

What Regulatory Frameworks Are More Conducive to Mobile Banking?

Empirical Evidence from Findex Data

Eva Gutierrez

Sandeep Singh

The World Bank
Latin America and the Caribbean Region
Finance and Private Sector Development
October 2013



Abstract

Mobile banking services offer great potential to expand financial services, particularly payment services, to the poor. They also provide a convenient and cost effective way to access bank accounts. This paper constitutes a first attempt to explain statistically what factors contribute to mobile banking usage, with a particular focus on the regulatory framework. The authors construct an index that measures the existence of laws and regulation that support mobile banking activity for 35 countries.

Using variations in regulatory environments across these countries and armed with newly released data on mobile banking usage by approximately 37,000 individuals in these 35 countries, the paper sheds light on the importance of laws and regulation in supporting mobile banking. The analysis finds that a supporting regulatory framework is associated with higher usage of mobile banking for the general population as well as for the unbanked.

This paper is a product of the Finance and Private Sector Development, Latin America and the Caribbean Region. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at egutierrez2@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

What Regulatory Frameworks Are More Conducive to Mobile Banking? Empirical Evidence from Findex Data

Eva Gutierrez and Sandeep Singh*

JEL classification codes: G20, G23, G28

Keywords: mobile banking, mobile money, mobile payments, regulatory framework, financial inclusion

Sector board: financial systems

* The authors work for the World Bank, respectively as Lead Financial Sector Economist in the LAC Region, (egutierrez2@worldbank.org) and consultant. The authors wish to thank the Korean Government for their support to this research through a grant. The authors also want to thank Leora Kappler and the participants in a World Bank Seminar for their comments. Research support on the elaboration of the regulatory Index used in this paper was provided by Moonjung Choi and Tony Choi.

1. Introduction

Mobile banking¹ – the use of mobile phones to conduct financial and banking transactions – represents a key area of financial innovation in recent times. Mobile banking (m-banking) has been identified as a potentially significant contributor to financial inclusion (G20 2010). The high rate of financial exclusion in developing countries has been well documented. According to the wide-ranging Global Financial Index (Demirguc-Kunt and Klapper 2012) survey of 148 countries, half the adults worldwide do not have access to formal bank accounts. Among developing countries, and especially among low/low-middle income individuals, this figure rises substantially; only about a quarter of the world's poor have access to a formal bank account. However, more than a billion of those unbanked already own a mobile phone (G20 2010).²

The ubiquity of mobile phones among the financially excluded presents a unique potential to reach these traditionally underserved portions of the population. Unbanked individuals cite difficulties in obtaining a bank account such as living too far away from branches (20 percent), not possessing necessary documents (18 percent), or that banking costs were too expensive (25 percent) (Findex 2011). All such barriers to finance can in theory be overcome through a pivot in business model that is supportive of m-banking. The oft-researched case of M-PESA in Kenya stands as just one of many successful deployments of m-banking around the world that targeted and profited from banking the unbanked (Leishman 2010). For these reasons organizations such as G20 have pushed innovative financial inclusion at the center of their strategic vision for inclusive growth³.

Mobile banking allows banks' customers convenient access to a variety of banking functions, and increases efficiency. Customers can access funds in their bank accounts 24 hours

¹ A clarification on terminology – the use of mobile phones to send, receive money, pay bills and execute other financial transactions has been variously referred to as mobile banking (Porteous 2006), mobile money (IFC 2011, GSMA), mobile transactions (Alexandre et al 2011) or simply mobile payment. Since we are considering both bank based and mobile network based models of mobile phone usage, we use the term mobile banking (m-banking) throughout.

² Analysis by CGAP and GSMA in 2009. They projected this number to increase to 1.7 billion by 2012.

³ See for example www.gfpi.org and the Maya Declaration (<http://www.afi-global.org/gpf/maya-declaration>)

through mobile phones, and transaction costs are driven down. Even when individuals have access to bank accounts with low fees, m-banking can reduce the opportunity cost of financial transactions. This model of providing financial services through a mobile phone linked to a bank account is referred to in the literature as the additive model. The use of m-banking in developed economies often follows the additive model. This contrasts with the practice of using m-banking to target the unbanked - the transformative model. Under this model, non-banks issue electronic currency to offer customers payment services and value storage services.

M-banking offerings are steadily increasing in developing countries. The uptake though, has been quite heterogeneous due to the diversity of demand and supply side considerations. Various individual characteristics such as age, income and education level are important determinants of m-banking usage. Country level variables such as existing access to banking, the penetration of bank branches and ATM's, and overall financial development have significant impact on both the demand and supply of m-banking. How an m-banking deployment has marketed its product in recognition of such individual, regional and country level variables is unarguably crucial to its successful adoption.

A key ingredient at the country level is the role of m-banking enabling legislative and regulatory environment. Changes in the legal and regulatory framework can either provide the right conditions for innovative m-banking players to thrive, or hinder its growth by compounding the risk already inherent in the acceptance of a novel product. The challenges of regulation are compounded by the diverse nature of operators in the market – m-banking models vary in their implementation from being entirely bank driven, to being purely driven by a mobile network operator, and more commonly a mixture of the two. Both telecommunication and banking regulators, as well as competition authorities, have a stake in the industry. Nevertheless, many countries have already adopted reforms supporting m-banking environment according to the CGAP (2010) Financial Access database⁴.

While there has been research on legal and regulatory principles that may help mobile banking expand, such studies have primarily been qualitative and concentrated on specific case

⁴ Such reforms include enabling branchless banking (43 countries), revising Know-your-customer requirements (55), facilitating access to rural areas (46), introducing basic bank accounts (20), enabling microfinance (53) and bolstering consumer protection (65). 64 countries have drawn up strategy documents to improve financial inclusion. See next section for a discussion on how some of these reforms support m-banking.

studies (Diniz 2011). To our knowledge, there has been no cross-country research to empirically ascertain whether such regulatory reforms have been associated with increasing use of m-banking. Our paper uniquely contributes to the literature by expanding the analysis to a comprehensive cross-country level. To this end, we construct an index that measures the existence of laws and regulation that support m-banking activity for 35 countries. Using variations in regulatory environments across these countries, and armed with newly released data of m-banking usage by approximately 37,000 individuals in these 35 countries, we shed light on the importance of laws and regulation in supporting m-banking.

Overall, we find evidence that enabling legal and regulatory frameworks are strongly associated with higher usage both for the banked and unbanked. However, supporting frameworks do not necessarily require a detailed regulation of mobile banking industries. Adequate regulatory frameworks for m-banking could also expand financial inclusion as they are associated with higher usage of m-banking services among those who do not have a bank account because lack of availability of service or high costs. As per what features of the regulatory framework encourage usage of m-banking amount the poorest we found that a regulatory framework that supports interoperability is associated with higher usage but stronger consumer protection is associated to lower usage among this segment. This is a puzzling result that requires further research. One hypothesis though is that strong consumer protection regulation increases the cost of the service.

In the next section, we present the data used in our analysis, including a description of how we construct the regulatory index. Section 3 describes the regression framework and section 4 discusses the results. Section 5 concludes with a summary.

2. Data Description

Regulatory Index

In order to summarize and quantify the legal and regulatory framework of a country, we define a concrete set of principles to allow adequate cross-country comparison. We construct a

Regulatory Index for 35 countries using six principles outlined by Porteous⁵ (2006, 2009) that provide enabling legal and regulatory environment for market players and end users. The six enabling principles are subdivided into two categories. The first three principles support an additive model of m-banking, and the other a transformative model.

The components of the index can also broadly be categorized along two relevant dimensions – certainty and openness. A regulatory principle supports certainty in the industry if it provides confidence that arbitrary legislative changes will not be introduced in the future. Openness is supported by regulation which allows increased access to the market for new entrants, and encourages innovation. Components of the index are classified either as supporting openness or certainty, or both to varying degrees. An ideal enabling legal and regulatory environment is one where there exists high degree of openness and certainty (Porteous 2006).

The E-contracting principle assesses whether electronic signatures are accepted by the law. When financial products and services are remotely delivered, the acceptance of electronic signature in the same standing as physical signatures for legal purposes becomes crucial. To ascertain legal certainty, we check e-contracting laws passed, and in particular at language used to describe the acceptability of e-signatures.

Consumer protection is an important element to encourage customer acceptance of a novel financial product by ensuring that customers are adequately protected against abuse and fraud. Following Porteous (2006), we subdivide this principle into three concrete sub-components. The first one is the existence of provisions that mandate customers be made aware of account terms through proper disclosure in plain language. This is especially important considering the numbers of unbanked who are likely to use m-banking, and are thus not aware of standard banking practices. The second sub-component looks at whether liability of unauthorized transactions, up to a certain limit, and under properly defined conditions, is placed on the providers. The third sub-component takes into consideration whether customers have access to simple and timely dispute resolution process.

⁵ All subsequent discussion of the regulatory index derives from work by Porteous (2006, 2009). More details are available in his papers.

The interoperability principle ascertains if there are provisions that allow customers to easily switch between m-banking providers, which increase acceptance among costumers and competition among providers. Interoperability has also two sub-components. The first looks at interoperability of payment platform by checking whether regulatory guidance is provided for the m-payment platform established by a mobile provider to be open to other providers within agreed time. It also considers if there exist provisions for new entrants to the market to be able to use an existing payment platform. The second sub-component focuses on interoperability of customers. This takes into consideration whether there is mobile number portability regulation in the country. Mobile numbers should be portable so that customers can easily switch between mobile operators and payment providers without losing their existing numbers.

The Know Your Customer and Costumer Due Diligence (KYC/CDD) component evaluates if the anti-money laundering laws of the country make allowance for reduced or simplified (KYC)/ (CDD) requirement to increase acceptance of mobile banking. To evaluate the principle we checked whether any of the two provisions are allowed in the KYC legislation – exemption to standard KYC/CDD for individuals with low value accounts, or for individuals classified as low risk through a well-defined set of criteria.

The principle on Agent/Branchless Banking takes into account if banks can use agents to receive deposits and accept withdrawals from customers outside of bank branches. To evaluate compliance, we ascertain how guidance by regulatory authorities treats the use of agents by commercial banks and mobile network operators. For our purposes, we are interested in regulation that has a permissive attitude towards branchless banking through agents, and in particular does not specifically prohibit banks from using agents. The use of agents is a crucial element to m-banking, especially those aimed towards unbanked individuals that do not have access to bank branches.

Finally, the E-money principle registers whether non-bank institutions can issue electronic money (e-money). For m-banking that is led by mobile network operators, it is especially important that e-money legislation allow them to accept, disperse and move funds under more relaxed regulation than banks. We check banking regulation to determine guidance provided on the issuance of e-money by non-bank market participants. While regulation on non-bank e-money issuers, when allowed, will certainly be lighter than banks, we expect legislation

to define clearly capitalization requirements and risk criteria. E-money legislation supports openness in m-banking regulatory environment.

To construct the regulatory index we review a comprehensive set of laws and regulations issued by both financial and telecommunications regulators⁶. We collected data on the electronic signature laws by studying the existence, scope and language of any contracting laws. We researched consumer protection laws in a variety of settings including consumer protection laws specific to mobile banking or financial services such as those provided by central bank Banking Law. If non-existent, we documented more general consumer protection within the framework of financial services legislation, and further to general consumer protection only implicitly associated with financial services (such as from a civil code). Interoperability of mobile payment platform was mostly available in cases where explicit mobile financial services regulation had been issued by the banking or telecommunication authorities. Telecommunication regulation also provided clear data on existence and implementation date of mobile number portability. AML/CFT regulations were available either through legislation or guidance by the central bank or in some case, specifically convened distinct bodies on anti-terrorism and anti-money laundering. Banking laws and legislation on payment services provided most of the data on the existence of branchless banking and e-money issuance.

The legal and regulatory environment relating to m-banking is rapidly evolving as regulators open up to their potential and increasing use. At the time of research for this paper, several comprehensive draft laws were under discussion in various countries. For the purpose of this paper, we only consider laws and regulations existing at the end of 2010. This is in consideration of the timeline of other data, including m-banking usage, which is available for our analysis.

⁶ Other organizations such as CGAP (2010) have collected a standardized set of data partially related to our variables. In such cases, we confirmed our data with those, and reviewed further in case of discrepancies. We also relied on in-depth countries specific studies such as those by CGAP (2008-2010) and IFC (2011) to confirm the validity of our index.

The Index Value

To construct the index we assign a binary value of 1 when the regulatory principle is satisfied and 0 if it is not. Each of the six enabling principles is equally weighted. Thus, our Regulatory Index ranges from 0 to 6, and an increase denotes a legal and regulatory environment that is more enabling of m-banking. When a components consists of more than one identifying criteria (for example in cases of consumer protection and interoperability), each is equally weighted (total sums to 1)⁷. An index of certainty and openness is separately constructed, using the classification of each principle identified above. Again, each component is given equal unitary weight, whereas when an enabling regulatory principle identified as secondarily supporting certainty, it is given ½ weightage in constructing the certainty index.

To assess the regulatory framework in countries with very different development of m-banking, we ranked countries by their average mobile banking usage as measured in Findex (see next section for discussion on that date), and selected 7 developing countries from each quintile distribution. We choose countries from different world regions (see Figure 1) for which information on their m-banking legislation were available online.

We found substantial variability on the adequacy of the regulatory framework for m-banking among the countries in our sample. Mexico had the most adequate framework, while Burundi did not comply with any of the principles. The mean value of the index for our sample is 3.26, with a standard deviation of 1.43⁸. Figure 2 below plots the openness and certainty index of all 35 countries in our sample to visually represent the variability. We divide the graph into four quadrants separated by the mean value of the corresponding axes. The top right quadrant contains the countries with high openness and high certainty, the best regulatory framework. A number of countries exhibit better regulation along only one dimension (top left and bottom right quadrants). We find that most of the variability in our index comes from components pertaining to openness - the standard deviation of the openness index is 1.1 as opposed to only 0.7 for the certainty index.

⁷ For example, each of the three criteria for the consumer protection principle are weighted 1/3.

⁸ See appendix Table 1 in the Appendix.

When looking at the individual principles, we found countries in our sample are well legislated in terms of electronic signature acceptance. Only eight out of 35 countries in our sample do not have any e-contracting laws. Of the 35 countries in our sample, only four countries satisfy all three consumer protection sub-components. Seven countries have no provisions of consumer protection, and satisfy none of the conditions. A further seven satisfy one of the three conditions, and 17 countries satisfy two. Interoperability regulation supports openness. While only two countries in our sample require interoperability of both payment platform and customer mobile number, a further 17 have passed legislation to support at least one. In our sample, we find that 19 of the 35 countries have modified KYC requirements to provide exceptions for small value accounts or for low risk customers as defined through well-defined risk-based guidance. Branchless banking is generally accepted with 27 countries allowing or promoting the use of agents to conduct banking activities such as deposits and withdrawals remotely. Finally, 13 countries have introduced legislation to allow non-banks to issue e-money under proper supervision and capitalization.

Principle Component Analysis

The assignment of unitary weight to all components for the construction of the regulatory index may be arguably arbitrary. On the flip side, including all six components separately in a regression analysis without creating an index has the drawback of introducing multicollinearity. To gauge what combination of regulatory factors explains most of the variability in the data we use principal component analysis.

Table 2 shows the first two principal components with eigenvalues greater than 1. Weights for the first component are chosen to explain the maximum amount of variation in the components without any restrictions. The first component puts positive weight on all six dimensions, and can be interpreted as being akin to our regulatory index, but with alternate weighting. The second component is calculated to explain remaining variations after accounting for the first principal component. This second component places negative weights on the observations associated with the additive, while those of the transformative model have positive weights. This very intuitive weighting suggest that after accounting for the positively weighted

index itself, the second most important facet of the observations is whether they follow the additive or transformational model⁹.

Global Findex Data

We use individual level data on mobile banking usage from the comprehensive Global Financial Index (Findex) survey. Findex is an individual level survey data on use of financial services in about 148 economies. At least 1000 adults are randomly selected to form a nationally representative sample over the 2011 calendar year. For our purpose, the survey provides mobile banking usage data on whether the individual used mobile phone to send money, receive money, and/or pay bills. For the 35 countries included in our analyses, there are approximately 37,000 individuals. Further individual level controls such as age, income, gender are also available from the Global Findex data.

Data from Findex (See Table 3) reveal that usage of m-banking services for the countries in our sample is lower for the unbanked than for the overall population (50 percent versus 65 percent), more common among the individuals that already have a bank account than for the unbanked, pointing to the prevalence of the additive model over the transformational one. Females tend to use m-banking services slightly less than men (45 percent of m-banking users were women). User of m-banking services have on average higher education (about 65 percent have at least a secondary degree compared to only 50 percent for the overall sample) and similar age than non-users. About 14 percent of the people in the lowest quintile distribution use m-banking.

⁹ Table 2 in the appendix provides the numerical value as well as ranking arising from principal component analysis of the regulatory principles of the 35 selected countries. As expected the ranks provided by the first component are very similar to the Porteous regulatory index. The ranking for the second principal component is elucidating, and provides necessary perspective on countries following the transformational model (higher ranked) as opposed to the additive model (lower ranked).

3. Methodology

Our analysis seeks to quantify the effect of m-banking regulatory framework on the use of mobile phones to send money, receive money, and pay bills, controlling for individual and other country level factors that may affect this relationship. To this effect, we set up a regression framework as follows:

$$m - \text{banking usage}_{ij} = \alpha_0 + \alpha_1(\text{regulatory index})_j + \alpha_2\{\text{vector of individual controls}_{ij}\} + \alpha_3\{\text{vector of country controls}_j\} + \text{Region}_k + \epsilon_{ij} \quad (\text{Equation 1})$$

M-banking usage_{ij} is a dichotomous variable on whether individual *i* in country *j* used m-banking to send money, receive money, pay bill, or any of the three. We are thus considering a total of four dependent variables. We use a logit model to estimate the above equation, and we weight regressions with sample weights from the survey to capture national representation.

Regulatory index_j refers to the regulatory index of country *j* that we have constructed, and described in the data section above. We also consider the index arising from the principal component analysis for alternate specifications. In addition, we regress the full set of six index components to analyze the relationship individual components. Finally, we also explore the dimension of openness and certainty in regulatory principles, and regress usage on the openness and certainty index we have separately constructed.

The vector of individual controls for individual *i* in country *j* includes education level, gender, access to formal banking, age and income quintile. We set up the first three of these variables as 0/1 dummy variables - whether the individual has completed secondary school, whether the individual is female, and finally whether the individual had access to a formal bank account. Income quintile refers to the within country relative income provided by the Global Findex dataset, and we include a set of four dummy variables in our analysis to capture the variable. Age is measured both by the age and age squared to account for non-linearity in how age affects usage as young adults could be more likely to use m-banking.

The country controls vary depending of the specification we use, but for our baseline regression it includes log of GDP per capita, percent of unbanked population, percent of urban population, percentage of population owning a mobile phone, concentration of banks (top three),

population density, and total population. We obtained these variables from the World Development Indicators (WDI) and the Global Payment System Survey (GPSS).

One of the main caveats when analyzing these results arises from the fact that the significance of our regulatory variables maybe due to the fact that our regulatory variable is correlated with other country characteristics not included in the regression. We introduce regional dummies to account for some of those unobserved variables but they are only a partial substitute for country fixed effects¹⁰.

We can however introduce country fixed effects to avoid omitted variable bias in a framework in which we interact regulatory variables with individual characteristics to see what regulatory factors are more conducive to usage among certain segments of the population such as the unbanked, the poor and the people with lower education. For these purposes we estimate:

$$\begin{aligned}
 m - \text{banking usage}_{ij} &= \beta_0 + \text{country}_j + \beta_1' \{ \text{vector of regulatory index components}_j \} \\
 &\quad * (\text{individual characteristic})_{ij} + \beta_3' * \{ \text{vector of individual controls}_{ij} \} + u_{ij}
 \end{aligned}
 \tag{Equation 2}$$

Our primary focus here is to estimate how pertinent individual characteristics such as unbanked, poor and less educated are differentially impacted by the components of the regulatory index. We are able to estimate the coefficients with country fixed effects (country_j) as our primary variable of interest varies at the individual level.

4. Results

Prior to conducting any regression, we plotted Findex data on m-banking usage on our regulatory index to see if we could identify any correlation. Overall we find a positive correlation between our regulatory index variable percentage of population using m-banking services to conduct any transaction, send and receive money and pay bills (Figure 3). However, countries

¹⁰ To address omitted variable bias issues we attempt an instrumental variable estimation approach. We identified the Doing Business Legal Rights Index as a potential instrument - it is likely does not have any direct impact on usage, but as a proxy for overall regulatory quality of a country, it is correlated with the Porteous regulatory index. However, while the first stage was strong, the instrument failed the Hausmann test for exogeneity.

with similar regulatory index values have very different rates of usage. For example, Kenya and Indonesia have a highly supportive regulatory framework according to the Porteus index but usage is much higher in Kenya.

Figure 4 explores whether higher usage of m-banking services tends to be associated with frameworks that support certainty or openness. The size of circle indicates the percentage of the population using m-banking services in the countries. Overall, countries with higher usage are located in the two upper quadrants, suggesting that a framework that supports openness is more associated to higher usage than a framework that supports certainty.

To assess whether this result holds after controlling for individual and country characteristics, we estimated equation (1). Table 4 shows the regression results for the different data on mobile banking usage (i.e. usage for any transaction, for sending money, receiving money and pay bills respectively in columns 1-4). A more adequate regulatory environment, as measured by a higher value of the Porteus index, is associated with higher mobile banking usage. The results also reflect the data characteristics previously discussed. The poor and individuals below the third quintile of the income distribution tend to use less mobile banking. Women, people with lower education and the unbanked also tend to use less mobile banking. Usage increases with age but the relation is non-linear, with the elderly showing less usage.

When looking at country characteristics other than the regulatory environment, usage appears to be lower in richer countries and countries with more urban population. However, higher level of mobile banking usage is associated to higher financial inclusion. Mobile phone penetration does not seem to be necessary for mobile banking development reflecting the fact that in many poorer countries mobile banking users do not own a mobile phone but have access to one. Other variables such as country size, population density and degree of competition in the financial sector, proxied by bank concentration, does not seem to have a clear definite effect on mobile banking usage¹¹. To control for outliers, we run the regression as well excluding Kenya and Indonesia but results were not affected.

¹¹ We also tried other controls such as ATMs per person but they were not statistically significant and reduced the sample size as they were not available for all countries.

To explore what types of regulations are more associated with mobile banking use, we run the regressions using the regulatory sub-indexes for openness and certainty (Table 5).¹² We find that countries with a regulatory framework that favors openness have higher usage of mobile banking (Columns 1-4). A regulatory framework that favors certainty is only associated with higher use of mobile banking for paying bills (Column 4). Table 6 continues delving into what specific regulations are more conducive to usage. With the exception of e-contracting, all other dimensions of the index are associated to higher usage of mobile banking services (Column 1). E-contracting though is associated with higher usage of mobile phones for paying bills (Column 4).

Table 7 provides the results of estimating equation (1) using the index arising from principal component analysis. Recall from the discussion in the data section that the first component provides positive weight on all six components, and is qualitatively akin to the Porteous index. Unsurprisingly, the beta coefficient for the first component is almost identical to the baseline specification. Hence, the use of unitary weights in the Porteous index does not appear to bias our results. The coefficient on the second component, however, is statistically insignificant. After account to the variations from the first component, whether the country pursued a transformational or additive model does not appear to explain outstanding differences in usage. Table 8 explores what factors are associated with higher usage for the unbanked population. Since Findex provides information on why the unbanked do not have a bank account, we control also for those factors. We find that a higher value of the regulatory index is associated with higher usage of mobile banking among the unbanked albeit the correlation is lower than for the overall population. As in the overall population, females, people with lower education and the elderly are less likely to use mobile banking. For this segment however, only those in the poorest quintile of the population are less likely to use mobile banking.

Individuals that indicated they do not have a bank account because it would be too expensive are more likely to use mobile banking, which points to the lower cost of the service as one of the main attractive features for the unbanked. Interestingly, we find that countries with more concentrated banking systems have less use of mobile banking services among the

¹² We maintained all the controls thorough all the regressions but for simplicity, we only show the significance of the regulatory variables as the sign and statistically significance of the controls do not vary.

unbanked. A possible explanation is that lack of competition may be pervasive in all key network industries, including banking and telecommunications, so that usage of mobile banking is lower due to higher costs or lack of innovation on the provision of telecom services.

As we did for the total users of mobile banking services, we explore what regulations are more conducive to mobile banking usage among the unbanked. Table 9 shows higher usage among the unbanked in countries with regulatory frameworks that support openness. Also we find that usage to conduct every transaction is higher in countries with regulatory frameworks that support certainty. Interoperability, simplified KYC requirements and the possibility for non-banks to issue e-money are the regulatory aspects associated with higher usage among the unbanked (Table 10). Curiously, e-contracting is associated with higher usage of mobile banking to pay bills among the unbanked, but lower usage for sending or receiving money.

As previously discussed, to solve the potential omitted variable bias we explore what regulatory factors are more conducive of using m-banking services among certain segments of the population using the framework provided by equation 2. Table 11 shows that regulatory frameworks that favor interoperability and that allow non-banks to issue money are associated with higher usage of mobile banking by the unbanked to send money. E-contracting is associated with higher usage of mobile banking to pay bills. These results are akin to those of Table 10, providing some comfort that our previous results were not driven by omitted variable bias.

Usage of mobile banking among the poorest is higher in countries with a regulatory framework that supports interoperability (Table 12). However, stronger consumer protection seems to be associated to lower usage among the poorest. This is a puzzling result. One possible explanation is that stronger consumer protection regulation increases the cost of providing mobile banking services, thus reducing its usage among the poorer. However, much more research is needed to assess the impact of consumer protection among the poor.

Table 13 shows that in countries where regulation allows for agent banking, mobile banking usage is higher among the most educated population. This result is consistent with results for financial capabilities surveys recently conducted in Mexico and Colombia that indicate that expanding banking networks through banking agents increases usage of banking services among the more educated unbanked. These results suggest that expanding infrastructure alone without financial education may not significantly increase financial inclusion. The results

also indicate that consumer protection encourages the use of m-banking among the most educated.

Finally we explore what regulatory environments are more likely to prompt usage of mobile banking services among different types of unbanked individuals. Table 14 indicates that a better regulatory framework increases usage of mobile banking for sending money among individuals that indicate they are unbanked because of lack of nearby banking services. Table 15 it shows that it also contributes to higher mobile banking usage among the people that are unbanked due to the high costs of bank accounts. However, our regulatory measure does not affect usage among those who indicate they are unbanked because they lack adequate documentation to open a bank account (Table 16).

5. Conclusions

Mobile banking services offer great potential to expand financial services to the poor, particularly payment services. It also provides a convenient and cost effective way to access bank accounts. Ultimately, what determine the usage of mobile banking services are the availability, cost and versatility of the service, which depends on several factors beyond the regulatory framework. However, we find that regulators can foster the development of mobile banking services through the enactment of supporting regulation. Certainly, there are countries with similar regulatory frameworks (either adequate or not) and very different development of mobile banking services, but on average we find that a better regulatory framework is associated with higher mobile banking services usage.

Our results do not establish causality, and it could be argued that countries where the mobile banking services develop tend to regulate the industry while those that do not have mobile banking do not tend to have a framework. However, our measure of regulatory adequacy is broad in the sense that it does not require having a detailed regulation of mobile banking industries, only a legal framework that does not impose restrictions to the development of mobile banking services by for example prohibiting non-banks to use e-money, or banks to use a network of agent banking. A light approach to regulation is enough to facilitate the development of mobile banking. The experience of some countries like Uganda indicates that the service can originate in a competitive telecom industry environment and in the absence of a

comprehensive regulatory framework for mobile banking but in the absence of key restrictions and some supporting regulations such as legal recognition of electronic signatures. However, to get a large percentage of the population to use the service, adequate consumer protection regulation may need to be enacted¹³.

Mobile banking services are particularly attractive to the financially excluded that do not use banking services due to unavailability of banking services nearby or due to the high cost of maintaining a bank account. They tend to use the system more than other unbanked individuals and a supporting regulatory framework is associated with higher usage among this group. Prompting usage of mobile banking services among the poorest quintile of the population is challenging; usage among this group is lower than for other segments of the unbanked population. Nevertheless, a regulatory framework that supports interoperability is associated with higher usage among the poorest. Curiously, stronger consumer protection is associated to lower usage among this segment. Increased cost of the service in the presence of strong consumer protection regulation could explain this result. Consumer protection is also found to be conducive of higher usage among people with higher education.

Our paper constitutes a first attempt to explain statistically what factors contribute to mobile banking usage, with a particular focus on the regulatory framework. Much more work needs to be done in this area, including exploring the influence of “de facto” industry operation characteristics (as opposed to “de Jure” regulatory frameworks as in our case). As new releases of the Findex data set expand, they will provide a picture of mobile banking services development over time and future papers could explore causality relationships.

¹³ Gutierrez and Choi (2013).

References

- Alexandre, C., I. Mas, and D. Radcliffe, 2010, "Regulating New Banking Models to Bring Financial Services to All." Challenge 54.3
- Allen, F., A. Demirguc-Kunt, L. Klapper and M. S. Martinez Peria, 2012, "The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts", World Bank Policy Research WP 6290
- A. Demirguc-Kunt and L. Klapper, 2012, "Measuring Financial Inclusion: The Global Findex", World Bank Policy Research WP 6025.
- CGAP, 2010, "Financial Access 2010", (<http://www.cgap.org/publications/financial-access-2010>),
- CGAP, 2008-2010, "Regulations in Branchless Banking", Various countries, (<http://www.cgap.org/site-search/regulation%20branchless%20banking>),
- Diniz, E., J. Porto de Albuquerque, and A. Kemmer Cernev, 2011, "Mobile Money and Payment: a literature review based on academic and practitioner-oriented publications (2001-2011)." Proceedings of SIG Global Development Fourth Annual Workshop, Shanghai, China.
- Donner, J., and C.A. Tellez, 2008, "Mobile banking and economic development: Linking adoption, impact, and use." Asian Journal of Communication 18.4
- G20, 2010, "G20 Principles for Innovative Financial Inclusion", (<http://www.gpfi.org/knowledge-bank/publications?page=1>)
- Gutierrez, E. and Choi, T., 2013, "Mobile Money Services Development: The cases of Korea and Uganda". World Bank, Mimeo.

- IFC, 2011, "Mobile Money Scoping Report", Various countries,
(http://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/industries/financial+markets/publications/ifc+mobile+money+scoping+reports)
- IFC, 2011, "Mobile Money Study",
(http://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/industries/financial+markets/publications/mobile+money+study+2011)
- Ivatury, G, and I. Mas, 2008, "The early experience with branchless banking." Focus Note 46
- K., Changsu, M. Mirusmonov, and I. Lee, 2010, "An empirical examination of factors influencing the intention to use mobile payment." *Computers in Human Behavior* 26.3: 310-322.
- Leishman, P., 2010, "Is there really any money in mobile money?." GSMA (<http://mmublog.org/global/is-there-really-any-money-in-mobile-money/9>)
- Lyman, T., M. Pickens, and D. Porteous, 2008, "Regulating transformational branchless banking: Mobile phones and other technology to increase access to finance." Focus Note 43
- Mas, I., 2009, "The economics of branchless banking." *innovations* 4.2: 57-75.
- Mayer, C., and M. Klein, 2011, "Mobile Banking and Financial Inclusion: The Regulatory Lessons." World Bank Working Paper.
- Mbiti, I., and D. N. Weil, 2011, "Mobile banking: The impact of M-Pesa in Kenya". No. w17129. National Bureau of Economic Research.
- O. Pinar Ardic, J. A. Ibrahim, and N. Mylenko, 2011, "Consumer Protection Laws and Regulations in Deposit and Loan Services"
- Porteous, D., 2006, "The Enabling Environment for Mobile Banking in Africa–Report Commissioned by Department for International Development (DFID)."

Porteous, D., 2007 , "Just how transformational is m-banking." Commissioned by Finmark

Porteous, D., 2009 , "Mobilizing money through enabling regulation." innovations 4.1: 75-90.

Table 1. The Porteous Regulatory Index for M-banking

Principles Supporting Additive Models	E-contracting	Certainty
	Consumer Protection	
	Interoperability	Openness
Principles Supporting Transformative Models	Know- Your- Costumer (KYC)	Openness (primary) and Certainty (secondary)
	Agent/Branchless Banking	
	E-money Legislation	Openness

Table 2. Principal Components

Variable	Component 1	Component 2
Index 1 - Econtracting	0.4034	-0.5297
Index 2 - Consumer Protection	0.428	-0.0768
Index 3 - Interoperability	0.5689	-0.1417
Index 4 - KYC/CDD Requirements	0.4239	0.0847
Index 5 - Agent Banking	0.2676	0.7718
Index 6 - E-money by Nonbanks	0.2813	0.301

Table 3. Profile of M-Banking Users
(values in percentage except for age)

Variable	M-Banking Users	All Individuals
Unbanked (% of population)	50.13	65.49
Female	45.19	51.25
Secondary Educated	64.83	49.87
Age	33.67	36.79

Table 4- Baseline Regression

	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Regulatory Index	0.031*** [0.007]	0.011*** [0.003]	0.021*** [0.005]	0.008*** [0.002]
Poorest 20% income dummy	-0.017*** [0.005]	-0.008*** [0.002]	-0.009*** [0.004]	-0.007*** [0.002]
Second 20% income dummy	-0.015** [0.006]	-0.006*** [0.002]	-0.004 [0.004]	-0.010*** [0.002]
Middle 20% income dummy	-0.013*** [0.005]	-0.005*** [0.002]	-0.006 [0.004]	-0.006*** [0.002]
Fourth 20% income dummy	-0.005 [0.004]	-0.002 [0.001]	0.000 [0.003]	-0.004*** [0.001]
Female	-0.011*** [0.004]	-0.006*** [0.002]	-0.006** [0.003]	-0.004** [0.002]
Education: secondary or higher	0.028*** [0.008]	0.012*** [0.003]	0.019*** [0.005]	0.005** [0.003]
Age	0.001** [0.001]	0.001** [0.000]	0.001* [0.000]	0.000** [0.000]
Age squared	-0.000*** [0.000]	-0.000*** [0.000]	-0.000** [0.000]	-0.000** [0.000]
Unbanked	-0.058*** [0.010]	-0.025*** [0.005]	-0.037*** [0.007]	-0.022*** [0.004]
Log GDP per capita	-0.048*** [0.014]	-0.017*** [0.006]	-0.032*** [0.011]	-0.007*** [0.002]
Mobile subscription (% of population)	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]
Urban population (% of total)	-0.001* [0.001]	-0.000** [0.000]	-0.001* [0.000]	-0.000 [0.000]
Unbanked population (% of adults)	-0.081* [0.046]	-0.030 [0.019]	-0.039 [0.034]	-0.027*** [0.010]
Bank concentration (%)	-0.001 [0.000]	-0.000* [0.000]	-0.000 [0.000]	0.000 [0.000]
Population	-0.000* [0.000]	-0.000*** [0.000]	-0.000 [0.000]	-0.000 [0.000]
Population density	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	37,475	37,359	37,369	37,412
No. of Countries	35	35	35	35
R-sq	0.215	0.309	0.262	0.165

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 5 - Openness and Certainty

	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Regulatory Index - Openness	0.035*** [0.007]	0.015*** [0.002]	0.025*** [0.005]	0.005** [0.002]
Regulatory Index - Certainty	0.012 [0.012]	0.000 [0.005]	0.005 [0.010]	0.008** [0.003]
Poorest 20% income dummy	-0.017*** [0.005]	-0.007*** [0.002]	-0.009*** [0.003]	-0.007*** [0.002]
Second 20% income dummy	-0.015** [0.006]	-0.006*** [0.002]	-0.004 [0.004]	-0.010*** [0.002]
Middle 20% income dummy	-0.013*** [0.005]	-0.005*** [0.002]	-0.006 [0.004]	-0.006*** [0.002]
Fourth 20% income dummy	-0.005 [0.004]	-0.002 [0.001]	0.000 [0.003]	-0.004*** [0.001]
Individual Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	37,475	37,359	37,369	37,412
No. of Countries	35	35	35	35
R-sq	0.218	0.315	0.268	0.163

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 6 - Individual Components

	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Index 1 - Econtracting	-0.005 [0.014]	-0.007 [0.005]	-0.010 [0.010]	0.010*** [0.002]
Index 2 - Consumer Protection	0.051* [0.026]	0.021** [0.010]	0.043** [0.018]	0.002 [0.005]
Index 3 - Interoperability	0.098*** [0.023]	0.043*** [0.008]	0.074*** [0.015]	0.009** [0.004]
Index 4 - KYC/CDD Requirements	0.038*** [0.014]	0.012* [0.006]	0.025*** [0.009]	0.006* [0.004]
Index 5 - Agent Banking	0.020* [0.011]	0.006 [0.004]	0.014** [0.007]	-0.000 [0.003]
Index 6 - E-money by Nonbanks	0.027** [0.012]	0.010** [0.004]	0.013 [0.008]	0.008** [0.004]
Individual Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	37,475	37,359	37,369	37,412
No. of Countries	35	35	35	35
R-sq	0.231	0.335	0.290	0.170

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 7 - Principal Components

	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Regulatory Index (PC 1)	0.035*** [0.007]	0.013*** [0.003]	0.024*** [0.005]	0.008*** [0.001]
Regulatory Index (PC 2)	0.009 [0.007]	0.004 [0.003]	0.008 [0.005]	-0.002 [0.002]
Individual Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	37,475	37,359	37,369	37,412
No. of Countries	35	35	35	35
R-sq	0.222	0.319	0.274	0.166

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 8 - Unbanked Subpopulation

VARIABLES	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Regulatory Index	0.016*** [0.004]	0.005** [0.002]	0.010*** [0.003]	0.003*** [0.001]
Poorest 20% income dummy	-0.011*** [0.004]	-0.004** [0.002]	-0.007** [0.003]	-0.005** [0.002]
Second 20% income dummy	-0.006 [0.005]	-0.003 [0.002]	-0.000 [0.004]	-0.005** [0.002]
Middle 20% income dummy	-0.005 [0.005]	-0.001 [0.002]	-0.001 [0.004]	-0.002 [0.002]
Fourth 20% income dummy	0.001 [0.005]	0.000 [0.002]	0.002 [0.003]	-0.002 [0.002]
Female	-0.007** [0.003]	-0.003** [0.001]	-0.003* [0.002]	-0.002* [0.001]
Education: secondary or higher	0.023*** [0.006]	0.007** [0.003]	0.016*** [0.005]	0.004** [0.002]
Age	0.001** [0.001]	0.001** [0.000]	0.001** [0.000]	0.000 [0.000]
Age squared	-0.000*** [0.000]	-0.000*** [0.000]	-0.000** [0.000]	-0.000 [0.000]
Too far away	-0.001 [0.004]	-0.002* [0.001]	-0.001 [0.003]	0.002 [0.002]
Too expensive	0.010*** [0.003]	0.003** [0.002]	0.005** [0.002]	0.002 [0.002]
Lack documentation	0.001 [0.004]	-0.001 [0.001]	0.000 [0.003]	-0.001 [0.002]
Log GDP per capita	-0.053*** [0.011]	-0.019*** [0.005]	-0.044*** [0.010]	-0.005*** [0.001]
Mobile subscription (% of population)	0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Urban population (% of total)	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Unbanked population (% of adults)	-0.131*** [0.036]	-0.049*** [0.015]	-0.083*** [0.026]	-0.028*** [0.006]
Bank concentration (%)	-0.001** [0.000]	-0.000*** [0.000]	-0.001*** [0.000]	0.000 [0.000]
Population	-0.000*** [0.000]	-0.000*** [0.000]	-0.000** [0.000]	-0.000 [0.000]
Population density	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	0.000 [0.000]
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	20,825	20,731	20,728	20,792
No. of Countries	35	34	34	35
R-sq	0.181	0.252	0.220	0.0678

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 9 - Unbanked Subpopulation: Openness and Certainty

VARIABLES	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Regulatory Index - Openness	0.021*** [0.005]	0.008*** [0.002]	0.017*** [0.003]	0.000 [0.001]
Regulatory Index - Certainty	-0.002 [0.006]	-0.005*** [0.002]	-0.008* [0.005]	0.006*** [0.002]
Individual Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	20,825	20,731	20,728	20,792
No. of Countries	35	34	34	35
R-sq	0.184	0.269	0.231	0.0689

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 10 - Unbanked Subpopulation - Individual Components

VARIABLES	[1]	[2]	[3]	[4]
	Any	Send	Receive	Pay bill
Index 1 - Econtracting	-0.010 [0.008]	-0.007* [0.004]	-0.016** [0.007]	0.008*** [0.002]
Index 2 - Consumer Protection	0.028 [0.023]	0.007 [0.006]	0.025 [0.018]	-0.001 [0.003]
Index 3 - Interoperability	0.058*** [0.018]	0.016* [0.008]	0.045*** [0.013]	-0.004 [0.003]
Index 4 - KYC/CDD Requirements	0.017 [0.011]	0.005* [0.003]	0.008 [0.008]	0.005* [0.002]
Index 5 - Agent Banking	0.008 [0.010]	-0.000 [0.002]	0.007 [0.005]	-0.003 [0.002]
Index 6 - E-money by Nonbanks	0.022** [0.011]	0.006 [0.005]	0.015* [0.009]	0.002 [0.002]
Individual Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	20,825	20,731	20,728	20,792
No. of Countries	35	34	34	35
R-sq	0.194	0.283	0.243	0.0809

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 11 - Country Fixed Effects and Interaction with Unbanked

	[1]	[2]	[3]
	Send	Receive	Pay bill
E-contracting x Unbanked	0.000 [0.005]	0.003 [0.008]	0.009** [0.004]
Consumer Protection x Unbanked	-0.011 [0.010]	-0.009 [0.015]	-0.006 [0.006]
Interoperability x Unbanked	0.014* [0.007]	0.016 [0.013]	-0.005 [0.005]
KYC x Unbanked	-0.007 [0.004]	-0.011 [0.008]	-0.002 [0.002]
Agent banking x Unbanked	-0.011 [0.007]	-0.013 [0.012]	-0.006 [0.004]
E-money x Unbanked	0.008* [0.005]	0.001 [0.008]	0.000 [0.003]
Individual Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	36,320	36,375	36,418
No. of Countries	34	34	34
R-sq	0.368	0.332	0.186

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 12 - Country Fixed Effects and Interaction with Income

	[1]	[2]	[3]
	Send	Receive	Pay bill
E-contracting x Poorest 20% income	0.001 [0.004]	0.004 [0.007]	0.004 [0.006]
Consumer Protection x Poorest 20% income	-0.014 [0.010]	-0.037*** [0.008]	-0.019*** [0.005]
Interoperability x Poorest 20% income	0.015* [0.008]	0.027*** [0.009]	0.009* [0.005]
KYC x Poorest 20% income	-0.000 [0.005]	-0.007 [0.006]	0.004 [0.005]
Agent banking x Poorest 20% income	-0.004 [0.005]	0.001 [0.014]	-0.004* [0.002]
Emoney x Poorest 20% income	0.000 [0.004]	-0.002 [0.006]	-0.002 [0.003]
Individual Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	36,320	36,375	36,418
No. of Countries	34	34	34
R-sq	0.364	0.331	0.188

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 13 - Country Fixed Effects and Interaction with Education

	[1]	[2]	[3]
	Send	Receive	Pay bill
E-contracting x Secondary	-0.002 [0.004]	-0.008 [0.006]	0.005 [0.003]
Consumer Protection x Secondary	0.011* [0.007]	0.013 [0.012]	0.004 [0.003]
Interoperability x Secondary	-0.007 [0.006]	-0.014 [0.010]	0.001 [0.003]
KYC x Secondary	-0.005 [0.004]	-0.005 [0.006]	-0.003 [0.002]
Agent banking x Secondary	0.010 [0.007]	0.025** [0.013]	0.007** [0.003]
E-money x Secondary	0.000 [0.003]	0.008 [0.007]	-0.003 [0.002]
Individual Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	36,320	36,375	36,418
No. of Countries	34	34	34
R-sq	0.365	0.334	0.186

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 14 - Country Fixed Effects and Interaction with Reason for not banking (Live too far away)

VARIABLES	[1]	[2]	[3]
	Send	Receive	Pay bill
Interaction: Regulatory Index x Too far away	0.001** [0.001]	0.001 [0.002]	-0.001 [0.001]
Poorest 20% income dummy	-0.004*** [0.001]	-0.007*** [0.002]	-0.003** [0.001]
Second 20% income dummy	-0.003*** [0.001]	-0.002 [0.003]	-0.003** [0.001]
Middle 20% income dummy	-0.000 [0.002]	0.000 [0.003]	-0.001 [0.001]
Fourth 20% income dummy	-0.000 [0.001]	0.000 [0.003]	-0.002 [0.001]
Female	-0.003*** [0.001]	-0.003 [0.002]	-0.002* [0.001]
Education: secondary or higher	0.004** [0.002]	0.010*** [0.003]	0.003*** [0.001]
Age	0.001*** [0.000]	0.001** [0.000]	0.000 [0.000]
Age squared	-0.000*** [0.000]	-0.000*** [0.000]	-0.000 [0.000]
Too far away	-0.006*** [0.002]	-0.005 [0.006]	0.004 [0.004]
Too expensive	0.002 [0.001]	0.003 [0.002]	0.001 [0.001]
Lack documentation	-0.001 [0.001]	-0.001 [0.003]	-0.001 [0.001]
Observations	17,733	19,469	19,242
Country FE	Yes	Yes	Yes
No. of Countries	29	32	33
R-sq	0.300	0.275	0.0949

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 15 - Country Fixed Effects and Interaction with Reason for not banking (Too expensive)

VARIABLES	[1] Send	[2] Receive	[3] Pay bill
Interaction: Regulatory Index x Too expensive	0.001** [0.001]	0.001 [0.001]	-0.001 [0.001]
Poorest 20% income dummy	-0.004*** [0.001]	-0.007*** [0.002]	-0.003** [0.001]
Second 20% income dummy	-0.003*** [0.001]	-0.002 [0.003]	-0.003** [0.001]
Middle 20% income dummy	-0.000 [0.002]	0.000 [0.003]	-0.001 [0.001]
Fourth 20% income dummy	-0.000 [0.001]	0.001 [0.003]	-0.002 [0.001]
Female	-0.003*** [0.001]	-0.003 [0.002]	-0.002* [0.001]
Education: secondary or higher	0.004** [0.002]	0.010*** [0.003]	0.003*** [0.001]
Age	0.001*** [0.000]	0.001** [0.000]	0.000 [0.000]
Age squared	-0.000*** [0.000]	-0.000*** [0.000]	-0.000 [0.000]
Too far away	-0.002*** [0.001]	-0.002 [0.002]	0.001 [0.001]
Too expensive	-0.003 [0.002]	-0.002 [0.003]	0.006 [0.004]
Lack documentation	-0.001 [0.001]	-0.001 [0.003]	-0.001 [0.001]
Observations	17,733	19,469	19,242
Country FE	Yes	Yes	Yes
No. of Countries	29	32	33
R-sq	0.300	0.275	0.0960

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Table 16 - Country Fixed Effects and Interaction with Reason for not banking (Lack documentation)

VARIABLES	[1] Send	[2] Receive	[3] Pay bill
Interaction: Regulatory Index x Lack documentation	-0.000 [0.001]	0.001 [0.002]	-0.001 [0.001]
Poorest 20% income dummy	-0.005*** [0.001]	-0.007*** [0.002]	-0.003** [0.001]
Second 20% income dummy	-0.003*** [0.001]	-0.002 [0.003]	-0.003** [0.001]
Middle 20% income dummy	-0.001 [0.002]	0.000 [0.003]	-0.001 [0.001]
Fourth 20% income dummy	-0.000 [0.001]	0.000 [0.003]	-0.002 [0.001]
Female	-0.003*** [0.001]	-0.003 [0.002]	-0.002* [0.001]
Education: secondary or higher	0.004** [0.002]	0.011*** [0.003]	0.003*** [0.001]
Age	0.001*** [0.000]	0.001** [0.000]	0.000 [0.000]
Age squared	-0.000*** [0.000]	-0.000*** [0.000]	-0.000 [0.000]
Too far away	-0.002*** [0.001]	-0.002 [0.002]	0.001 [0.001]
Too expensive	0.002 [0.001]	0.003 [0.002]	0.001 [0.001]
Lack documentation	-0.001 [0.004]	-0.006 [0.007]	0.002 [0.004]
Observations	17,733	19,469	19,242
Country FE	Yes	Yes	Yes
No. of Countries	29	32	33
R-sq	0.299	0.275	0.0949

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Logit regressions (Marginal effects displayed)

All regressions weighted by survey weights

Figure 1 – Geographic distribution of sample countries



Figure 2– Openness and Certainty

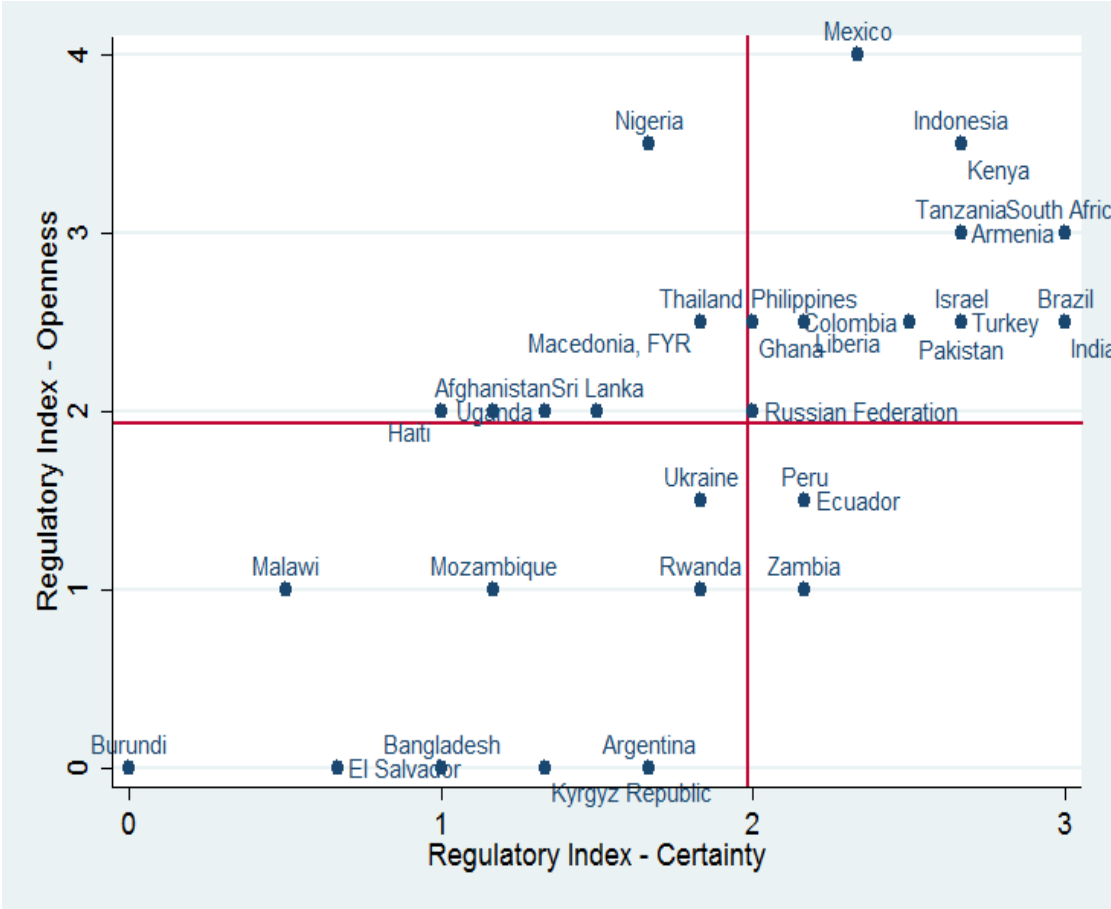


Figure 3 - Usage vs Regulatory Index

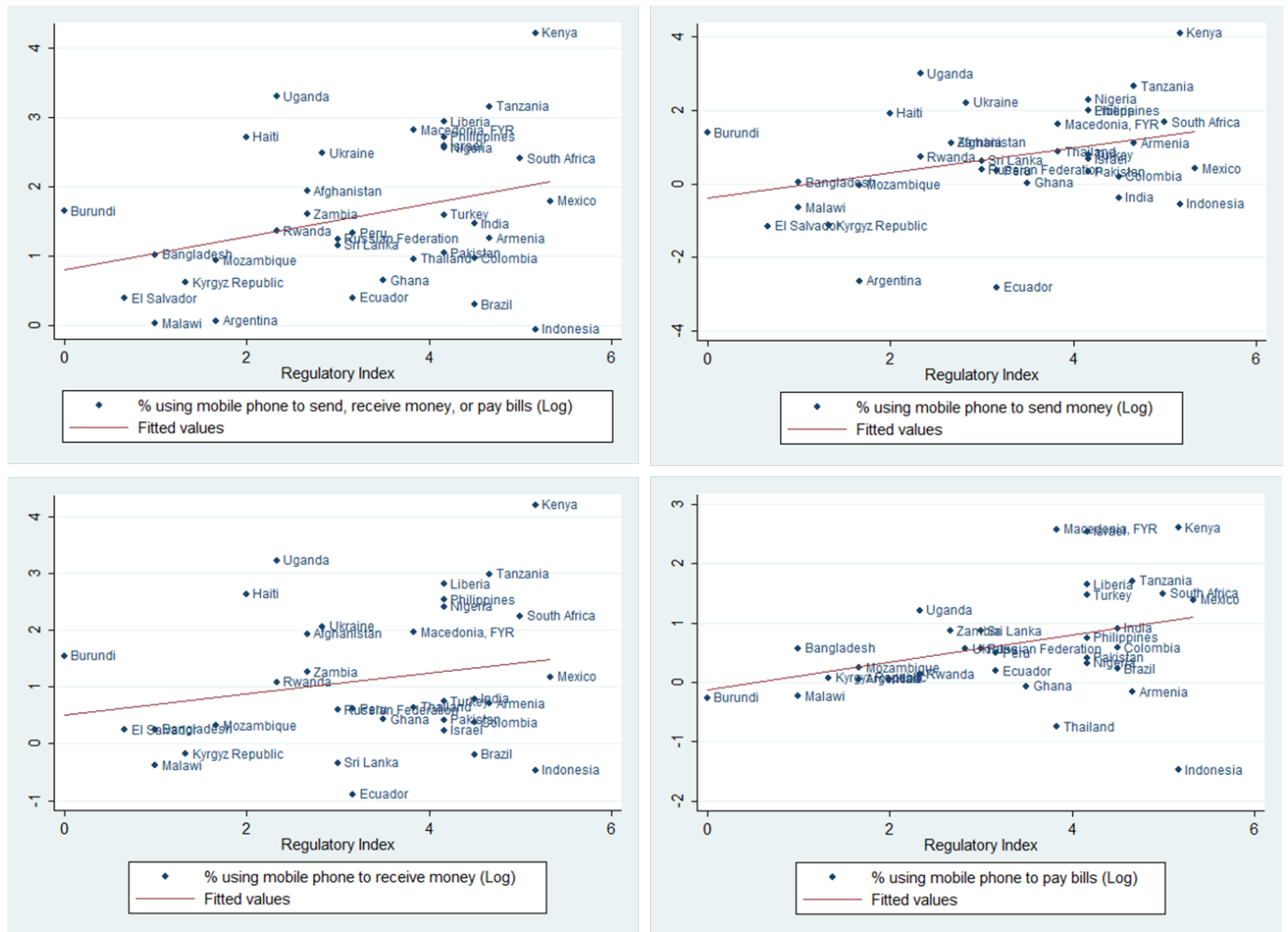
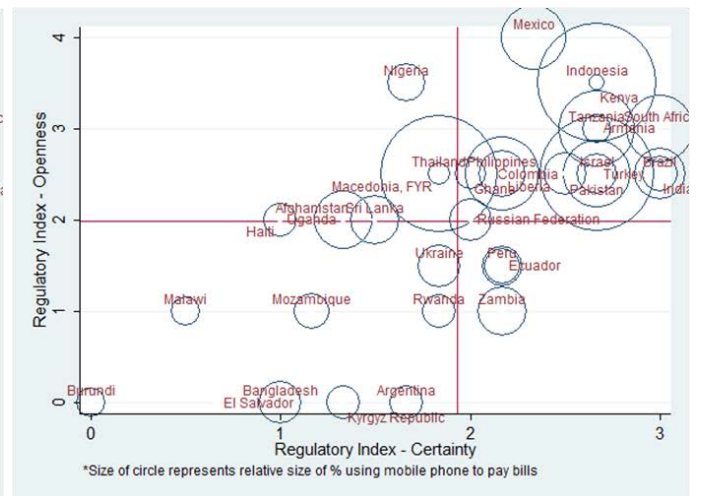
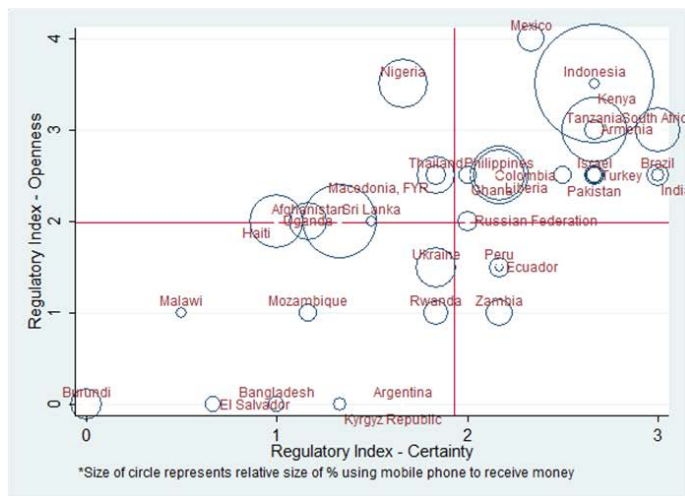
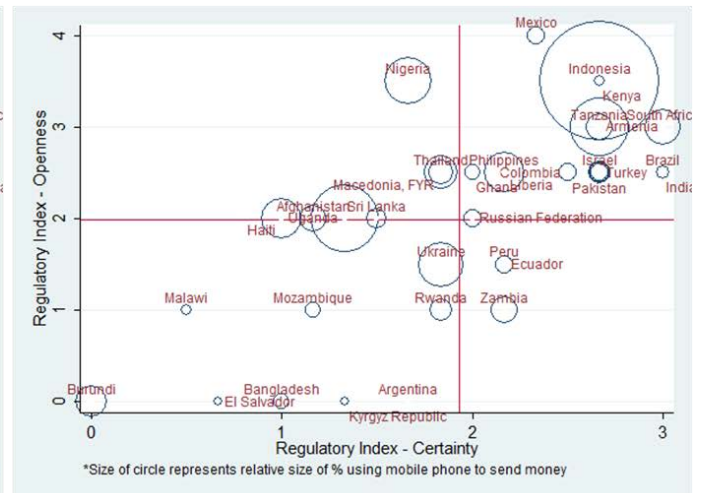
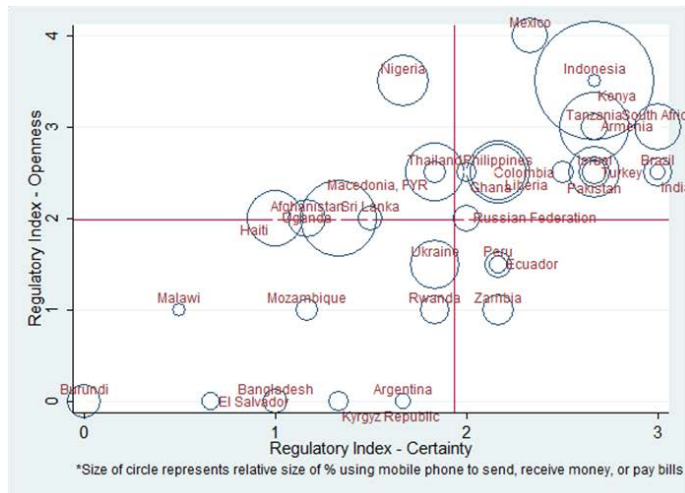


Figure 4 - Usage vs Certainty vs Openness



Appendix

Table A1– M-banking Regulatory Index Values

Country	Regulatory Index (6)	Regulatory Openess Index (4)	Regulatory Certainty Index (3)	Rank
Mexico	5.33	4.00	2.33	1
Indonesia	5.17	3.50	2.67	2
Kenya	5.17	3.50	2.67	2
South Africa	5.00	3.00	3.00	4
Armenia	4.67	3.00	2.67	5
Tanzania	4.67	3.00	2.67	5
Brazil	4.50	2.50	3.00	7
Colombia	4.50	2.50	2.50	7
India	4.50	2.50	3.00	7
Israel	4.17	2.50	2.67	10
Liberia	4.17	2.50	2.17	10
Nigeria	4.17	3.50	1.67	10
Pakistan	4.17	2.50	2.67	10
Philippines	4.17	2.50	2.17	10
Turkey	4.17	2.50	2.67	10
Macedonia, FYR	3.83	2.50	1.83	16
Thailand	3.83	2.50	1.83	16
Ghana	3.50	2.50	2.00	18
Ecuador	3.17	1.50	2.17	19
Peru	3.17	1.50	2.17	19
Russian Federation	3.00	2.00	2.00	21
Sri Lanka	3.00	2.00	1.50	21
Ukraine	2.83	1.50	1.83	23
Afghanistan	2.67	2.00	1.17	24
Zambia	2.67	1.00	2.17	24
Rwanda	2.33	1.00	1.83	26
Uganda	2.33	2.00	1.33	26
Haiti	2.00	2.00	1.00	28
Argentina	1.67	0.00	1.67	29
Mozambique	1.67	1.00	1.17	29
Kyrgyz Republic	1.33	0.00	1.33	31
Bangladesh	1.00	0.00	1.00	32
Malawi	1.00	1.00	0.50	32
El Salvador	0.67	0.00	0.67	34
Burundi	0.00	0.00	0.00	35

Table A2 - Principal Component Index

Country	PCA1	PCA2	Rank (PCA1)	Rank (PCA2)
South Africa	2.52	-0.47	1	27
Mexico	2.19	0.31	2	13
Indonesia	1.70	0.46	3	10
Kenya	1.70	0.46	3	10
Brazil	1.58	-0.24	5	23
India	1.58	-0.24	5	23
Colombia	1.52	-1.43	7	31
Israel	1.13	-0.15	8	20
Pakistan	1.13	-0.15	8	20
Turkey	1.13	-0.15	8	20
Liberia	0.86	0.29	11	14
Philippines	0.86	0.29	11	14
Armenia	0.76	0.69	13	7
Tanzania	0.76	0.69	13	7
Nigeria	0.75	1.70	15	2
Macedonia, FYR	0.62	-1.27	16	30
Thailand	0.41	0.37	17	12
Ecuador	0.29	-0.32	18	25
Peru	0.29	-0.32	18	25
Ghana	0.23	0.01	20	17
Ukraine	0.05	-1.89	21	34
Zambia	-0.66	-0.09	22	19
Russian Federation	-0.72	0.24	23	16
Sri Lanka	-0.98	0.69	24	9
Afghanistan	-1.03	1.77	25	1
Rwanda	-1.11	-0.01	26	18
Uganda	-1.21	1.40	27	4
Argentina	-1.28	-1.90	28	35
Mozambique	-1.60	1.16	29	6
Haiti	-1.66	1.48	30	3
Kyrgyz Republic	-1.73	-1.82	31	33
Bangladesh	-2.18	-1.74	32	32
El Salvador	-2.23	-0.66	33	29
Malawi	-2.50	1.32	34	5
Burundi	-3.13	-0.49	35	28