987	33,989
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Expected sign: C5 indicator	+	+	+	+	+	+	+	+	+	+
Expected sign: Boone indicator			+					+		
Expected sign: H-statistic				-					-	
Expected sign: Lerner index					+					+

Sources: IMF, International Financial Statistics database; World Bank, Global Index database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

factors, such as changes in the costs of inputs, could affect prices without affecting the level of competition in the industry.⁷

Estimated parameters in Table 12.6 show that individuals are generally less likely to report that they do not have an account because it is expensive in countries where the banking industry is more competitive. For the case of country fixed effects, we find intuitive signs of the competition coefficients for the C5, Boone, H-statistic, and Lerner indicators. Without country fixed effects, the results are less consistent with hypothesis 1. Therefore, we find a direct relationship between prices and competition, consistent with our hypothesis.

Table 12.7 presents estimates similar to Table 12.5 but for debit cards. The sign of the probit estimates for the competition indicators is generally consistent with hypothesis 1 but somewhat less robust than for bank accounts. The estimates for the interaction terms for competition variables are generally similar to those for accounts.

We also find that the effect of financial depth (measured with the ratio of credit to GDP) on GDP per capita and financial inclusion is in general positive. A similar result is obtained for credit cards.

Table 12.8 presents similar estimates to Table 12.5 for the adoption of credit cards. The signs of the probit estimates for the competition indicators are generally less consistent with hypothesis 1 than for accounts or debit cards. The effect of financial deepening or GDP per capita is, in general, positive.

In summary, the empirical results generally show an economically and statistically significant effect of competition on the adoption of bank accounts and debit cards, although not for credit cards. We combine the use of concentration indicators (C5) with other variables that have an easier behavioral interpretation (Boone, H-statistic, and Lerner). In general, we find that concentration matters in explaining financial inclusion, but concentration indicators need to be complemented with other indicators of competition that have a clearer behavioral interpretation. These results are, in general, robust after controlling for individual variables, other country-level variables, and country and year fixed effects.

We also find a statistically and economically significant relationship between less banking competition and bank accounts being too expensive for many individuals. This may be because more competition translates directly to banks offering lower prices for bank accounts. These results contribute to a better understanding of the importance of bank competition and industry deregulation to increase financial inclusion in sub-Saharan Africa.

Results for Adults in the Informal Economy

We repeat the previous regressions for individuals in the informal economy. We define them as individuals 18 years of age or older who do not receive a wage.

⁷ For example, in an extreme case, the equilibrium price of a perfectly competitive industry with perfectly elastic supply function only depends on the marginal cost of production; prices may depend on purely exogenous factors, such as exchange rates, costs of materials, and labor.

TABLE 12.7.

Individuals Who Have a Debit Card and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C5 indicator	-0.508*** (0.0355)	-0.699*** (0.0827)	-0.789*** (0.0700)	1.529*** (0.137)	-1.706*** (0.180)	-0.889*** (0.170)	-1.907*** (0.297)	0.353 (0.363)	2.523*** (0.677)	-3.667*** (0.628)
C5 Indicator × Credit/GDP		0.00557** (0.00221)					0.0516*** (0.0123)			
Boone indicator			19.31*** (2.867)					0.284 (7.090)		
C5 Indicator × Boone Indicator			-4.465*** (0.675)					0.174 (1.675)		
H-statistic				20.79*** (1.577)					40.05*** (6.738)	
C5 Indicator × H-Statistic				-4.904*** (0.358)					-9.062*** (1.552)	
Lerner index					-20.45*** (2.812)					-60.57*** (9.576)
C5 Indicator × Lerner Index					5.050*** (0.653)					14.37*** (2.253)
Credit/GDP	0.0108*** (0.000389)	-0.0134 (0.00959)	0.0113*** (0.000499)	0.00970*** (0.000534)	0.0142*** (0.000651)	0.0185*** (0.00326)	-0.203*** (0.0528)	0.00740* (0.00424)	-0.00457 (0.00401)	0.00522 (0.00535)
GDP per capita	0.269*** (0.00958)	0.271*** (0.00963)	0.211*** (0.0128)	0.372*** (0.0146)	0.0982*** (0.0198)	1.121*** (0.246)	1.242*** (0.249)	0.251 (0.376)	1.649*** (0.417)	-0.618 (0.475)
GDP	0.0497*** (0.00615)	0.0365*** (0.00801)	0.117*** (0.00822)	0.107*** (0.00878)	0.173*** (0.00998)	-0.199** (0.0799)	-0.234*** (0.0801)	-0.148 (0.129)	-0.254** (0.123)	0.620*** (0.214)
Respondent age	0.00736*** (0.000441)	0.00741*** (0.000441)	0.00732*** (0.000568)	0.00671*** (0.000588)	0.00720*** (0.000623)	0.00839*** (0.000457)	0.00836*** (0.000457)	0.00815*** (0.000588)	0.00747*** (0.000607)	0.00767*** (0.000645)
Female	0.0976*** (0.0128)	0.0979*** (0.0128)	0.0602*** (0.0164)	0.0515*** (0.0168)	0.0660*** (0.0180)	0.140*** (0.0132)	0.141*** (0.0132)	0.0880*** (0.0169)	0.0831*** (0.0174)	0.0910*** (0.0185)
Primary education or less	-0.351*** (0.135)	-0.352*** (0.134)	-0.0718 (0.176)	-0.0690 (0.181)	-0.0192 (0.196)	-0.407*** (0.142)	-0.408*** (0.142)	0.0223 (0.181)	0.0110 (0.186)	0.0443 (0.196)

(continued)

TABLE 12.7. (continued)

Individuals Who Have a Debit Card and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Secondary education	0.362*** (0.134)	0.359*** (0.134)	0.726*** (0.176)	0.731*** (0.181)	0.796*** (0.196)	0.307** (0.141)	0.307** (0.142)	0.808*** (0.181)	0.808*** (0.186)	0.833*** (0.196)
Tertiary education or more	1.049*** (0.137)	1.045*** (0.136)	1.492*** (0.179)	1.435*** (0.183)	1.596*** (0.200)	1.112*** (0.144)	1.112*** (0.144)	1.605*** (0.184)	1.626*** (0.189)	1.618*** (0.200)
Education: missing	-0.0870 (0.188)	-0.100 (0.188)	0.369 (0.263)	0.236 (0.266)	0.203 (0.411)	-0.324 (0.209)	-0.318 (0.209)	-0.0695 (0.272)	-0.0371 (0.277)	0.139 (0.398)
Poorest 20%	-0.789*** (0.0222)	-0.790*** (0.0222)	-0.862*** (0.0291)	-0.854*** (0.0297)	-0.856*** (0.0317)	-0.831*** (0.0231)	-0.831*** (0.0231)	-0.933*** (0.0301)	-0.917*** (0.0308)	-0.914*** (0.0328)
Second 20%	-0.646*** (0.0205)	-0.647*** (0.0205)	-0.717*** (0.0270)	-0.719*** (0.0276)	-0.733*** (0.0296)	-0.685*** (0.0211)	-0.685*** (0.0211)	-0.783*** (0.0277)	-0.778*** (0.0283)	-0.789*** (0.0304)
Middle 20%	-0.504*** (0.0188)	-0.505*** (0.0188)	-0.554*** (0.0241)	-0.551*** (0.0248)	-0.567*** (0.0265)	-0.537*** (0.0195)	-0.538*** (0.0195)	-0.611*** (0.0251)	-0.609*** (0.0257)	-0.618*** (0.0275)
Fourth 20%	-0.334*** (0.0170)	-0.334*** (0.0170)	-0.351*** (0.0217)	-0.341*** (0.0223)	-0.348*** (0.0238)	-0.357*** (0.0175)	-0.358*** (0.0175)	-0.387*** (0.0224)	-0.378*** (0.0230)	-0.383*** (0.0244)
No. of observations	62,863	62,863	38,992	37,987	33,989	62,863	62,863	38,992	37,987	33,989
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Expected sign: C5 indicator	-	-	-	-	-	-	-	-	-	-
Expected sign: Boone indicator			-					-		
Expected sign: H-statistic				+					+	
Expected sign: Lerner index					-					-

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 12.8.

Individuals Who Have a Credit Card and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C5 indicator	0.116** (0.0504)	0.312** (0.125)	-0.0873 (0.106)	1.037*** (0.247)	0.136 (0.275)	-0.810*** (0.259)	-0.491 (0.403)	1.242** (0.604)	1.252 (1.090)	-1.757 (1.090)
C5 Indicator × Credit/GDP		-0.00529* (0.00306)					-0.0162 (0.0162)			
Boone indicator			12.39*** (4.054)					2.824 (11.10)		
C5 Indicator × Boone Indicator			-2.635*** (0.947)					-0.232 (2.614)		
H-statistic				9.310*** (2.617)					18.39 (12.11)	
C5 Indicator × H-Statistic				-2.070*** (0.593)					-3.932 (2.772)	
Lerner index					-6.404 (4.450)					-39.02** (16.39)
C5 Indicator × Lerner Index					1.992* (1.023)					9.882*** (3.826)
Credit/GDP	0.00554*** (0.000495)	0.0284** (0.0132)	0.00223*** (0.000657)	0.00331*** (0.000687)	0.00140* (0.000815)	0.0161*** (0.00404)	0.0857 (0.0697)	0.0175*** (0.00585)	-0.000748 (0.00535)	0.0286*** (0.00737)
GDP per capita	0.220*** (0.0136)	0.218*** (0.0137)	0.296*** (0.0181)	0.304*** (0.0205)	0.333*** (0.0262)	-0.0749 (0.338)	-0.122 (0.341)	-1.358** (0.602)	-0.767 (0.645)	-1.234 (0.881)
GDP	-0.0435*** (0.00780)	-0.0292** (0.0115)	-0.00275 (0.0102)	-0.0398*** (0.0120)	-0.00940 (0.0126)	-0.469*** (0.121)	-0.456*** (0.121)	-0.548** (0.226)	-0.652*** (0.182)	0.0455 (0.316)
Respondent age	0.00429*** (0.000614)	0.00424*** (0.000615)	0.00651*** (0.000806)	0.00582*** (0.000827)	0.00601*** (0.000872)	0.00520*** (0.000623)	0.00521*** (0.000623)	0.00745*** (0.000822)	0.00667*** (0.000837)	0.00658*** (0.000889)
Female	0.115*** (0.0184)	0.114*** (0.0184)	0.0892*** (0.0242)	0.0831*** (0.0246)	0.0840*** (0.0264)	0.117*** (0.0188)	0.117*** (0.0188)	0.0960*** (0.0247)	0.0888*** (0.0251)	0.0911*** (0.0269)
Primary education or less	-0.457*** (0.167)	-0.453*** (0.167)	-0.424** (0.201)	-0.478** (0.199)	-0.346* (0.209)	-0.336** (0.167)	-0.335** (0.167)	-0.254 (0.202)	-0.269 (0.200)	-0.272 (0.209)

(continued)

TABLE 12.8. (continued)

Individuals Who Have a Credit Card and Bank Competition										
Indicator	No Country Fixed Effects					Including Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Secondary education	-0.0550 (0.166)	-0.0490 (0.166)	0.117 (0.200)	0.0545 (0.197)	0.193 (0.208)	0.0957 (0.167)	0.0960 (0.167)	0.299 (0.201)	0.286 (0.199)	0.259 (0.207)
Tertiary education or more	0.466*** (0.168)	0.473*** (0.168)	0.729*** (0.202)	0.668*** (0.199)	0.862*** (0.211)	0.623*** (0.168)	0.623*** (0.168)	0.928*** (0.203)	0.917*** (0.201)	0.942*** (0.211)
Education: missing	-0.0782 (0.239)	-0.0617 (0.239)	-0.403 (0.383)	-0.509 (0.382)	-0.128 (0.515)	0.0126 (0.241)	0.0110 (0.241)	-0.310 (0.384)	-0.310 (0.381)	-0.173 (0.514)
Poorest 20%	-0.496*** (0.0331)	-0.496*** (0.0331)	-0.576*** (0.0460)	-0.560*** (0.0461)	-0.521*** (0.0492)	-0.499*** (0.0337)	-0.498*** (0.0337)	-0.600*** (0.0464)	-0.576*** (0.0467)	-0.538*** (0.0497)
Second 20%	-0.347*** (0.0290)	-0.347*** (0.0290)	-0.441*** (0.0401)	-0.427*** (0.0402)	-0.389*** (0.0433)	-0.351*** (0.0295)	-0.351*** (0.0295)	-0.463*** (0.0406)	-0.441*** (0.0409)	-0.402*** (0.0439)
Middle 20%	-0.352*** (0.0276)	-0.352*** (0.0276)	-0.425*** (0.0370)	-0.416*** (0.0375)	-0.385*** (0.0403)	-0.362*** (0.0281)	-0.362*** (0.0281)	-0.448*** (0.0377)	-0.436*** (0.0381)	-0.403*** (0.0409)
Fourth 20%	-0.257*** (0.0242)	-0.257*** (0.0242)	-0.289*** (0.0314)	-0.289*** (0.0320)	-0.266*** (0.0346)	-0.260*** (0.0246)	-0.260*** (0.0246)	-0.296*** (0.0320)	-0.293*** (0.0325)	-0.272*** (0.0351)
No. of observations	62,863	62,863	38,992	37,987	33,989	62,863	62,863	38,992	37,987	33,989
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Expected sign: C5 indicator	-	-	-	-	-	-	-	-	-	-
Expected sign: Boone indicator			-					-		
Expected sign: H-statistic				+					+	
Expected sign: Lerner index					-					-

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

This definition is consistent with the guidelines provided by the International Labour Organization (2013). The Findex database only provides this wage indicator variable for 2014 and 2017. However, the four competition variables are not available from most countries for 2017. Therefore, the regressions for informally employed individuals mainly use observations from 2014, which reduces the number of observations available and subsequently also reduces the length of the panel, making it more difficult to estimate the effects of country-level variables when we include country fixed effects. Because of this, in the regressions for the informal economy, we do not use country fixed effects.

Table 12.9 shows the results for adoption of bank accounts. For brevity, we omit the individual-level demographic results. The results are generally consistent with previous results, and we find that greater competition leads to wider

TABLE 12.9.

Individuals Who Have a Bank Account and Bank Competition					
Indicator	No Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)
C5 indicator	-1.297*** (0.0510)	-1.938*** (0.109)	-1.867*** (0.115)	-0.982*** (0.178)	-2.309*** (0.260)
C5 Indicator × Credit/GDP		0.0206*** (0.00309)			
Boone indicator			34.31*** (4.591)		
C5 Indicator × Boone Indicator			-8.044*** (1.056)		
H-statistic				7.345*** (2.212)	
C5 Indicator × H-Statistic				-1.440*** (0.502)	
Lerner index					-10.95*** (3.827)
C5 Indicator × Lerner Index					2.290** (0.892)
Credit/GDP	0.0163*** (0.000631)	-0.0736*** (0.0135)	0.0216*** (0.00110)	0.0201*** (0.00112)	0.0306*** (0.00119)
GDP per capita	0.0908*** (0.0124)	0.0941*** (0.0124)	0.0213 (0.0182)	0.0470** (0.0228)	-0.466*** (0.0399)
GDP	-0.0316*** (0.00966)	-0.0708*** (0.0111)	0.0153 (0.0143)	-0.0981*** (0.0159)	0.158*** (0.0197)
No. of observations	29,139	29,139	14,743	13,229	11,463
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No
Expected sign: C5 indicator	-	-	-	-	-
Expected sign: Boone indicator			-		
Expected sign: H-statistic				+	
Expected sign: Lerner index					-

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

** $p < 0.05$; *** $p < 0.01$.

adoption of bank accounts. The signs of the C5, H-statistic, and Lerner index indicators are consistent with our hypothesis, whereas the sign of the Boone indicator has an intuitive sign. We also find that financial depth and higher GDP per capita increase the probability of individuals adopting an account.

In Tables 12.10 and 12.11, we show the effects of bank competition on the adoption of debit and credit cards. The results are similar to the full sample case, and we find that the effect on competition is more consistent with hypothesis 1 for debit cards than for credit cards. The ratio of credit to GDP and GDP per capita also have an intuitive positive effect on adoption of debit and credit cards.

In summary, the empirical results found for informally employed individuals confirm the results for the entire sample and generally show an economically and

TABLE 12.10.

Individuals Who Have a Debit Card and Bank Competition					
Indicator	No Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)
C5 indicator	-0.539*** (0.0534)	-1.050*** (0.127)	-0.629*** (0.120)	1.841*** (0.219)	-3.167*** (0.323)
C5 Indicator × Credit/GDP		0.0145*** (0.00335)			
Boone indicator			11.04** (5.279)		
C5 Indicator × Boone Indicator			-2.465** (1.222)		
H-statistic				27.18*** (2.492)	
C5 Indicator × H-Statistic				-6.207*** (0.569)	
Lerner index					-38.23*** (4.833)
C5 Indicator × Lerner Index					9.101*** (1.143)
Credit/GDP	0.0114*** (0.000584)	-0.0514*** (0.0145)	0.0122*** (0.000958)	0.00910*** (0.000929)	0.0245*** (0.00146)
GDP per capita	0.255*** (0.0144)	0.258*** (0.0145)	0.229*** (0.0226)	0.398*** (0.0263)	-0.228*** (0.0490)
GDP	0.0551*** (0.00983)	0.0219* (0.0124)	0.117*** (0.0152)	0.0550*** (0.0157)	0.303*** (0.0226)
No. of observations	29,139	29,139	14,743	13,229	11,463
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No
Expected sign: C5 indicator	-	-	-	-	-
Expected sign: Boone indicator			-		
Expected sign: H-statistic				+	
Expected sign: Lerner index					-

Sources: IMF, International Financial Statistics database; World Bank, Global Index database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

TABLE 12.11.

Individuals Who Have a Credit Card and Bank Competition					
Indicator	No Country Fixed Effects				
	(1)	(2)	(3)	(4)	(5)
C5 indicator	0.0517 (0.0818)	-0.0608 (0.201)	0.188 (0.217)	1.874*** (0.397)	-1.497*** (0.549)
C5 Indicator × Credit/GDP		0.00298 (0.00493)			
Boone indicator			9.246 (9.806)		
C5 Indicator × Boone Indicator			-2.339 (2.207)		
H-statistic				17.57*** (4.230)	
C5 Indicator × H-Statistic				-4.095*** (0.959)	
Lerner index					-28.50*** (8.508)
C5 Indicator × Lerner Index					7.304*** (2.011)
Credit/GDP	0.00752*** (0.000825)	-0.00535 (0.0213)	0.00792*** (0.00149)	0.00624*** (0.00142)	0.0169*** (0.00252)
GDP per capita	0.148*** (0.0230)	0.148*** (0.0231)	0.201*** (0.0343)	0.238*** (0.0477)	-0.181** (0.0877)
GDP	-0.0279* (0.0143)	-0.0356* (0.0193)	0.0335 (0.0228)	0.0360 (0.0237)	0.203*** (0.0365)
No. of observations	29,139	29,139	14,682	13,168	11,440
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No
Expected sign: C5 indicator	-	-	-	-	-
Expected sign: Boone indicator			-		
Expected sign: H-statistic				+	
Expected sign: Lerner index					-

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

statistically significant effect of competition on the adoption of bank accounts and debit cards, although not for credit cards.

FINANCIAL INCLUSION AND BANK BALANCE SHEET VARIABLES

We now study how relevant bank balance sheet variables affect financial inclusion, more precisely, the borrowing capacity of individuals. By estimating the importance of this bank-lending channel, we estimate how key balance sheet variables (such as Tier 1 capital ratios, or liquidity ratios) affect the probability of individual borrowing and how these variables interact with the economic cycle.

Empirical Model

To estimate individuals' borrowing capacity, we first consider a simple probit model in which borrowing depends on the following latent variable:

$$\begin{aligned} \text{Borrow}_{i,c,t}^* = & \beta_1 \text{GDPgrow}_{c,t-1} + \beta_2 \text{Tier1}_{c,t-1} + \beta_3 \text{LAR}_{c,t-1} \\ & + \beta_4 \text{Tier1}_{c,t-1} \times \text{GDPgrow}_{c,t-1} + \beta_5 \text{LAR}_{c,t-1} \\ & \times \text{GDPgrow}_{c,t-1} + \beta_6 X_{i,c,t} + \beta_7 t + \beta_8 c + \varepsilon_{i,c,t} \end{aligned} \quad (2),$$

where $\text{GDPgrow}_{c,t-1}$ is the lagged value of GDP growth for country c in period $t-1$, $\text{Tier1}_{c,t-1}$ is the lagged average Tier 1 ratio for the country, and $\text{LAR}_{c,t-1}$ is the average liquid asset ratio (liquid assets to total assets).

The dependent variable in the probit model is an indicator variable equal to 1 if the individual has borrowed in the past 12 months from a financial institution. The variable allows us to estimate the relationship between new loans obtained by individuals and lagged bank balance sheet variables. The parameters of interest in this regression are the terms $\beta_1 - \beta_5$, which represent the effect of lagged balance sheet variables, economic growth, and their interactions on the probability that an individual borrows from a bank. As in the previous model (1), in model (2) we use a vector of individual-level variables, other country-level variables, and fixed effects.

As discussed in the introduction, the existing literature has not found undisputed results regarding the relationship between an individual's borrowing and his or her country's balance sheet strength. In our model, $\beta_2, \beta_3 > 0$ would be consistent with the view that borrowing increases in countries with stronger financial systems (more liquid or more capitalized). Also, $\beta_4, \beta_5 < 0$ would imply a certain degree of countercyclicality in the credit. That is, stronger financial systems (in terms of higher capital or liquidity) provide less credit when GDP growth is high, so stronger banks are more countercyclical.

A limitation of our empirical strategy is that we are not able to separately identify supply from demand-side determinants of adoption of financial products or borrowing. To separately identify these effects, we would need access to accepted and rejected credit and bank product applications, as in Jiménez and others (2012, 2014). Instrumental variable estimation methods might also be useful to separately identify supply from demand effects, but valid instruments are usually difficult to find, given data constraints in sub-Saharan Africa.

Empirical Results

In the second set of results, we want to understand how bank balance sheets affect the borrowing capacity of individuals. By estimating the importance of this bank-lending channel, we can determine how Tier 1 capital ratios and similar balance sheet indicators affect the probability of borrowing.

As mentioned, the literature does not provide conclusive results on the effect of bank capital on lending. In addition, we are not able to disentangle demand-side from supply-side effects, given the limitations of our data. Also, we expect a certain degree of cyclicity, namely, that borrowing is constrained in

countries with lower GDP growth and with less capitalized or less liquid financial systems.

Table 12.12 presents the results of the probit model. Contrary to the probit estimates on competition, results changed considerably when country fixed effects were used. When considering no country fixed effects, we find, as shown in column (1), that countries that have financial systems with higher capital ratios generate a positive effect on borrowing. Also, a higher liquid asset ratio has a positive effect on borrowing in the next period. When we include Tier 1 capital ratios (column 3), we still obtain a positive (and larger) effect of the Tier 1 ratio, but the effect of the liquid asset ratio is not statistically significant.⁸

Second, we consider interaction effects among GDP growth, Tier 1, and liquid asset ratios in specifications (4) through (7). When considering the interaction terms, we generally find a procyclical effect with respect to capital and liquidity. In column (4), we find that higher GDP growth increases credit more in financial systems with higher liquidity ratios. That is, more liquid banks are more procyclical—they lend more. We also find a similar effect of Tier 1 capital in column (5): borrowing increases in countries with high GDP growth and higher capital ratios, so more capitalized banks are more procyclical. When combining the two interactions for liquidity and capital, only the Tier 1 interaction with GDP has a positive sign, whereas the liquidity interaction term has a negative sign.

In columns (8) through (14), we repeat the same regressions but include country fixed effects. Some of the results previously found are no longer present. The individual effects of capital and liquidity are less robust. Interaction terms with GDP have insignificant or opposite effects to the regressions run without fixed effects. We conclude from these results that the effect of bank balance sheet variables on individuals' borrowing is not undisputed.

As with the regressions for accounts, debit cards, and credit cards, we find similar intuitive results regarding the effect of demographic variables on borrowing. In all specifications, older individuals, female individuals, and well-educated individuals (tertiary education or more) are more likely to borrow. Also, poor individuals are less likely to borrow.

When we repeat the results for informally employed individuals (not shown), we do not find undisputed results. Some of the results are not robust and are different from the full sample results.

⁸ Higher Tier 1 capital ratios could also have an opposite effect. Tier 1 capital ratios tend to be higher in sub-Saharan Africa compared with other regions. Higher capital ratios may reflect an unstable financial system that is buffered to cover for future losses (Beck and others 2011). In sub-Saharan Africa, where banks incur high costs to raise capital, high capital ratios could constrain lending, such as in a “credit crunch” (Bernanke and Lown 1991).

TABLE 12.12.

Country and Year Fixed Effects for Individuals Who Borrowed in the Past Year and Bank Balance Sheet Variables							
Indicator	No Country Fixed Effects						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP growth	0.0264*** (0.00384)	0.0259*** (0.00368)	0.0259*** (0.00383)	0.00621 (0.00911)	-0.0514*** (0.0132)	0.00621 (0.00911)	-0.0435*** (0.0135)
Tier 1	0.0194*** (0.00202)		0.0182*** (0.00209)		-0.00943* (0.00529)		-0.0221*** (0.00592)
LAR		0.00160* (0.000919)	0.000159 (0.000967)	-0.00266 (0.00214)		-0.00266 (0.00214)	0.00867*** (0.00255)
LAR × GDP Growth				0.000778** (0.000332)		0.000778** (0.000332)	-0.00204*** (0.000485)
Tier 1 × GDP Growth					0.00537*** (0.000891)		0.00847*** (0.00113)
Respondent age	0.00647*** (0.000541)	0.00651*** (0.000547)	0.00667*** (0.000548)	0.00655*** (0.000548)	0.00655*** (0.000542)	0.00655*** (0.000548)	0.00679*** (0.000551)
Female	0.102*** (0.0177)	0.0996*** (0.0178)	0.100*** (0.0178)	0.0997*** (0.0178)	0.101*** (0.0177)	0.0997*** (0.0178)	0.0991*** (0.0179)
Primary education or less	0.262 (0.259)	0.269 (0.258)	0.266 (0.260)	0.267 (0.258)	0.271 (0.257)	0.267 (0.258)	0.279 (0.257)
Secondary education	0.616** (0.259)	0.628** (0.258)	0.618** (0.260)	0.625** (0.258)	0.633** (0.257)	0.625** (0.258)	0.640** (0.257)
Tertiary education or more	1.017*** (0.260)	1.054*** (0.259)	1.015*** (0.261)	1.050*** (0.260)	1.038*** (0.258)	1.050*** (0.260)	1.040*** (0.258)
Poorest 20%	0.351 (0.331)	0.343 (0.329)	0.347 (0.331)	0.340 (0.329)	0.366 (0.329)	0.340 (0.329)	0.366 (0.329)
Second 20%	-0.473*** (0.0315)	-0.465*** (0.0316)	-0.471*** (0.0317)	-0.466*** (0.0316)	-0.472*** (0.0316)	-0.466*** (0.0316)	-0.469*** (0.0318)
Middle 20%	-0.320*** (0.0283)	-0.316*** (0.0284)	-0.321*** (0.0285)	-0.316*** (0.0284)	-0.318*** (0.0283)	-0.316*** (0.0284)	-0.319*** (0.0285)
Fourth 20%	-0.232*** (0.0260)	-0.226*** (0.0262)	-0.231*** (0.0262)	-0.227*** (0.0262)	-0.230*** (0.0260)	-0.227*** (0.0262)	-0.228*** (0.0262)
No. of observations	45,903	44,903	44,903	44,903	45,903	44,903	44,903
Other country variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	No	No	No	No	No	No

(continued)

TABLE 12.12. (continued)

Country and Year Fixed Effects for Individuals Who Borrowed in the Past Year and Bank Balance Sheet Variables							
Indicator	Including Country Fixed Effects						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
GDP growth	0.00448 (0.00748)	0.00295 (0.00709)	0.00481 (0.00747)	0.0579*** (0.0147)	0.0419* (0.0236)	0.0579*** (0.0147)	0.0738*** (0.0248)
Tier 1	0.00319 (0.00586)		0.00554 (0.00598)		0.0208* (0.0123)		0.0107 (0.0125)
LAR		-0.00702* (0.00408)	-0.00786* (0.00417)	0.00590 (0.00518)		0.00590 (0.00518)	0.0109** (0.00551)
LAR × GDP Growth				-0.00204*** (0.000498)		-0.00204*** (0.000498)	-0.00362*** (0.000713)
Tier 1 × GDP Growth					-0.00263* (0.00159)		0.00256 (0.00184)
Respondent age	0.00697*** (0.000556)	0.00711*** (0.000563)	0.00711*** (0.000563)	0.00716*** (0.000563)	0.00698*** (0.000556)	0.00716*** (0.000563)	0.00717*** (0.000563)
Female	0.112*** (0.0181)	0.111*** (0.0182)	0.111*** (0.0182)	0.110*** (0.0182)	0.112*** (0.0181)	0.110*** (0.0182)	0.110*** (0.0182)
Primary education or less	0.367 (0.260)	0.369 (0.261)	0.367 (0.261)	0.382 (0.260)	0.364 (0.260)	0.382 (0.260)	0.382 (0.261)
Secondary education	0.707*** (0.260)	0.706*** (0.261)	0.704*** (0.261)	0.719*** (0.260)	0.704*** (0.260)	0.719*** (0.260)	0.718*** (0.260)
Tertiary education or more	1.127*** (0.261)	1.123*** (0.262)	1.119*** (0.262)	1.136*** (0.261)	1.124*** (0.262)	1.136*** (0.261)	1.133*** (0.262)
Poorest 20%	0.468 (0.332)	0.463 (0.333)	0.463 (0.333)	0.470 (0.332)	0.465 (0.332)	0.470 (0.332)	0.476 (0.332)
Second 20%	-0.484*** (0.0323)	-0.482*** (0.0325)	-0.483*** (0.0325)	-0.482*** (0.0325)	-0.484*** (0.0323)	-0.482*** (0.0325)	-0.483*** (0.0325)
Middle 20%	-0.334*** (0.0288)	-0.335*** (0.0290)	-0.335*** (0.0290)	-0.335*** (0.0290)	-0.334*** (0.0288)	-0.335*** (0.0290)	-0.336*** (0.0290)
Fourth 20%	-0.244*** (0.0265)	-0.243*** (0.0267)	-0.243*** (0.0267)	-0.242*** (0.0267)	-0.244*** (0.0265)	-0.242*** (0.0267)	-0.243*** (0.0267)
No. of observations	45,903	44,903	44,903	44,903	45,903	44,903	44,903
Other country variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sources: IMF, International Financial Statistics database; World Bank, Global Findex database; and World Bank, Global Financial Development database.

Notes: Probit regressions and bank competition. Robust standard errors are in parentheses. LAR = liquid asset ratio.

*p < 0.1; **p < 0.05; ***p < 0.01.

CONCLUSION

In this chapter, we studied how competition and financial soundness in the financial sector affect financial inclusion in sub-Saharan Africa. We used detailed individual-level survey data, combined with key country-level indicators of bank competition and financial soundness to study the effect of competition and the strength of several bank balance sheet variables on the adoption of key financial products.

Our results generally show a positive and significant effect of competition on the adoption of various financial products. We did not find clear results when considering the effect of balance sheet variables on borrowing by households. These results may help policymakers in sub-Saharan Africa and other regions to be aware of the importance of the key features of the banking sector necessary to promote financial inclusion. This could lead to regulations that may have positive effects on economic growth and long-term economic development.

Two remarkable forces of change could increase competition in the banking sector, with positive effects on financial inclusion. First, new and efficient technologies are being developed to transform the sector with new products, processes, and providers (fintech).⁹ Second, financial markets are increasingly interconnected across the world, and sub-Saharan Africa is not an exception. Both forces are instrumental in fostering an optimistic outlook regarding future improvements in financial inclusion.

Although mobile payments are successful in several eastern African countries, we expect that fintech will progressively cover other financial services, such as loans and saving accounts. More granular data are necessary to understand how these services are transforming the industry. Policymakers can take advantage of fintech and other developments to foster competition and improve financial inclusion. Given the economic, social, and political advances that sub-Saharan Africa has achieved, we believe that the financial sector offers opportunities for growth in the future. The potential to improve financial inclusion is high.

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⁹ For example, distributed ledger technologies, mobile payments, virtual currencies, crowdfunding, robo-advice, and others (Maino and others 2019).

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