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The African Financial Development and Financial Inclusion Gaps

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Abstract

This paper investigates the African financial development and financial inclusion gaps relative to other peer developing countries. The paper uses a set of variables related to financial development and inclusion. It first estimates the gaps between African countries and other developing countries with similar degrees of economic development. Then, it explores the determinants of financial development and inclusion. The analysis finds that population density is considerably more important for financial development and inclusion in Africa than elsewhere. Finally, the paper shows evidence that a recent innovation in financial services, mobile banking, has helped to overcome infrastructural problems and improve financial access.

The African Financial Development and Financial Inclusion Gaps

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1. **Introduction**

Although most Sub-Saharan African countries have undergone extensive financial sector reforms in the last two decades, their financial sectors remain under-developed, even relative to the standards of developing countries. Liquid liabilities and private credit in African financial sectors averaged below 40 and 25 percent of GDP, respectively, in 2011, substantially below the levels in other regions of the developing world (see Table 1). In terms of financial inclusion, the percentage of Sub-Saharan Africans older than 15 who had an account with or a loan from a formal financial institution were about 25 and 5 percent, respectively, in 2011 (see Table 2). Only developing countries from the Middle East and North Africa exhibited similar patterns.

There is little academic research that addresses the underperformance of the financial sector reforms in Africa and how this can be improved. This paper is part of a new research agenda addressing key issues at the heart of African financial development and financial inclusion. We have three goals. First, we assess whether financial development and financial inclusion gaps exist in Africa, using other developing countries as a benchmark. Second, we identify factors that have more pronounced impact on financial development and financial inclusion in Africa than in other developing countries. Third, we document recent innovations and financial services, such as mobile banking, which can help overcome infrastructural deficiencies to improve financial access (see Table 3).

We estimate both the average and country-specific financial development and financial inclusion gaps between Sub-Saharan Africa and the rest of the developing world. We expand standard models on the determinants of financial development and financial inclusion with a Sub-Saharan Africa dummy variable to test whether, on average, Sub-Saharan Africa behaves differently than peer developing regions. We find that Sub-Saharan Africa, on average, exhibits financial development and financial inclusion gaps relative to other peer developing regions.

Then, we examine potential heterogeneity across countries, estimating country-specific 'gaps' for each Sub-Saharan African country. We first analyze the determinants of financial development and financial inclusion in *other* developing countries and use the regression

coefficients to generate predicted levels of financial development and financial inclusion for Sub-Saharan African countries. We then compare those predicted levels with the actual levels of financial development in the African countries. We find that the majority of the African countries have lower levels of financial development and financial inclusion than the one that would be predicted based on their fundamentals. Those benchmarking regressions also indicate that population density is more strongly associated with financial development and financial inclusion in Africa than in other developing countries. These results seem plausible considering that many African countries have relatively scattered populations and that frequent interactions among firms, households, and investors are a necessary condition for business transactions, and hence financial development and financial inclusion.

In our analysis we focus on financial development and financial inclusion measures from 2007 to 2011. We obtain several results. First, in line with our previous findings based on a narrower dimension of African financial development for the period 1990-2006 (Allen et al., forthcoming), we find evidence of the existence of development gaps and of the importance of population density in explaining African financial underdevelopment. Second, as we broaden the dimension of African finance beyond the traditional banking sector development indicators, we provide new evidence indicating that gaps exist in financial inclusion as well relative to other peer non-African low income countries. Finally, based on surveys of users of financial services, we expand the indicators of financial development to include new measures of financial inclusion. The goal is to explore whether innovations in financial services, such as mobile banking, have helped to overcome sparse populations and infrastructural problems and improve financial access.

To evaluate the use of mobile telephones in financial transactions, we run regressions on the determinants of the share of adults that use mobile phones to send money, receive money, and make payments. We find that, controlling for a large set of country-level variables, the use of mobile phones to send and receive money is significantly more prevalent in Sub-Saharan Africa than in the rest of the developing world. These results indicate that technological advances, such as mobile banking, have been an avenue to facilitate broader financial inclusion.

In focusing on mobile banking as an indicator of financial development, our paper contributes to an emerging literature on the usage of financial services in Africa, which pays particular attention to financial product innovations and alternative delivery channels (for standard financial products). For example, our own recent research on Kenya shows how Equity Bank's branching expansion to underserved areas and a strategy to attract minority-speaking clients by communicating with them in their native tongue brought about substantial increases in the probability of having a bank account (5-10 percentage points relative to an initial level of 14% banked in 2006) and more modest increases in the share of Kenyans with formal loans (Allen et al., 2012).

Another area where Africa has seen substantial recent progress is electronic payments. M-transfer systems facilitate financial transactions via mobile phones, allowing users to deposit and withdraw cash from an account that is accessible by mobile handset. Users can store value in the account and transfer value between users via text messages, menu commands, and personal identification numbers (Aker and Mbiti, 2010). The most famous of these systems is M-Pesa in Kenya. Launched in 2007 by the Kenyan mobile network operator, Safaricom, the mobile payments wallet had 15 million registered users by early 2012. Recent analyses show that M-Pesa use has brought about a substantial decline in the costs of sending transfers and a substantial increase in their volume (especially remittances), a greater likelihood of being formally banked, and decreased the use of informal savings mechanisms (Mbiti and Weil, 2011; Jack and Suri, 2010).

Another example comes from Niger, where an M-transfer system is providing a more cost-effective means of implementing a cash transfer program to villages suffering from the effects of drought. Experimental evidence shows that the program substantially reduced the cost of distributing and obtaining the cash transfers (Aker et al., 2011). Households also used their transfers to purchase a more diverse set of goods, increased the diversity of their diets, depleted fewer assets, and grew a wider variety of crops (including marginal crops typically grown by women). Both the time savings for recipients of these M-transfers and the added security and privacy of electronic transfers are likely to be driving these effects.

The remainder of the paper is organized as follows. Section 2 describes the empirical strategy and data. Section 3 reports the African financial development and financial inclusion gaps.

Section 4 examines the determinants of financial development and financial inclusion in non-African countries and benchmarks country-specific gaps for African countries. Section 5 explores whether the determinants of financial development and inclusion are different in Africa than in the rest of the developing world. Section 6 provides evidence on the effects of mobile banking on usage of financial services, while Section 7 concludes.

2. Empirical Strategy and Data

The main objectives of this study are threefold. The first goal is to benchmark African financial development and financial inclusion relative to a set of variables that have been robustly associated with financial development, especially in low and middle income countries. The second goal is to explore whether the determinants of financial development and inclusion in Africa are the same as those in the rest of the developing world. The final goal is to examine whether financial innovations, such as mobile banking, have helped to overcome the underdevelopment of financial markets and the relative lack of financial inclusion in Africa. Below, we explain the methodology and the data that we use in our analysis.

2.1. Basic Determinants of Financial Development and Financial Inclusion

We employ regression analysis to examine the level and variation of financial development and financial inclusion across countries, relying on some of the same variables that have been used to study the links between financial development and growth (Levine, 2005).[2] We include macroeconomic variables, such as GDP per capita and growth, and broad measures of institutional development. We augment our models with a Sub-Saharan Africa dummy variable that captures whether, on average, this region exhibits a gap relative to other peer developing regions. We stress from the outset that we are not necessarily estimating causal relationships. For ease of exposition, however, we refer to all explanatory variables as determinants of financial development throughout the paper.

The regression model for the expanded set of explanatory variables is:

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[2] As in other recent papers, we use these variables, including growth, to describe financial development (Cull and Effron, 2008; Cull, Senbet, and Sorge, 2005). By contrast, in the finance and growth literature, the financial indicators are among the explanatory variables used to explain growth.

(1) $$y_i = \alpha + \beta_1 Population_i + \beta_2 Population\ Density_i + \beta_3 Natural\ Resources_i$$
$$+ \beta_4 Offshore\ Center_i + \beta_5 GDP\ per\ capita_i + \beta_6 Growth_i\ + \beta_7 Inflation_i$$
$$+ \beta_8 KKM\ Index_i + \beta_9 Manufacturing/GDP_i + \beta_{10} Sec./Prim.enrollment_i$$
$$+ \beta_{11} Sub - Saharan\ Africa_i + \varepsilon_i.$$

Where the dependent variable (y_i) represents a measure of either financial development or financial inclusion. *Sub-Saharan Africa_i* is a dummy variable that takes the value 1 for Sub-Saharan African countries, and 0 otherwise. We briefly explain all our variables below. Table A.1 in the appendix reports the list of all the variables used in this study, their descriptions and sources.

We average our indicators of financial development and our explanatory variables over multiple years (from 2007 to 2011), as is customary in the literature on financial development and growth so as to reduce the influence of outliers. We therefore have only one observation per country. Because our goal is to describe a general picture of the factors that are robustly linked to financial development, however, we present below only the simplest cross-country regressions in which the financial indicators and explanatory variables are contemporaneous. For financial inclusion variables, the only available year is 2011. Therefore, we can only estimate cross-country regressions. Again, to reduce the influence of outliers, all of our explanatory variables are an average of the period 2007-2011.

2.2. Financial Development Measures

In our analysis we use two standard indicators of financial development, namely the ratio of liquid liabilities in the banking system to GDP and the ratio of credit to the private sector to GDP. The choice of these variables is based on the approach taken in Beck *et al.* (2008). Under this approach, the potential financial development indicators are ranked on the following criteria: (a) the directness of their linkages to welfare, (b) the goodness of fit of regressions that explain variation in them, (c) their coverage in terms of countries and years, and, (d) the degree to which an indicator is stable within a country from year to year, but varies substantially across countries. Moreover, these variables are robustly associated with long-run economic growth (Levine, 2005; Levine, Loayza, and Beck, 2000). Our analysis is rooted in banking indicators because banks hold the vast majority of financial sector assets

in Africa and other developing countries.[3] The source of these variables is the World Bank Financial Development and Structure Dataset (Beck and Demirgüç-Kunt, 2009).

2.3. Financial Inclusion Measures

In this study, we employ five measures of financial inclusion. The first is the percentage of adults that have an account at a formal financial institution. The second is the percentage of adults that had a loan from a financial institution in the year prior to the survey. The last three variables are related to the use of mobile telephones in financial transactions. They are the percentage of adults using mobile telephones to send money, to receive money, and to pay bills. We use these variables to explore whether mobile banking has exhibited deeper penetration in Africa than elsewhere.

All variables related to financial inclusion are taken from the World Bank Global Financial Inclusion (Global Findex) Database, which measures how people in 148 countries save, borrow, make payments, and manage risk. This database was recently released and therefore only covers the year 2011.

2.4. Explanatory Variables

In the choice of the explanatory variables for financial development and financial inclusion, we rely on previous studies, in particular those on the finance-growth nexus (e.g., Levine, 2005) and from other studies that analyze the determinants of financial development (e.g., Beck et. al, 2008; Cull and Effron, 2008). These studies regress indicators of financial development on a set of variables that describe the environment in which such development takes place, but that are exogenous to that process such as population size and density, natural resources and a dummy variable for offshore financial centers. They also include per capita income as an exogenous regressor, claiming that its effect on financial development is contemporaneous while the effect of financial development on income is lagged. We expand further the set of regressors by including macroeconomic variables and broad measures of

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[3] For most countries of Sub-Saharan countries, stock exchanges are just a recent phenomenon. The number of stock exchanges has, in fact, proliferated to over two dozen in the last decade. While this is encouraging, the stock exchanges (except South Africa) are thin and malfunctioning, although liquidity provision has improved (Senbet and Otchere, 2008). With more robust stock market development in Ethiopia it would be worth expanding the domain of financial development to include stock markets in future analyses.

institutional development. Below we briefly discuss the economic intuition underlying our explanatory variables:

Population: A larger population should spur financial development due to scale and networking effects that make provision of financial services more efficient in larger economies.

Population density: We measure population density by the number of residents per square kilometer. It should have a positive impact on financial development and financial inclusion in part because it is easier for financial institutions to accumulate savings when a higher number of potential depositors have easy access to them.

Natural Resources: An abundance of natural resources may have a negative effect on financial development and financial inclusion via the so-called "resource curse."[4] We measure the intensity of a country's reliance on natural resources by using a comprehensive approach that measures resource abundance based on trade indicators rather than solely on oil exports:

$$Natural\ Resources = \sum_k \frac{Exports_k - Imports_k}{Labor\ Force}.$$

Where k ϵ{pretroleum, forest, tropical, animal, cereal, raw material}. The key advantage of this approach is that this measure of net exports is available for most countries and, as shown by Lederman and Maloney (2008), is more closely linked to actual natural resource reserves than other trade-based endowment measures. Given that an adequate measure of the abundance of natural resources needs to be measured with respect to other factors of production, net exports is divided by labor force.[5] Labor force is measured as people between the ages of 15-64.

Offshore Centers: The financial sectors of offshore centers are typically much larger than their economies would otherwise warrant. We measure this effect with a dummy variable for

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[4] Sachs and Warner (1995, 2001) offer evidence that resource-rich developing countries have grown more slowly since 1960 than other developing countries.
[5] In fact, as argued by Leamer (1984), the standard Heckscher-Ohlin trade theory dictates that the appropriate measure of abundance of natural resources is net exports of resources per worker.

offshore financial centers and we expect it to be positively related to financial development and financial inclusion.

GDP Per Capita: Per capita income is expected to be positively linked to financial development and financial inclusion, because the volume and the sophistication of financial activities demanded is greater in richer countries and, on the supply side, richer economies can better exploit scale economies in the provision of financial services.

Growth: The effect of real growth on financial development is ambiguous. On the one hand, countries with rapid growth may be associated with greater financial development and financial inclusion. On the other hand, countries with higher levels of development, as reflected in GDP per capita, tend to have slower growth according to 'conditional convergence' (Levine and Renelt, 1992; Easterly and Levine, 1997). Because financial development is highly correlated with per capita income, real growth may be negatively correlated with our measures of financial development and inclusion. Our growth measure corresponds to the five-year average growth.

Consumer price inflation: On the private credit side, inflation should slow financial development if it makes loan contracting over extended periods more difficult. Inflation could also have a dampening effect on liquid liabilities, making depositors more hesitant to place their savings in the formal financial system for fear of not being able to get them back quickly enough. Therefore, we expect the coefficient for inflation to be negative in our regressions.

KKM Index: We include in the regression the *KKM Index,* which is the measure of broad institutional development created by Kaufmann, Kraay, and Maztruzzi (2007). Institutional development has been found to foster financial development in developing countries (Cull and Effron, 2008), and thus we expect a positive coefficient for *KKM* in our regressions.

Manufacturing/GDP: We include the share of GDP generated by the manufacturing sector. Industrial sectors that are relatively more in need of finance tend to grow faster in countries with well-developed financial sectors (Rajan and Zingales, 1998). Manufacturing encompasses a broad variety of activities that tend to rely heavily on external finance so that we expect countries with a large manufacturing sector to have well-developed

complementary financial institutions. We therefore expect a positive coefficient for manufacturing in our regressions.

Secondary/Primary school enrollment: Finally, we want to measure the key role that education plays in financial development and financial inclusion. According to Cole, Paulson, and Shastry (forthcoming), education has not only a positive effect in financial inclusion, but also in financial management. Therefore, education is also likely to have an indirect impact on financial development through financial management as the lack of capacity in financial management may be a deterrent to financial development.

The summary statistics for all variables used in this study appear in Table 4. We divide our sample between Sub-Saharan countries and middle and low income countries other than Sub-Saharan African countries. The table shows that the mean values for the financial development and financial inclusion indicators (except for mobile financial transactions) are uniformly lower in Africa than in the rest of the developing world. We also see some marked differences in the explanatory variables between Africa and the rest of the developing world (e.g., population and population density).

3. The African Financial Development and Financial Inclusion Gaps

To benchmark whether Sub-Saharan Africa, on average, exhibits financial development and financial inclusion gaps, we estimate Equation (1). Table 5 presents our models for our sample of low- and lower-middle-income countries. Five out of the 45 African countries included in our sample are upper-middle-income economies (Gabon, South Africa, Mauritius, Botswana and Namibia). Given that most of these countries are not particularly reflective of the African experience, we mainly focus this analysis on low- and lower-middle-income economies and report results for upper-middle-income economies in Table A.2 in the appendix.

The results using our measures of financial development as the dependent variables are presented in Columns 1 to 4 of Table 5. The negative coefficients associated with the Sub-Saharan Africa dummy variable suggest that financial development gaps exist in Africa. Most of these coefficients are statistically significant at standard levels of confidence, even after controlling for a comprehensive set of country-level determinants of financial development.

The results using our measures of financial inclusion as the dependent variables are presented in Columns 5 to 8. While the results in Columns 7 and 8 present evidence of an African financial inclusion gap in terms of access to credit, we do not find statistically significant evidence of a gap in terms of access to accounts at a formal financial institution. These results are consistent with the emergence of recent alternative delivery channels for basic financial products in Africa. For example, our own recent research on Kenya shows how Equity Bank's branching expansion to underserved areas and a strategy to attract minority-speaking clients by communicating with them in their native tongue brought about substantial increases in the probability of having a bank account, but a more modest increase in the share of Kenyans with formal loans (Allen et al., 2012).

Table A.2 in the appendix shows there is no evidence of average financial development and financial inclusion gaps in the five upper-middle-income African countries covered in our sample. This result is consistent with the fact that countries such as Mauritius, Namibia, and South Africa are not particularly reflective of the African experience and, therefore, tend to have levels of financial development and financial inclusion higher than (or similar to) expected levels.

Given that infrastructural development is likely to reduce the costs for financial institutions to expand their services, we also consider variables of infrastructural development. However, when using these measures our sample drops drastically (around 40%-50%). Table A.3 in the appendix reports our main models including road density (i.e., km of road per 100 sq. km of land area) as an independent variable. Our main results remain qualitatively unchanged and the coefficient associated with road density is not significant.

4. Country-Specific Financial Development and Financial Inclusion Gaps in Africa

To benchmark country-specific financial development and financial inclusion gaps, we estimate Equation (1) for low- and middle-income countries outside Africa, which enables us to predict what African financial development and inclusion should be based on the experience of these other countries. Specifically, we first run the regressions excluding Sub-Saharan African countries, and we derive out-of-sample predictions for African financial

11

development and inclusion. Then we compare these predictions with the actual levels of African financial development and inclusion to measure the gaps.

4.1. Determinants of Financial Development and Financial Inclusion in non-Sub-Saharan Countries

Table 6 presents our models for low and middle income countries (excluding Sub-Saharan Africa). The results for Equation (1) using our measures of financial development as the dependent variables are presented in Columns 1 to 4. Columns 1 and 3 report our estimates for the specification with a limited set of regressors as a benchmark. All coefficients have the expected sign and some of them are statistically significant. GDP per capita and the Offshore Financial Center dummy variable are significantly positively associated with both indicators of financial development, and population density and natural resources are also significant in the private credit regression.

When we include macroeconomic, institutional, and other explanatory variables in Columns 2 and 4, the Offshore Financial Center variable is again positively associated with both liquid liabilities and private credit (as a percentage of the GDP). Inflation is negatively linked to liquid liabilities to GDP and Natural Resources is negatively related to private credit to GDP. Our proxy for the degree of institutional development, as represented by the KKM index, is positive and highly significant in the private credit to GDP regression. This result provides support for the notion that broad institutional development helps to foster financial development.

The results using measures of financial inclusion as the dependent variables are presented in Columns 5 to 8. Fewer variables are statistically significant. When we use the sample of non-African countries and the limited set of regressors as a benchmark, (see Columns 5 and 7), only GDP per capita is positively associated with the percentage of adults that have an account at a formal financial institution.

The expanded regression results are presented in Columns 6 and 8. The KKM Index is positively related to the percentage of adults that have an account at a formal financial institution. And, Growth is positively related to the percentage of people having a loan from a formal financial institution.

4.2. Predicted Versus Actual African Financial Development and Financial Inclusion

We now use the regression coefficients in Table 6 to derive predicted levels of financial development and financial inclusion for all African countries in our sample. Again, we are *not* claiming that the relationships we find in these tables are causal. Rather, we are asking what the level of financial development and financial inclusion would be if the same relationships held in Africa as in the rest of the developing world. To the extent that predicted and actual levels of financial development and financial inclusion are similar, one can say that African financial development and financial inclusion are about what they should be.

The top panel of Figure 1 shows that only eight of forty countries have levels of liquid liabilities to GDP that are at or above their predicted levels. Of these countries, only six exceed their predicted levels. Cape Verde (abbreviated as CPV in the figure), Mauritius (MUS) and Namibia (NAM) exceed their predicted levels, but none of them is particularly reflective of the African experience. The other countries with actual levels of liquid liabilities to GDP above their predicted levels are Kenya (KEN), Gabon (GAB), and Guinea (GIN). The result on Kenya is somewhat expected as in recent years the country has witnessed a strong bank branch expansion. As noted, this expansion has coincided with the emergence of Equity Bank, a pioneering commercial bank that devised a banking service strategy targeting low income clients and traditionally under-served territories (Allen et al., 2012). Gabon and Guinea are huddled in the lower left hand corner of the figure where actual and predicted values are very low.

The bottom panel of Figure 1 shows that only eight of forty countries have levels of private credit to GDP that exceed their predicted levels: Gabon, Angola (AGO), Liberia (LBR), Nigeria (NGA), Namibia, Cape Verde, South Africa (ZAF) and Mauritius. Of those countries, Gabon, Angola, and Liberia are in the lower left hand corner of the figure where actual and predicted values are very low. We note that because the predicted values are based on linear regressions, they tend to be very near zero for countries clustered in the lower left corner of the private credit panel in Figure 1. The fact that their actual levels exceed zero by some small amount is little consolation. Moreover, Cape Verde, South Africa and Mauritius are not particularly representative of the African experience.

In terms of financial inclusion, the evidence is more mixed. The top panel of Figure 2 shows that eighteen of thirty-five countries have percentages of adults with a bank account above their predicted values. However, it appears that access to loans remains a very important obstacle to financial inclusion. The bottom panel of Figure 2 shows that only three of thirty-five countries have a percentage of adults with a loan from a financial institution above their predicted values. Those countries are South Africa, Swaziland and Mauritius.

Overall, the gap between predicted and observed African financial development is important in several countries. The levels of liquid liabilities to GDP for African countries are about 78 percent the level predicted by statistical relationships that hold elsewhere in the developing world. Private credit ratios are even a bit lower. The percentage of adults with a loan from a formal financial institution is less than half of the predicted levels for African countries, though the share of adults with a bank account is near predicted levels. In contrast to low- and lower-middle income African countries, upper-middle-income African countries such as Mauritius, Namibia, and South Africa tend to have levels of financial development and financial inclusion higher than (or similar to) expected levels.

To provide additional context for interpreting these gaps, the next sections look at whether the factors in our base models relate to African financial development differently than to financial development in the rest of the world.

5. Are the Determinants of Financial Development and Financial Inclusion Different in Africa?

So far we have defined under-development in African financial sectors in terms of the determinants of financial development and financial inclusion in other parts of the developing world. However, the course of African financial sector development and financial inclusion might depend on a different set of factors than those that have been important elsewhere. While we are reluctant to accept that African financial sectors have a distinct model of development, it seems plausible that some factors may be somewhat more or less important in the African context. To see whether this is indeed the case, as a first step, we estimate Equation (1) for the sample of African countries. Note that this method essentially accepts that the level of financial development and financial inclusion in Africa is lower than that in the rest of the developing world, and then tries to explain variation around

14

the African mean based on the explanatory variables in our base models. Still, the results are instructive.

Table 7 reports the determinants of financial development and financial inclusion in Sub-Saharan African countries. Several coefficients are significant at standard confidence levels and all of these have the expected sign. Perhaps the most important difference between Africa and the rest of the developing world is that population density is much more strongly linked to both financial development and financial inclusion than it was elsewhere in the world. Moreover, our proxy for natural resources is strongly negatively linked to financial development and financial inclusion. GDP per capita and the KKM index are positively linked to financial development and financial inclusion for the African sample. In all, the determinants are more tightly linked to financial development and inclusion for African countries than for non-African countries. In part, this could be because the global financial crisis disrupted relationships between variables that held from 1990 to 2006 for non-African countries.

6. The Impact of Mobile Banking on Financial Development and Inclusion in Africa

Having established population density as a key factor for financial development and financial inclusion in Africa we explore whether innovations and financial services, such as mobile banking, have helped to overcome the financial gaps in Africa. As noted, the development of mobile banking in Africa started in Kenya with M-Pesa, which is a mobile phone–based service that greatly facilitates money transfers and remittances by the poor. It has been used primarily to transfer money between individuals rather than as a vehicle for saving.

According to the World Bank Global Financial Inclusion (Global Findex) Dataset, by 2011 67% and 60% of the adult population in Kenya used mobile telephones to receive and send money, respectively. Mobile banking spread quickly in Kenya thanks, in part, to the fact that the operator of M-PESA, Safaricom, controls two-thirds of the telecoms market in Kenya. However, as shown in Table 8, mobile banking has also taken off in other African countries such as Angola, Gabon, Republic of Congo, Nigeria, Somalia, Sudan and Uganda.

Table 9 explores whether mobile banking has deeper penetration in low- and lower-middle-income African countries than elsewhere. To do so, we estimate a model similar to the one presented in Equation (1). We use three different dependent variables: the percentage of adults using a mobile telephone to (a) send money, (b) receive money, and (c) to pay bills. The results suggest that the penetration of mobile telephones to receive and send money has been deeper in Sub-Saharan Africa than in the rest of the developing world. This result is robust even after controlling for our full set of country-variables. However, the penetration of mobile telephones to pay bills has not been stronger in Africa than in the rest of the developing world. Table A.4 in the appendix reports qualitatively very similar results for a sample of upper-middle income countries.

In all, the regression results in this section are consistent with the notion that mobile banking has advanced more rapidly in Africa than in other parts of the developing world (though not in terms of bill payment). Time will tell whether the initial inroads in terms of sending and receiving money via mobile phones will lead to deeper forms of financial inclusion (i.e., including savings accounts, loans, and other financial services such as insurance).

7. Conclusions

The available evidence provides a convincing linkage between financial development and economic development. Yet the levels of financial development and financial inclusion remain low in Africa based on standard indicators of banking development. Benchmarking based on the correlates of financial development and financial inclusion in other developing countries reveals important gaps between predicted and actual levels of African financial development and inclusion.

Population density appears to be more important in Africa than elsewhere. Presumably, bank branch penetration figures remain low in Africa because of difficulties in achieving minimum viable scale in sparsely populated, low-income areas. Therefore, technological advances, such as mobile banking, that enable users of financial services to be located far away from their financial institutions, have provided a promising way to facilitate African financial development and financial inclusion outside major cities, a topic that has been studied in the

context of Kenya, where the mobile payments services of M-PESA are now widely used (Mbiti and Weill, 2010; Jack and Suri, 2010).

At the same time, mobile banking has so far proven a success only within the context of sending and receiving money. While that could change, it seems likely that greater financial inclusion in terms of savings products, credit, and other financial services will require new approaches on the part of financial services providers. The experience of Equity Bank in Kenya provides one such example, and Equity Bank's more recent experience with agent banking, which employs small retailers as agents that can collect deposits, issue withdrawals, and process loan payments, provides another example. In addition, though we did not examine it in this paper, microfinance institutions have substantially increased their outreach in Africa over the past decade (Jarotschkin, 2013). In short, substantial gains in African financial inclusion and development are likely to require an array of new services, delivery channels, and providers, though there are signs that that process is already taking hold.

Appendix: Table A.1
Variables Description

Variable	Description and unit	Source
Liquid liabilities/GDP	Ratio of liquid liabilities to GDP	Financial Structure Dataset (Beck and Demirgüç-Kunt, 2009)
Private credit/GDP	Private credit by deposit money banks to GDP	Financial Structure Dataset (Beck and Demirgüç-Kunt, 2009)
Account at a formal financial institution	Account at a formal financial institution in the past year (% of people older than 15 year old)	Global Findex Database (Demirguc-Kunt and Klapper, 2012)
Loan from a financial institution	Loan from a financial institution in the past year (% of people older than 15 year old)	Global Findex Database (Demirguc-Kunt and Klapper, 2012)
Mobile phone used to pay bills	Mobile phone used to pay bills (% of people older than 15 year old)	Global Findex Database (Demirguc-Kunt and Klapper, 2012)
Mobile phone used to receive money	Mobile phone used to receive money (% of people older than 15 year old)	Global Findex Database (Demirguc-Kunt and Klapper, 2012)
Mobile phone used to send money	Mobile phone used to send money (% of people older than 15 year old)	Global Findex Database (Demirguc-Kunt and Klapper, 2012)
Population	Total population / 1,000,000	World Development Indicators, World Bank
Population density	People per square km of land area /1,000	World Development Indicators, World Bank
Natural resources	Net exports in resource intensive industries as described in the text.	Lederman and Maloney (2008)
Offshore center	Dummy variable that takes the value 1 if the country is a Offshore Center and 0 otherwise.	IMF (2007)
GDP per capita	GDP per capita (constant 2000 US$)	World Development Indicators, World Bank
Growth GDP per capita	GDP per capita growth (annual %)	World Development Indicators, World Bank
Consumer price inflation	Inflation, consumer prices (annual %)	World Development Indicators, World Bank
Road density	Km of road per 100 sq. km of land area	World Development Indicators, World Bank
KKM Index	Measure of broad institutional development	Kaufmann, Kraay, and Maztruzzi (2007)
Manufacturing/GDP	Manufacturing (% of GDP)	World Development Indicators, World Bank
Secondary/Primary school enrollment	Secondary school enrollment over primary school enrollment	World Development Indicators, World Bank

Regressions on Financial Development and Financial Inclusion, Upper-Middle-Income Countries

This table presents OLS regressions of liquid liabilities over GDP, private credit over GDP, the percentage of adults with an account at a formal financial institution, and the percentage of adults with a loan from a formal financial institution on the set of country-level variables listed below. This table reports the models for a sample of upper-middle-income countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Liquid Liabilities / GDP		Private Credit / GDP		Account		Loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Population)	0.0274	0.0060	0.0112	0.0132	0.0163	0.0154	0.0007	0.0030
	(0.030)	(0.045)	(0.019)	(0.026)	(0.022)	(0.025)	(0.007)	(0.009)
Ln(Population Density)	0.1238***	0.1020*	0.0884***	0.0624*	0.0532	0.0570	0.0099	0.0141
	(0.045)	(0.060)	(0.029)	(0.034)	(0.034)	(0.035)	(0.010)	(0.013)
Natural Resources	-0.0718	-0.0667	-0.0924*	-0.0629	-0.0298	0.0227	-0.0086	0.0052
	(0.076)	(0.096)	(0.049)	(0.055)	(0.046)	(0.052)	(0.014)	(0.019)
Offshore Center	0.4493*	0.2919	0.4799***	0.4058**	-0.0011	0.0924	0.0178	0.0208
	(0.262)	(0.289)	(0.169)	(0.166)	(0.149)	(0.131)	(0.043)	(0.047)
Ln(GDP per capita)	0.0244	0.0195	0.0012	-0.1336	0.0092	-0.0878	-0.0269	-0.0415
	(0.124)	(0.183)	(0.080)	(0.105)	(0.075)	(0.084)	(0.022)	(0.030)
Growth GDP Per Capita		2.8900		-0.2626		-2.6905*		0.7114
		(3.052)		(1.756)		(1.410)		(0.509)
Inflation		-2.3318		-0.5345		0.7185		0.3412
		(1.537)		(0.884)		(0.688)		(0.248)
KKM Index		0.0070		0.2148*		0.0618		0.0199
		(0.198)		(0.114)		(0.089)		(0.032)
Manufacturing/GDP		0.6733		0.8479		1.0264*		-0.0323
		(1.138)		(0.655)		(0.552)		(0.199)
Sec./Prim. School Enrollment		-0.1420		-0.0799		0.4396		0.0662
		(0.529)		(0.305)		(0.296)		(0.107)
Sub-Saharan Africa	0.1957	0.1658	0.2029*	0.0891	0.0811	0.1041	-0.0021	0.0023
	(0.183)	(0.217)	(0.118)	(0.125)	(0.118)	(0.110)	(0.034)	(0.040)
Constant	0.8527***	0.9110*	0.6871***	0.7637***	0.5657***	0.2268	0.1628***	0.0946
	(0.226)	(0.463)	(0.146)	(0.267)	(0.149)	(0.249)	(0.043)	(0.090)
Observations	42	39	42	39	36	35	36	35
Adjusted R-squared	0.1930	0.1768	0.3584	0.4442	-0.0369	0.3020	-0.0298	-0.0669
Root MSE	0.3519	0.3666	0.2272	0.2108	0.1968	0.1632	0.0573	0.0589

Regressions on Financial Development and Financial Inclusion

This table presents OLS regressions of liquid liabilities over GDP, private credit over GDP, the percentage of adults with an account at a formal financial institution, and the percentage of adults with a loan from a formal financial institution on the set of country-level variables listed below. This table reports the models for a sample of low- and lower-middle-income countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Liquid Liabilities / GDP		Private Credit / GDP		Account		Loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Population)	0.0687**	0.0826**	0.0443*	0.0532*	0.0104	-0.0046	-0.0134	-0.0227***
	(0.027)	(0.030)	(0.024)	(0.027)	(0.025)	(0.025)	(0.008)	(0.008)
Ln(Population Density)	-0.0141	0.0224	-0.0191	-0.0017	-0.0415	0.0003	0.0023	0.0135
	(0.034)	(0.037)	(0.030)	(0.033)	(0.029)	(0.029)	(0.010)	(0.009)
Natural Resources	-0.1336	0.0595	-0.2944	-0.1327	0.1667	0.1980	0.2647**	0.2622**
	(0.380)	(0.405)	(0.333)	(0.356)	(0.355)	(0.334)	(0.115)	(0.107)
Ln(GDP per capita)	0.0319	0.0304	0.0141	-0.0234	0.0453	0.0914	-0.0125	0.0081
	(0.060)	(0.069)	(0.053)	(0.061)	(0.052)	(0.054)	(0.017)	(0.017)
Growth GDP Per Capita		1.3126		0.3826		3.7702**		1.4366***
		(1.827)		(1.604)		(1.574)		(0.504)
Inflation		-0.7141		-0.1248		0.7242		0.3467
		(0.962)		(0.845)		(0.835)		(0.267)
KKM Index		0.1459		0.1487*		0.0952		0.0201
		(0.090)		(0.079)		(0.076)		(0.024)
Manufacturing/GDP		-0.9589		0.0335		-0.8331		-0.1631
		(0.626)		(0.549)		(0.495)		(0.158)
Sec./Prim. School Enrollment		0.1745		0.2069		0.0365		-0.0633
		(0.203)		(0.179)		(0.157)		(0.050)
Road Density	-0.0006	-0.0017	0.0001	-0.0009	0.0025**	0.0009	0.0002	-0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Sub-Saharan Africa	-0.1752*	-0.1488	-0.1414*	-0.1163	-0.0421	0.0483	-0.0875***	-0.0654**
	(0.089)	(0.115)	(0.078)	(0.101)	(0.078)	(0.094)	(0.025)	(0.030)
Constant	0.2651	0.4996*	0.1412	0.1484	0.0510	0.2283	0.1586***	0.2232***
	(0.160)	(0.252)	(0.140)	(0.221)	(0.141)	(0.212)	(0.046)	(0.068)
Observations	40	40	40	40	37	37	37	37
Adjusted R-squared	0.2339	0.2613	0.1411	0.1716	0.1564	0.3412	0.3705	0.5215
Root MSE	0.1867	0.1834	0.1639	0.1610	0.1564	0.1382	0.0508	0.0443

Appendix: Table A.4
Regressions on Mobile Phone Penetration, Upper-Middle-Income Economies

This table presents OLS regressions of percentage of people using mobile phone to make financial transactions on the set of country-level variables listed below. This table reports the models for all low and middle income countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

% of people using mobile phone to:	(1)	(2)	(3)	(4)	(5)	(6)
	send money		receive money		pay bills	
Ln(Population)	-0.0101	-0.0137	-0.0096	-0.0091	-0.0052	-0.0071
	(0.006)	(0.009)	(0.009)	(0.012)	(0.005)	(0.007)
Ln(Population Density)	0.0015	-0.0014	-0.0030	0.0003	-0.0003	0.0002
	(0.010)	(0.012)	(0.013)	(0.017)	(0.008)	(0.010)
Natural Resources	0.0613***	0.0491***	0.0708***	0.0567**	0.0054	0.0013
	(0.013)	(0.017)	(0.018)	(0.024)	(0.010)	(0.014)
Offshore Center	-0.0232	-0.0258	-0.0293	-0.0212	-0.0066	0.0030
	(0.043)	(0.043)	(0.059)	(0.059)	(0.033)	(0.036)
Ln(GDP per capita)	-0.0566**	-0.0133	-0.0720**	-0.0167	-0.0353**	-0.0132
	(0.022)	(0.029)	(0.030)	(0.039)	(0.017)	(0.024)
Growth GDP Per Capita		-0.3268		-0.7177		-0.4375
		(0.460)		(0.632)		(0.386)
Inflation		-0.6158**		-0.7192**		-0.2928
		(0.249)		(0.342)		(0.209)
KKM Index		-0.0626**		-0.0795*		-0.0417
		(0.030)		(0.041)		(0.025)
Manufacturing/GDP		-0.0090		-0.1797		0.0261
		(0.195)		(0.268)		(0.164)
Sec./Prim. School Enrollment		0.0179		0.0518		0.0539
		(0.098)		(0.135)		(0.082)
Sub-Saharan Africa	0.0634*	0.0849**	0.0776	0.1053**	-0.0022	0.0160
	(0.034)	(0.036)	(0.046)	(0.049)	(0.026)	(0.030)
Constant	0.1194***	0.0998	0.1328**	0.1297	0.0867**	0.0506
	(0.043)	(0.082)	(0.059)	(0.112)	(0.033)	(0.069)
Observations	35	34	35	34	35	34
Adjusted R-squared	0.5500	0.6090	0.4644	0.5393	-0.0110	-0.0210
Root MSE	0.0563	0.0532	0.0777	0.0731	0.0439	0.0446

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Table 1
Financial Development by Regions

This table reports the evolution of liquid liabilities over GDP and private credit over GDP by regions. The period runs from 2000 to 2011. Only middle and low income countries are considered. Regions correspond to the World Bank classification. The data source is the World Bank Database on Financial Development and Structure (Beck and Demirgüç-Kunt, 2009).

Region	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
						Liquid Liabilities/GDP						
East Asia and Pacific	55	57	58	56	57	60	60	62	63	69	71	74
Europe and Central Asia	20	22	24	24	26	29	32	36	39	45	45	45
Latin America and the Caribbean	43	45	46	46	46	46	46	47	48	52	53	54
Middle East and North Africa	57	60	58	60	60	59	63	64	61	79	84	96
South Asia	37	39	41	43	50	50	50	47	50	54	56	58
Sub-Saharan Africa	26	26	27	28	27	27	29	29	30	33	35	37
						Private Credit Extended by Deposit Money Banks/GDP						
East Asia and Pacific	40	40	39	38	39	42	42	44	47	51	52	55
Europe and Central Asia	11	12	13	14	17	20	25	32	42	42	40	40
Latin America and the Caribbean	36	36	36	34	32	32	33	35	38	39	40	41
Middle East and North Africa	32	33	29	29	28	29	32	33	31	35	37	47
South Asia	21	22	22	22	25	29	32	32	36	38	39	40
Sub-Saharan Africa	14	13	14	15	15	15	16	17	18	20	21	22

Table 2
Financial Inclusion by Regions

This table reports the percentage of adult people (older than 15 years old) having an account at a formal financial institution and a loan from a financial institution by regions. The data correspond to the year 2011. Only middle and low income countries are considered. Regions correspond to the World Bank classification. The data source is the Global Financial Inclusion (Global Findex) Database.

Region	Account at a formal financial institution (% age 15+)	Loan from a financial institution in the past year (% age 15+)
East Asia and Pacific	54.9	8.6
Europe and Central Asia	44.9	7.7
Latin America and Caribbean	39.3	7.9
Middle East and North Africa	17.7	5.1
South Asia	33.0	8.7
Sub-Saharan Africa	24.0	4.8

Table 3
Mobile Phone Use for Financial Transactions by Regions, 2011

This table reports the percentage of adult people (older than 15 years old) that use mobile telephones to send money, receive money and pay bills. The data correspond to the year 2011. Only middle and low income countries are considered. All countries with available data in these variables are considered in this table. Regions correspond to the World Bank classification. The data source is the Global Financial Inclusion (Global Findex) Database.

Region	Mobile phone used to send money (% age 15+)	Mobile phone used to receive money (% age 15+)	Mobile phone used to pay bills (% age 15+)
East Asia and Pacific	1.0	1.2	1.3
Europe and Central Asia	2.5	2.7	3.0
Latin America and Caribbean	0.8	1.9	1.8
Middle East and North Africa	1.3	2.4	1.0
South Asia	0.8	1.9	2.1
Sub-Saharan Africa	11.2	14.6	3.0

Table 4
Summary Statistics
This table reports the mean and standard deviation of all the variables used in the regressions in this study.

	Middle and Low Income Countries (Sub-Saharan excluded)		Sub-Saharan Countries	
	Mean	Std. Dev.	Mean	Std. Dev.
Dependent variables				
Liquid liabilities/GDP	55.4%	32.7%	31.8%	16.8%
Private credit/GDP	40.0%	24.7%	19.4%	16.9%
Account at a formal financial institution	35.2%	21.5%	21.0%	16.3%
Loan from a financial institution	10.1%	6.1%	5.2%	3.2%
Mobile phone used to send money	2.3%	4.1%	8.8%	13.2%
Mobile phone used to receive money	3.5%	6.1%	11.9%	15.3%
Mobile phone used to pay bills	2.5%	4.4%	3.3%	5.1%
Explanatory variables				
Population	50.6	184.1	18.3	27.1
Population density	0.131	0.179	0.090	0.123
Natural resources	0.063	0.385	0.112	0.650
Offshore center	6.5%	24.70%	0.00%	0.00%
GDP per capita	2,824	2,444	865	1221
GDP	0.102	0.344	0.012	0.030
Growth GDP per capita	3.1%	2.8%	2.3%	2.2%
Consumer price inflation	7.2%	4.2%	8.1%	5.0%
KKM Index	-0.393	0.612	-0.681	0.633
Manufacturing/GDP	14.7%	7.5%	10.2%	6.6%
Secondary/Primary school enrollment	0.670	0.206	0.331	0.163

Table 5

Regressions on Financial Development and Financial Inclusion

This table presents OLS regressions of liquid liabilities over GDP, private credit over GDP, the percentage of adults with an account at a formal financial institution, and the percentage of adults with a loan from a formal financial institution on the set of country-level variables listed below. This table reports the models for a sample of low- and lower-middle-income countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Liquid Liabilities / GDP		Private Credit / GDP		Account		Loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Population)	0.0164	0.0236	0.0154	0.0180	0.0116	-0.0029	-0.0057	-0.0100*
	(0.014)	(0.015)	(0.011)	(0.012)	(0.015)	(0.014)	(0.005)	(0.005)
Ln(Population Density)	0.0041	0.0211	0.0023	0.0099	0.0081	0.0193	0.0046	0.0039
	(0.019)	(0.019)	(0.015)	(0.015)	(0.017)	(0.015)	(0.006)	(0.006)
Natural Resources	-0.2733	-0.0949	-0.3050*	-0.1291	0.0032	0.0223	0.0719	0.0911
	(0.217)	(0.219)	(0.170)	(0.174)	(0.208)	(0.183)	(0.072)	(0.068)
Offshore Center	0.1987*	0.2544*	0.1996**	0.2581**				
	(0.117)	(0.140)	(0.092)	(0.111)				
Ln(GDP per capita)	0.0819**	0.0699*	0.0781***	0.0420	0.0650*	0.0883***	0.0019	0.0057
	(0.035)	(0.040)	(0.027)	(0.032)	(0.033)	(0.033)	(0.012)	(0.012)
Growth GDP Per Capita		1.0658		0.4893		2.8844***		0.8527***
		(0.926)		(0.736)		(0.801)		(0.298)
Inflation		-0.3532		0.1504		0.5018		0.1118
		(0.617)		(0.490)		(0.500)		(0.186)
KKM Index		0.1198**		0.1208***		0.1183***		0.0287*
		(0.053)		(0.042)		(0.042)		(0.016)
Manufacturing/GDP		-0.7257**		-0.0628		-0.6514**		-0.0334
		(0.322)		(0.256)		(0.272)		(0.101)
Sec./Prim. School Enrollment		0.0347		0.1346		0.0157		-0.0490
		(0.138)		(0.110)		(0.115)		(0.043)
Sub-Saharan Africa	-0.1107**	-0.1141*	-0.0749*	-0.0494	0.0140	0.0302	-0.0522***	-0.0632***
	(0.052)	(0.061)	(0.041)	(0.048)	(0.050)	(0.054)	(0.017)	(0.020)
Constant	0.4562***	0.6357***	0.2810***	0.2696***	0.2244***	0.3373***	0.1302***	0.1627***
	(0.076)	(0.120)	(0.059)	(0.096)	(0.075)	(0.106)	(0.026)	(0.039)
Observations	75	73	75	73	64	61	64	61
Adjusted R-squared	0.3082	0.3903	0.3663	0.4191	0.0283	0.3072	0.1743	0.3315
Root MSE	0.1756	0.1668	0.1376	0.1325	0.1473	0.1239	0.0512	0.0460

Table 6
Regressions on Financial Development and Financial Inclusion for the Sample of Non-Sub-Saharan *African* Countries

This table presents OLS regressions of liquid liabilities over GDP, private credit over GDP, the percentage of adults with an account at a formal financial institution, and the percentage of adults with a loan from a formal financial institution on the set of country-level variables listed below. This table reports the models for a sample of low and middle income non-Sub-Saharan African countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Liquid Liabilities / GDP		Private Credit / GDP		Account		Loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Population)	0.0246	0.0338	0.0129	0.0252	0.0125	0.0223	-0.0021	-0.0037
	(0.020)	(0.025)	(0.014)	(0.016)	(0.018)	(0.019)	(0.006)	(0.006)
Ln(Population Density)	0.0443	0.0489	0.0375*	0.0220	-0.0021	-0.0045	0.0005	0.0003
	(0.032)	(0.036)	(0.022)	(0.023)	(0.024)	(0.026)	(0.008)	(0.008)
Natural Resources	-0.1571	-0.0902	-0.1569**	-0.1352*	-0.0095	-0.0018	-0.0009	0.0009
	(0.103)	(0.110)	(0.072)	(0.069)	(0.075)	(0.077)	(0.024)	(0.025)
Offshore Center	0.3515**	0.3487**	0.3152***	0.3423***	-0.0066	0.0060	0.0118	-0.0083
	(0.150)	(0.174)	(0.104)	(0.109)	(0.147)	(0.148)	(0.048)	(0.047)
Ln(GDP per capita)	0.0823*	0.0348	0.0993***	-0.0158	0.1142***	0.0415	-0.0078	-0.0083
	(0.042)	(0.062)	(0.029)	(0.038)	(0.030)	(0.040)	(0.010)	(0.013)
Growth GDP Per Capita		2.4203		0.2869		-0.1518		0.9145**
		(1.542)		(0.965)		(1.109)		(0.356)
Inflation		-1.7581*		-0.1919		0.4664		0.2028
		(1.004)		(0.628)		(0.636)		(0.204)
KKM Index		0.1118		0.2420***		0.1319*		0.0174
		(0.099)		(0.062)		(0.066)		(0.021)
Manufacturing/GDP		-0.3958		0.3774		0.0793		-0.0532
		(0.641)		(0.401)		(0.415)		(0.133)
Sec./Prim. School Enrollment		0.0297		0.0952		0.1996		-0.0332
		(0.242)		(0.151)		(0.174)		(0.056)
Constant	0.5530***	0.7054***	0.3985***	0.3659***	0.2386**	0.1265	0.1128***	0.1111**
	(0.116)	(0.189)	(0.081)	(0.118)	(0.097)	(0.146)	(0.031)	(0.047)
Observations	77	72	77	72	64	61	64	61
Adjusted R-squared	0.1246	0.1644	0.2582	0.4019	0.1571	0.1971	-0.0697	-0.0128
Root MSE	0.3065	0.3072	0.2139	0.1922	0.1953	0.1891	0.0631	0.0606

Table 7
Regressions on Financial Development and Financial Inclusion for the Sample of Sub-Saharan *African* Countries

This table presents OLS regressions of liquid liabilities over GDP, private credit over GDP, the percentage of adults with an account at a formal financial institution, and the percentage of adults with a loan from a formal financial institution on the set of country-level variables listed below. This table reports the models for the sample of Sub-Saharan African countries (including and excluding South Africa). ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Liquid Liabilities / GDP		Private Credit / GDP		Account		Loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Population)	-0.0115	-0.0102	0.0177	0.0237	0.0211	0.0077	-0.0027	-0.0045
	(0.012)	(0.013)	(0.013)	(0.014)	(0.017)	(0.016)	(0.004)	(0.004)
Ln(Population Density)	0.0481***	0.0458***	0.0344**	0.0286*	0.0473***	0.0393**	0.0082**	0.0059
	(0.013)	(0.012)	(0.013)	(0.014)	(0.015)	(0.014)	(0.003)	(0.004)
Natural Resources	-0.0892***	-0.0709***	-0.0853***	-0.0580*	-0.0488	-0.0432	-0.0152**	-0.0146*
	(0.025)	(0.026)	(0.026)	(0.029)	(0.030)	(0.030)	(0.007)	(0.008)
Ln(GDP per capita)	0.1326***	0.0842**	0.1519***	0.0858**	0.1375***	0.1208***	0.0187***	0.0192*
	(0.018)	(0.031)	(0.019)	(0.035)	(0.023)	(0.036)	(0.005)	(0.009)
Growth GDP Per Capita		1.4790*		0.8870		2.5315**		0.3587
		(0.836)		(0.951)		(0.993)		(0.259)
Inflation		-0.3070		-0.4902		0.1562		0.0647
		(0.417)		(0.474)		(0.502)		(0.131)
KKM Index		0.0790**		0.0727*		0.0418		0.0054
		(0.032)		(0.037)		(0.038)		(0.010)
Manufacturing/GDP		-0.3115		0.0318		-0.0137		0.0670
		(0.242)		(0.275)		(0.290)		(0.076)
Sec./Prim. School Enrollment		0.1421		0.2289		-0.0194		-0.0388
		(0.138)		(0.156)		(0.149)		(0.039)
Constant	0.5984***	0.5761***	0.3774***	0.2810**	0.4174***	0.3643***	0.1018***	0.0939***
	(0.050)	(0.095)	(0.052)	(0.108)	(0.062)	(0.109)	(0.014)	(0.029)
Observations	40	40	40	40	36	35	36	35
Adjusted R-squared	0.6686	0.7292	0.6283	0.6505	0.5420	0.6458	0.3755	0.3698
Root MSE	0.0978	0.0884	0.1036	0.1005	0.1114	0.0975	0.0249	0.0254

Table 8
Mobile Phone Use in Financial Transactions by Country

This table reports the percentages of adult population (older than 15 years old) that use mobile phones to pay bills and receive and send money. The table only includes Sub-Saharan African countries.

Country	Mobile phone used to send money	Mobile phone used to receive money (% age 15+)	Mobile phone used to pay bills
Angola	11.7	19.3	13.6
Benin	0.2	0.4	0.2
Botswana	5.1	8.0	2.2
Burkina Faso	0.2	0.6	0.3
Burundi	4.0	4.7	0.8
Cameroon	3.3	8.8	0.6
Central African Repub	0.3	1.6	0.2
Chad	5.7	15.5	2.8
Comoros	0.5	3.5	0.3
Congo, Dem. Rep.	1.5	2.0	0.1
Congo, Rep.	20.1	32.0	1.6
Gabon	41.1	46.6	4.9
Ghana	1.0	1.5	0.9
Guinea	3.5	5.7	1.1
Kenya	60.5	66.7	13.4
Lesotho	5.7	6.7	4.6
Liberia	7.3	16.6	5.2
Madagascar	0.8	0.7	0.0
Malawi	0.5	0.7	0.8
Mali	0.3	1.0	0.3
Mauritania	7.1	16.0	7.5
Mauritius	6.8	7.3	1.8
Mozambique	1.0	1.4	1.3
Niger	0.9	2.6	0.4
Nigeria	9.9	11.2	1.4
Rwanda	2.0	2.9	1.1
Senegal	0.5	0.9	0.2
Sierra Leone	1.4	1.9	0.7
Somalia	31.7	32.2	26.2
South Africa	5.4	9.4	4.4
Sudan	30.5	44.7	4.0
Swaziland	16.2	16.4	4.7
Tanzania	14.0	19.6	5.5
Togo	0.2	1.1	0.4
Uganda	20.0	25.2	3.3
Zambia	3.0	3.5	2.4
Zimbabwe	1.5	1.8	2.6

Table 9
Regressions on Mobile Phone Penetration

This table presents OLS regressions of percentage of people using mobile phone to make financial transactions on the set of country-level variables listed below. This table reports the models for all low and middle income countries. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

% of people using mobile phone to:	(1)	(2)	(3)	(4)	(5)	(6)
	send money		receive money		pay bills	
Ln(Population)	0.0108	0.0092	0.0120	0.0126	0.0009	-0.0015
	(0.009)	(0.009)	(0.011)	(0.011)	(0.004)	(0.004)
Ln(Population Density)	-0.0036	-0.0043	-0.0081	-0.0101	-0.0057	-0.0071
	(0.010)	(0.010)	(0.012)	(0.012)	(0.005)	(0.004)
Natural Resources	0.0706	0.0214	0.1147	0.0114	-0.0263	-0.0572
	(0.120)	(0.125)	(0.148)	(0.150)	(0.057)	(0.053)
Ln(GDP per capita)	0.0445**	0.0619***	0.0492**	0.0764***	-0.0036	0.0039
	(0.019)	(0.022)	(0.024)	(0.027)	(0.009)	(0.009)
Growth GDP Per Capita		0.0156		0.3187		0.7780***
		(0.548)		(0.657)		(0.230)
Inflation		0.4650		0.2243		0.1129
		(0.342)		(0.410)		(0.144)
KKM Index		-0.0430		-0.0847**		-0.0184
		(0.029)		(0.035)		(0.012)
Manufacturing/GDP		-0.0353		-0.0682		0.1177
		(0.186)		(0.223)		(0.078)
Sec./Prim. School Enrollment		0.0730		0.1091		0.0129
		(0.078)		(0.094)		(0.033)
Sub-Saharan Africa	0.0912***	0.1250***	0.1111***	0.1631***	-0.0009	0.0219
	(0.029)	(0.037)	(0.035)	(0.044)	(0.014)	(0.015)
Constant	-0.0122	-0.1115	-0.0139	-0.1554*	0.0039	-0.0668**
	(0.044)	(0.072)	(0.053)	(0.087)	(0.021)	(0.030)
Observations	64	61	64	61	64	61
Adjusted R-squared	0.1171	0.1599	0.1304	0.2098	-0.0527	0.2249
Root MSE	0.0852	0.0847	0.1047	0.1015	0.0407	0.0355
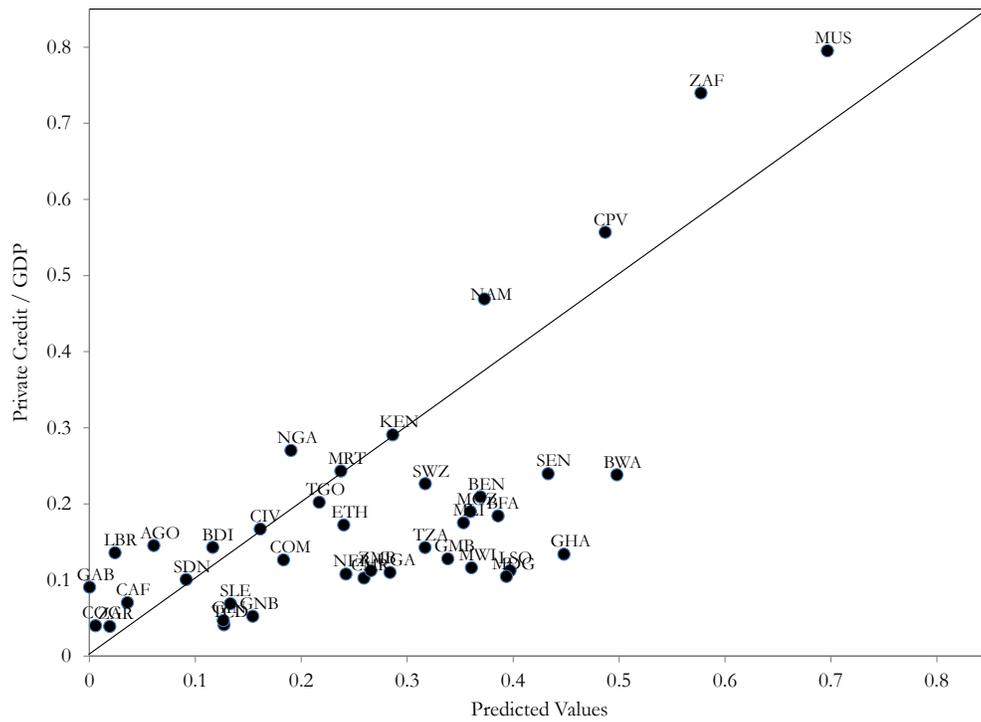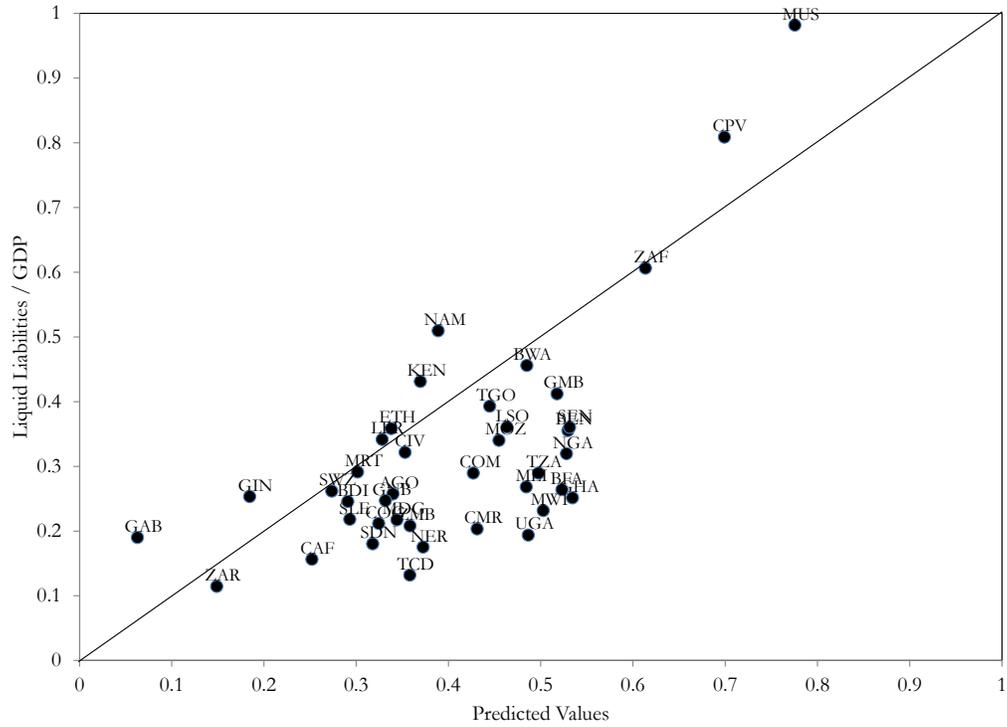
Figure 1. Liquid liabilities/GDP and Private Credit/GDP in African countries, actual vs. predicted values (Notes: Negative predicted values were replaced by zero).
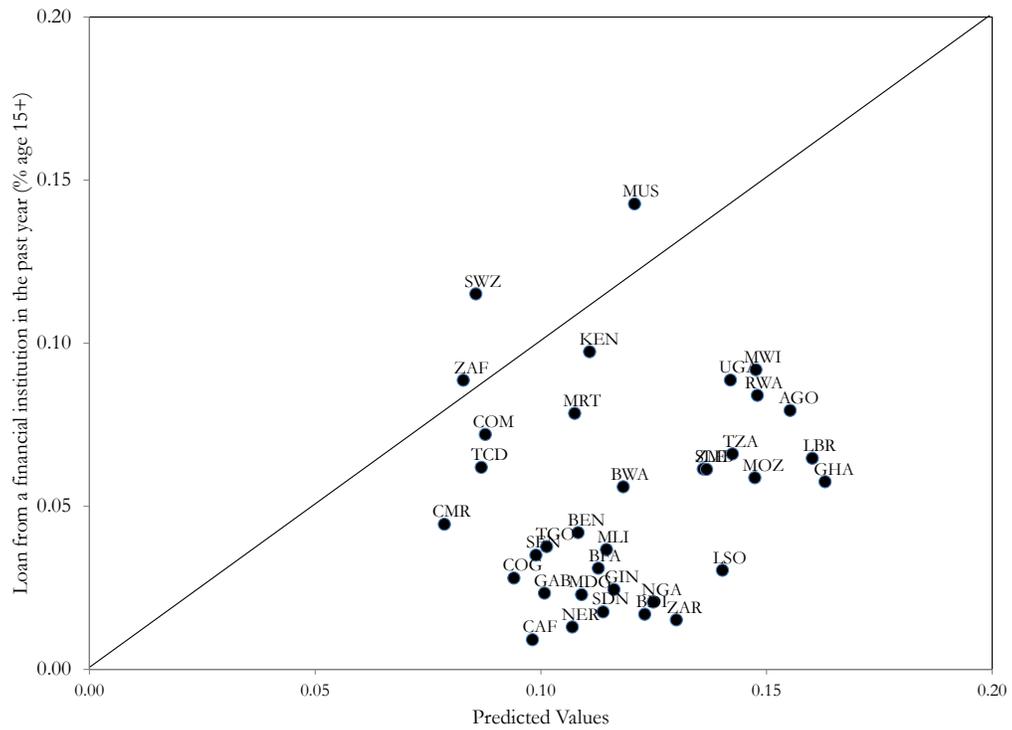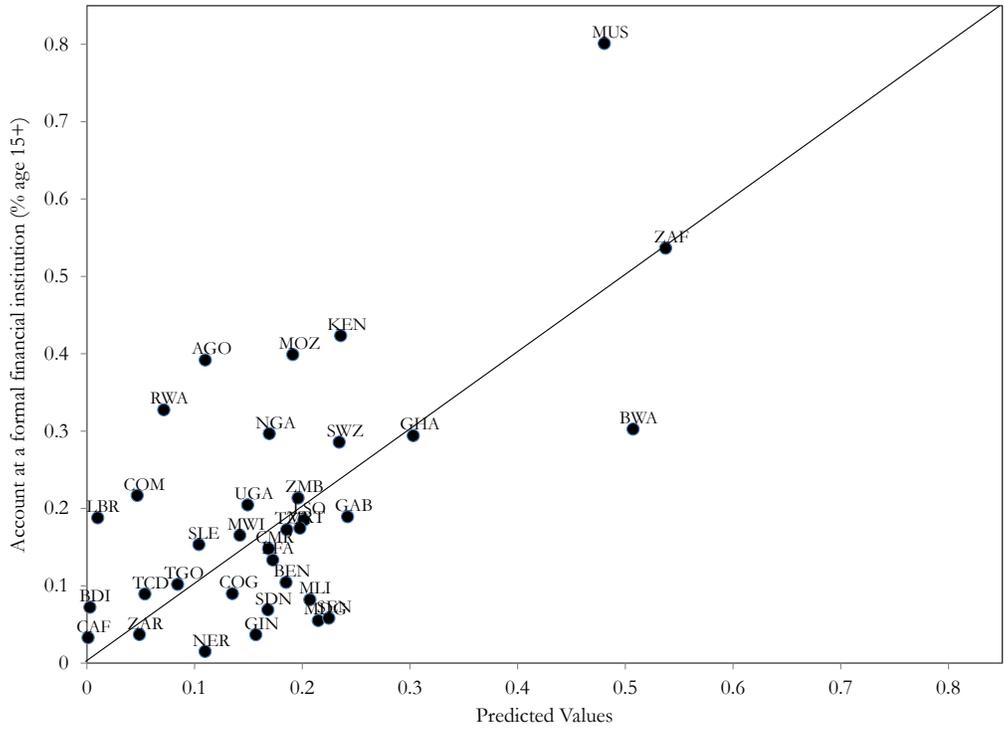
Figure 2. Account at a formal financial institution and loan from a financial institution, actual vs. predicted values. (Notes: Negative predicted values were replaced by zero).