Access to Banking Services in Sub-Saharan Africa: Essays in Development Economics

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Access to Banking Services in Sub-Saharan Africa: Essays in Development Economics

by

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Declaration

I declare that this dissertation has not been submitted as an exercise for a degree at this or any other University and that it is entirely my own work.

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To my unknown ancestors.

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Summary

Access to formal financial services has the potential to help transform the lives of low income individuals in Sub-Saharan African. Access and usage of saving, transaction and credit services can play a central role in efforts to smooth consumption, invest in human or productive capital, and reduce exposure to uncertainties. A recent estimate suggests that up to 2.5 million people globally are excluded from formal financial services and this thesis estimates that approximately 80 percent (300 million people) of the population of eleven countries surveyed in Sub-Saharan Africa are financially excluded.

This thesis comprises of three essays. The first presents a unique pooled dataset of eleven nationally representative surveys for Sub-Saharan Africa and derives comparable estimates of personal access to financial services. By examining the determinants of financial access, evidence is found for the importance of an individual's income, education, psychometric perspective and proximity to services in the likelihood of having personal access to financial services. Cross-country differences also play a significant role. Although financial access is likely to have a slow-burning effect on the household's welfare, a novel instrument, level of trust in banks, helps identify a causal role for use of financial services in influencing an individual's income.

The second essay examines the characteristics of 'unbanked' households in Nigeria, investigates the extent and determinants of supply and demand side barriers, and explores the specific role played by informality in financial exclusion. First, there is evidence to suggest that in Nigeria the unbanked four-fifths have lower incomes, lower education, are less likely to have a mobile phone, and have lower levels of financial sector knowledge and formal documents in their name than the remainder of the population. Second, a non-mutually exclusive framework for analysing barriers to formal banking is developed and insights on the characteristics of sub-groups of the unbanked population who face particular barriers are provided. While poverty and distance to bank branch are the most often cited barriers, informality also plays a significant role and tackling informality directly represents an opportunity for financial inclusion policy. Using instrumental variables, the precise role played by informality in financial exclusion is estimated and for individuals with four and five documents, it is found that an additional document increases the probability of being banked. This suggests that efforts to improve formality can yield returns for financial inclusion in the short term.

The third essay asks the question: Is the mobile banking revolution overcoming the tyranny of distance to bank infrastructure and improving financial inclusion in sub-Saharan Africa? Focusing on Kenya, this paper uses Global Positioning System (GPS) data to investigate the importance of distance and time to bank branch for personal access to both formal banking services and the mobile banking platform M-Pesa. Evidence suggests that greater distances and time to bank infrastructure reduce the likelihood an individual is formally banked, and that despite the significant expansion of the bank branch network in Kenya (2006-2009) the negative relationship between distance to bank branch and the likelihood of being banked has increased. In contrast, evidence is found to support the hypothesis that mobile banking in Kenya is overcoming the tyranny of distance to bank infrastructure for the financial inclusion of all economic groups in Kenya.

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Chapter 1

Introduction

Access to formal financial services has the potential to help transform the lives of low income households in Sub-Saharan African. Access and usage of saving, transaction and credit services can play a central role in household's efforts to smooth consumption, invest in human or productive capital, and reduce their exposure to uncertainties. These services are particularly important for the poor in Sub-Saharan Africa who tend to face fluctuating incomes in agricultural and informal sectors, and who are vulnerable to significant health and institutional shocks.

At a global level, it is estimated that 2.5 billion people are excluded from financial services, most of who live in poverty in middle income countries and in the poorest countries in the world (Morduch, Chaia, Dalal, Goland and Gonzalez, 2009). This thesis estimates that approximately 80 percent (300 million people) of the population of the eleven countries in Sub-Saharan Africa do not have a bank account of any kind, and as a result they are termed "financially excluded".

This thesis combines three academic papers on the topic of access to formal financial services in Sub-Saharan Africa. The objectives of this thesis are several fold and are as follows; (1) to provide comparable estimates of financial inclusion between countries in the Sub-Saharan Africa, (2) to understand the determinants of financial access in the region (3) to investigate the possible causal link between personal access to financial services and income, (4) to

investigate the relative importance of barriers to financial services, (5) to assess whether informality is a specific constraint to access, (6) to quantify the evolving importance of distance as a constraint to access and (7) to determine whether mobile banking is overcoming the importance of proximity to financial services for financial inclusion. In doing so, this thesis makes use of a unique set of surveys, collectively known as the Finscope Surveys, for eleven Sub-Saharan African countries, some of which are among the poorest in the world.[1] At the same time, it is worth acknowledging that for some of the questions addressed in this thesis, well-designed experimental approaches may be better placed to quantify the precise nature of the causal relationships. Nevertheless, by making use of comparable surveys that are representative of almost 50 percent of the Sub-Saharan African population, a number of important contributions to the literature on financial access are made.

Chapter 2 outlines the conceptual framework for understanding issues of 'access'. Drawing on microeconomic theory and the broader literature on financial inclusion, this chapter helps clarify thinking around supply and demand at the individual and national level, and sets out exactly how concepts such as financial access and financial inclusion are understood for the remainder of the thesis. Building on theoretical work such as Beck and de la Torre (2006) and Claessens (2006), this chapter distinguishes between issues such as voluntary exclusion, involuntary exclusion and supply constraints.

Chapter 3 pools eleven nationally representative surveys to examine the role of individual, geographic and national characteristics in influencing the use of formal financial services. This chapter makes a significant contribution to the recent literature on financial access, joining recent work such as Djankov et al. (2008), Beck and Brown (2010) and Johnston and Morduch (2008), while the regional focus on Sub-Saharan Africa complements these studies which focus on Mexico, transition countries in Eastern Europe and Indonesia respectively. While evidence is found for the importance of an individual's income, education, psychometric perspective and proximity to services in the likelihood of having personal access to financial services, cross-country differences also play

[1] Some countries have chosen their own survey name such as the Kenyan FinAccess Survey. Nevertheless, there is sufficient commonality in survey design and historical origins for inclusion under the umbrella name of Finscope.

a significant role.

Chapter 3 also addresses a weakness in the evidence base on the effects of financial access on individual or household level measures of welfare. The most striking fact about the current state of knowledge is the disconnect between evidence on the effects of national financial depth (seen as an imperfect proxy for overall financial development) and the effects of household financial penetration (Beck, Demirguc-Kunt and Honohan, 2009; Beck, Demirguc-Kunt and Levine, 2007b; Honohan, 2004). Specifically, the potential role played by personal access to financial services in influencing an individual's income is examined, on the basis that access has slow-burning effect on personal welfare. Using an instrumental variables approach to overcome concerns of endogeneity between access to banking services and personal income, a positive role for personal financial access is confirmed.

Following surveys of financial institutions in 62 countries, Beck et al. (2008) developed a set of cross-country indicators on barriers to financial inclusion. The indicators provide detail on the cost of financial services usage such as minimum account balances, account set-up or annual fees, the level of physical access defined as the number of locations to open a bank account, the number of required documents to open an account as well as the degree of bureaucratic inefficiencies. Chapter 4 takes a different approach to understanding barriers to financial access by capitalising on the large size of the 2008 Finscope Nigeria dataset and a dedicated additional survey module on the respondent's own perception of the barriers to financial inclusion they face. The focus on Nigeria is also motivated by the fact that it displays a low level of financial inclusion (four-fifths of the adult population do not have access to formal financial services) for its level of income per capita compared with regional peers.

Chapter 4 develops a non-mutually exclusive framework for analysing barriers to formal banking that differentiates between eleven 'buckets' under the headings of involuntary exclusion, voluntary exclusion and supply constraints. The characteristics of the individuals who cite each constraint are examined in detail and the results show that heterogeneity exists between groups who face different barriers. It is thus concluded that policy aimed at improving financial inclusion should adopt tailored strategies for different excluded populations.

While poverty and distance to bank branch are the most important barriers cited, informality is an often cited constraint. Indeed, Beck and Demirguc-Kunt (2008) estimate that the number of documents needed to open a checking account in Nigeria is high, estimated at 3.66 official documents, the ninth highest of the 54 developing countries with data available. Given that only 9.7 percent of the Nigerian population report to posses three or more official documents and only 5.6 percent of the population claim to have four or more official documents, it is unsurprising that four-fifths of the Nigerian population remain outside the formal banking sector.

Using instrumental variables, the precise role played by informality in financial exclusion is estimated in Chapter 4 and it is found that for individuals with four and five documents an additional document increases the probability of being banked by 17 percent and 15 percent respectively. This result is of particular note as it reveals the possibility that modest increases in financial inclusion may be possible without the need to wait for higher incomes, higher levels of education or greater financial literacy. The result is particularly strong for individuals around the threshold of four to five formal documents who can be considered close to the threshold of financial inclusion.

Chapter 5 seeks to ascertain the evolving importance of proximity to bank services in Kenya during a period of significant branch expansion. The importance of physical access to banking infrastructure was demonstrated by a pseudo-natural experiment in Mexico, the expansion of a savings institute (Pahnal), that showed that greater physical access increased the average saving rate of affected households by 3 to 5 percentage points (Aportela, 1999). In addition, Burgess and Pande (2005) found that the great Indian rural bank expansion between 1969 and 1996, which increased the number of bank branches from 8,262 to 63,092 with the greatest expansion in rural areas, lead to associated deposit mobilisation, credit disbursement and caused reductions in poverty levels.

Kenya has been at the centre of the mobile banking revolution that is occurring in Africa. The spread of mobile banking offers developing countries the exciting prospect of increases in financial inclusion without the need for expensive and slow branch expansion. It is possible that low income countries could leapfrog traditional branch based banking into mobile banking in similar fashion

to their leapfrog over landline telecommunication infrastructure and straight to mobile phone technology.

Chapter 5 asks the question whether mobile banking revolution is overcoming the tyranny of distance to bank infrastructure and improving financial inclusion in Kenya. This chapter uses Global Positioning System (GPS) data to investigate the importance of distance and time to bank branch for personal access to both formal banking services and the mobile banking platform M-Pesa. Evidence suggests that greater distances and time to bank infrastructure reduce the likelihood an individual is formally banked and that despite the significant expansion of the bank branch network in Kenya (2006-2009), the negative relationship between distance to bank branch and the likelihood of being banked has increased. In contrast, evidence is found to support the hypothesis that mobile banking in Kenya is overcoming the tyranny of distance to bank infrastructure for the financial inclusion of all economic groups in Kenya.

Chapter 2

Conceptual Framework

2.1 Definitions

The literature and discourse around the reach of financial services in developing countries has centered on terms such as 'financial inclusion' and 'access to financial services'. However, these terms are less straight forward than first impressions suggest, and care is required to set out clearly how each concept should be understood. The purpose of this chapter is to provide some background on how these terms have been used in the existing literature, and to provide clarity on how these concepts will be applied in this thesis. As a second step, I turn to consumer choice theory to provide a conceptual framework that can be used to identify the constraints to financial inclusion that will inform the remainder of this thesis.

The term financial inclusion was first mooted by geographers in 1993 in relation to the closure of bank branches in developed countries, and the subsequent decline in physical access to services (Leyshon and Thrift, 1993). In recent years a number of efforts to define financial inclusion have been put forward with most definitions relying on the term "access to financial services" (C-GAP, 2010; European Commission, 2008; United Kingdom Government, 2006). In its simplest form, financial inclusion can be defined as the ability to access appropriate financial products and services. A more comprehensive definition which makes reference to important potential supply side constraints is "Full financial inclu-

sion is a state in which all people who can use them have access to a full suite of quality financial services, provided at affordable prices, in a convenient manner, and with dignity for the clients" (Center For Financial Inclusion, 2012). This definition specifically highlights the importance of price, physical convenience and service quality in achieving full financial inclusion.

A distinction between access to and usage of formal financial services must be made. Individuals and households with access to formal financial services include those who currently use formal financial products and those who are voluntarily excluded (i.e. they have access to formal financial services but they choose not to use these services for religious, ethnic or preference reasons). Thus while usage and access rates may be similar in some contexts, usage is a definite sub-set of access. As a result of this distinction, a pure measure of access would include individuals who currently use financial services and those who have sufficient purchasing power, can meet all documentary requirements and enjoy sufficient proximity to banking services, but simply prefer to remain financially excluded. A dedicated set of survey questions may well be able to decipher the exact difference between usage and access at the micro level.

While this distinction is not maintained throughout the entire financial inclusion literature, with access considered synonymous with usage by many research articles, the difference is acknowledged by some (World Bank, 2008). In this thesis, I do not consider financial access as being synonymous with usage, but rather consider usage to include only those individuals who actually use financial services (I define this as "personal access" and use this term interchangeably with usage of formal financial services). This focus provides consistency with the measures of usage or personal access to financial services derived from the FinScope surveys used throughout this thesis.

There are further complexities with the definition of financial access. Strictly speaking, access could be considered as the physical proximity to services.[1] Indeed, efforts to distinguish between usage and access have been made at the country level. Beck, Demirguc-Kunt and Peria (2007a) suggest that 'access' could be measured as proximity, time to or abundance of branches or ATMs in a region, whereas 'usage' could be measured as deposit size, loan size or the

[1] Physical access to banking infrastructure is considered in Chapter 5.

number of accounts per 1,000 adults. This more narrow definition of 'access' is best considered as physical access, and this term is consistent with the view that an urban population, who may be involuntarily excluded from financial services because of low income or informality, may not face physical access constraints. The term physical access is adhered to throughout this thesis as proximity or time to banking infrastructure.

Building on these definitions and distinctions, the rest of this chapter sets out the conceptual framework for understanding the use of saving and transaction services in developing countries. Section 2.2 describes the specifics of the demand and supply framework for the usage of financial services and provides insights on financial inclusion from the perspective of consumer theory. Section 2.3 considers supply side issues from the perspective of different banking business models. Section 2.4 follows with a description of the approach to modelling personal access to financial services in this thesis, while Section 2.5 outlines the agenda for the remainder of this thesis.

2.2 Consumer Choice and the Demand and Supply of Financial Services

In order to identify the various constraints to greater financial inclusion I turn to basic microeconomic theory. I consider three approaches; demand and supply at the individual and the national level, and consumer choice theory at the individual level to highlight the various constraints to and dynamics of financial inclusion.

Figure 2.1 (chart a) provides the starting point for the conceptual framework. This chart shows the traditional demand and supply framework for usage of financial services by individual i, where usage is determined by the intersection of the demand and supply curves. The demand curve for financial services is downward sloping, as demand falls when the price of accessing (the set-up costs) or using financial services (the annual fee or the total annual costs for a certain level of transactions) increases. The supply curve is upward sloping, since banks have a greater incentive to supply services to more and more individuals as the price charged for these services rises. The intersection between the demand and

supply schedules determines the usage level of the financially included individual at a given price. Specifically, the financial sector is willing to provide a certain level of basic financial services at a price that the individual is prepared to pay.[2] However, this intersection can be absent for a variety of reasons, as discussed later, and depicted in charts b, c and d in Figure 2.1.[3]

The dynamics of demand and supply can also be modelled at the country level and Beck and de la Torre (2006) graph the equilibrium outcome of aggregate demand and supply for basic banking services, specifically transaction and saving services. Their framework distinguishes between the observed banked population and potential improvements in access due to an outward shift in the aggregate demand curve and a downward shift in the aggregate supply curve. Figure 2.2 presents these aggregate demand and supply curves and depicts what Beck and de le Torre (2006) describe as the "Access Possibilities Frontier" for payment and saving services; the maximum share of the population that could be served by financial institutions, for a given set of state variables.[4] This maximum share is reached when greater efficiencies in supply are achieved (S_1 shifts out to S_2) as distortionary regulatory policies are overcome and economies of scale and market contestability are achieved, and demand is increased (from D_1 to D_2) as the previously self-excluded become financially included.

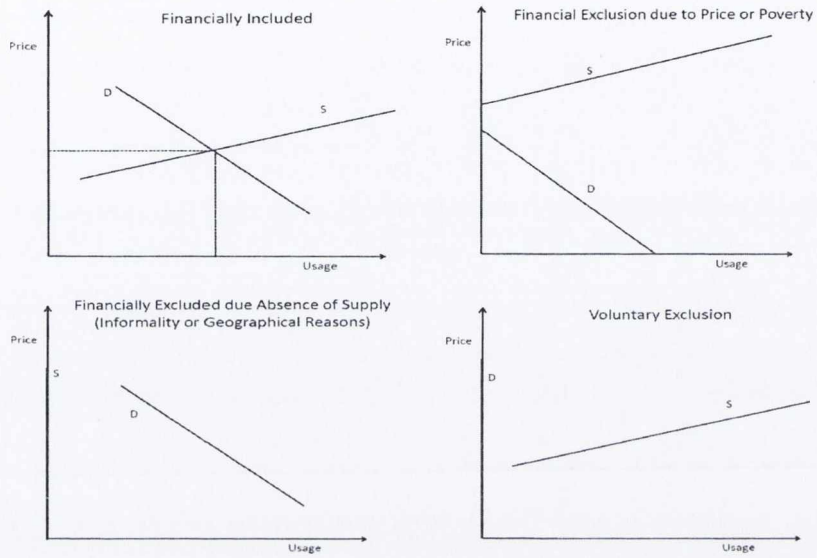
As a separate approach, a modest adaptation of the traditional two-good framework from consumer choice theory can help provide insights into the factors that affect the decision to use formal financial institutions for transaction and savings products at the individual level. The assumptions or building blocks of consumer choice theory - individual rationality, utility maximisation and preferences governed by completeness, transitivity and montonicity - may be generally applied to the market for financial inclusion. In the simplified world of transaction and savings products, utility is gained from a reduction in risk

[2]Distinction is made between a shift along the demand or supply curve and a shift in either of these curves. Ultimately however changes in price occur because of shifts in either demand or supply curves and it is these shifts that are considered in the subsequent analysis in section 2.2.2.

[3]These graphs were inspired by the discussion in "Finance for All: Policies and Pitfalls in Expanding Access" (World Bank, 2008).

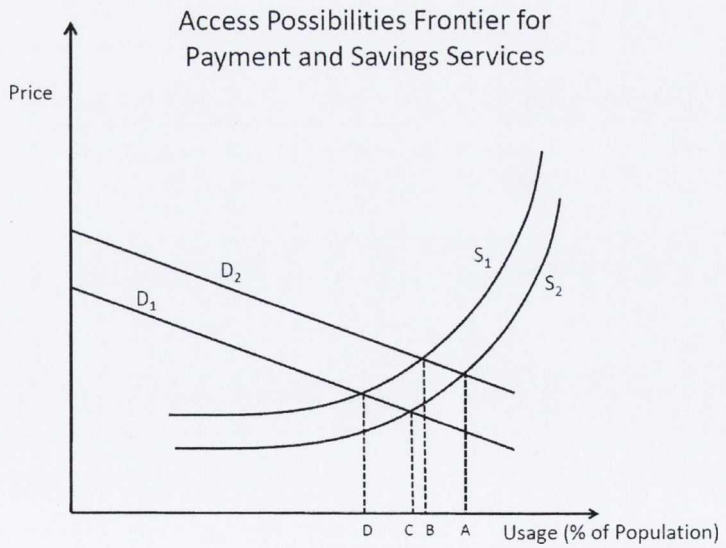
[4]Beck and de la Torre (2006) define state variables as "market size, macroeconomic fundamentals, available technology, the average level and distribution of per capita income, and system-wide costs of doing business related, for instance, to the quality of transport and communication infrastructure, the effectiveness of the contractual and informational frameworks, and the degree of general insecurity associated with crime, violence, terrorism etc."

Figure 2.1: *Demand and Supply of Financial Services (a,b,c,d)*



Source: Graphed by Author.

Figure 2.2: *Macro-level Access Possibilities Frontier*



Source: Beck and de la Torre (2006).

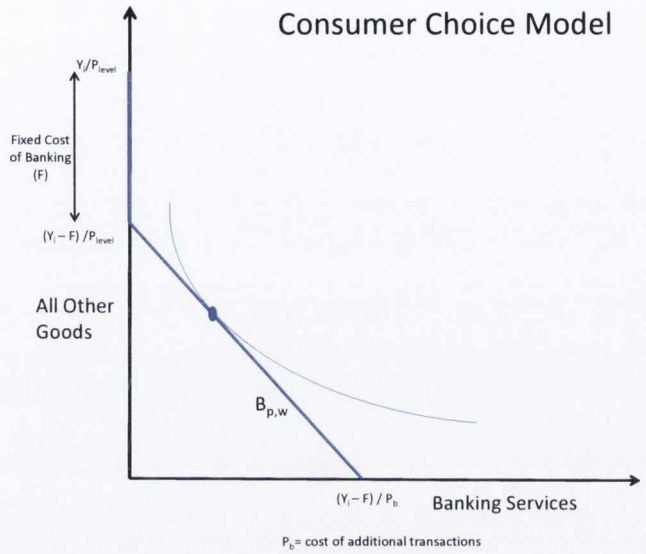
profile of the household asset portfolio, the modest interest gained and in some circumstances the ease of transactions. Arguably the assumption of economic rationality in a narrow sense is not necessarily appropriate as it can be argued that individuals may self-exclude themselves from financial services because of mistrust in banks based on cultural, religious, ethnic or other considerations.

Nevertheless, I model an individual's use of financial services as one consumable in a basket of goods where the purchasing decision between banking services and all other services is described using the traditional two-good diagram of classical demand theory. The decision to purchase financial services and all other goods is illustrated in Figure 2.3, with banking services on the horizontal axis. The chart depicts the budget constraint faced by a consumer as the solid blue line as well as the indifference curves describing the relative preferences between banking services and all other goods. I specifically model the cost of financial services with a fixed component, either a fixed set up charge or an annual fee, and a series of additional charges for the level of usage. This leads to a budget constraint where the length of the vertical segment of the budget constraint represents the fixed cost of access to financial services. Research has shown that for example, the annual fee for a savings account as a percentage of Gross Domestic Product (GDP) is 0.9 percent in South Africa, 2.0 percent in Kenya, 3.4 percent in Uganda and 3.6 percent in Malawi (Beck et al., 2008).

In this graph, individuals will demand no financial services up to a certain point and then the moment they purchase the minimum amount of financial services they give up a certain volume of other goods. In other words, financially excluded individuals will spend all their income on other goods at point Y_i/P_{level}.[5] If the individual chooses an infinitesimally small amount of financial services, the fixed cost will have to be paid and $(Y_i - F)/ P_{level}$ will be chosen. Thereafter, demand for the feasible bundles of goods with increasing number of financial transactions is determined by the relative price of transactions and the general price level. In the unlikely scenario that an individual chooses to spend all of their income on banking services, the amount of transactions would be determined by $(Y_i - F)/P_b$, where P_b is the cost of each additional banking transaction.

[5] P_{level} is defined simmply as the general prive level.

Figure 2.3: *Consumer Budget Constraint with a Fixed Cost*



Source: Graphed by Author.

Using these three frameworks, I specifically identify a series of constraints to greater financial inclusion. Each in turn is included in the classification of barriers or constraints to financial services that is developed in Chapter 4.[6]

2.2.1 Income Insufficiency

Under the individual level demand and supply framework shown in Figure 2.1, a low income can lead to financial exclusion when the demand curve does not meet the supply curve before the supply curve reaches the vertical axis (see Figure 1b). Rising incomes would push the demand schedule outwards, opening up the possibility of an intersection point and financial inclusion. Equally, in the aggregate demand and supply framework shown in Figure 2.2, an increase in average incomes would cause the aggregate demand schedule to shift upwards

[6]In Chapter 4, supply constraints include high cost, distance (or the cost of travelling to financial services), lack of trust in banks or issues around poor services. While trust in banks is considered as a supply constraint, a rationale to consider it a demand issue is perhaps equally valid as trust is ultimately a two-way process. Involuntary exclusion comprises income insufficiency (or income poverty), informality and low education or financial sector knowledge, whereas voluntary exclusion include religious, ethnic or simply preference reasons. It is possible to consider a lack of financial sector knowledge as a form of voluntary exclusion.

from D_1 to D_2 leading to an increase in the banked population from point D to point B (Beck and de la Torre, 2006).

In the consumer choice framework involuntary exclusion caused by income insufficiency can occur when the fixed cost is sufficiently high that the individual will choose to spend all their income on other goods, even in the presence of strong underlying preferences for financial services, result in exclusion.

2.2.2 Supply of Financial Services

The prices that banks are willing to supply financial services at may simply be out of reach of many poor households, thus leading to financial exclusion. This high price may be due to the poor performance, and thus high cost, of the financial sector which could be the result of inefficiencies, monopolies or weak regulatory environments (see Figure 2.2b). Consequently, it is possible to increase usage by reducing the cost of opening or using a bank account. In Figure 2.1a, this would lead to a downward shift in the supply curve (out to the right), resulting in improved financial inclusion (all else equal).

In a similar fashion, a shift in the aggregate supply curve out to the right can increase the banked population. This shift in the supply curve could occur when greater efficiencies are achieved in financial intermediation, when distortionary regulatory policies are reduced or when economies of scale are achieved by local banks (Beck and de la Torre, 2006). Figure 2.2 depicts both the prevailing supply curves for financial services for a given set of state variables (S_1) and the potential supply curve (S_2) if supply side developments allow for financial services to be provided at lower prices. If such improvements are achieved the proportion of the population that use financial services can be increased from point D to point C without any change in the demand schedule (Beck and de la Torre, 2006).

In the two-goods consumer choice framework, as mentioned previously, I model the cost of financial services with a fixed component, either a fixed set up charge or an annual fee, and a series of additional charges for the level of usage. A change in the cost of financial services can thus take two forms; a reduction in the fixed cost of participation or a reduction in the marginal cost of using additional financial services. The former is represented by a reduction

in the length of vertical segment of the budget constraint, while the latter would involve a change in the slope of the budget constraint after B_{min}. For potential customers with low levels of financial dealings, the fixed set up or annual cost is likely to deter inclusion, while others may consider the overall annual cost of using financial products including the costs per transaction.

2.2.3 Financial Literacy/Education

Improving the level of understanding of the benefits of financial services can lead to an outward shift in individual or aggregate demand curves, which for a given supply of financial services, can result in an increase in the banked population (Beck and de la Torre, 2006). Recent research has attempted to quantify the potential gains for financial inclusion of greater knowledge of personal finance and banking products (see for example Cole, Sampson and Zia (2012)).

In the two-goods framework, education and financial literacy can alter the shape of the indifference curves to reflect an increased relative preference for financial services. When an individual values financial services more highly, it is possible for an individual to become banked holding everything else constant.

2.2.4 Geographical Isolation

Physical access to banking services is limited in most rural areas in sub-Saharan Africa and represents an important barrier to financial inclusion. An absence of supply may prevail when banks are simply not present in certain rural areas and as a result the supply curve will be vertical at the origin as depicted in Figure 1c (World Bank, 2008). Issues of physical access can also occur when the time or cost to banking services are particularly high, although this can best be modelled with a higher effective supply curve representing banking fees plus the cost of physical access similar to the scenario illustrated by Figure 1b.

When considered within the context of the consumer choice framework of Figure 2.3, geographical isolation can simply increase the effective cost per transaction faced by the individual. The fixed cost of opening the account would also increase but as this is a one-off expense, it is the recurring cost in terms of regular transactions that will likely involve long and time consuming distances to travel.

2.2.5 Voluntary Exclusion

Voluntary exclusion can occur when an individual simply prefers to remain outside the formal banking system despite the existence of a supply schedule. This may be due to religious, ethnic or other preference reasons. In the case of voluntary exclusion, the demand schedule is simply vertical at the origin (see Figure 1.1d).

In the case of aggregate demand, Beck and de la Torre (2006) argue that greater understanding of the benefits of banking services (reduced financial illiteracy) and/or cultural preferences (potentially religious) can shift the aggregate demand curve for banking services to a higher potential for a given level and distribution of national income.[7]

In the two-goods framework, education and financial literacy in particular can change the shape of the indifference curves. When an individual values financial services more highly, it is possible for an individual to become banked holding everything else constant. Figure 2.3 points to the potential of changes in preferences towards financial products, as a consequence of societal change towards a more consumeristic and bank friendly society, to increase the 'banked' population by altering the slope of the indifference curves.

2.2.6 Eligibility Criteria: Informality

Eligibility criteria to open a bank account can play a key role in financial exclusion. If an individual fails to meet the documentary requirements to open a bank account, in our static framework, increases in income, a fall in the cost of banking or a change in preferences will not allow for inclusion in the banking sector. In essence, when perfect information between potential account holders and bank branches is not present, and strict documentary requirements are needed for inclusion, informality prevents engagement. This is represented in Figure 1c where the supply curve is absent.

[7] Beck and de la Torre equate low levels of financial illiteracy to voluntary exclusion, whereas in this thesis I consider this a form of involuntary financial exclusion. In any case this alternative classification does not make any significant difference to the analyses conducted in this thesis, yet it is worthy of note.

2.2.7 Risk and Uncertainty

The role of risk and uncertainty can also be incorporated into the preference functions (or indifference curves) for banking services versus other methods of asset holding and mode of transactions. If the perceived relative risk of non-banking solutions increases relative to using banking services, then preference curves will change their slope accordingly and an individual increases their likelihood of the usage of financial services for a given income, relative prices and minimum cost to open and use financial services.

2.3 Supply of Financial Services: Value/Volume Considerations

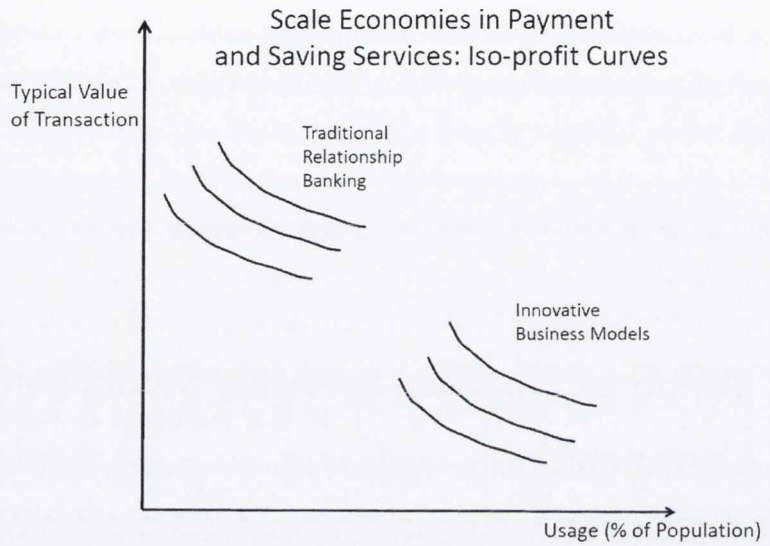
Characteristics of the local banking sector play a significant role in determining the level of usage of financial services. Levels of productivity, cost structures and banking competition define the outreach and price of financial services. To help understand the dynamics of supply in developing countries, Beck and de la Torre (2006) provide a framework for modelling business models of financial institutions and how they affect financial usage.

Specifically, Beck and de la Torre (2006) illustrate alternative business models for banks through two series of iso-profit curves relating volume to frequency of transactions (see Figure 2.4). The two sets of iso-profit curves could be interpreted as a traditional African bank focused on elites and relationship banking and a mobile banking operator such as M-Pesa in East Africa that owes its profitability to a high volume of low value transactions from millions of clients.[8] The vertical axis measures the value of a typical transaction whereas the horizontal axis represents the number of clients or frequency of transactions. The iso-profit curves represent combinations of size of transactions and volume of transactions that yield the same profit for the two alternative financial institutions with different business models.

As pointed out by Beck and de la Torre (2006), a rightward movement along the iso-profit curves broadens financial access, but for a traditional relationship-

[8]M-Pesa is the leading mobile banking platform in East Africa. See Chapter 5 for further details.

Figure 2.4: *Scale Economies in Payment and Saving Services*



Sources: Beck and de la Torre (2006).

based bank with a low number of high value transactions, business model limitations prevent broader financial inclusion without the development of new platforms or products. These restrictions, along with vast populations of informal and low income citizens, help explain why in sub-Saharan Africa the clustering of financial institutions is towards the North-West corner of the space in Figure 2.4. The emergence of mobile phone banking and other low cost, high volume financial services offers the potential for banking initiatives to colonise the South-East corner of Figure 2.4 (Beck and de la Torre, 2006).

2.4 Modelling Financial Usage

In line with related literature, throughout this thesis usage of financial products is modelled using multivariable probit models, where the dependent variable of interest is the financial status of the individual, generally defined as the use of financial services. This approach mirrors that taken by Beck and Brown (2010) and Djankov et al. (2008). A variety of explanatory variables are employed in this thesis, many of which represent issues deduced from the conceptual frame-

work outlined. First, measures of income and wealth and demand determinants such as education levels and financial sector knowledge are universally employed. Measures of individual informality such as the number of individual documents and the formality of basic services such as WC and refuse collection are also included in the analysis.

Measures of physical access such as urban/rural dummies and time to grocery store, an imperfect measure of time to basic services, are used throughout. However, superior measures of distance and time to bank branch are employed in Chapter 5. Psychometric variables which may help explain voluntary exclusion such as trust in banks and risk aversion are also included in the analysis. Finally, a range of national, state and district level controls are included in the models and in some incidences regional level variables such as financial infrastructure, informality and average income levels are also included.

2.5 Agenda for Thesis

The conceptual framework presented in this chapter helps identify an agenda for financial inclusion for policymakers and an accompanying research agenda. This thesis specifically seeks to address the issues of informality and geographic isolation that exclude individuals from partaking in financial services as well as considering the role played by personal access to financial services on individual income.

First, the pursuit of financial inclusion is motivated by the positive impact greater inclusion will have on livelihoods directly, and indirectly through deeper financial systems. Bilandzic et al. (2010) propose several benefits of financial inclusion and these include the facilitation of productivity enhancing investment, protection against vulnerability, the leverage of assets, ease of transactions and improvement of quality of life. With this in mind, Chapter 3 specifically investigates the role played by usage of financial services on personal income, typically the most important indicator of well-being, in addition to providing a new set of estimates of formal financial service usage rates.

Second, outside of traditional issues of supply and demand, prerequisites for access play a central role in financial exclusion in sub-Saharan Africa. Docu-

mentary requirements and widespread informality simply exclude the majority of sub-Saharan African from accessing financial services. With this in mind, the role played by informality, as measured by the number of official documents possessed by individuals, is considered at length in Chapter 4. The potential for improvements in the usage of financial products and services from interventions specifically designed to provide formal legal documents to individuals is assessed.

Finally, improving the supply of financial services can be considered a legitimate policy objective, and policies aimed at reducing the cost (the price) of financial service usage and the indirect, but no less important cost of accessing financial services such as reducing distances and time to bank infrastructure, should play a central role in the pursuit of financial inclusion. Efforts at improving financial sector productivity, competition and opportunities for innovation will help bring the cost of usage down and facilitate the development of low volume, high frequency of transaction business models. Such efforts will also support the expansion of bank branches into previously 'unbanked' areas and open access for greater numbers of Africans. Addressing these efforts, Chapter 5 helps our understanding of the importance of physical access to bank branches in financial inclusion and the potential of mobile banking to overcome the supply constraints of distance and time to branch.

Chapter 3

Cause and Effect of Financial Access: Evidence from the Finscope Surveys[1]

3.1 Introduction

Access to financial services is widely considered essential for the economic well-being of households in low income countries. Savings, payment and credit services facilitate household level consumption smoothing, help insure against risk and allow investment in education and other forms of capital. Despite this, levels of access to financial services vary widely with up to 2.5 billion people globally outside the formal banking system (Morduch et al., 2009). In Africa, estimates from the Finscope Surveys suggest that the proportion of the population with access to formal financial services ranges from 8 percent in Mozambique to 54 percent in neighbouring South Africa.

While innovations in microfinance have taken centre stage in efforts to expand financial access over the last two decades, attention is now shifting to opportunities to reform formal banking systems to open savings, loan and in-

[1] This work is based closely on a soon to be published article with a similar title by Patrick Honohan and Michael King. The article has been included in Robert Cull, Asli Demirguc-Kunt and Jonathan Morduch (eds.) *Banking the World: Empirical Foundations of Financial Inclusion*, MIT Press, 2012.

surance products up to the financially excluded (Karlan and Morduch, 2009). Despite growing interest in formal banking systems, there was until recently limited availability of detailed surveys of household usage of financial services in sub-Saharan Africa, especially at the cross-country level (Beck and Demirguc-Kunt, 2008). Addressing this weakness, a wave of financial access surveys, known as the Finscope surveys, have been conducted across Sub-Saharan Africa since their launch in 2004 and this chapter provides the latest estimates of formal banking penetration, determined by the intersection of the demand and supply curves for financial access, for eleven sub-Saharan African countries.[2]

By pooling eleven nationally representative Finscope surveys, I exploit commonalities in survey design to comprehensively examine the role of individual, geographic and national characteristics in influencing the use of financial services in Sub-Saharan Africa.[3] This chapter complements recent research conducted on Mexico and transition economies in Eastern Europe that has shed light on the characteristics of households with formal financial access (Djankov et al., 2008; Beck and Brown, 2010).

In the pooled dataset of eleven countries, I confirm that income and education are key demand side determinants of access to formal banking. I find that the more sophisticated an individual's financial sector knowledge the higher their likelihood of being formally banked and that trust in banks is associated with significantly higher chances of being formally banked. Geographical location also plays a role. I confirm the supply side constraint of location, as measured by the urban-rural divide or mobile phone usage, in determining the financial status of households in sub-Saharan Africa. However, while I maintain the view that distance to financial services is a central determinant of the usage of financial services in Africa, notwithstanding recent advances in mobile banking, the time to grocery store variable, a potential proxy measure for distance to bank, is not significantly related to usage of financial services when country or district controls are included. While the role of gender is confirmed as an im-

[2]Formal banking penetration is defined as the percentage of individuals who have an account with a formal financial institution.

[3]The data for the chapter come from the Finscope surveys and we include Botswana (2004), Kenya (2006), Malawi (2008), Mozambique (2009), Namibia (2004), Nigeria (2008), Rwanda (2008), South Africa (2006), Tanzania (2006), Uganda (2006) and Zambia (2005) in our analysis. The penetration rate for formal financial services is defined as the percentage of users in a given country.

portant correlate of financial access in summary statistics and univariate tests, it is revealing that when psychometric variables and education are controlled for, gender is not statistically significantly related to financial access.

This chapter also contributes to the literature on the impact of access to financial services on individual level income at the micro level. I argue for the validity of trust in banks as an instrumental variable for the use of banking services and believe this innovation contributes to the related literature. The rationale for the validity of this instrumental variable approach is presented in the methodology section. However, without the use of sophisticated experimental techniques it remains plausible that some elements of endogeneity, reverse causality or omitted variable bias may not have been overcome. Nevertheless, in the pooled dataset, I specifically find, using this instrumental variable, that usage of formal banking services increases an individual's monthly income by 1.67 percent, which in economic terms represents an increase of $1.41 in monthly income when evaluated at the mean.

The remainder of the chapter is organised as follows. Section 3.2 provides an overview of related literature. In section 3.3 I discuss the data and the methodology. Section 3.4 presents and describes the results, while section 3.5 concludes.

3.2 Literature Review

Accumulated evidence at the national level on penetration rates of formal finance has identified some of the main country characteristics that influence these penetration rates, and offered preliminary estimates of the magnitude of the effects (Honohan, 2008a,b). Average income, the quality of national institutions, and indicators of geographic isolation, such as population density or mobile phone penetration, are strongly related to household financial penetration rates, with additional factors such as age distribution also playing a role.

At the household level, recent research documenting access to formal banking services in Mexico and transition economies has shed light on the characteristics of households with formal financial access. In their study of Mexican households using data collected by BANSEFI and the Mexican Ministry of Agriculture,

Djankov, Miranda, Seira and Siddharth (2008) find that households with bank accounts enjoy higher levels of consumption, possess greater assets and are more likely to be college educated. Beck and Brown (2010) exploit the European Bank for Reconstruction and Development's (EBRD) Life in Transition Survey (LITS) database to assess the correlates of access to formal banking services. At the household level, they find that the likelihood of holding a bank account or bank card increases with income, wealth and education in most transition countries. They also find evidence of a statistically significant role played by religion and minority status as well as the urban rural divide.

Economic theory suggests that financial development can have ambiguous outcomes for poverty and inequality reduction at the national level. The empirical evidence is, however, suggestive of the positive role played by financial development in reducing poverty and easing inequality. In a literature review on cross-country studies, Beck, Demirguc-Kunt and Levine (2007b) find that financial development reduces income inequality, while Honohan (2004) shows that financial depth helps explain the level of poverty as measured as the proportion of people with incomes of less than $1 or $2 a day.

At the household and individual level, economic theory suggests that access to financial services can contribute to poverty reduction. Access to finance should allow poor households to save, invest in the future in the form of physical and human capital and insure against income and health shocks. The most striking fact about the current state of knowledge is the disconnect between evidence on the effects of national financial depth (seen as an imperfect proxy for overall financial development) and the effects of household financial penetration (Beck et al., 2009, 2007b; Honohan, 2004). Thus, although considerable evidence at both cross-country and sectoral level confirms a causal role for financial sector development in contributing to economic growth and economic welfare - a confirmation not overturned by the recent severe collapses, following over-extension, in the financial systems of most advanced economies - surprisingly little evidence has so far been obtained to confirm a robust link at the micro level between financial penetration and the welfare of individuals and households. Many recent empirical studies have suggested a direct link between access to microfinance and welfare outcomes, but failed to adequately take into

consideration selection bias in their econometric strategies. However, some recent research has pointed to a possible link. Addressing the issue of selection bias, Burgess and Pande (2005) find that rural branch expansion significantly reduces poverty at the household level by examining the state-led rural bank expansion in India between 1977 and 1990. Burgess and Pande (2005), along with Aportela (1999) in his research on the expansion of a Mexican savings institute (Pahnal), exploit natural experiments in banking expansion regulations to help overcome issues of endogeneity and reverse causality. For example, Burgess and Pande (2005) exploited the policy rule introduced in 1977 whereby permission to open a bank branch in an already banked location was only granted if branches were opened in four previously unbanked locations. In the area of microfinance, there is reason to believe that well-managed innovative community based financial products can lead to poverty reduction (Haley and Morduch, 2002), although controversies remain.

In the last decade, development economics has turned to the medically inspired randomised control trials as the default econometric technique for establishing causality. Experimental approaches to estimating the impact of access to financial services have recently focused on the response of microentrepreneurs and microenterprises randomly assigned credit facilities (Field and Pande (2008), Karlan and Zinman (2009a), Karlan and Zinman (2009b)) or the impact of of randomly allotted savings products rather than simple bank accounts on socioeconomic houtcomes at the household or individual level (Ashraf, Karlan and Yin (2006)).

3.3 Data and Methodology

3.3.1 Data Sources

The data come from the Finscope surveys that have been conducted between 2004 and 2009 in Sub-Saharan Africa. The eleven surveys were carried out using broadly similar stratified multistage random sampling and the sample size varies from 1,200 in Botswana and Namibia to 21,110 in Nigeria, giving us a

total of 55,762 individual observations.[4] Three of the more recent surveys from Malawi, Mozambique and Nigeria capitalised on greater resources available to oversample rural areas and interview a broadly equal number of people in different districts, provinces and states respectively. Nevertheless, these surveys as well as the remaining eight surveys include adult weights, and for the purpose of summary statistics I use these adult weights to transform the eleven datasets into nationally representative datasets. In addition, all regression analyses conducted in this chapter, including the pooled regressions, take these weights into consideration.

The surveyed countries include some of the poorest in the world and it is not surprising that they display very low penetration of financial services. Previous survey estimates have put usage of formal financial services as low as 5 per cent in Tanzania, for example, although Finscope's more probing interviews lift this number somewhat (Honohan, 2008a). On the other hand, three of the countries in Southern Africa: Botswana, Namibia and South Africa, are middle-income countries with some of the highest mean incomes in Sub-Saharan Africa, although they are also countries with exceptionally high levels of inequality.

The Finscope surveys contain significant detail on an individual's awareness and usage of different financial products and service providers, and while the surveys collect details on some individual characteristics, unlike the Living Standards Measurement Survey (LSMS) they do not attempt to build a rounded profile of each household's economic activities. The questions asked are not exactly the same for each country, as is inevitable to some extent given the different product and provider ranges and cultural settings, but there is enough commonality between the surveys to allow quite a degree of cross-country comparison.

Finscope take a country specific approach to assessing whether an individual is formally, informally banked, or financially excluded. For each country, respondents are asked whether they currently use up to 30 different financial products. While it is obvious for the vast majority of the financial products which are formal or informal, there may be a difference of opinion for some of the marginal cases. Table A10 in Appendix A details the financial products I consider as formal financial products. Two significant differences between

[4]Other details of survey methodologies etc are well documented on the Finscope website http://www.finscope.co.za.

this chapter's approach and the official Finscope methodology are worthy of note. First, I have included a small number of additional products for Malawi, Namibia, Rwanda and Zambia to improve consistency in approach between the countries. Second, the absence of a published methodology for Mozambique, Tanzania and Uganda means that I was unable to compare the list of formal financial products used in this chapter with the list used by Finscope.

Tables A.1-A.9 in Appendix A provide the summary statistics and coding on how country level variables are turned into variables comparable across all eleven datasets. While variables such as age, urban, mobile (phone) and female are instantly comparable across datasets, considerable work is required to ensure that education, personal monthly income, financial sector knowledge, bank trust, risk aversion and time to grocery store are comparable. Education is firstly standardised on a scale of 1-8 from "no formal education" up to "completed university education", but for the purposes of the multivariable regressions I derive four binary measures of education: less than primary education, completed primary education, completed secondary education and above secondary education.

The financial sector knowledge score is a normalised score (on a scale of 1-10) achieved in a financial sector knowledge quiz given during the interview. For nine countries a series of financial products/terms are mentioned and the individual receives two points for "I understand", one point for "I have heard of" and zero points for "never heard of/ don't understand". For example, in Namibia respondents are asked whether they understand or have heard of the 16 financial terms/products: ATM, interest rates, bad debts, application process, bond/mortgage loan, credit bureau, credit record, the Bank of Namibia and eight others. No information on financial knowledge is available for Kenya while for Uganda, I was forced to rely on the response to the question, "What do we call an increase in prices?", as a proxy for financial knowledge. In this case, different scores are given for each of 17 possible answers.

To support the analysis I derive two important psychometric variables for each individual: risk aversion and trust in banks. For seven of the countries the measure of risk aversion is calculated using an individual's response to the question, "To get ahead in life, one needs to take some risks", but for three

of the countries I have had to use more innovative approaches to ascertain the level of risk aversion at the individual level with varying degrees of success. For Tanzania, an individual is classified as being risk averse if they responded positively to having insurance or agreeing with the statement "I would like to have insurance but I cannot afford it". For Malawi and Rwanda risk aversion is ascertained by the respondent mentioning over and above a threshold number of risks to their household. For nine of the countries the banktrust variable is determined by the question "I trust banks" or similar but in the case of Tanzania trust in banks is defined as a positive response to "Banks are my ideal financial service provider" or "I don't use banks at the moment but would really like to" minus those who say that their lack of trust in banks is the reason they don't have a bank account or the reason they don't save with banks.

While the mobile banking revolution in Africa is reducing the need for large scale rural bank branch expansion to improve financial inclusion, distance or time to banking infrastructure is likely to continue to remain a significant barrier to multi-layered financial services for the rural poor. To capture this barrier accurately, data on distance or time to nearest bank branch would be ideal. Unfortunately, for the Finscope surveys data of this kind is only available for Kenya and Rwanda. Instead, for the remainder of the countries I rely on a time to grocery store variable as a proxy for distance to banking infrastructure. Tanzania is an exception where I use distance to where the respondent usually conducts their business transactions. Of course in remote rural areas in Africa, grocery stores are significantly more abundant than banking infrastructure and as a result it is important to consider the results with this distinction in mind.

Monthly personal income is mostly recorded in the Finscope surveys as a categorical variable with up to 20 possible bands, with the exception of Nigeria which records the exact income amount. For the purposes of the pooled dataset I have taken the midpoint of these categories and converted the amount into US dollars by the average exchange rate for the year of the survey.[5]

In Chapter 2, the theoretical framework presented illustrates that usage of

[5]The exact approach taken and the exchange rates used are available for reference in Table A.6 in Appendix A. A significant number of observations are recorded as zero, which meant that when we used the natural log of income, we lost a number of observations. Assuming that these individuals truly had very low but nonzero income, to obtain the regression results reported, we have added $1 to every respondent's monthly income. Alternative approaches to this issue are undertaken in the robustness section.

financial services at the individual level occurs at the intersection of the individual demand curve and the supply curve of financial services. Multivariable regressions do not necessarily distinguish between demand and supply issues specifically, instead assessing the role played by a series of individual level, geographic and national characteristics. For example, low levels of trust in banks may be considered a demand side issue that could be addressed with the provision of information on banks to the public and thereby improving the reputations of the financial sector. Alternatively, a lack of trust in banks could be considered a supply side issue where central banks could prioritise improved financial regulation. Equally so the measures of geographic isolation, such as time to grocery store and the urban-rural dummy, can be considered as indicators of the physical supply of financial services. However, banks are not only more likely to locate in areas with higher population densities but also where higher income and more formal potential customers are located, suggesting that geographic variables may also be considered demand related. Interpretation of subsequent analyses should take these complexities into consideration.

For most of the analyses in this chapter Kenya drops out because FinAccess Kenya does not have many of the variables of interest such as income, trust in banks, financial sector knowledge or risk aversion. The remainder of the pooled dataset has good coverage of the variables of interest with the exception of no observations for time to grocery store for Mozambique and Uganda, and an unorthodox approach to calculating personal income in Uganda that leads to 80 percent missing values.[6] Tables A.1-A.9 in Appendix A detail the proportion of missing values for all observations.

In Table 3.1 I present the summary statistics of the percentage of adults with access to formal financial services in general and with various attributes for the eleven countries of interest. In addition, I graph the underlying distribution of four non-binary variables of interest: financial sector knowledge, education, the natural log of monthly income and time to store, for both the banked and unbanked populations (see figures A1-A8 in Appendix A).

At the country level, formal financial service penetration rates are higher in

[6]Ugandan respondents were asked for their exact household income from farming enterprises and other non-farming economic activities. This variable is for the entire household rather than the individual and there is a significant bias in responses towards agricultural households.

the relatively more affluent countries of South Africa (53.9 percent), Namibia (47.4 percent) and Botswana (43.4 percent) and lower in the poorer countries of Kenya (17.0 percent), Malawi (16.0 percent), Tanzania (14.3 percent), Zambia (14.5 percent), Rwanda (15.3 percent) and Mozambique (7.9 percent). The exception is Nigeria, which records a low financial sector penetration rate (21.1 percent) despite its relative affluence among sub-Saharan African peers. Figure 3.1 shows a graphical representation of this relationship between mean income and financial penetration at the national level and highlights Nigeria's underperformance.[7]

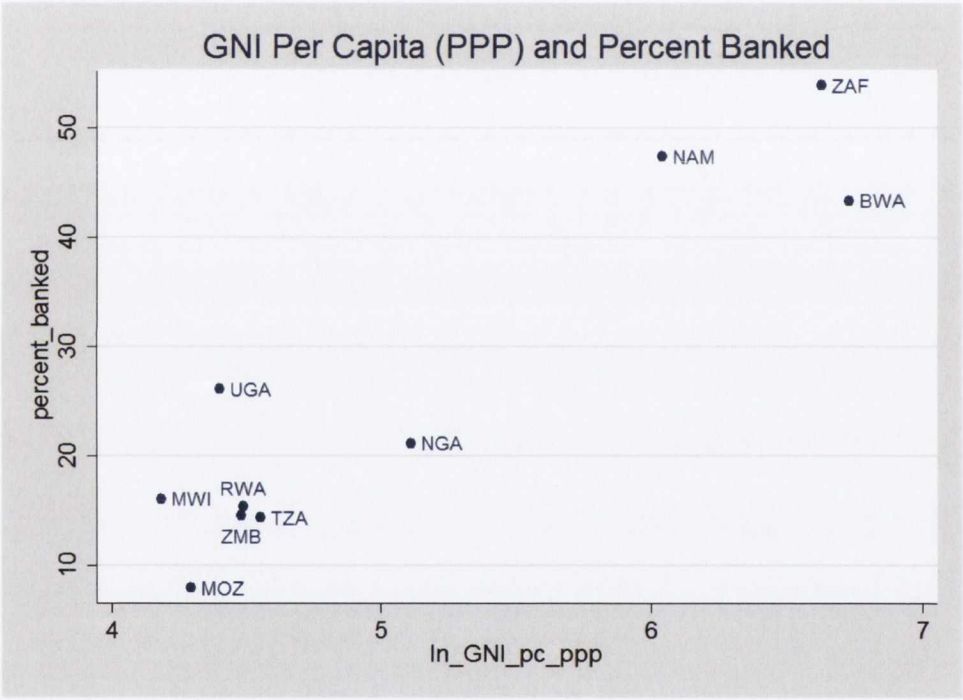
Previous estimates of usage of formal financial services such as Honohan (2008a) use country level correlates to predict the level of financial penetration (based on equation 3.4 in Honohan (2008a)). In Table 3.2 I compare the Finscope estimates of formally banked with Honohan (2008a) estimates of warranted penetration rates and the Mark IIIe estimates.[8] For definitions and method see Honohan (2008a). The Finscope surveys have raised the estimates of formally banked in Kenya, Namibia, Nigeria, South Africa and Uganda. As one might expect, the predicted (warranted) penetration rate using the fitted values for a country with the same GDP per capita, age dependency, ownership of mobile phones and quality of institutions index enjoys mixed success when compared with either the original Mark IIIe estimates or the Finscope estimates.

Table 3.1 shows that there are lower financial services penetration rates among the poorest individuals, defined as those who earn less than $1 a day, in sub-Saharan Africa. The differences are particularly striking in countries with higher inequality such as South Africa, Botswana and Namibia. In Namibia for example, 60.3 percent of those earning above $1 per day have personal access to formal financial services, while only 14.5 percent of those earning less than $1 per day have access. Graphical inspection of the income distribution charts for the pooled banked and unbanked populations confirms the country level results of Table 3.1. Figures A.1 and A.2 in Appendix A illustrate the income distribution for both the banked and unbanked subsamples in the pooled dataset.

[7]The average income figure for Uganda is likely to be biased downwards due to a bias towards agricultural income among respondents.

[8]The Mark IIIe dataset for financial access is reported in Honohan (2008a) and is based on the author's calculations as well as Beck, Demirguc-Kunt and Peria (2007a); Claessens (2006); Peachey and Roe (2006); Christen, Jayadeva and Rosenberg (2004) and subsequent revisions.

Figure 3.1: *Mean Income and Percent with Bank Account in Finscope Surveys*



Sources: World Bank (2012) and Finscope Surveys.

Table 3.1: Formal financial service penetration for individuals with various characteristics (% of surveyed adults in each category)

	Botswana (2004)	Kenya[a] (2006)	Malawi (2008)	Mozambique (2009)	Namibia (2004)	Nigeria (2008)	Rwanda (2008)	South Africa (2006)	Tanzania (2006)	Uganda[a] (2006)	Zambia (2005)
Total	43.4	17.0	16.0	7.9	47.4	21.1	15.3	53.9	14.3	26.1	14.5
Region											
Urban	56.8	29.2	40.9	19.3	64.9	39.1	26.5	69.7	22.0	31.9	24.5
Rural	37.0	13.0	11.2	2.0	35.7	14.1	13.3	44.2	11.3	24.2	9.2
Gender											
Female	41.3	12.9	14.5	6.0	47.9	15.0	13.5	53.2	11.5	21.9	11.4
Male	45.9	21.3	17.7	10.1	46.9	26.7	17.7	54.5	17.4	30.7	17.5
Education											
Did not complete primary	22.9	5.6	4.2	5.7	19.6	2.2	4.5	27.5	6.3	20.0	1.8
More than secondary school	66.9	40.9	51.9	14.7	77.2	43.7	50.0	79.9	36.0	31.2	42.1
Income[b]											
Under $1 per day	16.7	N/A	4.2	3.2	14.5	13.2	9.8	20.2	6.3	N/A	8.7
Above $1 per day	64.5	N/A	31.4	11.3	60.3	31.8	35.8	65.2	19.4	N/A	20.3
Age (years)											
60+	37.9	15.0	10.2	6.6	44.0	20.9	10.9	41.5	12.3	16.8	15.8
50-59	45.1	22.5	16.2	8.1	49.8	22.3	15.1	61.2	11.9	27.9	26.2
40-49	46.1	21.1	17.5	8.6	53.6	25.7	18.4	58.4	20.1	27.4	27.3
30-49	54.2	21.0	19.4	8.9	57.9	23.3	20.0	66.0	14.9	32.1	22.5
16-29	38.0	12.1	14.9	7.3	40.6	17.9	10.2	46.0	13.1	24.6	8.0

[a]Income figures for Kenya not available and not sufficient coverage for Uganda.
[b]30.4 days per month.

Table 3.2: Formal penetration rates: estimated and warranted

	Mark IIIe Estimate[a]	Warranted[b]	Over-performance[c]	Finscope Formally Banked
Botswana	47.0	46.8	0.1	43.4
Ghana	16.2	26.0	-9.8	-
Kenya	10.0	14.8	-4.8	17.0
Lesotho	17.0	29.7	-12.7	-
Malawi	21.1	15.0	6.2	16.0
Mozambique	11.8	17.6	-5.8	7.9
Namibia	28.4	38.5	-10.2	47.8
Nigeria	14.8	11.0	3.8	21.1
Pakistan	12.2	21.3	-9.1	11.0
Rwanda	22.9	11.7	11.1	15.3
South Africa	46.0	51.1	-5.1	53.9
Swaziland	35.3	27.9	7.4	-
Tanzania	5.0	16.3	-11.3	14.3
Uganda	20.2	17.7	2.6	26.1
Zambia	15.4	17.2	-1.8	14.5

[a] Honohan(2008a).
[b] Fitted value from equation 3.4 in Honohan (2008a) showing expected penetration for a country with the same GDP per capita, age dependency, ownership of mobile phones and quality of institutions index.
[c] Mark IIIe estimates minus warranted.

The relationship between education and access to formal banking services is confirmed in Table 3.1 which provides the financial services penetration rates for those with above secondary education and those who did not complete primary education. Individuals with less than full primary education display very low levels of financial access, with the poorly educated in Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania and Zambia recording penetration rates between roughly 2 and 6 percent. In contrast, individuals with low levels of education in relatively more affluent countries, South Africa, Namibia and Botswana and display penetration rates of 28, 23 and 20 percent respectively, reflecting the greater depth in local financial infrastructure. The level of financial inclusion of lower education individuals in Uganda stands out for particular note at 20 percent. More generally, Figures A.3 and A.4 in Appendix A graphically illustrate the underlying distributions of education level for the banked and unbanked populations for the pooled dataset and confirm the conclusion from the country level summary statistics.

In line with previous studies I also find that urban financial services penetra-

tion rates are considerably higher than those in rural areas. There is greater formal financial penetration among men than women for ten Sub-Saharan African countries, with the exception of Namibia, and the middle-aged tend to have slightly more usage than the youngest and oldest age categories, but the differences here are slight.

Figures A.5 and A.6 in Appendix A illustrate the clear differences in the distribution of financial sector knowledge between the banked and unbanked populations. The differences are less clear for time to grocery store but the banked population are still more likely to experience a shorter time to store (see figures A.7 and A.8).

3.3.2 Methodology

The first part of the analysis ascertains the determinants of access to formal financial services at the individual level. Following a series of univariate tests, I employ a multivariable probit model. The simplest model to assess the probability of a household or individual i in country n having an account (Use=YES) would be:

$$Pr(USE_{i,n} = YES_{i,n}) = f(IND_{i,n}, GEO_{i,n}, NAT_n^f, NAT_n^{n,f}) \tag{3.1}$$

In the equation $\text{IND}_{i,n}$ are characteristics of the individual respondent, $\text{GEO}_{i,n}$ are characteristics of that individual's local environment, NAT_n^f are country characteristics which are thought of as being subject to the influence of financial access policy and NAT_n^{nf} are other country characteristics or non-financial characteristics. Individual characteristics can be broken down into socioeconomic variables such as monthly income, education, financial sector knowledge, age, gender, and psychometric variables such as risk aversion and trust in banks. Individual level geographical variables include an urban dummy, time to grocery store (agnostic to the mode of transport) and whether an individual has a mobile phone or not. With ten countries in the pooled dataset, it was deemed prudent to use country controls or dummy variables rather than including a myriad of country level financial characteristics and other country level variables, an approach taken by Beck and Brown (2010).

In addition, to help control for unobserved regional heterogeneity and the related problem of omitted variables, a series of sub-national district controls are included. Specifically, I control for five Ugandan provinces, five Rwandan provinces, nine South African provinces, nine Zambian provinces, eleven Mozambique provinces, 13 regions in Namibia, 25 districts in Botswana, 26 regions in Tanzania, 30 districts in Malawi and 37 states in Nigeria.[9]

Reflecting the literature, I expect the demand side determinants such as income and education to have strong positive coefficients in the assessment of the determinants of personal financial access. The measure of financial sector knowledge, which is related to education level, is also likely to be significant and positively related to the likelihood of being formally banked. I expect that trust in banks will have a positive influence on being banked but are less certain on the relationship the measure of risk aversion will display.

In line with the findings of Beck and Brown (2010), I anticipate that the location of the respondent in relation to banking services (proxied by distance to the nearest grocery store) will be significantly and negatively related to the likelihood of being banked. The interpretation of the mobile phone coefficient is more complex. At least in the early stage of the roll-out of mobile telecommunications, possession of a mobile phone is likely to indicate proximity to services as well as individual wealth. As mobile phones increasingly reach rural areas, the ability to interpret the mobile dummy as a measure of proximity to services becomes less clear. However one decides to interpret the mobile phone variable, I consider it an important control variable.

In the second step of the analysis, I attempt to find a causal link between access to formal banking services and income. I model the determinants of monthly personal income using equation 3.2 as follows:

$$INCOME_{i,n} = f(BANKED_{i,n}, IND_{i,n}, GEO_{i,n}, NAT_{i,n}) \qquad (3.2)$$

There is reason to suspect that usage of financial services may not be exogenous, which could lead to misleading estimates. This suspicion is confirmed

[9] Attempts were made to conduct the analyses in this chapter using controls at the electoral area (EA) or sub-location area. While there was evidence to suggest that the core results of this chapter did not change, the approach was undermined by the fact that there were in fact 5,000 electoral areas for 50,000 observations with some electoral areas only having one or two observations.

from the model of the determinants of usage of financial services in this chapter. The channel whereby access to financial services influences income is at least as plausible as the likely mechanism whereby passing a threshold level of income opens up the opportunity for an individual to personally access formal banking services. If this is the case, reverse causality is likely to lead to inconsistent estimation of the role played by usage of financial services in determining income in the Ordinary Least Squares (OLS) regression.

An additional form of bias in OLS estimates can be caused when unobserved heterogeneity at the individual level such as ambition, ability or conscientiousness may make the individual more likely to simultaneously have a higher income and have a formal bank account. Such endogeneity may lead to an over estimation of the role played by formal banking in determining income in OLS estimates.

As the potential endogeneity of personal access to formal financial services brings into question the validity of the ordinary least squares estimates, I propose the use of trust in banks as an instrumental variable for bank use. Trust in banks has been suggested in the literature as a reason for exclusion from formal banking system by Bertrand et al. (2004) and I expect the first stage regression to show that bank trust is significantly related to access to formal banking and that when I control for an individual's innate level of risk aversion, that trust in banks is not related to income level.

I must go further than proving the relevance of trust in banks as an instrumental variable and first argue that banktrust is not correlated with omitted variables (the source of the endogeneity); in essence that there is no covariance between banktrust (Z) and the error term in the second stage regression (Cov ϵ, Z = 0), and that there is sufficient exogenous variation in banktrust. I argue that the relationship between psychometric variables such as trust and attitudes to risk, and monthly income are complex and unlikely to exhibit any predictable relationship. When it comes to determining future monthly income, I argue that while trust in others, whether colleagues, customers or fellow villagers, is likely to have a positive influence on income at least outside of dysfunctional institutional environments, trust in banks is not likely to influence future income. If the decision to trust banks was related to a general preference to be risk averse,

and risk aversion had a systematic relationship with income, then banktrust may not be a good instrument. However, as I include a measure for risk aversion in the model I can rule out this channel, at least as far as the measure of risk aversion captures the psychometric phenomenon of risk aversion.

Intuition would suggest that banktrust should be correlated with education level and level of financial sector knowledge, and this is confirmed in basic cross tabulations. In particular there is reason to believe that banktrust may be related to the level of annual banking transactions an individual engages in, although I do not have a measure of this. However, I argue that there is some exogenous element to bank trust that is independent of all potential correlates, emerging from an inner trustfulness to part with ones money that is sufficient, in the African context, to allow the use of trust in banks as an instrument. To support this strategy, the instrumental variables strategy is supported by an attempt to control for as many potential correlates of banktrust as possible, including the use of a series of interaction terms.

The instrumental variable estimates allow me to test for the endogeneity of formally banked by comparing the coefficients between the OLS and IV estimators, otherwise known as the Hausman test. If I find a considerable difference in the coefficients then it was necessary to instrument in the first place to derive accurate estimates. I use a bootstrapped approach to calculating the Hausman test statistic because of the adherence to robust standard errors.

I remain open to the idea that an individual's education is in fact endogenous in the specification and I did attempt to use instrumental variables to overcome this problem. I investigated the use of time to grocery store as a potential instrument but in truth the nature of the datasets and the precise nature of the time to grocery store variable precludes an obvious instrument for education. Likewise financial sector knowledge may be considered endogenous to banking status and while an argument could be made that financial sector knowledge is endogenous to income, the endogeneity of this relationship is less obvious. In any case, I present the results with and without financial sector knowledge as a control variable.

3.4 Empirical Results

3.4.1 Determinants of Formally Banked

The results of univariate tests which compare the differences in means for the sub-samples of formally banked and non-formally banked respondents are reported in Table 3.3. This first step of the analysis confirms the predictions from the literature. Firstly, in terms of measures of household location, I find that banked respondents are more likely to be urban dwellers, experience a shorter time to the local grocery store and have a mobile phone as the difference in the means of the two sub-samples for each of these variables is statistically significant at the 1 percent level. Gender differences are found in the two sub-samples as I find that men are more likely to have personal access to formal banking services.

In accordance with expectations, univariate tests find that the level of education, financial sector knowledge and monthly income are all higher for the formally banked sub-sample of the population. As for psychometric variables, the central prediction of lower trust in banks among the unbanked population is confirmed by the univariate tests. I also find that the unbanked population displays higher levels of risk aversion compared with those integrated into the formal banking system.

In the next step of the analysis, I investigate the determinants of the use of formal bank services more systematically using multivariable probit regressions and find some interesting correlation results. The results are presented in Table 3.4. The table reports the marginal effects defined as the change in the probability of an individual making formal use of banking services for an infinitesimal change in each independent, continuous variable, and by default, the discrete change in the probability for dummy variables or other discrete variables. While I provide results of the model without country controls (columns 1, 4 and 7), greater emphasis is placed on the results with country controls (columns 2, 5 and 8) and district controls (columns 3, 6 and 9). The more comprehensive the geographical controls are, the more unobserved regional heterogeneity is controlled for. Not only are the eleven countries in the dataset likely to be characterised by heterogeneous economic, financial and social circumstances, but different

districts within each country are likely to exhibit different geographical and economic characteristics.

Reading from column 9, the importance of education and financial literacy is confirmed. It is found that those who have completed primary education increase their chances of being banked by 4 percent compared with the omitted category of less than primary education or illiteracy, and when those with completed secondary education (13 percent increase in the likelihood of being banked) and those with above second level education (43 percent increase in the likelihood of being banked) are considered the relationship strengthens. In similar fashion, increasing financial sector knowledge by one unit is associated with an increase in the likelihood of being formally banked by 3 percent.[10]

Table 3.3: Univariate Tests: Determinants of Formally Banked

	All Households	Banked		t-statistic	Sample Test
		Yes	No		
Female	0.509	0.412	0.537	24.58	***
Mobile	0.350	0.753	0.238	-120.00	***
Urban	0.318	0.506	0.266	-51.61	***
BankTrust	0.396	0.724	0.303	-86.84	***
RiskAversion	0.322	0.259	0.334	16.15	***
FSKnow	3.719	6.058	3.047	-110.00	***
Time to Store	4.134	3.734	4.262	18.27	***
Educ	3.412	5.083	2.942	-130.00	***
LnIncome	3.652	4.722	3.304	-74.29	***

*** denotes the significance level of the results of the linear independent sample tests. The sample tests are conducted on an unweighted pooled dataset.

It is found that a 1 percent increase in monthly personal income increases the chances of being banked by 3 percent, while having a mobile phone increases the probability of being banked by 12 percent. This result adds weight to the reasonable suspicion of potential two way causality between banking status and income. Having trust in banks is associated with an 11 percent increase in the chances of being banked, a result that is statistically significant with or without country controls and under different specifications of the model. It is found that

[10]The relationship between financial sector knowledge and being formally banked could be considered bidirectional, whereby having a bank account increases your financial sector knowledge and having financial sector knowledge increases the likelihood of having a bank account.

risk aversion is inversely related to formally banked in the full specification with country controls but further country level analysis indicates that this result in the pooled dataset is largely driven by the Nigerian data.

While the role of gender is confirmed as an important correlate of personal financial access in summary statistics and univariate tests, it is revealing that when psychometric variables and financial sector knowledge are controlled for gender is not statistically significantly related to financial status. As indicated earlier, the time to grocery store variable may not be a perfect proxy for time to nearest bank branch and I find that the time to grocery store variable is not significantly related to financial status when country or district level controls are included. However, I do find that living in an urban environment increases the chances that an individual is formally banked.

The country level analysis confirms the results but with some striking differences between countries (see Table 3.5). The extent of the role played by income level, education and financial sector knowledge varies by country. In Namibia, South Africa, Tanzania and Botswana it is found that a 1 percent increase in monthly personal income is associated with increases in the chances of being banked by 14 percent, 11 percent 11 percent and 10 percent respectively compared with a less sizeable significant relationship in some of the poorer countries in the sample such as Mozambique, Zambia and Nigeria.

Table 3.4: Determinants of Formally Banked - Marginal Effects

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LnPerIncome	0.04***	0.03***	0.03***	0.04***	0.03***	0.03***	0.04***	0.03***	0.03***
	(0.004)	(0.009)	(0.002)	(0.005)	(0.008)	(0.002)	(0.005)	(0.007)	(0.002)
Primary completed	0.09***	0.07***	0.06***	0.09***	0.06***	0.05***	0.08***	0.05**	0.04***
	(0.017)	(0.018)	(0.011)	(0.019)	(0.014)	(0.011)	(0.017)	(0.015)	(0.011)
Secondary completed	0.22***	0.23***	0.21***	0.19***	0.17***	0.15***	0.17***	0.15***	0.13***
	(0.022)	(0.035)	(0.018)	(0.026)	(0.015)	(0.016)	(0.022)	(0.017)	(0.015)
Some third level	0.58***	0.63***	0.63***	0.51***	0.48***	0.47***	0.47***	0.44***	0.43***
	(0.028)	(0.064)	(0.030)	(0.031)	(0.029)	(0.027)	(0.029)	(0.030)	(0.026)
Age/100	0.93***	0.98***	0.90***	0.90***	0.99***	0.93***	0.90***	0.97***	0.91***
	(0.129)	(0.157)	(0.101)	(0.138)	(0.175)	(0.107)	(0.127)	(0.138)	(0.100)
Age/100 sq	-0.77***	-0.85***	-0.80***	-0.68***	-0.83***	-0.80***	-0.70***	-0.83***	-0.79***
	(0.142)	(0.210)	(0.120)	(0.148)	(0.233)	(0.126)	(0.138)	(0.177)	(0.116)
Female	-0.01	-0.03**	-0.03***	0.00	-0.01	-0.01*	0.00	-0.01	-0.01
	(0.007)	(0.008)	(0.005)	(0.007)	(0.007)	(0.005)	(0.007)	(0.007)	(0.005)
Mobile Phone	0.20***	0.20***	0.18***	0.18***	0.15***	0.14***	0.16***	0.13***	0.12***
	(0.013)	(0.026)	(0.009)	(0.015)	(0.019)	(0.008)	(0.013)	(0.019)	(0.009)
Urban	0.07***	0.07***	0.07***	0.05*	0.03**	0.03***	0.05*	0.03**	0.03***
	(0.017)	(0.013)	(0.008)	(0.023)	(0.011)	(0.008)	(0.021)	(0.009)	(0.008)
Time to Store[a]				0.01***	0.00	0.00	0.01**	0.00	0.00
				(0.003)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)
FSKnow				0.02***	0.04***	0.04***	0.02***	0.03***	0.03***
				(0.003)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)
BankTrust							0.14***	0.11***	0.11***
							(0.016)	(0.008)	(0.007)
RiskAversion							-0.02*	-0.02**	-0.02***
							(0.009)	(0.006)	(0.006)
Country Controls		Yes			Yes			Yes	
District Controls			Yes			Yes			Yes
Observations	43,788	43,788	43,774	36,759	36,759	36,747	36,062	36,062	36,050

[a] Mozambique and Uganda are excluded when time to grocery store is included.

Country controls involve a series of country dummies and clustered standard errors at the country level.

District controls involve a series of country district dummies and clustered standard errors at the district level.

Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

Table 3.5: Determinants of Formally Banked by Country - Marginal Effects

VARIABLES	Botswana	Malawi	Mozambique	Namibia	Nigeria	Rwanda	S. Africa	Tanzania	Uganda	Zambia
LnPerIncome	0.10***	0.03***	0.01***	0.14***	0.01***	0.07***	0.11***	0.11***	0.08***	0.01***
	(0.011)	(0.004)	(0.002)	(0.035)	(0.001)	(0.007)	(0.011)	(0.011)	(0.022)	(0.002)
Primary completed	0.22**	0.04***	0.00	0.21*	0.01	0.09***	0.05	0.05	-0.03	0.02
	(0.079)	(0.009)	(0.004)	(0.102)	(0.011)	(0.028)	(0.062)	(0.062)	(0.093)	(0.017)
Secondary completed	0.23***	0.07***	-0.00	0.34***	0.08***	0.20**	0.18***	0.18***	0.32***	0.12**
	(0.071)	(0.021)	(0.005)	(0.098)	(0.015)	(0.073)	(0.035)	(0.035)	(0.059)	(0.038)
Some third level	0.51***	0.37***	0.00	0.37***	0.31***	0.13	0.34***	0.34***	0.34***	0.38***
	(0.079)	(0.102)	(0.006)	(0.101)	(0.026)	(0.149)	(0.055)	(0.055)	(0.040)	(0.076)
Age/100	2.66***	0.37	0.15***	1.70*	0.58***	0.81*	2.56***	2.56***	-0.04	0.88***
	(0.640)	(0.191)	(0.043)	(0.735)	(0.092)	(0.389)	(0.306)	(0.306)	(0.764)	(0.150)
Age/100 sq	-1.82*	-0.34	-0.12*	-1.38	-0.45***	-0.60	-2.88***	-2.88***	-0.10	-0.87***
	(0.788)	(0.223)	(0.052)	(0.884)	(0.095)	(0.465)	(0.430)	(0.430)	(0.798)	(0.178)
Female	0.07	-0.00	-0.00	0.04	-0.01*	0.03***	0.03	0.03	-0.08*	0.00
	(0.045)	(0.009)	(0.002)	(0.035)	(0.006)	(0.005)	(0.033)	(0.033)	(0.042)	(0.007)
Mobile	0.17***	0.08***	0.03***	0.06	0.11***	0.04	0.19***	0.19***	0.18***	0.02
	(0.049)	(0.012)	(0.009)	(0.053)	(0.009)	(0.035)	(0.057)	(0.057)	(0.039)	(0.016)
Urban	-0.27***	0.01	0.02***	0.08	0.03***	0.01	0.05	0.05	0.12***	0.01
	(0.050)	(0.027)	(0.005)	(0.046)	(0.007)	(0.030)	(0.062)	(0.062)	(0.015)	(0.010)
Time to Store	0.00	-0.00		-0.02	0.00	-0.00	0.00	0.00		0.00
	(0.011)	(0.003)		(0.012)	(0.002)	(0.003)	(0.014)	(0.014)		(0.003)
FSKnow	0.10***	0.02***	0.01***	0.05***	0.02***	0.03**	0.06***	0.06***	0.00	0.01***
	(0.020)	(0.002)	(0.001)	(0.011)	(0.002)	(0.009)	(0.010)	(0.010)	(0.005)	(0.002)
BankTrust	0.27***	0.07***	0.06***	0.32***	0.08***	0.07***	0.27***	0.27***	0.02	0.04
	(0.065)	(0.015)	(0.008)	(0.043)	(0.008)	(0.012)	(0.041)	(0.041)	(0.038)	(0.020)
RiskAversion	-0.07	-0.01	0.00	0.10**	-0.02***	-0.02	-0.07	-0.07	-0.02	-0.02*
	(0.076)	(0.008)	(0.002)	(0.038)	(0.005)	(0.017)	(0.042)	(0.042)	(0.103)	(0.007)
District Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,007	3,964	3,728	993	21,109	1,809	2,773	2,773	580	2,511

District controls involve a series of country dummies and clustered standard errors at the district level.

Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

The results from the pooled regression in relation to education are broadly confirmed in the country level regressions, particular for the most educated groups. At lower levels of education the relationship with personal financial access loses statistical significance in countries such as Mozambique, Nigeria, South Africa, Tanzania, Uganda and Zambia. The location variables reveal some interesting results. While the effect of having a mobile phone is uniformly positive for the majority of countries, the coefficients on time to store and the urban dummy reveal some points worthy of note. Mozambique, Nigeria, and Uganda are the only countries in the sample that record a positive and significant relationship between urban dwelling and formally banked. In Botswana the opposite result is achieved indicating that living in an urban environment means an individual is less likely to use formal banking services when all other variables are controlled for. The coefficient for time to grocery store remains insignificant for all countries when district controls are included.

The absence of a role for gender in determining financial access, when all other variables are included, can be seen in the majority of the country level regressions. However, in Nigeria and Uganda being female reduced the likelihood that an individual is formally banked, whereas in Rwanda the opposite is the case. In relation to trust in the financial system it is found that trust in banks increases the likelihood of being formally banked in all countries with the exception of Uganda and Zambia.[11]

3.4.2 Personal Financial Access and Income

Although personal access to financial services is likely to have a slow-burning effect on an individual's welfare, nevertheless, it may be possible to detect such an effect in cross-sectional data, if access changes only gradually. Table 3.7 displays the results of the multivariable investigation into the causal relationship between personal financial access and personal income with the pooled dataset.

The ordinary least square estimates (columns 1-4) confirm the prior that having personal access to formal financial services is associated with higher income; estimated at approximately 1 percent higher income per month when

[11]The results do indicate a positive relationship between the two variables in Uganda and Zambia, but these coefficients are not statistically significant.

either country or district controls are included. Having a mobile phone is both a proxy for location and income/wealth level and it is unsurprising that it is positively and significantly related to monthly personal income. It is found that being female is associated with a 39 percent lower monthly income (in column 4).

A number of less expected results are also present in the data. In line with recent concerns over returns to education in Africa, no statistically significant relationship between education level and income is found when country controls are concluded Pritchett (2001). However, when greater regional heterogeneity is controlled for, the relationship between education and income is re-established. The results show that differences between countries in average education levels and average attitudes to risk are more important than levels of education and risk aversion at the individual level. The R-squared for the OLS models with country controls is 0.19, higher than the model without country controls.

The analysis shows that while time to grocery store does not play a statistically significant role in determining the likelihood that an individual is banked, it does play a statistically significant role in the determination of income. Specifically, it is found that at the 5 percent level of significance, time to grocery store is negatively related to income in the specification with district controls.

The central challenge in assigning causation to access to financial services is the issue of endogeneity. In the methodology section the use of trust in banks as an instrumental variable in an exactly identified equation is proposed to overcome this issue.

Examining the relevance of trust in banks as an instrumental variable, the first stage regression shows that bank trust is statistically significantly related to personal access to financial services, across a range of specifications and with country and district fixed effects (see Table 3.6). I find that the Angrist-Pischke multivariate F-test of excluded instruments at 69.47 (prob $>$ F $=$ 0.00), is significantly higher than the general rule of thumb suggested by Staiger and Stock (1997) and the Stock and Yogo (2005) critical values for the specification that includes country controls and 159.76 for the model with district controls. As a result, I feel comfortable rejecting the null hypothesis of weak instruments in the pooled dataset.

Table 3.6: First Stage Probit Regression

VARIABLES	(1)	(2)	(3)	(4)
BankTrust	0.17***	0.14***	0.16***	0.12***
	(0.003)	(0.004)	(0.020)	(0.009)
Primary completed	0.04***	0.03***	0.03	0.01
	(0.004)	(0.004)	(0.017)	(0.007)
Secondary completed	0.14***	0.13***	0.14**	0.09***
	(0.005)	(0.006)	(0.030)	(0.011)
Some third level	0.47***	0.44***	0.47***	0.38***
	(0.006)	(0.008)	(0.051)	(0.015)
Age/100	1.02***	1.01***	1.01***	0.97***
	(0.051)	(0.057)	(0.145)	(0.093)
Age/100 sq	-0.87***	-0.84***	-0.91***	-0.85***
	(0.058)	(0.065)	(0.138)	(0.097)
Female	-0.02***	-0.01**	-0.02*	-0.01*
	(0.003)	(0.004)	(0.010)	(0.005)
Mobile	0.20***	0.17***	0.18***	0.13***
	(0.004)	(0.004)	(0.019)	(0.008)
Urban	0.05***	0.04***	0.05**	0.02**
	(0.004)	(0.004)	(0.010)	(0.009)
Time to Store		0.00*		-0.00
		(0.001)		(0.002)
FSKnow		0.02***		0.04***
		(0.001)		(0.002)
RiskAversion		-0.01**		-0.01**
		(0.004)		(0.005)
Constant	-0.25***	-0.29***		
	(0.011)	(0.012)		
Country Controls			Yes	
District Controls				Yes
Observations	43,788	36,062	43,788	36,061
Adj. R-squared	.	.	.	.
Angrist-Pischke F-Stat	2490.66	1304.46	69.47	159.76

Country controls involve a series of country dummies and clustered standard errors at the country level. District controls involve a series of country dummies and clustered standard errors at the district level.
Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

The central results from the respective country level first stage regressions are presented at the bottom of tables 3.8 and 3.9. I find that bank trust is statistically significantly related to personal access to financial services for eight of the ten countries and that the Angrist-Pischke multivariate F-test of excluded instruments is greater than ten for all but three of the countries.

Making the case that banktrust only affects personal income through the use of banking services is more challenging. I argued in the previous section why I believe this to be the case and in the absence of any formal test of the validity

of an instrument, I point to the absence of a relationship with banktrust in the multivariable OLS regression examining the determinants of income under any of the specifications, and irrespective of whether risk aversion is included in the model. [12]

The instrumental variable results are found in columns 5-8 in Table 3.7. A number of specifications with and without country fixed effects are presented and the results are consistent throughout. It is found that access to formal banking services increases an individual's monthly income by 1.67 percent on average, an economically more significant result than the ordinary least squares estimates suggested. Evaluated at the mean, 1.67 percent of monthly income represents $1.41.

This result is achieved under the IV specification with district fixed effects. In comparison the specification with country fixed effects finds that access to formal banking services increases an individual's monthly income by 1.92 percent on average, an estimate that is higher than the IV specification with district fixed effects, suggesting that the district fixed effects control for a greater degree of omitted variables or district level heterogeneity.

The comprehensiveness of the control variables helps provide the case for the independence of banktrust to the error term. To add further robustness to the analysis, a number of interaction terms were separately added to the model. For all combinations interaction terms between urban, female, education level, financial sector knowledge quartile and risk aversion, the coefficients on the instrumental variable regression are almost identical to the specification without interaction terms as reported in Table 3.7.

While I remain open to the critique that education is in fact endogenous to income and that the model may require re-specification, I have reason to believe that this is not a significant issue for the purposes of the empirical approach. First, the coefficient(s) on education, whether I use the one variable or the three dummy categories, is not significant in the country fixed effect ordinary least squares estimation. Second, when I omit education from this model very modest changes in the coefficient on formally banked are observed.

[12] A series of reduced reform equations were estimated for increasing number of control variables, country and district fixed effects. I find that trust in banks does not have a statistically significant independent relationship with personal income once formally banked is included as an explanatory variable.

Table 3.7: Natural Log of Personal Income and Use of Banked Services

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS Estimates				IV: Trust in Banks			
Banked	1.27***	1.32***	1.04***	0.92***	1.65***	2.01***	1.92***	1.67***
	(0.027)	(0.031)	(0.160)	(0.066)	(0.114)	(0.164)	(0.298)	(0.357)
Primary completed	0.11***	0.13***	0.10	0.22***	0.08***	0.09***	0.06	0.21***
	(0.020)	(0.025)	(0.147)	(0.054)	(0.023)	(0.028)	(0.123)	(0.054)
Secondary completed	0.07*	0.16***	0.21	0.38***	-0.00	0.06	0.06	0.30***
	(0.028)	(0.034)	(0.150)	(0.075)	(0.034)	(0.041)	(0.103)	(0.083)
Some third level	0.19***	0.28***	0.46*	0.52***	-0.02	-0.04	-0.01	0.22
	(0.043)	(0.052)	(0.171)	(0.099)	(0.071)	(0.089)	(0.193)	(0.177)
Age/100	8.21***	9.08***	8.75***	29.52***	7.82***	8.39***	7.84***	8.79***
	(0.292)	(0.340)	(1.310)	(0.587)	(0.312)	(0.376)	(1.292)	(0.706)
Age/100 sq	-8.58***	-9.51***	-9.14***	-9.17***	-8.25***	-8.95***	-8.32***	-8.54***
	(0.335)	(0.390)	(1.508)	(0.606)	(0.344)	(0.407)	(1.501)	(0.691)
Female	-0.42***	-0.45***	-0.44***	-0.39***	-0.41***	-0.44***	-0.41***	-0.38***
	(0.018)	(0.021)	(0.091)	(0.047)	(0.018)	(0.021)	(0.082)	(0.047)
Mobile	0.30***	0.28***	0.32***	0.42***	0.22***	0.16***	0.14*	0.32***
	(0.022)	(0.026)	(0.058)	(0.037)	(0.033)	(0.039)	(0.064)	(0.061)
Urban	0.05*	-0.04	-0.06	-0.07	0.02	-0.08**	-0.12	-0.09
	(0.020)	(0.026)	(0.163)	(0.051)	(0.022)	(0.026)	(0.149)	(0.052)
Time to Store		0.04***		-0.03*		0.03***		-0.02*
		(0.005)		(0.010)		(0.006)		(0.010)
FSKnow		-0.00		0.05***		-0.02***		0.02
		(0.005)		(0.010)		(0.006)		(0.017)
RiskAversion		0.21***		0.02		0.22***		0.03
		(0.023)		(0.041)		(0.024)		(0.041)
Constant	0.93***	0.57***	1.54***	0.69***	1.01***	0.78***		
	(0.060)	(0.072)	(0.317)	(0.136)	(0.066)	(0.087)		
Country Controls			Yes				Yes	
District Controls				Yes				Yes
Observations	43,788	36,062	43,788	36,062	43,788	36,062	43,788	36,061
R-squared	0.15	0.15	0.19	0.27	0.14	0.14	0.12	0.16
Adj. R-squared	0.15	0.15	0.19	0.27	0.14	0.14	0.12	0.15

Mozambique and Uganda are excluded when time to grocery store is included. Country controls involve a series of country dummies and clustered standard errors at the district level. District controls involve a series of district dummies and clustered standard errors. Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

To enrich the analysis, the model for each individual country is estimated and Table 3.8 and 3.9 present the results. In South Africa, Namibia, Botswana, Malawi, Mozambique and Nigeria the positive role played by access to financial services in determining income is confirmed, noting in the case of the latter five countries the relationship becomes economically more significant when we use instrumental variables. While in all countries we are able to find a correlation between the use of formal services and monthly income through the OLS specification, we are unable to find a relationship in the instrumental variable models for Rwanda, Tanzania, Uganda and Zambia suggesting considerable heterogeneity in national circumstances. Analysis of the respective first stage regressions helps explain these results. In countries where banktrust is statistically significantly related to personal access to financial services at the 1 percent level and the F-test for excluded instruments is greater than 30, the instrumental

variables estimator produces statistically significant results.

There is also reason to believe that for Uganda this result can in part be attributed to the unorthodox approach to measuring income, whereas the nature of the banktrust variable for Tanzania may undermine the IV (Instrumental Variable) approach.

The country specific regressions also highlight the different mechanisms at play in determining income across diverse countries in Africa particularly around the urban/rural divide. Urban dwellers are likely to have higher incomes in Namibia, Rwanda, South Africa and Tanzania, when all other variables are controlled for and district level controls are included. However the opposite is the case in Mozambique, Nigeria and Zambia. The binary variable for female behaves as expected in all countries but it is not significant in Namibia and Uganda.

The higher IV estimates provide an insight into the nature of the endogeneity between banked and income level in this dataset. Endogeneity driven by unobservables such as ambition, ability or conscientiousness would have lead to an upward bias in the OLS estimates. The IV estimates suggest that this form is not the most significant source of endogeneity. Alternatively, reverse causality can be responsible for either an upward or downward bias in the OLS estimates, and may account for the higher coefficients achieved once for banked is instrumented for using banktrust.

Alternatively, attenuation bias or regression dilution caused by measurement error in the formally banked variable could be responsible for the higher instrumental variable estimates of the relationship between banked in income. It could be plausibly argued that it is household level access to financial services that plays a role in determining income. For example, parental access to financial services can help maintain consistent investments in education that facilitate higher incomes for young adults. An even more reasonable explanation might come from the nature of inter-household transfers and borrowings which can help maintain the income levels of a particular individual in the household, through helping to overcome health or other income shocks, and prevent against costly divestment of productive assets.

Table 3.8: Natural Log of Personal Income and Use of Banked Services by Country I

	Botswana		Malawi		Mozambique		Namibia		Nigeria	
VARIABLES	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Banked	1.72***	3.24**	0.66***	2.40***	0.47**	0.83***	1.28***	2.19***	0.75***	1.68**
	(0.228)	(0.998)	(0.081)	(0.576)	(0.128)	(0.240)	(0.206)	(0.506)	(0.074)	(0.580)
Primary completed	0.26	0.01	0.35***	0.30***	-0.05	-0.05	0.00	-0.13	0.22*	0.24**
	(0.208)	(0.254)	(0.047)	(0.050)	(0.058)	(0.058)	(0.107)	(0.131)	(0.084)	(0.080)
Secondary completed	0.48	0.18	0.43***	0.18	-0.01	-0.01	0.56**	0.30	0.32**	0.25*
	(0.274)	(0.347)	(0.106)	(0.134)	(0.112)	(0.105)	(0.131)	(0.165)	(0.112)	(0.117)
Some third level	1.63***	0.89	1.08***	0.32	-0.11	-0.10	1.35***	1.11***	0.42**	0.04
	(0.285)	(0.506)	(0.156)	(0.302)	(0.133)	(0.123)	(0.238)	(0.216)	(0.133)	(0.266)
Age/100	13.88***	10.14*	4.53***	3.28***	3.24***	3.04***	12.30***	9.88***	10.08***	9.37***
	(3.511)	(5.093)	(0.807)	(0.941)	(0.696)	(0.715)	(1.611)	(1.922)	(0.766)	(0.928)
Age/100 sq	-11.77**	-8.85	-5.55***	-4.34***	-3.39**	-3.20***	-10.27***	-8.09***	-9.78***	-9.19***
	(3.880)	(5.158)	(0.929)	(1.053)	(0.856)	(0.861)	(1.721)	(2.116)	(0.781)	(0.896)
Female	-0.26*	-0.25*	-0.13**	-0.15***	-0.15*	-0.15**	-0.16	-0.17	-0.51***	-0.48***
	(0.111)	(0.100)	(0.039)	(0.040)	(0.054)	(0.052)	(0.107)	(0.100)	(0.076)	(0.077)
Mobile	0.45*	0.19	0.55***	0.31**	0.24***	0.19***	0.18	0.09	0.48***	0.36***
	(0.160)	(0.254)	(0.058)	(0.094)	(0.036)	(0.039)	(0.127)	(0.136)	(0.055)	(0.081)
Urban	-0.07	0.23	0.26	0.19	-0.12	-0.13	0.21	0.12	-0.07	-0.11
	(0.256)	(0.223)	(0.201)	(0.207)	(0.070)	(0.069)	(0.148)	(0.135)	(0.061)	(0.066)
Time to Store	0.02	0.01	-0.06***	-0.05***	N/A	N/A	0.04	0.06	-0.01	-0.01
	(0.036)	(0.036)	(0.014)	(0.014)	N/A	N/A	(0.025)	(0.032)	(0.021)	(0.020)
FSKnow	0.23***	0.10	0.10***	0.03	0.12***	0.10***	0.07**	0.03	0.04*	-0.01
	(0.053)	(0.100)	(0.015)	(0.024)	(0.018)	(0.022)	(0.018)	(0.030)	(0.015)	(0.028)
Risk Aversion	0.19	0.23	0.00	0.02	-0.08	-0.08	0.02	-0.03	0.05	0.07
	(0.135)	(0.171)	(0.057)	(0.053)	(0.105)	(0.101)	(0.110)	(0.125)	(0.073)	(0.074)
Constant	-0.72		1.40***		2.09***		-0.09		0.64**	
	(0.720)		(0.282)		(0.144)		(0.411)		(0.200)	
District Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,019	1,018	3,964	3,964	3,728	3,728	993	993	21,109	21,109
R-squared	0.53	0.39	0.32	0.14	0.25	0.17	0.47	0.38	0.20	0.13
Adj. R-squared	0.51	0.36	0.32	0.13	0.25	0.16	0.46	0.36	0.20	0.13
First Stage										
Banktrust is significant		***		***		***		***		***
Angrist-Pischke F-Stat		35.78		19.83		171.78		35.22		85.14

District controls involve a series of district dummies and clustered standard errors at the district level.
Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

Table 3.9: Natural Log of Personal Income and Use of Banked Services by Country II

	Rwanda		S.Africa		Tanzania		Uganda		Zambia	
VARIABLES	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Banked	0.79***	0.52	1.64***	1.46**	0.39***	2.51	0.31*	2.35	0.41*	1.95
	(0.040)	(0.583)	(0.181)	(0.543)	(0.069)	(1.911)	(0.078)	(4.020)	(0.149)	(1.562)
Primary completed	0.17*	0.20*	-0.38*	-0.36*	0.22*	0.35*	0.20*	0.18	0.39*	0.38*
	(0.044)	(0.086)	(0.165)	(0.165)	(0.081)	(0.154)	(0.070)	(0.190)	(0.167)	(0.158)
Secondary completed	0.62*	0.70***	0.07	0.12	0.29**	0.09	0.20	-0.45	0.50	0.35
	(0.143)	(0.117)	(0.163)	(0.198)	(0.100)	(0.209)	(0.151)	(1.374)	(0.219)	(0.190)
Some third level	0.71***	0.81***	0.90**	0.97**	0.74***	0.23	0.93**	0.23	0.17	-0.65
	(0.050)	(0.225)	(0.264)	(0.311)	(0.084)	(0.491)	(0.196)	(1.301)	(0.388)	(0.751)
Age/100	3.45*	3.83**	9.65***	9.98***	1.33	0.59	1.28	0.78	20.43**	18.77***
	(0.865)	(1.386)	(1.212)	(1.120)	(0.749)	(1.032)	(1.024)	(2.040)	(4.117)	(5.076)
Age/100 sq	-4.05**	-4.38***	-6.79***	-7.06***	-1.45	-1.01	-1.40	-0.53	-21.99**	-20.39***
	(0.821)	(1.188)	(1.312)	(1.134)	(0.793)	(1.001)	(1.037)	(2.228)	(4.889)	(5.689)
Female	-0.25**	-0.25***	-0.51***	-0.51***	-0.29***	-0.22	-0.09	0.02	-0.29**	-0.28***
	(0.048)	(0.044)	(0.077)	(0.074)	(0.065)	(0.112)	(0.063)	(0.224)	(0.069)	(0.053)
Mobile	0.44**	0.48**	0.65***	0.69***	0.36***	-0.03	0.40**	0.02	0.01	-0.10
	(0.086)	(0.158)	(0.106)	(0.203)	(0.071)	(0.352)	(0.079)	(0.686)	(0.124)	(0.169)
Urban	0.19*	0.21***	0.28	0.29	0.18**	0.21*	-0.05	-0.21	-0.46	-0.43*
	(0.053)	(0.056)	(0.193)	(0.167)	(0.059)	(0.098)	(0.070)	(0.321)	(0.207)	(0.214)
Time to Store	-0.04	-0.05*	-0.03	-0.03	0.02	0.01	N/A	N/A	-0.01	-0.02
	(0.022)	(0.022)	(0.033)	(0.033)	(0.010)	(0.015)	N/A	N/A	(0.030)	(0.022)
FSKnow	0.11**	0.12**	0.06*	0.07*	0.06***	-0.03	0.01	-0.01	0.11*	0.08
	(0.022)	(0.043)	(0.026)	(0.030)	(0.011)	(0.082)	(0.015)	(0.019)	(0.033)	(0.054)
RiskAversion	0.07	0.06	0.07	0.06	-0.11	-0.13	0.01	-0.02	-0.28*	-0.23*
	(0.074)	(0.066)	(0.078)	(0.083)	(0.077)	(0.080)	(0.113)	(0.309)	(0.098)	(0.106)
Constant	0.94*		0.25		1.95***		3.25***		-1.69*	
	(0.207)		(0.414)		(0.174)		(0.209)		(0.718)	
District Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,809	1,809	2,773	2,773	1,884	1,884	582	582	2,511	2,511
R-squared	0.39	0.31	0.38	0.37	0.31	-0.36	0.23	-0.58	0.19	0.14
Adj. R-squared	0.38	0.31	0.37	0.36	0.30	-0.39	0.21	-0.62	0.18	0.13
First Stage										
Banktrust is significant		*		***		No		No		*
Angrist-Pischke F-Stat		11.85		51.19		2.49		1.11		6.53

District controls involve a series of district dummies and clustered standard errors at the district level.

Robust standard errors in parentheses. ***p<0.001, **p<0.01, *p<0.05

3.4.3 Robustness

To lend weight to the instrumental variables approach I formally test for endogeneity of personal financial access by comparing the coefficients between the OLS and IV estimators. I use a bootstrapped approach to calculating the Hausman test statistic because of the adherence to robust standard errors. If I find a considerable difference in the coefficients then it was necessary to instrument in the first place to derive more consistent estimates. The test results indicate that there is reason to believe that the formally banked variable is endogenous to income. I strongly reject the null hypothesis of exogeneity when I instrument with banktrust and as a result the necessity of using instrumental variables is confirmed.

The analyses of the causal role played by access to formal banking services in determining personal income has been conducted with an important change to the income data. As noted previously, the reported results avoided technical problems of taking the natural log of a zero income by assuming that those households (10,632 in total and about 20 percent of the total pooled dataset) reporting zero income truly had very low but nonzero incomes, assumed to be $1 per month. While I stand by this approach, it may be open to challenge as it specifically changes relative income levels, particularly at low incomes. To help assuage concerns the investigation into personal income was performed under two alternative approaches; taking the natural log without adding the $1 to monthly personal income and therefore losing 10,632 of the poorest individuals and using the transformation x/(1+x) for an alternative scaling, an approach which produces more challenging coefficients for interpretation. The first approach produces a lower but statistically significant coefficient at the 5 percent level for the same specification represented in column 9 of Table 3.7, confirming a causal relationship. However, this result must be seen within the context of the loss of information associated with excluding 10,632 of the poorest individuals from the dataset, and hence the likely underestimating of the magnitude of the relationship. The second approach produces coefficients for all equations implied in Table 3.7 that are strongly statistically significant and larger than the corresponding OLS estimates.

3.5 Conclusion

The Finscope surveys greatly expand the information available on the use of financial services in Sub-Saharan Africa, and provide a platform for increased research on financial access in some of the poorest countries in the world, a contribution that will only be strengthened when repeat surveys are completed. This chapter has sought to understand this unique source of data on personal access to finanial services as a result these efforts make a significant contribution to the literature in this regard.

In this chapter, the importance of wider development efforts to the financial inclusion agenda is confirmed when it is found that income and education are key demand side determinants of access to formal banking. In the shorter term, some suggestive evidence is found that financial literacy programmes may be effective interventions for greater financial inclusion. Specifically, the results show that improving financial sector knowledge is associated with increases in the likelihood of being formally banked and developing trust in banks is related to a significant increase in the chances of being formally banked. As the expansion of mobile banking in Sub-Saharan Africa reaches more and more consumers, opportunities exist to overcome the dearth of bank branch infrastructure across the continent, but this will take time. In the mean time, the supply side constraint of location is confirmed, as measured by the urban-rural divide, in determining the financial status of households in sub-Saharan Africa.

Using a novel instrument, attempts have been made to identify a causal role for the use of financial services by individuals in influencing income. While the case has been made for the validity of this instrumental variable approach, it remains plausible that some elements of endogeneity, reverse causality or omitted variable bias may not have been overcome. In the pooled dataset of ten countries, using instrumental variables it is found that personal access to formal banking services increases individual monthly income by 1.67 percent, which in economic terms is significant. However, the pooled regression results mask significant heterogeneity at the country level.

To assist with the financial inclusion agenda, future research should continue attempts to identify, not only the magnitude of the effect of personal financial access on important socio-economic outcomes, but to decipher the relative im-

portance of the different channels of causation at the individual and household level. In this chapter an unprecedentedly large pooled dataset for eleven Sub-Saharan African countries has been capitalised on and it is expected that these efforts will be complemented with more experimental approaches to identifying the causal role played by financial access.

Nevertheless, there is more to be learned from the cross-country pooled datasets of this kind, notably on the use of different financial products, and on attitudes. However, it needs to be borne in mind that, in order to do justice to the complexity of the financial, economic and social systems in the different countries, and responding to a variety of stakeholders, the surveys display considerable variation in detail from country to country.

Chapter 4

The Unbanked Four-Fifths: Barriers to Financial Services in Nigeria

4.1 Introduction

Financial exclusion remains a global phenomenon with up to 2.5 billion people globally excluded from the formal banking system (Morduch, Chaia, Dalal, Goland and Gonzalez, 2009). In Africa, estimates from the Finscope surveys suggest that the proportion of the population without access to formal financial services ranges from 44 percent in South Africa to 92 percent in Mozambique, with Nigeria, the most populous country in Africa, lying at the higher end of this scale with 79 percent, approximately four-fifths of the adult population, estimated to be 'unbanked'.[1]

Improving access to financial services is increasingly considered a key objective in wider efforts to reduce poverty and vulnerability in low income countries. Economic theory and an increasing body of empirical research suggest that access to savings, payment and credit services facilitates consumption smoothing,

[1] Figure 3.1 in Chapter 3 illustrates the relationship between mean income levels and the percent of the population with access to formal financial services for 10 countries surveyed by Finscope. Nigeria is an outlier, recording a low level of financial inclusion for its relatively high level of mean income among its Sub-Saharan African peers.

helps insure against risk and allows investment in education and other forms of capital. Despite this, little is known about the relative importance of different barriers to financial services. Disentangling the roles played by demand constraints, such as income insufficiency, poor education, informality and financial illiteracy, and supply constraints, such as distance and high cost is a crucial first step in attempts to design effective policies to broaden the reach of formal financial services.

Recent research estimating access to formal banking services in Mexico, transition economies and Sub-Saharan Africa has shed light on the characteristics of financially excluded households (Djankov, Miranda, Seira and Siddharth, 2008; Beck and Brown, 2010). In their study of Mexican households, Djankov et al. (2008) provide evidence that increased financial inclusion is important for economic development when they find that households with bank accounts enjoy higher levels of consumption, possess greater assets and are more likely to be college educated. Similarly, Beck and Brown (2010) find that the likelihood of holding a bank account or bank card increases with income, wealth and education in most transition countries. In Chapter 3, a study on eleven Sub-Saharan African countries, finds that while an individual's income, education, and proximity to services help determine the likelihood of having access to financial services, individual level psychometric perspectives also play a significant role. The first contribution of this chapter is to extend the approach taken in Chapter 3 by exploiting a richer Nigerian dataset and using a series of state level variables to derive more precise estimates of the determinants of personal financial access.

Recent literature helps provide the analytical context for the treatment of barriers to financial services used in this chapter. Beck and de la Torre (2006) provide an analytical framework for understanding barriers to payment, savings and credit services that differentiates between demand and supply insufficiency constraints and a host of underlying conditions or state variables. Claessens (2006) makes a further distinction between voluntary exclusion, defined as having access to but not making use of financial services because of a lack of awareness, price/poverty reasons, or a simple lack of need for the services, and involuntary exclusion, defined as having no access. Building on this literature

and the conceptual framework presented in Chapter 2, this chapter develops a framework for understanding the barriers faced by individuals in availing of formal financial services. The framework, a series of non-mutually exclusive self-reported supply and demand barriers derived from respondent answers to the Finscope survey, provides evidence of the relative importance of the different barriers from the perspective of the individual respondent, and allows for the assessment of individual and state level determinants for the citing of each barrier. This is the second contribution of this chapter.

One such barrier to financial inclusion is individual level informality, a constraint cited by 15 percent of the unbanked population in Nigeria.[2] In Chapter 2, the theoretical role that informality can play in the involuntary exclusion of individuals from gaining access to financial services was highlighted. Informality induced involuntary exclusion can occur for individuals who may demand and have sufficient resources to avail of financial services but who are prevented from access. In this context, greater formalisation could therefore offer the potential to make improvements to financial inclusion, without the need to wait for a wider development process and higher incomes.

While informality is likely to be related to low incomes, low education and distance from administrative centres, it remains a distinct form of poverty. Individuals in the informal sector may enjoy reasonable levels of income, send their children to school and yet be not particularly formalised. This may be due to recent migration, weak institutions where either the state fails to deliver opportunities to formalise in the form of land rights, voter registration cards etc., or a preference on behalf of the individual to avoid labyrinthine or dysfunctional institutions.

Recent literature has challenged many of traditional perceptions on informality as pre-capitalistic or pre-development enterprises or households. One strand postulates that perverse incentives can encourage transition to informality by previously formal micro-enterprises, particularly in overly-bureaucratic institutional settings (Jonasson, 2011; Hanson, 2010). A more benign view points to the fact that "survival type" informal enterprises can play a significant role in reducing poverty (Gulyani and Talukdar, 2010). The determinants of informal

[2]There is also reason to believe that informality plays a role for the 64 percent of individuals who cite poverty as a reason for financial exclusion.

micro-enterprises are considered by Loayza et al. (2009) and they suggest that a combination of poor public services, a burdensome regulatory regime, and weak monitoring and enforcement capacity by the state lead to higher levels of informality.

The theory and empirics behind individual level informality has been explored in the literature in less detail. Bureaucratic barriers to individual level formalisation, coupled with heterogeneous perceptions about potential benefits and mistrust of state institutions means that many of Africa's poor may not actively pursue formalisation. However, formalisation can help reduce poverty and vulnerability through improvements in land, employment and political rights and access to utilities and banking services.

The cross country evidence provided by Beck et al. (2008) suggests that documentary requirements are a significant barrier to financial services in Nigeria.[3] Beck et al. (2008) estimate that the number of documents needed to open a checking account in Nigeria is high, estimated at 3.66 official documents, the ninth highest of the 54 developing countries surveyed. However, particular administrative barriers to the formalisation of the urban and rural poor exist in most of sub-Saharan Africa, but are particularly important in Nigeria. According to Davis et al. (2005) passports are issued only for approved travel purposes in Nigeria, while driving licenses are available only to drivers, and proof of a registered residential address eludes the population living in rural areas and in informal settlements.

The importance of informality in determining financial access is suggested by the Finscope Nigeria dataset. The 16,127 unbanked respondents have an average of 0.94 official documents in their name, compared with 2.95 for the 4,131 'banked' respondents. Following this motivation, the third and final objective of this chapter is to investigate the role played by individual level informality in financial exclusion. Specifically, the hypothesis that informality plays a distinct

[3]Beck et al. (2008) figures for Nigeria are averages from a survey completed by three of Nigeria's largest banks. The authors find that the cost of banking services is high in Nigeria. For transactions, although the annual fee for a checking account is low in Nigeria, the minimum balance needed to open a checking account is higher than annual GDP per capita, the second highest of the 55 countries surveyed. In addition, the cost of using an ATM card is particularly high at 60 cents per $100 USD withdrawn. For savings accounts it is a similar story. The minimum balance required to open a savings account is over 20 percent of GDP per capita, the seventh highest of the 55 countries surveyed, while the annual fee for a savings account is negligible.

and significant role in financial exclusion will be tested with an instrumental variables approach.

To overcome the potential endogeneity of the informality (measured by the number of formal documents held) and personal access to financial services, two instruments are employed; the type of refuse collection used and the time to water source faced by individual respondents. Controlling for heterogeneity at the local state and local government area level, evidence is found that the number of official documents plays a significant role in the likelihood of being banked. The result is particularly strong for individuals around the threshold of four to five formal documents who can be considered on the cusp of financial inclusion.

The remainder of this chapter proceeds as follows: Section 4.2 describes the data, both the 2008 Finscope Nigeria survey and ancillary data sources. Section 4.3 presents the methodologies employed and outlines the identification strategy. Section 4.4 presents the empirical results and Section 4.5 concludes.

4.2 Data Description

4.2.1 Primary Data: Individual Level Data

Individual level data is taken from the 2008 Finscope survey of Nigeria which asks 21,110 individuals across all 36 states plus the Federal Capital Territory (FCT) of Abuja about their use of an array of financial products. The survey also records details about a respondent's personal characteristics, quality of life and psychographics. The sample design and weighting procedure was conducted by the National Bureau of Statistics (NBS) and a random selection of eligible members in each household is conducted by the Kish grid Table Method. The Nigerian dataset is one of three Finscope surveys that oversampled less populated states by surveying approximately 560 individuals in each of the 36 states and the FCT of Abuja. For nationally representative summary statistics and regressions, adult weights are employed and in this chapter these weights are used unless otherwise stated.

Table 4.2 and 4.3 provide the summary statistics and coding for all the individual level variables used in this chapter. While binary variables such as urban,

mobile phone and female are straightforward, further definition is required for other variables used such as formally banked, financial status, education, personal monthly income, financial sector knowledge, bank trust, risk aversion, formality, time to water source, type of refuse collection and time to store.

In the Finscope surveys, respondents are asked whether they currently use or have up to 30 different financial products. While it is obvious for the vast majority of the financial products which of these are formal or informal, there may be a difference of opinion for some of the marginal cases.[4] Two approaches are taken to defining personal financial access in this chapter. Following the approach taken in Chapter 3, formally banked is firstly defined as those with personal access to formal financial products from formal financial institutions. A slightly modified variable financial status is also employed on occasion, defined as the three mutually exclusive statuses: formally banked, informally banked only and financially excluded. Summary statistics for these three groups are presented in Table 4.1.

[4]This chapter follows the definition of formal bank products used in Chapter 3 for Nigeria. See Table 4.2 for the exact list the products and services that define a respondent as being formally or informally banked in this chapter.

Table 4.1: **Summary Statistics by Financial Status**

	Formally Banked	Informally Banked	Financially Excluded
Total	21.1	25.2	53.8
Region			
Urban	39.1	20.0	40.9
Rural	14.1	27.2	58.7
Gender			
Female	15.0	27.3	57.8
Male	26.7	23.3	50.0
Education			
More than secondary school	43.7	19.7	36.6
Did not complete primary	2.2	28.1	70.0
Income			
Under $1 per day	13.2	23.7	63.1
Above $1 per day	31.8	28.2	41.1
Age			
60 +	20.9	19.7	56.2
50-59	22.3	22.9	49.0
40-49	25.7	28.7	46.3
30-49	23.3	28.1	48.1
16-29	17.9	22.1	60.0

Note: The unbanked four-fifths are made up of the financially excluded and informally banked only groups.

Table 4.2: **Summary Statistics and Data Sources**
Weighted mean in parentheses. Remainder of summary statistics are based on unweighted data.

	Coding	Obs	Mean	Std. Dev	Min	Max	Source
Individual Level Variables							
Financial Status, often the binary variable Formal Banked	Formally Banked = 1, Informal Only = 2, Financially Excluded = 3. Formally Banked products include An ATM card, Debit card, Credit card, Savings/transaction account, Current or cheque account, Fixed deposit bank account, Mortgage or housing loan, Personal loan from a bank, Vehicle finance, overdraft, Islamic loan and Islamic financing investment. Informal Products include Membership of a saving club, Loan from government, Loan from employer, Loan from a microfinance organisation, Loan from a pool, Loan from a cooperative, Loan from Government to start/run business and Credit from a local store.	21110	2.42 (2.33)	0.8	1	3	FinScope 2008
Formality Documents	1 point given for having each of the 16 forms in respondents name.	21110	1.46 (1.33)	1.89	0	16	FinScope 2008
PerIncome	Exact amount turned into US dollars using exchange rate 0.00854 .	21110	69.24 (69.24)	189.96	0	8540	FinScope 2008
Educ	No formal education = 1, Some primary school = 2, Primary school completed = 3, Some secondary school = 4, Secondary school completed = 5, Professional Qualification or equivalent = 6, Some university = 7, University completed = 8.	21110	3.61 (3.80)	2.14	1	8	FinScope 2008
Age	Exact Age	21110	36.14 (35.63)	14.54	18	99	FinScope 2008
Female	Female = 1, Male = 0	21110	0.48 (0.48)	0.5	0	1	FinScope 2008
Mobile phone	Yes = 1, No or Not Answered = 0	21110	0.42 (0.45)	0.49	0	1	FinScope 2008
Time to Store	Length of time taken to get to grocery store	21110	15.79 (14.96)	16.61	0	245	FinScope 2008
Urban	Urban = 1, Rural = 0	21110	0.24 (0.28)	0.42	0	1	FinScope 2008
Banktrust	Yes = 1, No = 0	21110	0.34 (0.36)	0.47	0	1	FinScope 2008
Risk Aversion	Agree or Dont Know = 0, Disagree = 1	21110	0.16 (0.16)	0.36	0	1	FinScope 2008
FSKnow	Scaled into a 0-10 index. Score given for the following responds for each of the 33 financial terms below: Heard but do not understand = 1 point, Heard and do understand = 2 points.	21109	3.59 (3.76)	2.78	0	10	FinScope 2008
Time to water source (IV)	Coded as follows: in dwelling = 1, less than 5 minutes = 2, up to 15 minutes = 3, up to 30 minutes = 4, up to 1 hour = 5 and more than 1 hour = 6.	21110	2.34 (2.30)	0.89	1	5	FinScope 2008
Type of Refuse Collection (IV)	1 = Household bin collected by government or Household bin collected by private agency, 2 = Disposal within compound, 3 = Unauthorised refuse heap or Throw in drainage/flowing river	21110	2.45 (2.40)	0.65	1	3	FinScope 2008

Table 4.3: **Summary Statistics and Data Sources, continued**
Weighted mean in parentheses. Remainder of summary statistics are based on unweighted data.

	Coding	Obs	Mean	Std. Dev	Min	Max	Source
State Level Variables							
Used Bribe	If had to give a bribe or a gift to, or do a favour for government officials to get a document or a permit, to get water or sanitation service, or to avoid a problem with the police: Once or twice, few times, often = 1 (used bribe), otherwise = 0 (did not use bribe)	37	0.32	0.17	0.04	0.81	Afrobaromoter 2008
Societal Trust	*How much do you trust each of the following types of people?: Other Nigerians* Dummy variable equal to 1 if answers "I trust them somewhat" or "I trust them a lot." If answers "not at all" or "just a little", set variable equal to 0.	37	0.30	0.21	0.00	0.68	Afrobaromoter 2008
Informality (no income taxes)	1 = Level of informality, 0 = Level of formality	37	0.75	0.22	0.18	0.98	Afrobaromoter 2008
Crime level	*Over the past year, how often, if ever, have you or anyone in your family: Had something stolen from your house? Been physically attacked? Feared for your safety at home?* Dummy variable equal to 1 if crime or fear of crime experienced and equal to 0 if did not experience or fear crime	37	0.55	0.19	0.14	1.00	Afrobaromoter 2008
Branches per million	Survey of 6 of the largest banks in Nigeria on branch numbers per state	37	12.15	10.53	2.10	55.60	OPM 2010
Atms per million	Survey of 6 of the largest banks in Nigeria on branch numbers per state	37	11.23	11.68	1.80	60.50	OPM 2010
Mfos per million	Survey of 823 Microfinance Organisations in Nigeria	37	5.91	6.10	0.43	29.89	OPM 2010
GDP per Capita	Gross Domestic Product per Capita (in USD and PPP)	37	2124	1289	667	5798	Nigerian Statistics Office

Four-fifths of Nigerians surveyed do not have access to formal banking services, with only 3 percent of those surveyed declaring access to formal credit services such as an Islamic loan, an overdraft, a loan from a bank, a mortgage or housing loan, a credit card or a valu card. For those who have access to formal banking services (20.1 percent), the majority have personal access to savings and payment services (19.4 percent), with only 3.1 percent enjoying personal access to formal credit facilities. The descriptive statistics find that people living in a rural location, women and those with low education and income are less likely to have access to formal financial services. Informal access to financial services is more widespread, with 25.2 percent of respondents reporting personal access. Those deemed financially excluded - individuals with no access to formal or informal savings, transaction or credit services - total 53.8 percent of the population.

The education variable is standardised on a scale of 1-8 from "no formal education" up to "completed university education". As shown in Table 4.2, the average level of education among respondents lies between primary school completed and some secondary education.

Unlike many of the other Finscope surveys, personal income in Nigeria is recorded as the specific monthly value. I use the average 2008 exchange rate, the year of the survey, to convert these values into US Dollars. The average personal monthly income is $69, and the distribution is skewed heavily to the right.[5]

Identical to the approach taken in Chapter 3, the financial sector knowledge score is a normalised score (on a scale of 1-10) achieved in a financial sector knowledge quiz given during the interview. A series of financial products/terms are mentioned and the individual receives 2 points for "I understand", 1 point for "I have heard of" and 0 points for "never heard of/ don't understand". With 33 products, there the highest score possible is 66 but as the score is reduced to a one to ten scale, the average respondent has financial sector knowledge of 3.6 out of 10.

To support the analysis I derive two important psychometric variables for

[5] A significant number of income observations are recorded as zero, which meant that when the natural log of income was used, about 35 percent of the observations were lost. To overcome this issue, $1was added to each respondent's monthly income.

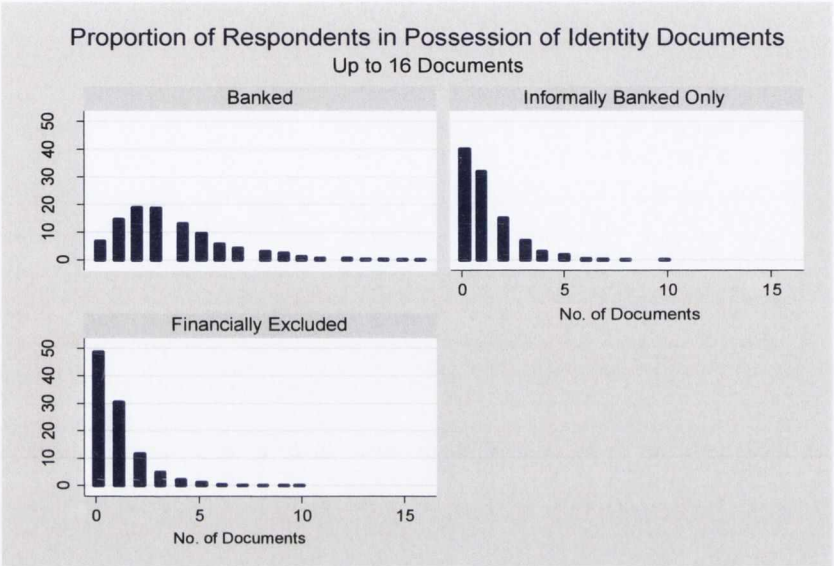
each individual; risk aversion and trust in banks. The measure of risk aversion is calculated using an individual's response to the question: "To get ahead in life, one needs to take some risks". Sixteen percent of respondents are deemed to be risk averse. The banktrust variable is determined by the respondent's reaction to the statement: "I trust banks". Thirty six percent of respondents confess to trusting banks.

The level of informality among respondents is measured using the question: "Which of the following documents, if any, do you have that are in your name?" The list of options include documents such as an electricity bill, a water bill, a municipal rates and taxes invoice, a telephone bill/account, a lease or rental agreement, a tax return, an insurance policy document, a national identity card, an international passport, a payslip, land ownership documents or house ownership documents. For each positive response the respondent achieves one point, up to a maximum of 16 points. The average Nigerian enjoys 1.33 formal documents; not sufficient to open a bank account. Figure 4.1 displays the distribution of the number of official documents for the banked, informally banked only and financially excluded populations.

4.2.2 Data on Barriers to Formal Banking Services

In Chapter 2, the demand and supply framework differentiates between voluntary and involuntary exclusion, both demand side issues, and supply side considerations. Building on this approach, a comprehensive framework to classify respondents' self declared reasons for being unbanked is developed. The framework emanates from the survey question "There are many reasons why people often don't have a bank account. You said earlier that you don't currently have a bank account. Why is this?" Potential answers range from supply side issues such as 'snobbish staff/not helpful', profit/interest is low to demand side issues such as lack of income or preference to deal in cash. Table 4.4 presents an overview of the way in which all 32 possible responses are classified in this study. The framework, depicted in Figure 4.2, illustrates the eleven categories that responses are grouped into. Demand side issues are divided into involuntary and voluntary exclusion. Reasons for being involuntarily excluded include poverty, informality, financial illiteracy and low education, whereas reasons for

Figure 4.1: *Distribution of Formal Documents*



Sources: Graphed by Author. Data from Finscope Nigeria (2009).

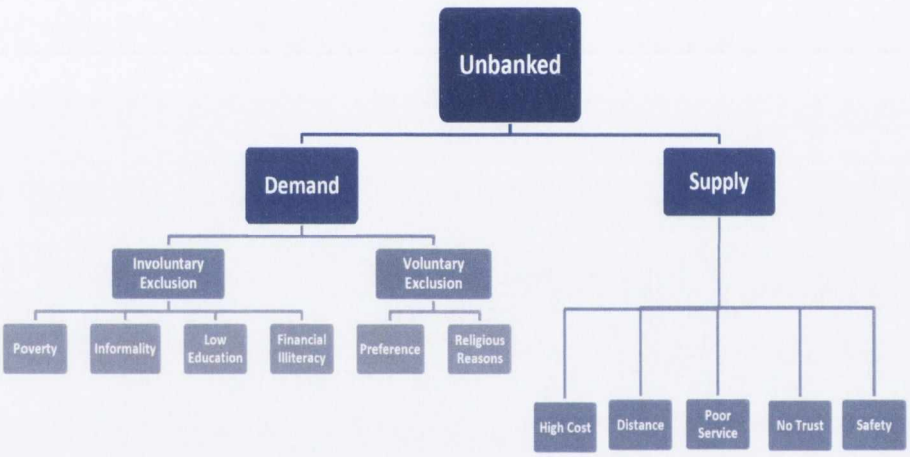
voluntary exclusion include simple preference or religious values. Supply side barriers include high cost, distance, poor service, lack of trust and safety concerns.

The important point is that the reasons for not having a bank account are not mutually exclusive. A respondent can point to multiple reasons for being unbanked across demand and supply constraints. In total there are approximately 16,000 people without a bank account and over 41,000 constraints to financial access were identified.

The majority of barriers cited by respondents are classified as involuntary exclusion reasons (82 percent of unbanked respondents cite an involuntary constraint), with poverty reasons (64 percent of unbanked respondents), financial illiteracy (24 percent of unbanked respondents) and informality reasons (15 percent of unbanked respondents) representing the largest components. Supply constraints make up the second most important set of reasons cited (36 of unbanked respondents), with high cost (14 percent of unbanked respondents) and

distance (10 percent of unbanked respondents) the two most frequently cited reasons for being unbanked. Only 8 percent of unbanked respondents cite reasons pertaining to voluntary exclusion.

Figure 4.2: *Breakdown of Reasons for Being Unbanked*



Sources: Developed by Author from Finscope Nigeria 2008.

Table 4.4: **Reasons Provided for Not Having a Bank Account, Respondents, Percent**[a]

Barrier (Level 1)	Barrier (Level 2)	Details	Responses	% of Total Responses	% of Unbanked Population
Involuntary Exclusion (Demand Side)	Informailty	I don't have an identity document	1,095	2.58	6.45
		I don't have a reference for the bank	533	1.26	3.14
		Too much documentation involved	1,039	2.45	6.12
		Irregular signature	349	0.82	2.06
	Poverty	I don't have enough money to open an account	8,318	19.63	49.00
		I don't have regular income /Not presently working	4,915	11.60	28.95
		Do not have enough collateral	580	1.37	3.42
	Financial Illiteracy	Lack of information about bank products and services	2,382	5.62	14.03
		Don't know how to open an account	1,898	4.48	11.18
	Low Education	Literacy/Can't read or write	2,114	4.99	12.45
Voluntary Exclusion (Demand Side)	Religious Exclusion	Payment and receiving of interest stops me from going to a bank	280	0.66	1.65
	Preference	Never thought about it/ No need for it	1,852	4.37	10.91
		I prefer dealing in cash	1,397	3.30	8.23
Supply Inefficiency	High Cost	It is expensive to have a bank account	2,479	5.85	14.60
		Charges and fees too high (e.g. opening fee, monthly fee)	527	1.24	3.10
		It costs too much to reach a bank	1,722	4.06	10.14
		Profit/interest is low	1,112	2.62	6.55
	Distance	Bank is far away	4,166	9.83	24.54
	Poor Service	Snobbish staff/not helpful	289	0.68	1.70
		Staff doesn't understand my needs	348	0.82	2.05
		Staff speaks in complicated terms	407	0.96	2.40
		Inconvenient hours of operation/Processing too long/Not user friendly	303	0.72	1.78
		Accessibility is poor for disabled people	527	1.24	3.10
		Banks are overcrowded/long queues	206	0.49	1.21
	No Trust	Don't trust banks or other financial institutions	790	1.86	4.65
		Too much corruption (e.g. bribes)	428	1.01	2.52
	Safety	Feel unsafe when leaving bank with money	267	0.63	1.57
		Scared or uneasy in a bank environment	309	0.73	1.82

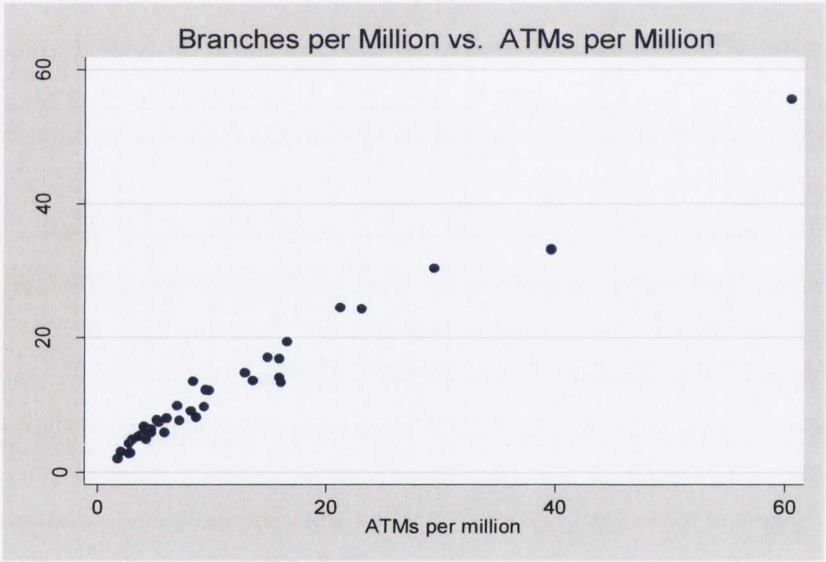
[a]Note: Summary data is derived from the unweighted dataset.

4.2.3 Ancillary Data Sources

The Finscope dataset is complemented with a series of state level financial sector and institutions variables. First, the Oxford Policy Management (OPM) Supply Side Survey 2010 comprises supply side data from a range of financial service providers such as commercial banks, microfinance banks and payment service providers as well as the Central Bank of Nigeria. Most relevant for this chapter is the data from six of the largest retail banks in Nigeria. In fact, 63 percent of all those 'banked' in the 2008 Finscope survey held accounts with one of these six banks. I have taken three variables from this dataset: the number of branches per million inhabitants, the number of ATM locations per million inhabitants and the number of microfinance branches per million inhabitants in each state. The microfinance data covers 823 branches of the total 901 regulated by the Central Bank of Nigeria in June 2010. Unsurprisingly, the geographical distribution of bank branches and ATMs is positively related as shown in Figure 4.3.

The second source of state level data is the 2008 version of Afrobarometer Nigeria. This survey provides state level measures of crime, trust in other Nigerians, the level of corruption (bribery) and formality (pay income taxes) in Nigeria. The Afrobarometer surveyed a nationally representative, random, stratified probability sample of 2,324 Nigerians. For this chapter, the average (mean) responses on the four state level variables of interest are employed. First, the degree of state level bribery is derived from the individual question: "Do you have to give a bribe, give a gift, or do a favor for government officials to get a document or a permit, to get water or sanitation service, or to avoid a problem with the police?". A dummy variable used bribe is then calculated and the proportion of people who used a bribe in each state is deduced. Second, the question "How much do you trust each of the following types of people: Other Nigerians?" is used to derive the dummy variable societal trust. Third, whether or not the individual has paid income taxes is used as a proxy for state level formality. Finally, the state level of crime is derived from the proportion of individuals who have experienced crime, directly or within their family, or feared for their safety in their own home over the past year. Table 4.3 provides the details and descriptive statistics for these state-level variables.

Figure 4.3: *Banking Infrastructure by Nigerian State: Branches and ATMs*



Sources: Graphed by Author. Data from Finscope Nigeria (2009).

4.3 Econometric Model and Identification Strategy

4.3.1 Determinants of Financial Status

TThe first part of the analysis is to ascertain the determinants of financial status at the individual level, accounting for relevant state variables. In doing so, I build on and modify the model used in Chapter 3. Specifically, I use three probit models to assess the probability of individual i in state n being banked, informally banked only or unbanked (the opposite of formally banked) collectively known as financial status as follows:

$$Pr(FINANCIALSTATUS_{in} = f(IND_{in}, GEO_{in}, STATE_n^f, STATE_n^{nf}) \tag{4.1}$$

where $\text{IND}_{i,n}$ are characteristics of the individual respondent; $\text{GEO}_{i,n}$ are characteristics of that individual's local environment; STATE_n^f are state level financial services infrastructure variables defined as branches per million, ATMs per million and micro-finance branches per million; and STATE_n^{nf} are other state characteristics such crime levels, levels of bribery, level of societal trust, state level informality and income per capita.[6]

This particular analysis goes beyond chapter 3 in a number of respects. First, a focus on one country helps avoid the significant heterogeneity of legal systems, financial regulation and other institutions across countries in Sub-Saharan Africa. Second, the introduction of state level variables such as levels of crime, corruption and income level and measures of financial development at the state level help provide better estimates of the determinants of financial status. Third, there is also the opportunity to assess the differences between the determinants of formally banked and individuals that are solely engaged with services in the informal financial sector.

[6]Given the mutually exclusive nature of the categories banked, informally banked only and financially excluded, I first used a multinomial logit model but the assumption of the independence of irrelevant alternatives (IIA) was violated.

4.3.2 Barriers to Formal Financial Services

To understand the characteristics of respondents who face different barriers to formal financial services I employ a multivariate or multinomial probit model. While similar to the generic probit specification, the multivariate probit model specifically allows for the estimation several correlated binary outcomes jointly. The model is estimated at two levels; at the level of voluntary exclusion, involuntary exclusion and supply constrained (the upper branches of Figure 3) and then on three separate occasions for each of the disaggregate reasons given for being unbanked under the 'buckets' voluntary exclusion, involuntary exclusion and supply constrained. In each scenario the model is estimated for the unbanked four-fifths of individuals in the dataset.

The multivariate probit regressions are conducted using a maximum likelihood (SML) estimator with a Geweke-Hajivassiliou-Keane (GHK) smooth recursive conditioning simulator which enjoys a number of desirable properties such as simulated probabilities that are unbiased, bounded within the (0,1) interval and more efficient in terms of the variance of the estimators of probabilities than other simulators (Borsch-Supan and Hajivassiliou, 1993). The multivariate probit model conducted for the upper branches of Figure 4.2 can be depicted as follows:

$$Pr(Constraint_{cin} = f(IND_{in}, GEO_{in}, STATE_n^f, STATE_n^{nf}) \tag{4.2}$$

where c = supply reasons, involuntary exclusion or voluntary exclusion.

The analysis is further deepened by using three separate multivariate probit models for the specific constraints cited as one moves down the barriers framework outlined above and graphically presented in Figure 4.2. The multivariate probit approach was chosen because the non-mutually exclusive nature of the responses leads to correlation in the error terms and requires a fexible underlying covariance structure.

4.3.3 Formal Documents and Financial Status

In the final step of the analysis, I attempt to estimate the precise role played by a respondent's informality, as measured by the number of official documents they possess in their name, in their likelihood of being banked. The 16,127 unbanked respondents in the survey have an average of 0.94 official documents in their name. In comparison, the 4,131 respondents that have bank accounts possess an average of 2.95 official documents in their name.

The initial model I employ is a probit model with the number of documents as one of the explanatory variables. Equation 4.1 outlines the basic probit approach taken.

$$Pr(BANKED_{in}) = f(IND_{in}, GEO_{in}, STATE_n^f, STATE_n^{nf}) \tag{4.3}$$

There is reason to suspect that formality, as measured by the number of documents in possession, may not be exogenous, which could lead to misleading estimates. Unobserved heterogeneity at the individual level such as conscientiousness or motivation may make the individual more likely to simultaneously have a high number of official documents and be banked. For example, it is possible that individual i has an innate conscientiousness or administrative abilities, which could make the collection of official documents easier and increase the probability that they engage with formal financial services. There may also be unobserved heterogeneity at the village level in the form of an efficient local administrator or uncontrolled for strategic proximity considerations that may also simultaneously lead to individual i having a high number of official documents and availing of formal financial services. Either of these types of endogeneity may lead to an over estimation of the role played by level of formality in determining the likelihood of being banked in the probit estimates.

Reverse causality may also be a feature of this model as it may plausibly be argued that registering for a bank account may be an early step in getting other official documents such as utility bills. While the minimum balance to open a checking account in Nigeria, estimated to be 106 percent of GDP per capita for a checking account by Beck et al. (2008) is likely to reduce the likelihood

that individuals would register for a bank account in order to access additional documents and increase their formality, it remains plausible that having a bank account opens up opportunities to formalise. The bias in the probit estimates due to potential reverse causality could run in either direction.

As a result of these two potential biases, an instrument that directly affects the number of official documents individual i possesses but does not directly affect the likelihood of being formally banked, except through the number of documents channel, is required. To achieve this, two instruments, type of refuse collection and time to water source, are employed.

First, survey respondents are asked what type of refuse collection they use. In increasing degrees of informality, responses include: household bin collected by government or household bin collected by private company (both coded as one); disposal within compound (coded as two) and unauthorised refuse heap or throw in drainage/flowing river (coded as three). The rationale behind using type of refuse collection as an instrument is that it provides us with information regarding the informality of individual i, which I argue should not independently affect the individuals likelihood of being banked but will affect the number of formal documents the individual possesses.

With significant populations of urban poor as well as rural poor, Nigeria is characterised by significant heterogeneity in housing conditions and access to public utilities (such as refuse collection). This chapter postulates that individual level informality, as distinct from economic or educational poverty, can be proxied in part by the degree of formality of the type of refuse collection practices engaged in by the individual. An informal method of refuse collection indicates that an individual is less likely to enjoy housing facilities associated with utility bill documents and less likely to own their own home or have a formal lease, leading to a lower number of formal documents.

I find that this instrument enjoys a relevance to the potentially endogenous variable, number of official documents, as evidenced by the significant coefficient in Table 4.5, the first stage regression. The relevance of this instrument is tested separately and the first stage of the exactly identified instrumental variables estimation with refuse collection as the only instrument produces an Angrist-Pischke multivariate F-test of excluded instruments of 7.13.

Second, respondents are asked how long it takes to get to their main water source. The variable is coded in increasing time from dwelling as follows: in dwelling (coded as one); less than 5 minutes (coded as two); up to 15 minutes (coded as three); up to 30 minutes (coded as four); up to 1 hour (coded as five) and more than 1 hour (coded as six). The rationale behind using time to water source as an instrument is that it provides us with information regarding the informality of individual i, which I argue should not affect the likelihood of being banked.

In similar fashion, time to water source is likely to tell us something about individual level informality. If an individual faces a significant distance to water, they are unlikely to enjoy housing facilities that generate utility bill documents and less likely to own their own home or have a formal lease, leading to a lower number of formal documents.

I find that this instrument displays a high degree of relevance to the potentially endogenous variable, number of official documents, as shown by the significant coefficient in Table 4.5, the first stage regression. In similar fashion, the relevance of this instrument is tested separately and the first stage of the exactly identified instrumental variables estimation with refuse collection as the only instrument produces an Angrist-Pischke multivariate F-test of excluded instruments of 26.91.

However, in this chapter both instrumental variables are employed in the identification strategy. The first stage results of the instrumental variable estimation with both type of refuse collection and time to water source as instruments allow us to reject the null hypothesis of weak identification; the Angrist-Pischke multivariate F-test of excluded instruments is 15.84. Possible overidentification is tested for with the Sargan-Hansen test. In this test, the residuals from the 2SLS are regressed on all exogenous variables and the test statistic indicates whether or not it is possible to accept the null hypothesis that all instruments are uncorrelated with the error term. In this model the Hansen J p-value is 0.930, greater than 0.05 and hence the null hypothesis cannot be rejected and it can be concluded that the the instruments are deemed valid.

The IV approach is based on the exclusion restriction that time to water source and type of refuse collection only influence the likelihood of being banked

Table 4.5: **First Stage Regression, Ordinary Least Squares Dependent Variable: Number of Formal Documents**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Type of Refuse Collection			Time to Water Source			Both Instruments		
Individual Level Variables									
Refuse disposal	-0.13*	-0.13*	-0.14***				-0.13*	-0.13*	-0.14***
	(0.049)	(0.047)	(0.032)				(0.049)	(0.047)	(0.031)
Water distance				-0.09***	-0.08***	-0.08***	-0.09***	-0.08***	-0.08**
				(0.018)	(0.020)	(0.023)	(0.019)	(0.019)	(0.023)
LnPerIncome	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***	0.10***
	(0.015)	(0.014)	(0.009)	(0.015)	(0.015)	(0.010)	(0.015)	(0.014)	(0.010)
Primary completed	0.15***	0.14**	0.14***	0.15***	0.15**	0.14***	0.15***	0.15***	0.14***
	(0.038)	(0.041)	(0.035)	(0.039)	(0.043)	(0.036)	(0.037)	(0.041)	(0.035)
Secondary completed	0.26***	0.24**	0.24***	0.27***	0.26**	0.24***	0.26***	0.25**	0.24***
	(0.064)	(0.070)	(0.050)	(0.065)	(0.073)	(0.050)	(0.063)	(0.071)	(0.050)
Some third level	0.97***	0.99***	0.95***	0.98***	1.01***	0.96***	0.96***	0.99***	0.94***
	(0.096)	(0.108)	(0.080)	(0.100)	(0.111)	(0.081)	(0.097)	(0.110)	(0.080)
Age/100	5.07***	5.29***	4.96***	5.07***	5.30***	4.96***	5.08***	5.29***	4.96***
	(0.789)	(0.750)	(0.542)	(0.801)	(0.765)	(0.547)	(0.796)	(0.754)	(0.542)
Age/100 sq	-2.67**	-2.97**	-2.49***	-2.66**	-2.97**	-2.48***	-2.67**	-2.96**	-2.49***
	(0.878)	(0.860)	(0.626)	(0.892)	(0.878)	(0.632)	(0.885)	(0.865)	(0.625)
Female	-0.53***	-0.53***	-0.53***	-0.53***	-0.53***	-0.53***	-0.53***	-0.54***	-0.53***
	(0.047)	(0.047)	(0.030)	(0.047)	(0.047)	(0.030)	(0.047)	(0.047)	(0.030)
Mobile phone	0.37***	0.35***	0.33***	0.37***	0.34***	0.33***	0.36***	0.34***	0.32***
	(0.039)	(0.043)	(0.036)	(0.038)	(0.042)	(0.036)	(0.039)	(0.042)	(0.036)
Urban	0.08	0.05	0.07	0.08	0.05	0.07	0.06	0.03	0.05
	(0.051)	(0.060)	(0.078)	(0.051)	(0.060)	(0.079)	(0.049)	(0.060)	(0.079)
Time to Store	-0.00	-0.00	0.00	0.00	0.00	0.00	-0.00	0.00	0.00
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank Trust	0.09	0.10*	0.09*	0.09	0.09	0.09*	0.09	0.10	0.09*
	(0.048)	(0.049)	(0.036)	(0.047)	(0.049)	(0.037)	(0.047)	(0.048)	(0.036)
Risk Aversion	-0.16*	-0.15*	-0.17***	-0.15*	-0.14	-0.17***	-0.15*	-0.15*	-0.17***
	(0.067)	(0.070)	(0.044)	(0.067)	(0.070)	(0.043)	(0.067)	(0.070)	(0.043)
FSKnow	0.13***	0.12***	0.12***	0.13***	0.12***	0.12***	0.12***	0.12***	0.12***
	(0.011)	(0.013)	(0.010)	(0.012)	(0.013)	(0.010)	(0.012)	(0.013)	(0.010)
State Level Variables									
Used bribe		-0.23	0.19		-0.24	0.17		-0.22	0.21
		(0.214)	(0.143)		(0.231)	(0.151)		(0.215)	(0.143)
Societal trust		-0.04	-2.50***		-0.04	-2.34***		-0.04	-2.39***
		(0.183)	(0.077)		(0.182)	(0.090)		(0.182)	(0.090)
Informality (no income taxes)		-0.95***	4.12***		-0.88***	4.31***		-0.92***	4.23***
		(0.226)	(0.101)		(0.234)	(0.106)		(0.224)	(0.103)
Crime level		-0.18	-3.38***		-0.12	-3.06***		-0.15	-3.27***
		(0.303)	(0.168)		(0.313)	(0.192)		(0.307)	(0.173)
GDP per capita PPP		0.00	0.00*		0.00	0.00		0.00	0.00
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Branches per million		-0.00	-0.13***		0.00	-0.18***		-0.00	-0.15***
		(0.026)	(0.018)		(0.025)	(0.020)		(0.026)	(0.020)
Atms per million		0.01	0.20***		0.00	0.25***		0.01	0.23***
		(0.022)	(0.019)		(0.021)	(0.020)		(0.022)	(0.020)
Mfos per million		0.01	-0.10***		0.01	-0.10***		0.01	-0.10***
		(0.008)	(0.002)		(0.007)	(0.002)		(0.008)	(0.002)
Constant	-0.53*	0.12	-0.57***	-0.66***	-0.13	-0.95***	-0.32	0.25	-0.46**
	(0.220)	(0.273)	(0.168)	(0.178)	(0.236)	(0.143)	(0.223)	(0.284)	(0.170)
Observations	21,109	21,109	21,109	21,109	21,109	21,109	21,109	21,109	21,109
State Controls	Yes			Yes			Yes		
LGA Controls			Yes			Yes			Yes
R-squared	0.36	0.34	0.40	0.36	0.34	0.40	0.36	0.34	0.40
Adj. R-squared	0.35	0.34	0.39	0.35	0.34	0.38	0.36	0.34	0.39
Angrist-Pischke F-Test							15.84	10.62	15.13

State controls comprise a series of state dummy variables. Local government area controls comprise of a series of 586 dummy variables. Less than completed primary education is the omitted education category. Robust standard errors, clustered by state in parentheses. ***p<0.001, **p<0.01, *p<0.05

through informality and not through proximity to banking infrastructure. In other words, there is no covariance between the instruments and the error term in the second stage regression (Cov ϵ, Z = 0), where ϵ is the error term and Z represents the instruments.

Arguably, any weakness in the exclusion restriction is likely to be most relevant in a rural setting where time to water source and formality of refuse collection may be related to proximity to services such as banking infrastructure. However, there may also be other regional characteristics that affect the

type of refuse collection or the extent of drinking water infrastructure that simultaneously affect the likelihood of being banked, such as prevailing levels of poverty, informality or the strength of local government.

To overcome these concerns at the state level a series of control variables for average state levels of income, formality, corruption and banking infrastructure are included, as well as a series of state level dummy variables under an alternative specification, and I feel confident that this approach helps surmount the threats to the exclusion restriction at the state level.

Heterogeneity at the village, electoral or local government area level is a more challenging issue to overcome and two approaches are pursued in this regard. First, I include urban/rural dummies and distance to store to at least partially account for the possible relationship between the instruments and distance to banking services. I also endeavour to control for other issues such as prevailing levels of poverty, informality or the strength of local government at the local government level with the inclusion of dummy variables for the 587 local government areas in Nigeria.

A second important argument is the existence of sufficient exogenous variation in our instruments for formality. It was previously argued that informality can be considered a distinct form of poverty which may be related to income, education, location etc, but that it is a distinct form of disadvantage. A number of cross tabulations were conducted to substantiate this claim. First, while the number of documents an individual has is found to have a consistent relationship with education level, it increases for those in the top three income deciles. On the other hand, time to water source and type for refuse collection do not exhibit variation with education or income decile with an exception for those who have completed university education, a small number of Nigerians, and those in the top income decile.[7] This suggests that there is reason to believe that the two instruments are at least in part reflecting an exogenous component of informality. In any case our specification includes a comprehensive list of control variables including education and income.

Finally, it is worth assessing whether either of the instruments varies consistently with time to grocery store, the measure of proximity to services employed

[7]These cross tabulations are not reported in this chapter but are available on request.

in this chapter. In cross tabulations, there is no evidence that type of refuse collection varies with time to grocery store but there is modest evidence to suggest that time to water source increases with distance to grocery store. Nevertheless, distance to grocery store is likely to be more related to distance to bank branch and as we include this as a control variable in all specifications, concern over correlation between time to water source and the error term are eased. To reduce the overall violation of the assumption that the instruments are related to the error term we also include a series of interaction terms as further controls.

4.4 Empirical Results

4.4.1 Determinants of Financial Status

This chapter uses three probit models to estimate the determinants of a respondent's financial status and the results are presented in Table 4.6. The table reports marginal effects, in other words the change in the probability of being formally banked, informally banked only or unbanked for an infinitesimal change in each independent, continuous variable or discrete change for binary or other discrete variables.

The results confirm many of the intuitive conclusions found in Chapter 3. The unbanked four-fifths (shown in the final two columns of Table 4.6) have lower incomes, lower education, are less likely to have a mobile phone, have lower levels of financial sector knowledge and a lower number of formal documents in their name than the remainder of the population. In terms of psychometric characteristics, the unbanked four-fifths display low levels of trust in banks and higher risk aversion than the population. When state level dummy variables are included, the unbanked group are more likely to be located in rural areas.[8]

In line with the results of Chapter 3, gender is significantly related to measures of financial access only in simpler specifications.[9] The coefficient on female becomes insignificant when the full specification is estimated, in particular when education level and psychometric variables are included.

Respondents who use only informal financial services share a number of

[8]However, when state level financial sector, institutions and income levels are instead included this result is insignificant.

[9]These simpler specifications are not presented but are available on request.

characteristics with the unbanked group, such as that they tend to mistrust banks, have low education and have fewer formal documents in their name than the remainder of the population.[10] In terms of monthly personal income, the informally banked group do not suffer from the same level of poverty as the unbanked population. Even when state level controls are included, the informally banked population are associated with states with higher levels of informality, lower numbers of bank branches per million population and higher numbers of atms per million population. This suggests that informal financial services are more likely to be prevalent in states with lower levels of formal banking infrastructure (specifically bank branches), and also higher levels of state level informality that would preclude successful bank expansion strategies based on the traditional documentary requirements to open a bank account.

The probit results for the banked population are reported in columns 1-2 in Table 4.6. The formally banked population are more likely to live in urban areas, have a high level of bank trust, enjoy higher levels of financial sector knowledge and be less risk averse. They are also likely to have higher income and education, and a greater number of formal documents in their name. Significantly, the banked population live in states characterised by a higher degree of formality, as measured by the proportion of people who pay income taxes and this is likely to be related the presence of more widespread banking infrastructure in states with higher levels of formality.

While banked respondents are likely to be in states with a higher number of bank branches but a lower number of ATMs, the converse is also true. The unbanked and informal only respondents are more likely to reside in states with a lower number of bank branches and a higher number of ATMs. And while the extent of bank branch and ATM infrastructure in Nigerian states shows a strong positive and almost linear relationship in Figure 4.3, leading to some concerns about multicollinearity, these results perhaps suggest that to some degree banks deploy ATM strategies in states with greater informality and lower numbers of banked citizens.

[10]The comparison group here is the banked and unbanked groups.

Table 4.6: **Probit Regressions - Respondent Financial Status, Marginal Effects**

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Formally Banked		Informally Banked		Unbanked	
Individual Level Variables						
LnPerIncome	0.01***	0.01***	0.02***	0.01***	-0.01***	-0.01***
	(0.001)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)
Formality documents	0.02***	0.02***	-0.02**	-0.01	-0.02***	-0.02***
	(0.002)	(0.002)	(0.005)	(0.006)	(0.002)	(0.002)
Primary completed	0.01	0.02	0.02	0.04	-0.01	-0.02
	(0.011)	(0.012)	(0.017)	(0.021)	(0.011)	(0.012)
Secondary completed	0.07***	0.09***	0.01	0.03	-0.07***	-0.09***
	(0.015)	(0.017)	(0.021)	(0.023)	(0.015)	(0.017)
Some third level	0.29***	0.32***	-0.18***	-0.17***	-0.29***	-0.32***
	(0.027)	(0.033)	(0.020)	(0.023)	(0.027)	(0.033)
Age/100	0.44***	0.41***	1.28***	1.30***	-0.44***	-0.41***
	(0.078)	(0.091)	(0.179)	(0.196)	(0.078)	(0.091)
Age/100 sq.	-0.37***	-0.32***	-1.37***	-1.39***	0.37***	0.32***
	(0.088)	(0.098)	(0.175)	(0.207)	(0.088)	(0.098)
Female	0.00	0.00	0.02	0.02*	-0.00	-0.00
	(0.007)	(0.007)	(0.013)	(0.012)	(0.007)	(0.007)
Mobile Phone	0.10***	0.11***	0.02	0.02	-0.10***	-0.11***
	(0.008)	(0.011)	(0.015)	(0.016)	(0.008)	(0.011)
Time to Store	-0.00	0.00	0.00	0.00	0.00	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Urban	0.02***	0.02	-0.01	-0.00	-0.02***	-0.02
	(0.007)	(0.010)	(0.019)	(0.020)	(0.007)	(0.010)
Bank Trust	0.08***	0.08***	-0.07***	-0.07***	-0.08***	-0.08***
	(0.008)	(0.010)	(0.017)	(0.019)	(0.008)	(0.010)
Risk Aversion	-0.02***	-0.02***	-0.00	-0.01	0.02***	0.02***
	(0.005)	(0.006)	(0.021)	(0.020)	(0.005)	(0.006)
FSKnow	0.02***	0.02***	-0.01	-0.01	-0.02***	-0.02***
	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)	(0.002)
State Level Variables						
Used bribe		0.01		-0.05		-0.01
		(0.039)		(0.097)		(0.039)
Societal trust		-0.00		-0.02		0.00
		(0.034)		(0.069)		(0.034)
Informality (no income taxes)		-0.07		0.28***		0.07
		(0.038)		(0.080)		(0.038)
Crime level		-0.04		0.14		0.04
		(0.046)		(0.078)		(0.046)
GDP per capita PPP		0.00		0.00		-0.00
		(0.000)		(0.000)		(0.000)
Branches per million		0.01**		-0.02*		-0.01**
		(0.003)		(0.008)		(0.003)
Atms per million		-0.01**		0.02**		0.01**
		(0.002)		(0.007)		(0.002)
Mfos per million		-0.00		-0.00		0.00
		(0.001)		(0.003)		(0.001)
Observations	21,109	21,109	21,109	21,109	21,109	21,109
State Controls	Yes		Yes		Yes	

State controls comprise a series of state dummy variables. Unbanked category includes those financially excluded and the informally banked. Less than completed primary education is the omitted education category. Robust standard errors, clustered by state in parentheses.
***p<0.001, **p<0.01, *p<0.05

4.4.2 Barriers to Formal Financial Services

To assess the determinants of the variety of barriers to financial inclusion, the multivariate probit estimation is conducted for both the high level constraints, voluntary, involuntary and supply barriers, as well as the more specific barriers, represented by the lower branches of Figure 4.2. It is worth recalling from the methodology section that in each case the analysis is conducted for only the unbanked four-fifths of the sample.

In the analysis, cross contamination is allowed because of the non-mutually exclusive nature of reasons cited for being unbanked, and as a result I find only modest differences between groups, reflecting the multidimensionality of poverty and financial exclusion. Nevertheless, a number of interesting results

are uncovered. Among the unbanked population, unsurprisingly, lower income and lower education increase the likelihood that an individual will cite involuntary exclusion reasons such as poverty, financial illiteracy; low education and informality (see Table 4.7). There is evidence to suggest that individuals who cite supply constraints have higher income and a higher number of formal documents, suggesting that to be aware of supply constraints such as high cost, safety concerns and poor service, an individual is likely not to be among the poorest in Nigeria. As distance is the fourth supply constraint, the findings in Table 4.7 confirm that individuals who cite supply constraints are more likely to be rural dwellers. In addition, those who cite voluntary exclusion reasons tend to have more formal documents but lower financial sector knowledge.

Table 4.7: **Reasons for Being Unbanked - Multivariate Probit Results**

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Supply Constraints		Involuntary Exclusion		Voluntary Exclusion	
Individual Level Variables						
LnPerIncome	0.06***	0.05**	-0.03*	-0.05**	-0.00	-0.02
	(0.015)	(0.018)	(0.016)	(0.017)	(0.014)	(0.015)
Formality documents	0.06**	0.07**	-0.04*	-0.02	0.05*	0.07**
	(0.022)	(0.024)	(0.015)	(0.019)	(0.025)	(0.025)
Primary completed	0.09	0.17**	-0.05	-0.08	0.06	0.11
	(0.047)	(0.054)	(0.054)	(0.060)	(0.067)	(0.062)
Secondary completed	0.07	0.18*	-0.06	-0.15*	0.09	0.18*
	(0.066)	(0.075)	(0.071)	(0.074)	(0.088)	(0.082)
Some third level	0.08	0.21*	-0.09	-0.14	0.10	0.22*
	(0.096)	(0.097)	(0.131)	(0.132)	(0.122)	(0.114)
Age/100	1.85***	1.76**	-0.44	0.15	0.92	1.04
	(0.517)	(0.550)	(0.665)	(0.632)	(0.736)	(0.721)
Age/100 sq.	-2.19***	-2.05***	0.32	-0.31	-0.92	-1.11
	(0.558)	(0.581)	(0.750)	(0.720)	(0.870)	(0.879)
Female	-0.07*	-0.05	-0.01	-0.02	0.03	0.05
	(0.033)	(0.031)	(0.031)	(0.030)	(0.045)	(0.045)
Mobile Phone	0.01	0.05	-0.04	-0.05	-0.03	-0.00
	(0.056)	(0.061)	(0.050)	(0.054)	(0.037)	(0.047)
Urban	-0.21**	-0.29***	0.08	0.18**	-0.01	-0.04
	(0.081)	(0.062)	(0.057)	(0.060)	(0.068)	(0.069)
Time to Store	0.00**	0.00*	-0.00	-0.00	-0.00	-0.00
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Bank Trust	0.03	0.01	0.10	0.13*	-0.02	-0.03
	(0.071)	(0.070)	(0.056)	(0.052)	(0.063)	(0.061)
Risk Aversion	0.11	0.14	0.00	0.02	0.02	0.03
	(0.074)	(0.070)	(0.055)	(0.056)	(0.066)	(0.064)
FSKnow	-0.02	-0.02	-0.00	0.01	-0.03*	-0.04**
	(0.013)	(0.014)	(0.019)	(0.018)	(0.014)	(0.015)
State Level Variables						
Used bribe		0.10		-0.35		-0.15
		(0.383)		(0.256)		(0.352)
Societal trust		-0.17		-0.02		-0.25
		(0.300)		(0.245)		(0.241)
Informality (no income taxes)		-0.47		0.11		-0.68*
		(0.497)		(0.299)		(0.272)
Crime level		0.32		0.28		0.21
		(0.401)		(0.298)		(0.337)
GDP per capita PPP		0.00		-0.00		-0.00
		(0.000)		(0.000)		(0.000)
Branches per million		-0.01		-0.01		0.03
		(0.025)		(0.022)		(0.032)
Atms per million		-0.01		0.01		-0.05
		(0.023)		(0.020)		(0.029)
Mfos per million		-0.02*		0.00		0.01
		(0.008)		(0.009)		(0.008)
Constant	-0.61***	-0.37	1.20***	1.02**	-1.04***	-0.49
	(0.113)	(0.461)	(0.114)	(0.311)	(0.135)	(0.357)
Observations	16,978	16,978	16,978	16,978	16,978	16,978
State Controls	Yes		Yes		Yes	

State controls comprise a series of state dummy variables. Less than completed primary education is the omitted education category. Robust standard errors, clustered by state in parentheses. ***p<0.001, **p<0.01, *p<0.05

The pooled nature of these categories means that most of the information occurs at the more disaggregated level. As a next step I therefore look at the disaggregated categories of voluntary exclusion, involuntary exclusion and

supply constraints in more detail, setting each of the component categories, as represented by the lower branches of Figure 4.2, as the dependent binary variable in separate probit regressions and assessing the effect of our various independent variables on the probability of facing these particular constraints. The results, which are shown in Table 4.8, suggest that individuals who simply prefer, for non-religious reasons, not to engage with formal financial service providers are likely to be more formalised but have lower financial knowledge, when compared with the wider unbanked population. Individuals who cite religious reasons for being unbanked tend to have higher income levels than the unbanked, reflecting the relative economic status of religious groups in Nigeria.

Table 4.8: **Reasons for being Unbanked, Voluntary and Involuntary Exclusion - Multivariate Probit Results Separate Multivariate Probit Regressions for Voluntary and Involuntary Constraints**

VARIABLES	(1) Informality	(2) Informality	(3) Poverty	(4) Poverty	(5) Financial Illiteracy	(6) Financial Illiteracy	(7) Low Education	(8) Low Education	(9) Religion	(10) Religion	(11) Preference	(12) Preference
Individual Level Variables												
LnPerIncome	0.03	0.02	-0.06***	-0.06***	0.02	-0.00	-0.00	-0.03	0.07**	0.06**	-0.01	-0.03
	(0.019)	(0.020)	(0.014)	(0.015)	(0.017)	(0.017)	(0.022)	(0.020)	(0.025)	(0.019)	(0.015)	(0.016)
Formality documents	-0.01	0.01	-0.03	-0.00	-0.02	-0.01	-0.05*	-0.04	-0.00	0.03	0.05*	0.06*
	(0.022)	(0.021)	(0.013)	(0.016)	(0.021)	(0.021)	(0.027)	(0.027)	(0.046)	(0.039)	(0.025)	(0.025)
Primary completed	0.06	0.05	0.18**	0.13	0.02	0.03	-0.60***	-0.59***	0.00	0.01	0.07	0.12
	(0.069)	(0.073)	(0.066)	(0.071)	(0.058)	(0.055)	(0.107)	(0.103)	(0.104)	(0.084)	(0.068)	(0.064)
Secondary completed	0.17**	0.16*	0.10	-0.02	0.03	0.06	-0.77***	-0.76***	0.16	0.16	0.09	0.19*
	(0.054)	(0.065)	(0.082)	(0.087)	(0.062)	(0.062)	(0.101)	(0.094)	(0.129)	(0.105)	(0.089)	(0.083)
Some third level	0.19	0.24*	0.08	-0.02	-0.04	0.04	-1.10***	-1.00***	0.13	0.19	0.09	0.21
	(0.114)	(0.110)	(0.112)	(0.117)	(0.113)	(0.111)	(0.181)	(0.179)	(0.196)	(0.173)	(0.131)	(0.122)
Age/100	1.08	1.41*	-0.91	-0.54	-0.12	0.05	0.60	0.81	0.60	0.63	0.95	1.05
	(0.703)	(0.681)	(0.542)	(0.500)	(0.449)	(0.426)	(0.621)	(0.647)	(1.322)	(1.215)	(0.791)	(0.768)
Age/100 sq.	-1.07	-1.44	0.80	0.47	-0.22	-0.46	0.29	-0.04	-0.13	-0.30	-1.06	-1.19
	(0.840)	(0.807)	(0.660)	(0.619)	(0.505)	(0.497)	(0.601)	(0.630)	(1.401)	(1.264)	(0.927)	(0.929)
Female	-0.01	0.00	0.03	0.04	-0.05	-0.06	0.03	0.02	-0.03	0.01	0.03	0.04
	(0.039)	(0.039)	(0.052)	(0.049)	(0.044)	(0.041)	(0.057)	(0.055)	(0.091)	(0.091)	(0.044)	(0.043)
Mobile phone	-0.02	-0.02	0.04	0.01	0.02	0.03	-0.19**	-0.15*	0.06	0.04	-0.03	-0.01
	(0.061)	(0.056)	(0.054)	(0.058)	(0.051)	(0.047)	(0.060)	(0.060)	(0.096)	(0.094)	(0.035)	(0.047)
Urban	-0.16**	-0.12*	0.06	0.20**	-0.03	-0.08	-0.16**	-0.10	0.12	0.10	-0.02	-0.04
	(0.061)	(0.061)	(0.063)	(0.068)	(0.060)	(0.064)	(0.063)	(0.052)	(0.096)	(0.099)	(0.072)	(0.070)
Time to Store	0.00	0.00	0.00	0.00	0.00	-0.00	-0.01**	-0.01**	0.00	-0.00	-0.00	-0.00
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Bank Trust	0.07	0.08	0.08	0.11*	-0.10*	-0.09	-0.02	0.02	0.16*	0.21**	-0.04	-0.05
	(0.073)	(0.068)	(0.053)	(0.055)	(0.041)	(0.045)	(0.095)	(0.102)	(0.080)	(0.075)	(0.063)	(0.061)
Risk Aversion	0.05	0.07	-0.10*	-0.08	-0.01	0.03	-0.06	-0.05	-0.09	-0.01	0.03	0.03
	(0.070)	(0.071)	(0.039)	(0.043)	(0.051)	(0.050)	(0.066)	(0.067)	(0.087)	(0.080)	(0.065)	(0.064)
FSKnow	0.00	0.00	0.04**	0.04***	-0.06***	-0.06***	-0.10***	-0.10***	-0.04	-0.04	-0.03*	-0.04**
	(0.016)	(0.017)	(0.014)	(0.014)	(0.015)	(0.015)	(0.025)	(0.022)	(0.022)	(0.022)	(0.014)	(0.015)
State Level Variables												
Used bribe		-0.21		-0.00		-0.22		-0.70*		-0.13		-0.14
		(0.374)		(0.321)		(0.389)		(0.308)		(0.572)		(0.342)
Societal trust		-0.07		-0.01		-0.15		0.16		-0.22		-0.25
		(0.313)		(0.336)		(0.313)		(0.269)		(0.352)		(0.233)
Informality (no income taxes)		-0.55		0.84*		-0.66*		-0.76*		-0.37		-0.68*
		(0.298)		(0.381)		(0.273)		(0.330)		(0.460)		(0.266)
Crime level		-0.01		0.16		0.03		0.53		0.03		0.22
		(0.386)		(0.388)		(0.299)		(0.417)		(0.462)		(0.333)
GDP per capita PPP		0.00		-0.00		0.00		-0.00		-0.00		0.00
		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)
Branches per million		0.03		0.01		-0.09**		0.02		0.04		0.03
		(0.035)		(0.027)		(0.028)		(0.028)		(0.039)		(0.031)
Atms per million		-0.05		0.00		0.07**		-0.02		-0.05		-0.05
		(0.030)		(0.024)		(0.024)		(0.026)		(0.037)		(0.029)
Mfos per million		-0.01		-0.00		0.01		0.02		-0.00		0.01
		(0.009)		(0.011)		(0.007)		(0.014)		(0.020)		(0.008)
Constant	-1.31***	-0.85*	0.39***	-0.31	-0.03	0.23	-0.37	-0.22	-2.13***	-1.88***	-1.12***	-0.51
	(0.138)	(0.388)	(0.097)	(0.348)	(0.095)	(0.319)	(0.207)	(0.385)	(0.284)	(0.505)	(0.146)	(0.355)
Observations	16,978	16,978	16,978	16,978	16,978	16,978	16,978	16,978	16,978	16,978	16,978	16,978
State Controls	Yes		Yes		Yes		Yes		Yes		Yes	

State controls comprise a series of state dummy variables. Less than completed primary education is the omitted education category. Robust standard errors, clustered by state in parentheses. ***p<0.001, **p<0.01, *p<0.05

Columns 1-8 in Table 4.8 present the results for the four involuntary exclusion reasons for being unbanked. While those who cite informality reasons (columns 1 and 2) tend to be educated and rurally based, they do not display any greater levels of informality over the wider unbanked population. This suggests that education helps individuals understand the role played by formality in access to banking services. Poverty is cited as a constraint by 64 percent of the unbanked population and, as shown in columns 3 and 4 of Table 4.8, these individuals have lower income and higher financial sector knowledge than the wider unbanked population.

Individuals who cite low education as a reason for being unbanked are characterised by lower levels of education, lower financial knowledge and are less likely to face distances to services than the unbanked group. Again confirming the robustness of the results, individuals who cite financial illiteracy as one of their reasons for being unbanked score lower on the financial sector quiz on the questionnaire.

The differences become more obvious when the group of individuals who cite supply reasons for being unbanked is considered as a result of the greater heterogeneity in responses that make up the supply constrained group (see Table 4.9). Those who cite safety concerns are characterised by lower levels of financial sector knowledge. Those who cite low trust in banks are likely to be more risk averse. Unsurprisingly, distance is cited as a reason for being unbanked more often in rural areas, among those who face longer distances to services.

4.4.3 Formal Documents and Financial Status

Table 4.9 presents the results of the probit and instrumental variable estimations of the importance of the number of formal documents in the likelihood of being banked. The probit estimates confirm the prior that the number of formal documents plays a statistically significant role in the determination of being banked. However, as outlined in section 4.3, it could be the case either that the number of formal documents held by an individual is endogenous to being banked or that reverse causality may be present between the number of documents and formally banked, or both. With this in mind, columns 3 - 4 in Table 4.9 provide the instrumental variable estimates for the case where the

number of formal documents held is instrumented with time to water source and type of refuse collection.

The results show that the number of official documents plays a significant role in the likelihood of being banked. The IV estimates are higher than the probit estimates across all model specifications. The coefficients are 0.54 for each of the two specifications presented. Reverse causality is the most likely reason for this downward bias in the probit estimates.

Table 4.9: **Formally Banked and No. of Formal Documents, Probit and Instrumental Variables Estimates**

	(1)	(2)	(3)	(4)
	Probit		Both IVs	
Individual Level Variables				
Formality documents	0.17***	0.16***	0.54**	0.54**
	(0.016)	(0.016)	(0.174)	(0.175)
LnPerIncome	0.10***	0.09***	0.04	0.04
	(0.009)	(0.010)	(0.042)	(0.040)
Primary completed	0.10	0.16	0.02	0.07
	(0.087)	(0.087)	(0.103)	(0.110)
Secondary completed	0.49***	0.57***	0.29	0.36
	(0.090)	(0.087)	(0.192)	(0.203)
Some third level	1.27***	1.31***	0.64	0.65
	(0.099)	(0.100)	(0.496)	(0.520)
Age/100	3.53***	3.04***	0.86	0.30
	(0.625)	(0.647)	(1.928)	(1.950)
Age/100 sq	-2.99***	-2.40***	-1.40	-0.73
	(0.712)	(0.715)	(1.342)	(1.326)
Female	0.01	0.03	0.22*	0.24*
	(0.054)	(0.051)	(0.111)	(0.106)
Mobile phone	0.73***	0.76***	0.45*	0.48*
	(0.057)	(0.060)	(0.224)	(0.234)
Urban	0.19***	0.13*	0.11	0.08
	(0.048)	(0.065)	(0.067)	(0.090)
Time to Store	-0.00	0.00	0.00	0.00
	(0.002)	(0.002)	(0.002)	(0.002)
Bank Trust	0.57***	0.51***	0.44**	0.38**
	(0.050)	(0.047)	(0.152)	(0.143)
Risk Aversion	-0.14**	-0.16**	-0.05	-0.07
	(0.047)	(0.053)	(0.086)	(0.096)
FSKnow	0.17***	0.17***	0.09	0.09
	(0.018)	(0.016)	(0.069)	(0.067)
State Level Variables				
Used bribe		0.06		0.15
		(0.292)		(0.258)
Societal trust		-0.03		-0.00
		(0.253)		(0.227)
Informality (no income taxes)		-0.50		-0.04
		(0.284)		(0.494)
Crime level		-0.27		-0.15
		(0.341)		(0.242)
GDP per capita PPP		0.00		0.00
		(0.000)		(0.000)
Branches per million		0.06*		0.04
		(0.023)		(0.024)
Atms per million		-0.05*		-0.04
		(0.020)		(0.022)
Mfos per million		-0.00		-0.01
		(0.010)		(0.009)
Observations	21,109	21,109	21,109	21,109
State Controls	Yes		Yes	
Hansen JP-Value			N/A	0.5879

State controls comprise a series of state dummy variables.
Robust standard errors, clustered by state in parentheses.
***p<0.001, **p<0.01, *p<0.05

To help interpret the results, I calculate marginal effects at the mean and at each level of formality for both the probit and instrumental variable probit models with state level variables and controls included; the results are presented

in Table 4.10. The marginal effects represent the change in the probability of being banked for a one unit change in the number of formal documents held by the respondent. Similar to the point estimates, the marginal effect at the mean (MEM) is higher after instrumentation, suggesting that a one unit increase in the number of formal documents held by the respondent leads to a 7.7 percent increase in the probability of being banked, although this coefficient is marginally outside the 95 percent confidence level (column 4). This compares with a 2.1 percent estimate from the probit model (column 3).

However, the marginal effect at the mean is not likely to be particularly informative as the change in the probability of being banked is likely to be very different when a respondent is going from two formal documents to three than from nine to ten, or indeed zero to one. Table 4.10 shows the estimated marginal effects from both models. The change in the distribution in marginal effects between the probit model and the IV probit model is striking. The instrumented marginal effects are higher than the probit estimates between zero and eight formal documents and lower thereafter. Arguably, the instrumented marginal effects are in fact more intuitive as the larger gains from an additional document in terms of the probability of being banked are likely to the higher close to some threshold number of documents, or tipping point, estimated to be at four and five documents. Equally so, increases in the probability of being banked as a respondent goes from eleven formal documents to twelve should be negligible and this is what is found by the instrumented marginal effect estimates.

The analysis specifically finds that individuals who increase their number of formal documents by one when at zero documents increase their probability of being banked by 5.5 percent. However, when an individual possesses four and five documents an additional document increases their probability of being banked by 17 percent and 15 percent respectively (column 2). The result at five documents is statistically significant at the 1 percent level for both specifications with state level variables and state controls.[11]

In other words, the intuitive finding from the marginal effects analysis is

[11] As a robustness check I use different versions of the number of formal documents, specifically binary variables for greater than two, greater than three, greater than four, greater than five and greater than six formal documents and find statistically significant coefficients for these variables of interest in line with marginal effects analysis.

Table 4.10: **Marginal Effects, Clustered by State at Alternative Levels of Formal Documents.**
IV: Categorical Version of Instruments

	With State Level Variables		With State Controls	
Marginal Effects at:	Probit	IV Probit	Probit	IV Probit
mean	0.021***	0.08	0.021***	0.077
0	0.021***	0.055***	0.021***	0.055***
1	0.022***	0.092	0.022***	0.089
2	0.024***	0.131	0.024***	0.124
3	0.025***	0.160	0.025***	0.152
4	0.027***	0.168*	0.027***	0.161
5	0.028***	0.147***	0.028***	0.146***
6	0.030***	0.105	0.030***	0.110
7	0.031***	0.060	0.031***	0.067
8	0.033***	0.027	0.033***	0.033
9	0.034***	0.009	0.034***	0.013
10	0.036***	0.002	0.035***	0.004
11	0.037***	0.001	0.036***	0.001
12	0.038***	0.000	0.037***	0.000
13	0.035***	0.000	0.038***	0.000
14	0.038***	0.000	0.038***	0.000
15	0.039***	0.000	0.038***	0.000

Robust standard errors, clustered by state in parentheses.
***p<0.001, **p<0.01, *p<0.05

that when individuals are close to having sufficient documents, an additional document will lead to a statistically significant increase in the likelihood the individual is banked. However, an explanation for the result that moving from none to one document increases the chances of being banked by 5 percent requires some explanation. It is likely that this result is being driven by the large number of people at this level of documents and it is noteworthy that the size of the coefficient is one third that of the coefficient at the threshold. Indeed, the coefficients for one, two and three documents are each in turn larger than the previous one, suggesting an increasing function towards the threshold, although in these cases the coefficients are not statistically significant.

4.4.4 Robustness

To assess the robustness of this result, a number of approaches are taken. First, a comprehensive array of interaction terms are included in the instrumental variable regressions, specifically all combinations of monthly income, financial sector knowledge, urban, gender, education, banktrust and risk aversion were

employed, and the size and significance of the coefficient on number of documents remains remarkably consistent.

Second, I conduct the IV regression separately for both the urban and rural subsamples and find similarly sized coefficients that are again larger than the OLS estimates. This robustness check considered the possibility that our two instruments might be less successful in a rural setting but no evidence was found for such a weakness.

Third, I include local government area dummies in the instrumental variables estimation to control for unobserved heterogeneity at the local level. With a local government area fixed effect linear model I not only find that the two instruments retain their relevance to number of formal documents, and fail to reject the null hypothesis that all instruments are uncorrelated with the error term, but that the coefficient on number of documents remains positive and statistically significant at the 1 percent level.[12] Hence, by taking into consideration local government fixed effects, this suggests that the central result that informality plays a statistically significant and causal role in the determination of banking status is robust.

Fourth, the two categorical instruments employed were transformed into a system of dummy variables and these were used to instrument for formal documents. While none of the individual dummy variables were found to be significant in the first stage, which is not surprising, the coefficients on the instrumental variables regression are very similar to the coefficients in the main specification presented. The two coefficients are 0.52 and 0.51 for the specification with state controls and state variables respectively, and both are statistically significant at the 1 percent level. While the marginal effects of this approach are not presented in this chapter, they follow almost an identical pattern to the marginal effects presented in Table 4.10, specifically a threshold effect around four to five documents and an effect moving from no documents to one document. The main difference in this case is that the mean effect is statistically significant at the 1 percent level, whether using state controls or

[12] A weakness of this approach is that the local government areas (LGAs) uniquely identify the dependent variable in a significant number of cases which is not surprising as on average there are only 34 observations for every LGA. A linear model is used as convergence is not achieved for the instrumental variable probit model. As a result a comparable estimate is not generated for inclusion in Table 4.9.

state level variables.

Finally, to assess whether the number of documents was in fact endogenous in the model I use a bootstrapped approach to calculating the Hausman test statistic because of the adherence to robust standard errors. The test results indicate that there is reason to believe that the number of documents held is indeed endogenous to formally banked. I reject the null hypothesis of exogeneity, with a p-value of 0.00 when I instrument with time to water source and type of refuse collection. This suggests that the IV approach was an essential improvement in the estimation.

4.5 Conclusion

Documentary requirements for opening a bank account are particularly high in Nigeria, estimated at 3.66 official documents (Beck, Demirguc-Kunt and Peria, 2008). Given that only 9.7 percent of the Nigerian population posses three or more official documents and only 5.6 percent of the population posses four or more official documents, it is unsurprising that four-fifths of the Nigerian population remain outside the formal banking sector.

The evidence on the determinants of the financial status of the Nigerian population suggests that not only are the banked population likely to have more official documents to their name, but they are also more likely to live in states characterised by a higher degree of formality as measured by the proportion of people who pay income taxes.

This chapter represents an attempt to understand the relative importance of, and underlying characteristics of the individuals who face different types of barriers to formal banking services in Nigeria. The results show that significant heterogeneity exists between groups who face different barriers. Policy aimed at improving financial inclusion should adopt differing strategies for excluded populations based on the specific constraints they face. As the data used in this chapter emanate from three static surveys with broad based objectives, an opportunity remains open to investigate the nature of barriers to formal financial services through more focused experimental surveys.

The instrumental variable results show that the number of official documents

an individual holds plays a significant role in the likelihood of being banked. This result is of particular note as it reveals the possibility that significant increases in financial inclusion may be possible without the need to wait for higher incomes, higher levels of education or greater financial literacy. The result is particularly strong for individuals around the threshold of four to five formal documents who can be considered on the cusp of financial inclusion. Hence, the greater formalisation in the status of the poor in Nigeria, and across Africa is likely to lead to greater use of formal financial services.

Chapter 5

Is Mobile Banking Breaking the Tyranny of Distance to Bank Infrastructure? Evidence from Kenya

5.1 Introduction

Distance to financial services has long been a constraint for financial inclusion in sub-Saharan Africa, a region characterised by an especially high proportion of rural dwellers. In 2010, 63 percent of Sub-Saharan Africans lived in rural areas, and while this percentage has declined steadily from 85 percent in 1960, the absolute number of rural residents in sub-Saharan Africa has risen to 534 million from 196 million in 1960 (World Bank, 2012). Evidence for the role of geography in financial exclusion was provided in Chapter 3 where it was found that the usage of formal financial services was lower in rural areas across 11 sub-Saharan African countries surveyed, with rural penetration rates less than 15 percent in the poorer countries; Kenya, Malawi, Mozambique, Rwanda, Tanzania, Zambia as well as in Nigeria.

Geographical isolation in the form of distance or time to bank branch can

increase the effective cost of using financial services, shifting upwards the effective financial services supply curve out of reach of individuals with a modest demand for these services. Indeed, geographic isolation can lead to the complete absence of a supply curve, condemning rural dwellers to exclusion from formal savings, transaction and loan products irrespective of their material wealth and demand for services.

For higher levels of financial inclusion to be achieved in sub-Saharan Africa either bank networks will have to expand into small towns and villages or the mobile banking revolution will have to gather pace.[1] Branch expansion offers the potential of incremental improvements in financial inclusion but the profitability of rural bank expansion can be undermined by low levels of demand due to significant levels of informality and poverty in rural areas, and the high costs of branch expansion.

Kenya experienced significant expansion in its financial sector infrastructure over the period 2006-2008 which resulted in a 46 percent increase in bank branches (Central Bank of Kenya, 2011, 2010, 2009, 2008, 2007). Bank branch networks expanded in both urban and rural areas from a total of 581 in 2006 to 849 in 2008. While there was no increase in bank branches in the north of the country, there was significant expansion into more densely populated areas in the south of the country stretching from Lake Victoria to the port city of Mombasa. The net effect of this branch expansion, together with wider economic growth in Kenya, was to increase the proportion of Kenyan adults with access to formal financial services from 16 percent in 2006 to 24 percent in 2009.

Alternatively, the rapid expansion in mobile banking in Sub-Saharan Africa can help achieve greater financial inclusion by bringing increasingly sophisticated and lower cost services to rural communities, beginning with saving and transaction services. The spread of mobile banking offers developing countries the tantalising prospect of increases in financial inclusion without the need for branch expansion. It is possible that low income countries could leapfrog branch centred banking into mobile banking, in similar fashion to their leapfrog over landline telecommunication infrastructure straight to mobile technology.

Kenya has been at the forefront of the mobile banking revolution in Africa

[1] Of course the improvement in transport infrastructure and reduction in costs or affordability of visiting the bank can help improve financial inclusion.

with M-Pesa, the venture launched by Safaricom, Vodafone's Kenya affiliate, reaching over 10 million registered customers, or 40 percent of Kenya's population by 2010 (Beck, Maimbo, Faye and Triki, 2012). Registered M-Pesa users can store, transfer or accept sums of money through their mobile phones and turn their virtual balances into cash at any one of over 20,000 authorised Safaricom dealers. Despite the remarkable success of M-Pesa, the system is not a perfect substitute for the range of services offered by a formal bank, with the notable absence of a credit facility for customers. However, recent innovations have begun to bridge the gap with the opening up of M-Pesa to institutional payments, enabling companies to pay salaries and collect bill payments for example. It is conceivable that further innovations will reduce the differences in breadth of services offered by mobile banking in Kenya when compared with the traditional service offerings by formal banks.

This chapter seeks to answer two questions and test one central hypothesis. First, an attempt to quantify the nature of the tyranny of distance in financial inclusion in Kenya is made.[2] I define the tyranny of distance as the situation when an individual's chance of having a bank account depends on proximity to a branch. In the event of a saturation in the number and location of branches across a country, the distance to branch would no longer be a factor in determining whether an individual had a bank account: one could always find a branch sufficiently close to make distance a negligible factor. Specifically, Global Positioning System (GPS) coordinates for both bank customers and bank branches are used to estimate the relationship between physical distance to bank infrastructure and the likelihood of being formally banked. To complement this analysis the relationship between time to bank branch and personal financial access is also assessed. Second, this chapter ascertains whether changes have taken place in the importance of distance to bank branch for financial inclusion between 2006 and 2009, a period of significant banking expansion. Finally, taking advantage of the recent mobile banking revolution in Kenya and use of M-Pesa by over 10 million Kenyans, the hypothesis that mobile banking in Kenya is overcoming the tyranny of distance to bank infrastructure for financial inclusion is tested.

[2]The phrase tyranny of distance to banking infrastructure was first used by Petersen and Rajan (2002) in relation to small business lending.

In this chapter, the individual level data comes from the 2006 and 2009 Kenyan FinAccess surveys. In addition to containing a wealth of information on usage and perceptions of financial services and basic socio-economic data on the respondent, the surveys contain GPS coordinates for the home of the respondent. This data is combined with data from the Central Bank of Kenya on the names, addresses and locations of bank branches in 2006 and 2009 to answer the two questions and main hypothesis posed.

The univariate tests confirm the importance of physical access, as measured by distance and time to banking infrastructure, for formal financial inclusion and this result is backed up by more systematic bivariate probit regressions. For example, in 2009 a 1 percent increase in the distance from a bank branch leads to a decrease in the chances of being banked by 3 percent. By dividing the data into subsamples and separately using a series of interaction terms, evidence is found that distance is a binding constraint for middle income individuals, defined as those in expenditure quartiles two and three, and for those with non-zero assets.

While penetration rates of formal banking increased modestly in rural areas from 12 percent in 2006 to 17 percent in 2009, there is evidence that the financially included resided closer to bank branches in 2009 than in 2006. This is likely to reflect a combination of greater increases in financial inclusion in urban areas, the predominance of bank branch expansion in urban areas or in rural areas with higher population density and the increased use of M-Pesa by potential bank customers in rural areas.[3] The failure of the significant expansion in the Kenyan banking system to overcome, to any great extent, the tyranny of distance to bank infrastructure is perhaps an ominous sign for the potential of branch expansion to improve financial access in regions of low population density in the short term.

Evidence is found to support the hypothesis that mobile banking in Kenya is overcoming the tyranny of distance to bank infrastructure for financial inclusion. In the main specification with control variables for wealth and level of formality, it is found that distance or time to bank branch is not a statistically significant

[3] Usage of formal banking services increased from 27 percent in 2006 to 41 percent in urban areas in 2009, whereas the increase in rural areas was 12 percent in 2006 to 17 percent in 2009.

determinant of the use of mobile banking. Even before wealth and expenditure level are controlled for, increased distances from bank infrastructure do not reduce the likelihood that an individual is a mobile bank user as much as it does for formal banked account holders. While this result suggests that mobile banking may be breaking the tyranny of distance for those with greater wealth, further analysis on sub-samples suggest that the non-relationship found between distance or time to bank branch and mobile banking is not overturned for any personal expenditure quartile and breadth of assets. This provides evidence that mobile banking is breaking the tyranny of distance (or time) to traditional bank infrastructure for greater financial inclusion of all economic groups in Kenya.

This chapter is structured as follows. Section 5.2 provides a short review of the relevant literature. Section 5.3 outlines recent developments in both the formal and mobile banking systems in Kenya. Section 5.4 describes the data sources used in this paper - FinAccess 2006 and 2009 - and a supply side survey of bank branches by the Central Bank of Kenya. Section 5.5 describes the econometric model and empirical results and Section 5.6 concludes.

5.2 Literature

Debates over channels of causation between financial development and economic growth have existed since innovations in banking and legal currency gathered pace in Western Europe in the 17th and 18th Centuries. While acknowledging the likely bi-directionality of the causation, recent research has substantiated the position that increasing depth of the financial sector stimulates economic growth by increasing the rate of capital accumulation and improving the efficiency of capital (King and Levine, 1993). To support this hypothesis, King and Levine (1993) focus on four different measures of financial depth, one of which may be considered a crude approximation of the depth of the bank branch network; the ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets. The cross-country evidence from King and Levine (1993) suggests that greater levels of bank deposits are strongly correlated with economic growth.[4] While a wide reaching branch net-

[4]The other three measures of financial depth employed by King and Levine include the ratio of liquid liabilities of the financial system to GDP, the proportion of credit allocated to

work should go hand in hand with depth in bank deposits, it is possible that foreign deposits could inflate domestic deposit levels without necessitating the mobilisation of domestic savings through branch expansion. In addition, the depth of central bank domestic assets will differ by country and depend on the varying institutional approaches to prudent levels of assets to underpin stability in the financial system.

Irrespective of the outcome of debates over causality between the depth of banking infrastructure and growth, difficulties of physical access to banking services represent an important constraint to greater financial inclusion in developing countries as African and African-based banks tend to concentrate their branch networks in urban areas (World Bank, 2008). The importance of physical access to banking infrastructure was demonstrated by a pseudo-natural experiment in Mexico, the expansion of a savings institute (Pahnal), that showed that greater physical access increased the average saving rate of affected households by 3 to 5 percentage points (Aportela, 1999). Further evidence for the importance of physical access comes from the great post-nationalisation expansion of bank branches in India. Between 1969 and 1996, India increased the number of bank branches from 8,262 to 63,092 with the greatest expansion in rural areas; the proportion of bank branches in rural areas increased from 22 percent to 52 percent (Kohli, 1999). The aggressive supply-led bank branch expansion was motivated by social policy objectives and pursued through a policy of mandatory licensing, introduced in 1977, whereby permission to open a bank branch in an already banked location was only granted if branches were opened in four previously unbanked locations (Burgess and Pande, 2005). By exploiting this policy change, Burgess and Pande (2005) found that rural branch expansion, and associated deposit mobilisation and credit disbursement, caused reductions in poverty levels.

While these studies focus on the socio-economic impacts of branch expansion, a separate strand of the literature looks at the determinants of access to financial services (Beck and Brown, 2010; Djankov, Miranda, Seira and Siddharth, 2008). While these studies assess the role played by personal, national or regional characteristics, formal assessment of the importance of physical access

private enterprises by the financial system and the ratio of claims on the nonfinancial private sector to GDP.

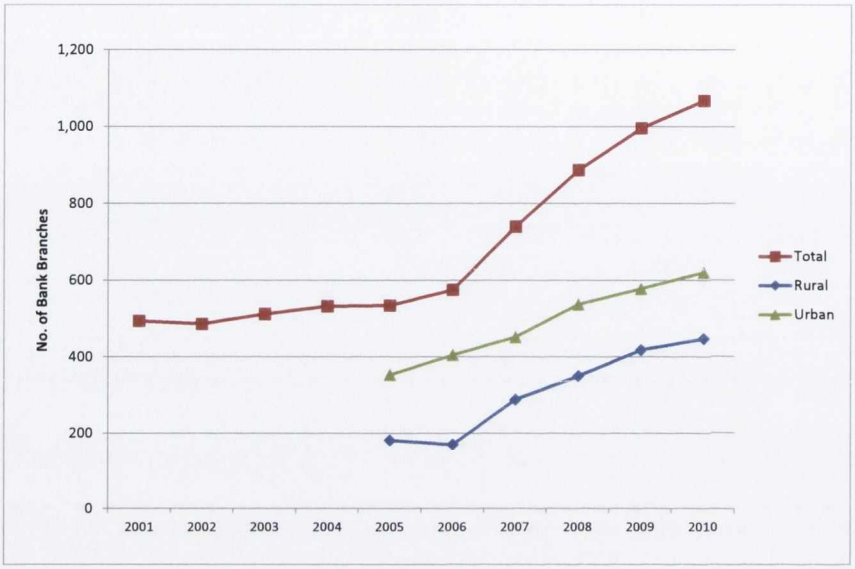
to banking infrastructure for financial inclusion is absent from the development economics literature.[5] Conceptually, physical access can be defined as either physical distance or time to branch. In some circumstances, travel time could be a more important determinant than distance in kilometres especially in urban areas and for rural areas with varying degrees of road infrastructure and public transport.

One modest exception to this comes from Chapter 3, where time to grocery store is used as a proxy for distance, not necessarily to banking services, but services more generally, and while the relationship between whether an individual respondent is formally banked or not and time to grocery store is not found when a breadth of control variables are considered, this cannot disprove the importance of physical access to banking services in financial inclusion. Indeed, these results show that living in an urban environment increases the chances that an individual is formally banked.

Related literature on the role played by physical distance in small and medium enterprise lending in developed countries suggests that physical distance to branch networks has become less important for bank lending (Petersen and Rajan, 2002; Degryse and Ongena, 2005). According to Petersen and Rajan (2002), the increase in the physical distance between lending banks and small firms in the US between 1973 and 1993 is not due to a retrenchment of bank branch networks but centralisation of lending functions and associated increases in labour productivity. While Degryse and Ongena (2005) find limited evidence of a similar decline in the distance between lending banks and small firms over the period 1975 to 1997 in a survey of 15,000 Belgian firms, they do find evidence of distance-based price discrimination.

[5] Although Chapter 3 considers the role played by distance to grocery store.

Figure 5.1: *Kenyan Bank Branch Expansion (2001-2010)*



Source: Graphed by Author. Kenyan Central Bank 2012 Note: These series are taken from Kenyan Annual Banking Supervision Reports and specifically includes bank head offices.

5.3 Developments in the Kenyan Banking System

5.3.1 Branch Network Expansion

Since 2005 Kenya has experienced a period of significant bank branch expansion according to data from the Central Bank, with a 46 percent increase in three years from a total of 581 branches in 2006 to 849 branches in 2008.[6] While more bank branches are located in urban areas, the growth rate in rural areas has been higher than in urban areas since 2005. Nevertheless, the regional insurance and banking centre of Nairobi also saw significant growth in bank branches, despite experiencing lower growth rates than for rural areas. Figure 5.1 presents the changes in the number of bank branches in Kenya since 2001, and since 2005 for urban and rural areas.

[6]These figures and the data used in this chapter exclude head offices unless otherwise stated.

Figure 5.2 shows the location of Kenyan provinces and Figure 5.3 traces the expansion in bank branches since 1999 for each of the eight provinces in Kenya and presents estimates of formal banking penetration rates from the two FinAccess surveys in 2006 and 2009. At year end 2008, the urban centre of Nairobi had 112 branches per million population (353 branches in total), followed by 33 branches per million in the Coast province (111 branches in total). The provinces of Nyanza (11 branches per million), Western (9 branches per million) and North Eastern (4 branches per million) all had less than 12 branches per million population.

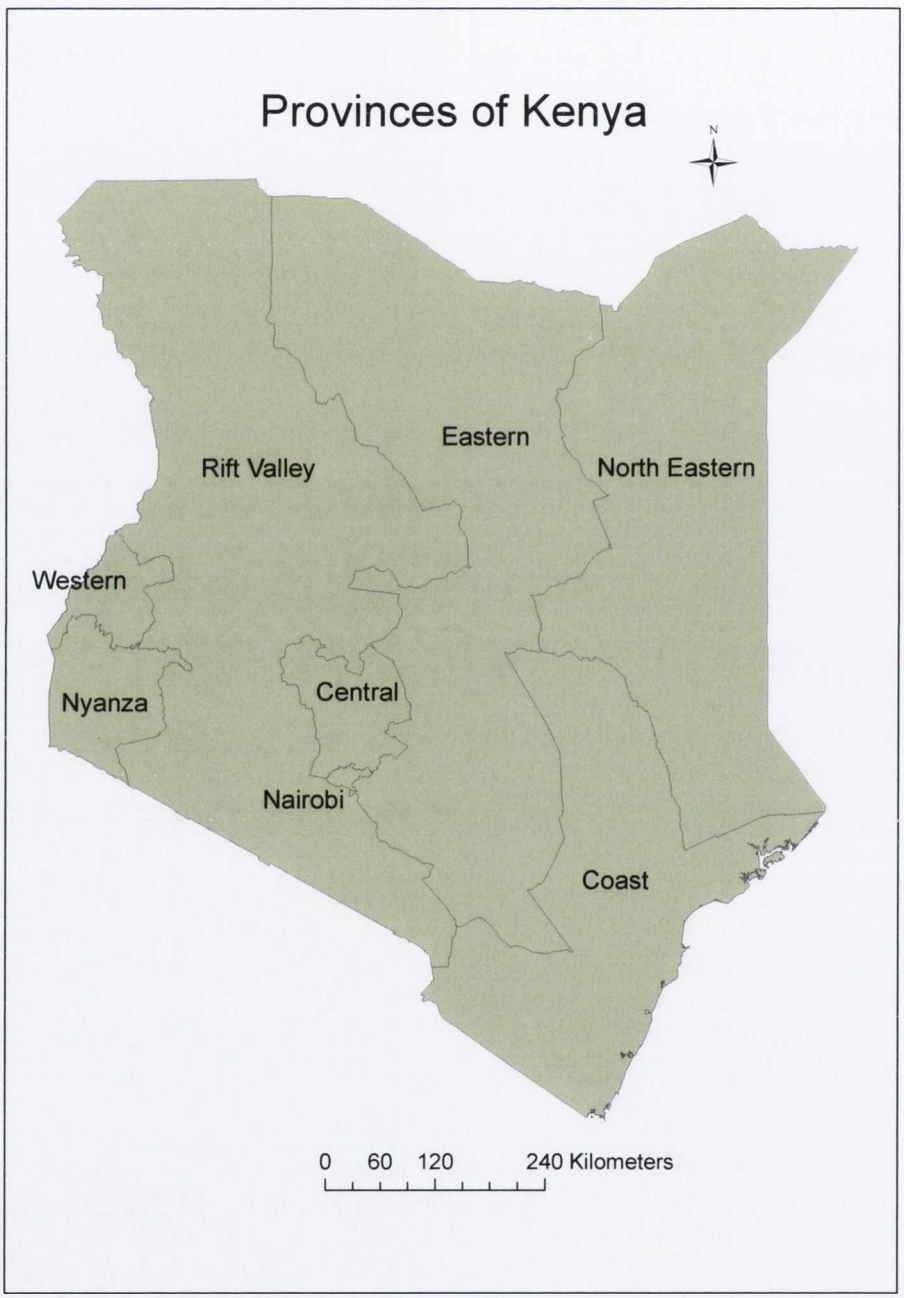
The higher growth rates in bank branch expansion in rural areas hides important differences between rural areas. Rural areas in Kenya vary greatly in terms of population density and I find evidence that the expansion in rural areas is solely confined to the more densely populated areas in the south and near large cities and towns. Figure 5.4 shows all the newly opened bank branches in Kenya between 2006 and 2009. It is clear from the map that there was no increase in bank branches in the north of the country and that the branch expansion occurred in more densely populated rural areas in the south of the country stretching from Lake Victoria to the port city of Mombasa.

As banks tend to expand into regions with high and growing demand for financial services, measures of proximity to banking services are likely to change as demand patterns alter because of a mix of changes in levels of income, formality, consumerism and population density as well as in changes in the supply of bank infrastructure. For example, urbanisation will naturally reduce the distance between the citizens of Kenya and urban based financial services.[7] Alternatively, improved transport networks will reduce the opportunity cost of time to access financial services. This inherent endogeneity in the expansion decision of bank infrastructure means that measures of proximity to banking services cannot be seen as solely a supply side phenomenon.

Over the period 2006 to 2009, there were significant changes in market structure and three trends stand out. First, there was a significant increase in the number of banks licensed in Kenya with many international, middle

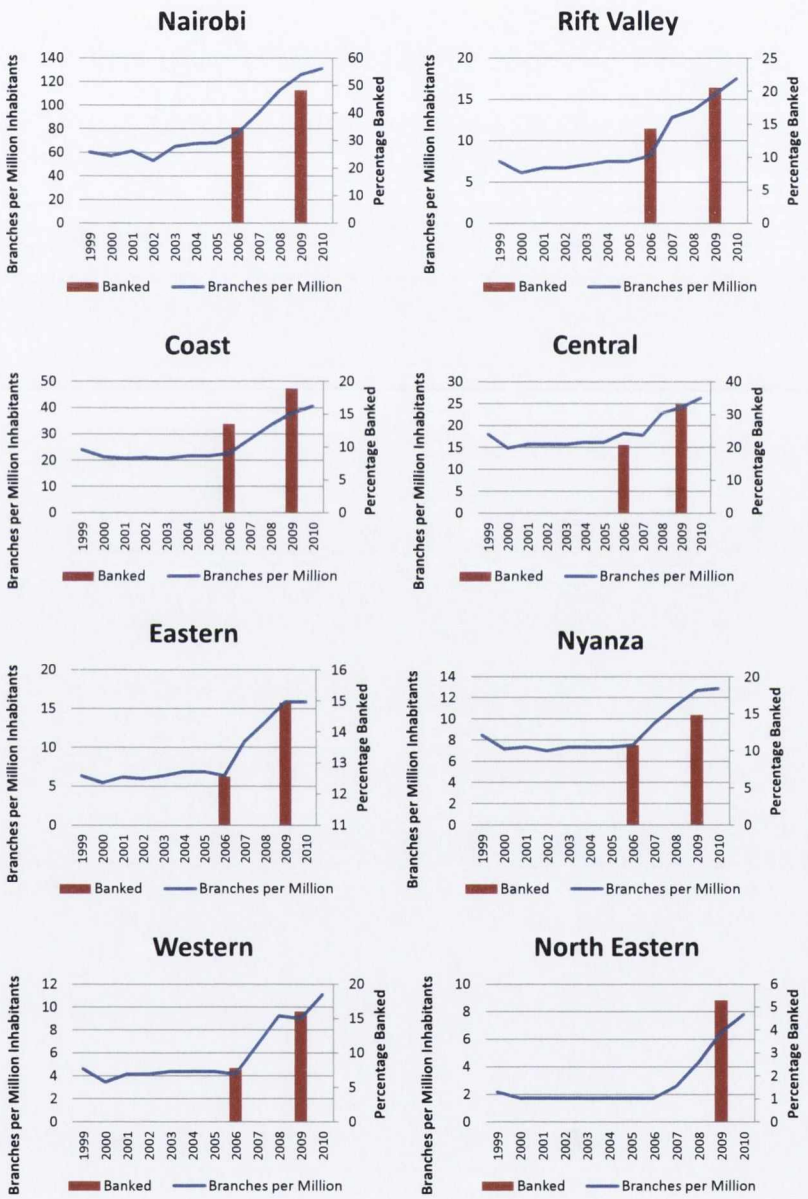
[7]Indeed the fact that the average annual urban population growth rates over the period 2006 and 2009 was 4 percent, compared with 2.2 percent for rural areas is suggestive of a possible role for migratory/demographic changes in reducing the average distance to banking services.

Figure 5.2: *The Provinces of Kenya*



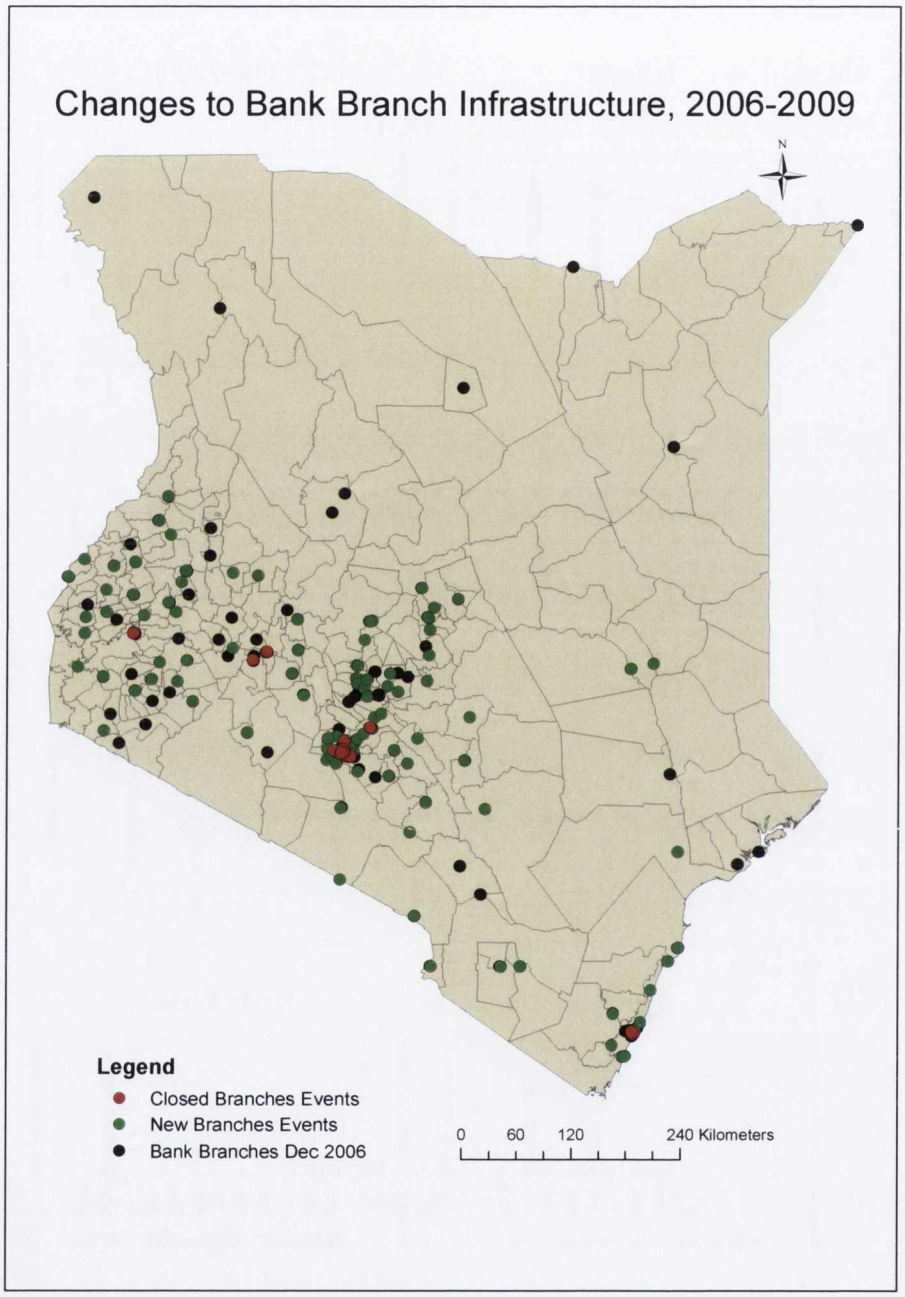
Source: ARC-GIS Map

Figure 5.3: *Provincial Expansion in Bank Branches and Percent Formally Banked*



Source: FinAccess 2006, 2009 and Kenyan Banking Supervision Reports. Data series specifically includes head offices.

Figure 5.4: *Changes to Bank Branch Infrastructrue, 12/2005 - 12/2008*



Source: FinAccess 2006, 2009 and Kenyan Banking Supervision Reports. Data series specifically includes head offices.

eastern/Indian and other African banks setting up in Kenya's large cities with very small market share of the domestic retail banking market. Second, Equity Bank achieved a remarkable increase in market share from 17 percent in 2006 to 44 percent in 2009 on the back of its significant expansion in branch network and product innovation. Finally, Kenya's more established banks, Co-operative Bank and Kenya Commercial Bank have lost market share as a result of Equity bank's performance and have been joined by Barclay's Bank and Post Bank in second tier of Kenyan Banks, with each of the four banks on eight to ten percent market share.

5.3.2 Mobile Banking Revolution

Traditionally late adopters of western technological developments, developing countries have instead been at the vanguard of innovation in the area of mobile banking. The spread of mobile banking offers developing countries the tantalising prospect of increases in financial inclusion without the need for branch expansion. It is possible that low income countries could leapfrog branch based banking into mobile banking in similar fashion to their leapfrog over landline telecommunication infrastructure straight to mobile phone technology.

Kenya has been at the forefront of the mobile banking revolution. Following a pilot in 2005, Safaricom and Vodafone launched M-Pesa, a mobile-based payment service targeting the un-banked, pre-pay mobile subscribers in March 2007 (Vaughan, 2007).[8]

In practical terms, M-Pesa acts like mobile phone credit where customers are allowed to deposit cash into their M-Pesa account to create an e-float balance, exchange this e-float back into cash at some future time or transfer some e-float to another M-Pesa user (Mbiti and Weil, 2011). A customer can check their e-float balance and transfer funds from their mobile phone whereas cash based transactions are conducted at registered M-Pesa agents throughout the country. While M-Pesa e-float transfers became the primary method of in-country remittances, increasingly e-float transfers are also used to pay for goods and services directly (Jack and Suri, 2010). M-Pesa differs from a traditional

[8]The name M-Pesa is derived from "M" for mobile and "Pesa" for money in Swahili. See Vaughan (2007) and Mas and Radcliffe (2010) for further details on M-Pesa.

bank account in two important ways. M-Pesa account holders do not earn interest on their e-float balances and as of 2012 it was not possible for customers to borrow money through M-Pesa.

M-Pesa makes money in three ways. First, M-Pesa charges a sliding tariff on cash withdrawals. For example, the cost of withdrawing $100 is about $1 or 33 US cents for $33 (Jack and Suri, 2010). Second, e-float transfers are charged a flat fee of about 40 US cents whether the purpose is remittances or retail payments (Jack and Suri, 2010). Third, customers are charges a total of US 1.3 for balance inquiries on their mobile phone (Jack and Suri, 2010).

By June 2010, M-Pesa had more than 10 million registered customers in Kenya, or 40 percent of Kenya's population (Beck, Maimbo, Faye and Triki, 2012). The volume of transactions has also been impressive at US$400 million per month, or 15 percent of Kenya's GDP by June 2010 (Beck, Maimbo, Faye and Triki, 2012). In the early years of operation, M-Pesa enjoyed complete market share but by 2010 the queue of potential competitors was growing with the launch of platforms such as Mkesho, Mobicash, Orange money, Yu-cash, Elma, Pesa-Pap and Pesa-Connect (Central Bank of Kenya, 2011). However, with Safaricom still enjoying three-quarters of the market share in mobile phones it retains significant market dominance in mobile banking in Kenya. Importantly for this chapter, M-Pesa enjoyed a de-facto monopoly in mobile banking in Kenya between 2006 and 2009.

Contrary to the aims of bringing banking to the poor and isolated, previous calculations of summary statistics from the 2009 FinAccess survey find that that the average M-Pesa user is younger, wealthier, better educated, banked, employed in non-farm sectors, more likely to own cell phones and to reside in urban areas (Aker and Mbiti, 2010; Mbiti and Weil, 2011). Using the same dataset Mbiti and Weil (2011) also find differences in the frequency of use of M-Pesa, with the already formally banked group using M-Pesa almost three times more often than the unbanked population.

The emerging literature on M-Pesa has identified a number of important substitution effects. First, M-Pesa has emerged as the dominant medium of money transfer reducing the traditional role played by the formal mechanisms such as post office and Western Union, and informal mechanisms such as bus

companies (Mbiti and Weil, 2011). Second, Mbiti and Weil (2011) find that increased use of M-Pesa lowers the propensity to use informal savings mechanisms such as ROSCAS. Third, qualitative studies on M-Pesa such as Morawczynski and Pickens (2009) find that M-Pesa usage can serve as a partial substitute for the safe-keeping of savings in the formal banking system.[9]

5.4 Data Description

Supply side data on bank branches is provided by the Central Bank of Kenya which records the names and addresses of all bank branches in Kenya. In their annual returns to the Central Bank, financial institutions are required to provide an array of balance sheet and transactions related financial information, along with a list of operational bank branches and their addresses. The list of bank branches used in this paper comes from the 31st of December 2008 and 31st December 2006 returns as the closest dates to when the 2009 and 2006 FinAccess surveys were conducted.[10]

The GPS coordinates for bank branches in 2010 were found using the Google Maps GPS locator tool by staff of the Central Bank of Kenya.[11] By cross-referencing the names and addresses of bank branches in 2010 with the list of bank branches for 2008 and 2006, I developed a list of all bank branches with GPS coordinates for year-end 2006 and 2008. A small number of branches were closed before 2010 that existed in either the 2008 or 2006 list, and as a result these were not included in the 2010 list created by the Central Bank of Kenya. To overcome this, I used the Google Maps GPS locator to find the coordinates of these branches. In total there were 298 new branches opened and 29 branches closed between 2006 and 2008. Only three bank branches not present in the 2010 list and not identifiable from their name and address were omitted from the dataset.

[9]Morawczynski and Pickens (2009) also find that M-Pesa users send smaller but more frequent remittances, which resulted in overall larger remittances to rural areas. They also observe that urban migrants using M-Pesa visited their rural homes less frequently.

[10]FinAccess 2006 took place in the third quarter of 2006. FinAccess 2009 took place in the first quarter of 2009. An argument can be made for the use of the 31st December 2005 list of bank branches but this list was not available. In any case, the growth rate in bank branches for 2006 was significantly smaller than for 2007, 2008 and 2009.

[11]To ensure the accuracy of the geo-positioning data, I audited a random sample of five percent of bank branch GPS coordinates and the accuracy of the data was confirmed.

The individual level data come from the 2006 and 2009 Kenyan FinAccess surveys. The 2009 survey was conducted by the Kenyan National Bureau of Statistics and was designed to be nationally representative using three-stage cluster stratified probability sampling. Of particular note is the first stage of this sampling process which selected a set of 650 clusters to ensure representation at national, provincial and urbanization levels (urban/rural). The approach taken to rural sampling is of particular interest in the case of this chapter with the focus on distances between households and banking services. While a full census would produce more accurate estimates of distances between households and banking services, efforts on behalf of the samplers to be geographically representative helps overcome some concerns over the choice of clustering in rural areas. As the average distance between households and services is less than 15km, the non-inclusion of some very remote rural areas as clusters may be a source of bias that serves to underestimate the role of proximity to banking services in financial inclusion. In the second step of the sampling process, twelve households are targeted in each cluster and ten chosen for inclusion. Finally, the individual for interview is selected randomly from household members who are aged 16 years and older using the KISH grid method. The 2006 FinAccess sample comprised 442 clusters (143 urban and 299 rural) using a similar stratified three-stage design.[12]

The 2009 and 2006 FinAccess surveys include a series of adult weights to ensure the dataset is nationally represented. A particular characteristic of the two FinAccess surveys is a gender bias towards female respondents as a result of the absence of a greater number of males during house-to-house visits and this bias has been corrected through weights. The summary statistics and regression analyses conducted in this chapter are based on this weighted dataset unless otherwise specified.

Tables 5.1 and 5.2 present the summary statistics and description of the variables employed in this chapter. The list of banking services that define whether an individual is formally banked is presented in Table 1 and is identical to the approach outlined in Chapter 3. In 2009, 24 percent of Kenyans were formally banked which was up from 17 percent in 2006. The binary variable

[12]Further details on the 2006 and 2009 survey can be obtained from the Financial Sector Deepening Trust website.

for mobile banked is defined from the survey question "Are you currently a registered M-Pesa user?". Overall, 26.5 percent of the Kenyan population were registered M-Pesa users in 2009. In addition, evidence is found for the dual use of formal banking products and M-Pesa by Kenyans. In the 2009 survey, 53 percent of formally banked were also M-Pesa users.

Table 5.1: **Summary Statistics and Data Sources**
Weighted mean in parentheses. Remainder of summary statistics are based on unweighted data.

	Coding	Obs	Mean	Std. Dev	Min	Max
2009 Survey Variables						
Formally Banked	Formally Banked products include personal loan/business loan from a bank, Loan to buy/build a house, or to buy land from a bank or building society, Postbank account, Bank account for savings or investment, current account, bank account for everyday needs but no cheque book, overdraft, ATM card or Debit card, Credit card.	6,527	0.24 (0.22)	0.43	0	1
Mobile Banked	Registered M-Pesa user.	6,527	0.28 (0.26)	0.45	0	1
KM to Branch	Kilometres to Bank Branch (Bank Branches as at 31 December 2008)	6,516	14.36 (14.05)	20.55	0.02	141.12
Time to Bank	Response to the question, *"How long would it take you to get to the bank, if you did not combine the trip with any other activities?"*	6269	2.90 (2.96)	1.50	1	9
Expenditure	Expenditure is derived as total monthly expenditure on mobile/ telecommunications, personal expenses (such as clothing), education, household bills, entertainment and socializing, groceries and food, medical related expenses, paying off loans, transport, donations to religious groups, rent or mortgages, savings and supporting other members of family.	6.519	14,311 (12.276)	30,801	20	812,500
Age	Exact Age	6,527	38.66 (38.92)	16.69	16	105
Female	Female = 1, Male = 0	6,527	0.59 (0.59)	0.49	0	1
Mobile phone	Yes = 1, No or Not Answered = 0	6,527	0.47 (0.46)	0.50	0	1
Urban	Urban = 1, Rural = 0	6,527	0.29 (0.22)	0.45	0	1
Risk Aversion	Agree or Don't Know = 0, Disagree = 1 with statement "You avoid taking risks with your money or resources".	6,527	0.70 (0.69)	0.46	0	1
FSKNow	Scaled into a 0-10 index. Score given for the following responses for each of the 16 financial terms: Heard but do not understand = 1 point, Heard and do understand = 2 points.	6,527	5.30 (5.15)	3.00	0	10
Breadth of Assets	Which of the following items does your household own? One point for each of the following assets: Built-in kitchen sink, Fixed telephone line or outstanding application, Camera, Hi-fi/music centre, Microwave oven, Electric stove with oven, Vacuum cleaner, Free-standing deep freezer, DVD player, Video recorder/player and Electric iron.	6,527	0.70 (0.50)	1.855	0	11

Table 5.2: **Summary Statistics and Data Sources**
Weighted mean in parentheses. Remainder of summary statistics are based on unweighted data.

	Coding	Obs	Mean	Std. Dev	Min	Max
2006 Survey Variables						
Formally Banked	Formally Banked products include personal loan/business loan from a bank, Loan to buy/build a house, or to buy land from a bank or building society, Postbank account, Bank account for savings or investment, current account, bank account for everyday needs but no cheque book, overdraft, ATM card or Debit card, Credit card.	4,308	0.16 (0.15)	0.37	0	1
KM to Branch	Kilometres to Bank Branch (Bank Branches as at 31 December 2006)	4,268	14.53 (14.78)	19.81	0.03	293.79
Educ	No formal education = 1, Some primary school = 2, Primary school, completed = 3, Some secondary school = 4, Secondary school, completed = 5, Professional Qualification or equivalent = 6, Some university = 7, University completed = 8.	4,292	3.15 (3.15)	1.69	1	8
Age	Exact Age	4,308	36.47 (36.66)	15.53	16	90
Female	Female = 1, Male = 0	4,308	0.56 (0.51)	0.50	0	1
Mobile phone	Yes = 1, No or Not Answered = 0	4,308	0.27 (0.26)	0.44	0	1
Urban	Urban = 1, Rural = 0	4,308	0.32 (0.25)	0.47	0	1
Risk Aversion	Agree or Don't Know = 0, Disagree = 1 with statement "You avoid taking risks with your money or resources".	4,308	0.74 (0.73)	0.43	0	1
WC Formality	What type of toilet facilities does the household use? Coding: None =1, Bucket = 2, Uncovered pit latrine = 3, Covered pit latrine = 4, Ventilated improved pit latrine = 5 and Flush toilet = 6.	4,307	3.32 (3.28)	1.19	1	6
Breadth of Assets	Which of the following items does your household own? One point for each of the following assets: Built-in kitchen sink, Fixed telephone line or outstanding application, Camera, Hi-fi/music centre, Microwave oven, Electric stove with oven, Vacuum cleaner, Free-standing deep freezer, DVD player, Video recorder/player and Electric iron.	4,308	0.64 (0.46)	1.80	0	11

As part of the interview process for FinAccess Kenya, the interviewer used a handheld device to note three sets of GPS coordinates and an average of the three sets of coordinates was recorded as the final location for each individual. When mapped using ARC-GIS software a small number of the observations in the 2009 dataset, 11 in total, were demonstratably incorrect and were as a result excluded.[13] In 2009, the banked population lived an average of 8.13 kilometres from a bank branch, representing a reduction on the 2006 figure of 8.88 kilometers. The decline could suggest that proximity to bank branch was a more important predictor of personal financial access in 2009. Of course this could also be due to greater urbanization or branch expansion into areas with previously banked individuals. There was a more modest fall in the average distance between the unbanked and bank branch between 2006 and 2009 from 15.84 kilometers to 15.75 kilometers. To shed light on the central hypothesis, that mobile banking is breaking the tyranny of distance to bank branch, the summary statistics suggest that M-Pesa users in 2009 were on average located a little further away from bank infrastructure than the formally banked at 8.88 kilometers. Figure 5.5 graphically presents these summary statistics.[14]

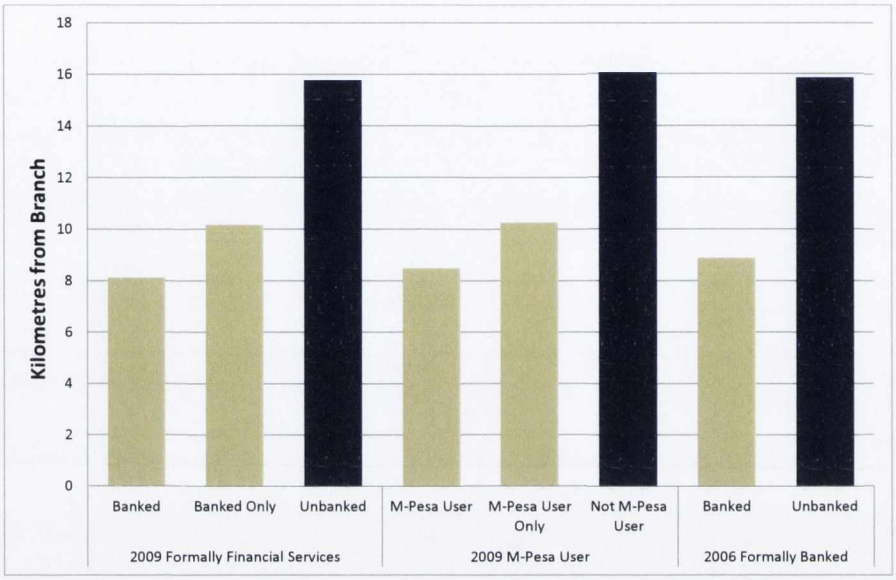
Acknowledging the difference between distance to banking services and time to banking services, I also use a categorical variable, time to bank branch, which records how long it would take respondents to get to the bank, if they did not combine the trip with any other activities. There are nine possible responses ranging from under 10 minutes to 7 or more hours. Figure 5.6 graphs the relationship between the nine categorical responses with the average distance to a bank branch for respondents in that category. Confirming the similarity of the time to bank and distance to bank variables, the graph shows a consistently positive relationship between the two variables.

Using ARC-GIS, changes to bank branch infrastructure over the period 2006 to 2009 are mapped in Figure 5.3. It is noticeable that the distribution of new bank branches is broadly confined to the region around Nairobi and Central

[13] In the 2006 data three individuals were deleted as erroneous and no GPS data was available for nine individuals.

[14] In the regression analysis which follows the distance variable is the natural log of one plus the distance in kilometres. This approach is similar to the approach taken in (Degryse and Ongena, 2005).

Figure 5.5: *Distance to Nearest Branch by Financial Status (2006, 2009)*

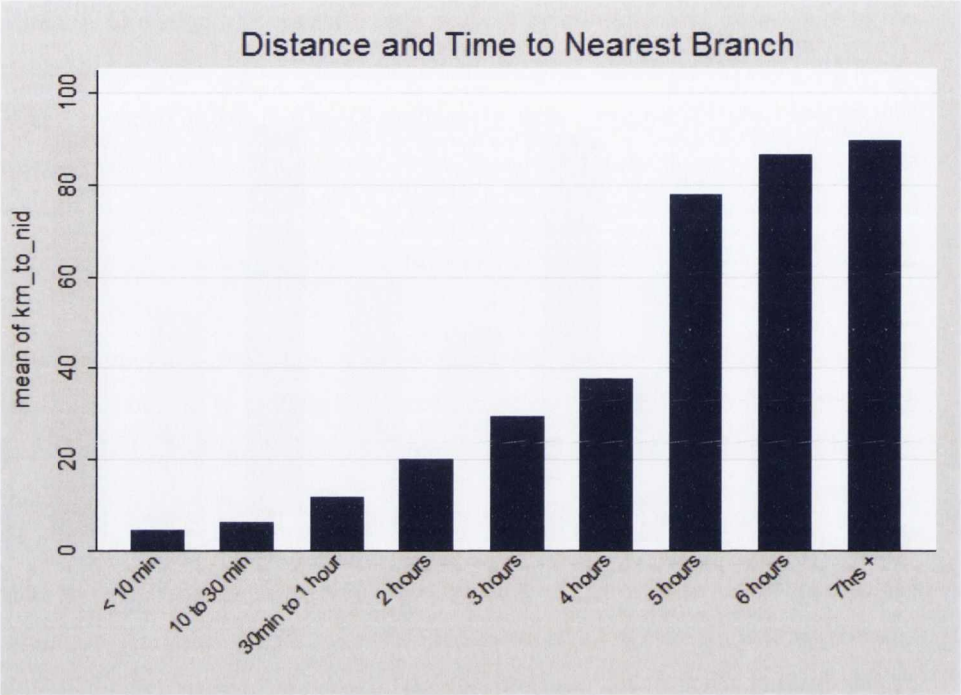


Source: Calculations by Author. Data from FinAccess 2006, 2009 and Central Bank of Kenya.

Province, the densely populated areas of western Kenya and the Rift Valley, Mombasa, and the road between Nairobi and Mombasa. It is also apparent that some modest bank branch expansion has occurred in the mid-east of the country, along the borders of Eastern, North Eastern and Coast provinces. Figures B.1, B.2, B.3 and B.4 in Appendix B depict the distribution of bank branches and the location of formally banked and unbanked respondents for both 2006 and 2009. The maps show a greater distribution of unbanked respondents in rural areas with significant distances from banking infrastructure. However, there are still a sizeable number of unbanked respondents living in urban areas, centres with numerous bank branches, suggesting a significant urban or semi-urban financially excluded population. Before conducting more systematic analysis, figures B.5 and B.6 graphically suggest that the distribution of those with access to mobile banking and those without are broadly similar for both the banked and unbanked populations.

For consistency a number of control variables have been derived using a sim-

Figure 5.6: *Distance and Time to Nearest Branch, 2009*



Source: Time to bank branch is self reported in FinAccess 2009, whereas distance to bank branch has been calculated by Author.

ilar approach to Chapter 3 and Chapter 4. First, financial sector knowledge is a normalised score (on a scale of 1-10) achieved in a financial sector knowledge quiz given during the interview. A series of financial products/terms are mentioned and the individual receives two points for "I understand", one point for "I have heard of" and zero points for "never heard of/ don't understand". Second, education is standardised on a scale of 1-8 from "no formal education" up to "completed university education" and is transformed into four dummy variables for the regression analysis in this paper.[15] Third, risk aversion is measured by a binary variable where "1" represents agreement with the statement "You avoid taking risks with your money or resources" and "0" otherwise.

A number of additional variables have been derived from the 2009 FinAccess Kenya dataset. First, the wealth of the household is proxied by the variable assets breadth, a variable that was defined originally by the World Bank LSMS

[15]Education is defined as less than completed primary education, completed primary education, completed secondary education and above secondary education.

questionnaire and included in FinAccess Kenya, that counts the number of household durables owned by the household. This variable is available for both the 2006 and 2009 datasets. Available for only the 2009 dataset is a measure of individual level expenditure. Expenditure is derived as the natural log of total monthly expenditure on mobile/telecommunications, personal expenses (such as clothing), education, household bills, entertainment and socializing, groceries and food, medical related expenses, loan repayments, transport, donations to religious groups, rent, savings and support for other members of family. See Tables 5.1 and 5.2 for further details.

5.5 Econometric Model and Empirical Results

5.5.1 Baseline Empirical Results

The results of univariate tests which compare the average distance to banking services for the sub-samples of formally banked and non-formally banked for 2009 and 2006, and M-Pesa and M-Pesa non-users for 2009. The results are reported in Table 5.3. This first step confirms the importance of physical access to banking infrastructure for financial inclusion. In 2009, both distance to branch and time to branch for the formally banked sub-sample are statistically different from those without formal bank accounts. The univariate tests of the M-Pesa user and non-user sub-samples also find similar results.

Table 5.3: **Univariate Tests: Proximity to Banking Services 2009 and 2006**

	All Households	Formally Banked 2009		T-Statistic	Sample Test
		Yes	No		
KM to Branch	14.36	7.17	16.69	16.42	***
Time to Bank	2.9	2.32	3.1	18.65	***
		Mobile Banking User 2009			
		Yes	No		
KM to Branch	14.17	7.53	16.99	17.03	***
Time to Bank	2.9	2.33	3.13	19.76	***
		Formally Banked 2006			
		Yes	No		
KM to Branch	14.54	8.48	15.72	8.91	***

***, ** and * denote the significance level of the results of the linear independent sample tests. The sample tests are conducted on an unweighted dataset.

Table 5.3 shows that the distance between survey respondents and their nearest bank branch fell marginally between 2006 to 2009 from 14.54km to 14.36km. Within the context of the significant increase in the branch network this could be considered a marginal decline. Furthermore, it is likely that urbanisation would act to reduce the average distance faced by Kenyan adults to bank infrastructure and may explain this reduction. According to the World Development Indictors the urban population growth rate in Kenya over the period 2006 and 2009 was 4 percent, compared with 2.2 percent for rural areas.

As a next step I analyse the relationship between proximity to bank branch and banking status in a multivariable setting with a bivariate probit specification where the dependent variable, banking/mobile banking status is regressed on distance to nearest bank branch and time to bank branch separately, and a series of control variables as outlined in the previous section. A bivariate probit model specifically acknowledges the likely correlation in unobservables for the decision to be banked and to be an M-Pesa user.

Different specifications of the model are estimated with increasing numbers of control variables, and including and excluding district dummy variables.[16] The basic model for both formally banked and M-Pesa user is as follows:

$$Pr(BANKED_{i,d}) = f(IND_{i,d}, GEO_{i,d}, DISTRICT_d) \tag{5.1}$$

for individual i located in district d. IND are a list of individual characteristics such as age, gender, education level, financial sector knowledge, three measures of wealth, a measure of informality and risk aversion. Geography related variables (GEO) alternate between distance in kilometres to bank branch and time to bank under different specifications, and also include an urban / rural dummy variable.

The second approach employed here involves a pooled cross-section probit regression to ascertain precisely whether there has been a change in the relationship between distance to banking services and the likelihood of being banked between 2006 and 2009, when examined using a common model.

Before considering the results of these models some reflections are worthy of

[16]There are 67 districts in the dataset with a median of 411 individuals per district and ranging from 818 in Nairobi to 8 in Moyale a market town on the border with Ethiopia.

note. First, if a statistically significant relationship is found between proximity to banking services and the likelihood of being banked this means that distance is a constraint to financial inclusion but not necessarily the most binding constraint. It is likely that the benefits to financial inclusion from significant branch expansion into rural areas would be hindered by low incomes, widespread informality and low levels of financial sector knowledge. Disentangling which are the most important constraints would require more sophisticated experimentation.

Second, the results should be considered within the context of the likely endogeneity of bank branch expansion into areas with higher demand for financial services. Indeed in section 5.3, evidence was provided that suggested that bank branch expansion occurred not in the poorer, more informal regions of northern Kenya between 2006 and 2009. For this model, important regional heterogeneity would include differences in average levels of informality, wealth, education and financial sector knowledge. To control for these differences, I include the series of district dummy control variables. For the same demand determinants, heterogeneity at the individual level is also likely to influence the likelihood of being banked and so far as the wealth, education, expenditure and other control variables comprehensively measure these differences, individual level heterogeneity is controlled for.

Third, the absence of an instrumental variables strategy or experimentation means that the coefficients in this model cannot strictly be considered causal. Nevertheless, the descriptive estimations in this chapter make a significant contribution to the understanding of the dynamics of distance to personal access to formal and mobile banking services in Kenya.

Table 5.4 presents the results of the bivariate probit regression investigating the determinants of being formally banked. Similar to the approach taken in Chapter 4, the multivariate probit regressions are conducted using a maximum likelihood (SML) estimator, specifically a Geweke-Hajivassiliou-Keane (GHK) smooth recursive conditioning simulator, which enjoys a number of desirable properties such as simulated probabilities that are unbiased, bounded within the (0,1) interval and more effcient in terms of the variance of the estimators of probabilities than other simulators Borsch-Supan and Hajivassiliou (1993).[17]

[17]The multivariate probit model is estimated with maximum likelihood using the Geweke-Hajivassiliou-Keane (GHK) sampling technique that samples recursively from truncated nor-

After computing the marginal effects it is found that that a 1 percent increase in the distance from a bank branch is associated with a decrease in the chances of being banked by 3 percent, in both specifications with and without district controls (columns 4 and 5 in Table 5.4). A similar result is found when proximity to banking infrastructure is measured by the self reported time to bank branch (see columns 4 and 5 in Table 5.5). Increased time to bank branch, as measured by a one unit discrete increase in the categorical variable time to bank branch, reduces the probability of being formally banked by 2 percent or 1 percent for the full specification with district controls included.

These results provide more systematic evidence, to support the descriptive statistics and visual demonstrations, that both distance and time to banking infrastructure play important roles in formal financial exclusion. Before I consider the potential of mobile banking, these results are suggestive that rural bank branch expansion may be a necessary, but not sufficient condition to increased personal access to formal financial services. To ascertain whether changes have taken place in the importance for financial inclusion of distance to bank branch, the model is re-estimated for the 2006 dataset; Table 5.6 presents the results. The tyranny of distance to banking infrastructure is also confirmed for 2006. After computing the marginal effects I find that a 1 percent increase in the distance from a bank branch is associated with a decrease in the chances of being banked by 2 percent when district controls are not included and 2 percent when district controls are included, although this latter coefficient is not significant. This suggests that distance may have become a greater 'constraint' to personal financial access by 2009 despite the bank expansion described in section 3.[18] Such a scenario is likely to reflect a combination of more significant increases in financial inclusion in urban areas from 27 percent to 41 percent and the predominance of bank branch expansion (2006-2009) in urban areas or in rural areas with higher population density.

mal distributions after a Cholesky transformation. (Hajivassiliou, McFadden and Rudd, 1996) find that the GHK outperforms all the other methods considered for small numbers.

[18]The time to bank branch is not available from the 2006 FinAccess survey.

Table 5.4: **Bivariate Probit Results 2009 (Distance)**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Formally Banked					Mobile Banked				
Distance	-0.28***	-0.21***	-0.19***	-0.19***	-0.18**	-0.16***	-0.10**	-0.09*	-0.07*	-0.06
	(0.049)	(0.047)	(0.055)	(0.049)	(0.060)	(0.036)	(0.033)	(0.040)	(0.036)	(0.049)
Urban	0.08	0.01	-0.04	-0.22*	-0.22	0.32*	0.27*	0.25*	0.14	0.18
	(0.115)	(0.114)	(0.125)	(0.110)	(0.130)	(0.136)	(0.133)	(0.109)	(0.177)	(0.134)
Female	-0.20***	-0.00	0.01	0.01	0.01	-0.22***	-0.09*	-0.09	-0.03	-0.03
	(0.046)	(0.054)	(0.056)	(0.058)	(0.063)	(0.043)	(0.047)	(0.048)	(0.049)	(0.051)
Age/100	8.80***	7.50***	8.14***	5.01***	5.42***	5.33***	4.34***	4.86***	0.64	0.79
	(0.865)	(0.888)	(0.882)	(0.740)	(0.745)	(1.049)	(1.064)	(1.076)	(1.105)	(1.214)
Age/100 sq	-7.74***	-6.09***	-6.65***	-3.42***	-3.81***	-6.40***	-5.32***	-5.79***	-1.44	-1.60
	(1.001)	(1.041)	(1.023)	(0.874)	(0.879)	(1.270)	(1.295)	(1.299)	(1.273)	(1.361)
Completed Primary	0.64***	0.29***	0.27***	0.15*	0.16**	0.59***	0.34***	0.27***	0.19**	0.12
	(0.062)	(0.066)	(0.063)	(0.064)	(0.060)	(0.063)	(0.070)	(0.066)	(0.074)	(0.066)
Completed Secondary	1.33***	0.65***	0.63***	0.40***	0.41***	1.23***	0.74***	0.64***	0.45***	0.37***
	(0.073)	(0.076)	(0.072)	(0.078)	(0.074)	(0.065)	(0.083)	(0.070)	(0.090)	(0.080)
Above Secondary	1.89***	1.02***	0.97***	0.59***	0.58***	1.56***	0.94***	0.81***	0.50***	0.43***
	(0.099)	(0.113)	(0.112)	(0.117)	(0.116)	(0.110)	(0.123)	(0.117)	(0.126)	(0.114)
FSKnow		0.23***	0.24***	0.18***	0.19***		0.14***	0.16***	0.09***	0.10***
		(0.012)	(0.013)	(0.011)	(0.012)		(0.016)	(0.017)	(0.015)	(0.015)
Risk Aversion		0.03	0.05	0.04	0.06		0.04	0.08	0.03	0.07
		(0.055)	(0.060)	(0.061)	(0.068)		(0.046)	(0.049)	(0.047)	(0.050)
Log Expenditure				0.29***	0.31***				0.14***	0.17***
				(0.035)	(0.038)				(0.036)	(0.040)
Mobile phone				0.65***	0.65***				1.66***	1.69***
				(0.062)	(0.066)				(0.104)	(0.114)
Breath assets				0.03*	0.03*				-0.02	-0.04
				(0.014)	(0.014)				(0.028)	(0.026)
Constant	-2.84***	-3.93***	-3.94***	-6.04***	-6.01***	-1.80***	-2.41***	-2.61***	-3.60***	-3.68***
	(0.229)	(0.231)	(0.237)	(0.411)	(0.420)	(0.209)	(0.211)	(0.212)	(0.291)	(0.307)
District Controls			Yes		Yes			Yes		Yes
Observations	6,516	6,516	6,516	6,508	6,508	6,516	6,516	6,516	6,508	6,508
Distance Marginal Effect	-0.06***	-0.04***	-0.04**	-0.04***	-0.03**	-0.04***	-0.03**	-0.02*	-0.01	-0.01
	(0.011)	(0.009)	(0.011)	(0.009)	(0.011)	(0.009)	(0.008)	(0.009)	(0.007)	(0.008)

District controls comprise a series of district dummy variables. Less than completed primary education is the omitted education category. Robust standard errors, clustered by district in parentheses.
Standard errors of marginal effects are calculated using the delta method. ***p<0.001, **p<0.01, *p<0.05

Table 5.5: **Bivariate Probit Results 2009 (Time to Bank)**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Formally Banked					Mobile Banked				
Time to Bank	-0.15***	-0.11***	-0.09**	-0.10***	-0.07*	-0.08**	-0.05	-0.02	-0.02	0.00
	(0.027)	(0.025)	(0.027)	(0.026)	(0.028)	(0.029)	(0.028)	(0.020)	(0.029)	(0.024)
Urban	0.35***	0.19*	0.10	-0.04	-0.06	0.47***	0.37**	0.33***	0.22	0.26*
	(0.082)	(0.084)	(0.092)	(0.072)	(0.089)	(0.129)	(0.133)	(0.090)	(0.168)	(0.105)
Female	-0.18***	0.01	0.02	0.02	0.02	-0.20***	-0.09	-0.09	-0.03	-0.04
	(0.049)	(0.059)	(0.060)	(0.063)	(0.066)	(0.042)	(0.048)	(0.050)	(0.050)	(0.053)
Age/100	8.49***	7.32***	8.01***	4.82***	5.31***	5.06***	4.15***	4.69***	0.52	0.72
	(0.915)	(0.928)	(0.923)	(0.769)	(0.773)	(1.050)	(1.063)	(1.092)	(1.144)	(1.264)
Age/100 sq	-7.37***	-5.87***	-6.53***	-3.21***	-3.71***	-6.05***	-5.10***	-5.60***	-1.28	-1.53
	(1.048)	(1.082)	(1.065)	(0.907)	(0.909)	(1.266)	(1.286)	(1.310)	(1.310)	(1.405)
Completed Primary	0.63***	0.28***	0.26***	0.15*	0.16*	0.57***	0.32***	0.25***	0.18*	0.11
	(0.062)	(0.065)	(0.062)	(0.064)	(0.061)	(0.064)	(0.070)	(0.063)	(0.074)	(0.064)
Completed Secondary	1.30***	0.63***	0.60***	0.39***	0.39***	1.20***	0.72***	0.62***	0.44***	0.37***
	(0.074)	(0.075)	(0.073)	(0.080)	(0.077)	(0.062)	(0.080)	(0.070)	(0.089)	(0.080)
Above Secondary	1.86***	1.00***	0.93***	0.58***	0.57***	1.53***	0.92***	0.79***	0.49***	0.43***
	(0.091)	(0.108)	(0.108)	(0.114)	(0.114)	(0.114)	(0.121)	(0.113)	(0.125)	(0.113)
FSKnow		0.23***	0.24***	0.18***	0.19***		0.14***	0.16***	0.09***	0.10***
		(0.012)	(0.013)	(0.011)	(0.012)		(0.017)	(0.018)	(0.015)	(0.015)
Risk Aversion		0.02	0.04	0.02	0.04		0.05	0.09	0.04	0.08
		(0.057)	(0.061)	(0.063)	(0.069)		(0.048)	(0.050)	(0.048)	(0.050)
Log Expenditure				0.29***	0.30***				0.14***	0.16***
				(0.035)	(0.038)				(0.036)	(0.040)
Mobile phone				0.65***	0.64***				1.65***	1.68***
				(0.064)	(0.067)				(0.106)	(0.117)
Breath assets				0.04*	0.03				-0.02	-0.04
				(0.015)	(0.015)				(0.029)	(0.027)
Constant	-3.00***	-4.03***	-4.08***	-6.12***	-6.14***	-1.88***	-2.46***	-2.70***	-3.64***	-3.78***
	(0.205)	(0.227)	(0.226)	(0.408)	(0.419)	(0.213)	(0.231)	(0.223)	(0.314)	(0.335)
District Controls			Yes		Yes			Yes		Yes
Observations	6,269	6,269	6,269	6,261	6,261	6,269	6,269	6,269	6,261	6,261
Time to Bank Marginal Effect	-0.04***	-0.02***	-0.02**	-0.02***	-0.01*	-0.02**	-0.01	-0.01	-0.00	0.00
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.007)	(0.007)	(0.005)	(0.006)	(0.005)

District controls comprise a series of district dummy variables. Less than completed primary education is the omitted education category. Robust standard errors, clustered by district in parentheses.
Standard errors of marginal effects are calculated using the delta method. ***p<0.001, **p<0.01, *p<0.05

Table 5.6: **Probit Results 2006 (Distance)**

VARIABLES	(1)	(2)	(3)	(4)	(5)
Distance	-0.17**	-0.17**	-0.15*	-0.15**	-0.12*
	(0.060)	(0.058)	(0.067)	(0.052)	(0.062)
Urban	0.10	0.10	0.03	-0.23*	-0.14
	(0.110)	(0.110)	(0.128)	(0.097)	(0.118)
Female	-0.16*	-0.16*	-0.16*	-0.16	-0.16
	(0.075)	(0.075)	(0.080)	(0.081)	(0.087)
age/100	5.88***	5.84***	6.43***	4.89***	5.37***
	(1.171)	(1.169)	(1.260)	(1.040)	(1.098)
Age/100 sq	-4.80***	-4.77***	-5.41***	-3.65**	-4.22**
	(1.389)	(1.384)	(1.500)	(1.223)	(1.311)
Completed Primary	0.47***	0.47***	0.45***	0.32***	0.30***
	(0.082)	(0.081)	(0.086)	(0.079)	(0.083)
Completed Secondary	1.14***	1.14***	1.12***	0.77***	0.77***
	(0.093)	(0.093)	(0.104)	(0.111)	(0.120)
Above Secondary	1.79***	1.80***	1.82***	1.10***	1.15***
	(0.111)	(0.112)	(0.114)	(0.106)	(0.112)
Risk Aversion		0.12	0.04	0.11	0.04
		(0.120)	(0.137)	(0.112)	(0.128)
Mobile phone				0.86***	0.89***
				(0.091)	(0.093)
Breath assets				0.16***	0.15***
				(0.023)	(0.021)
Constant	-2.69***	-2.78***	-2.94***	-2.77***	-2.90***
	(0.274)	(0.264)	(0.253)	(0.268)	(0.269)
District Controls			Yes		Yes
Observations	4,268	4,268	4,058	4,268	4,058
Distance Marginal Effect	-0.03**	-0.03**	-0.035*	-0.02**	-0.02*
	(0.011)	(0.011)	(0.012)	(0.009)	(0.010)

District controls comprise a series of district dummy variables.
Less than completed primary education is the omitted education category.
Robust standard errors, clustered by district in parentheses.
Standard errors of marginal effects are calculated using the delta method.
***p<0.001, **p<0.01, *p<0.05

Whether distance has become a more significant constraint for financial services is formally tested by combining the two datasets into a pooled cross section and re-running the previous models; Table 5.7 presents the results. I find that distance to bank branch is negatively related to the likelihood of being banked, and while the signs on the coefficients for the 2009 interaction term are negative, they are not statistically significant. Comparison of the marginal effects from this model shows that the marginal effect for 2009 is higher and statistically significant for all versions of the model.[19] However, it is important to note that this pooled regression omits two important control variables, monthly expenditure and financial sector knowledge because neither of these are found in the 2006 survey. The major result from this model is the fact that the role played by the level of household assets has declined as a predictor of formally banked which may suggest that formal banking is reaching individuals with lower levels

[19]These marginal effects are not reported but are available on request from the author.

of assets.

Table 5.7: **Pooled Cross Section: Probit Regression Dependent Variable: Formally Banked**

VARIABLES	(1)	(2)	(3)	(4)	(5)
09 Dummy	0.09	0.08	-0.12	-0.38	-0.53
	(0.389)	(0.365)	(0.356)	(0.388)	(0.396)
Distance	-0.15*	-0.15*	-0.14*	-0.14*	-0.12*
	(0.061)	(0.060)	(0.056)	(0.054)	(0.053)
Distance*09	-0.12	-0.12	-0.07	-0.11	-0.07
	(0.078)	(0.076)	(0.072)	(0.072)	(0.072)
Urban	0.10	0.11	0.02	-0.21*	-0.18*
	(0.109)	(0.108)	(0.088)	(0.098)	(0.090)
Urban*09	-0.01	-0.01	0.08	0.09	0.16
	(0.142)	(0.142)	(0.130)	(0.161)	(0.157)
Female	-0.12	-0.12	-0.13	-0.13	-0.14
	(0.075)	(0.075)	(0.078)	(0.081)	(0.084)
Female*09	-0.06	-0.06	-0.06	-0.01	-0.00
	(0.090)	(0.089)	(0.095)	(0.098)	(0.104)
Age/100	5.60***	5.56***	6.03***	4.72***	5.08***
	(1.147)	(1.147)	(1.201)	(1.024)	(1.066)
Age/100*09	2.73	2.73	2.93*	2.75*	2.90*
	(1.431)	(1.434)	(1.449)	(1.278)	(1.302)
Age/100 sq	-4.02**	-3.99**	-4.47**	-3.17**	-3.56**
	(1.348)	(1.346)	(1.414)	(1.186)	(1.244)
Age/100 sq*09	-3.05	-3.04	-3.27	-2.69	-2.90
	(1.700)	(1.697)	(1.718)	(1.485)	(1.517)
Educ	0.40***	0.40***	0.40***	0.26***	0.27***
	(0.021)	(0.020)	(0.022)	(0.023)	(0.024)
Educ*09	0.00	0.00	0.00	0.03	0.03
	(0.031)	(0.031)	(0.032)	(0.035)	(0.036)
Risk Aversion		0.12	0.07	0.11	0.05
		(0.118)	(0.122)	(0.110)	(0.114)
Risk Aversion*09		0.02	0.08	0.03	0.08
		(0.153)	(0.160)	(0.149)	(0.157)
Mobile phone				0.82***	0.83***
				(0.090)	(0.090)
Mobile phone*09				0.05	0.05
				(0.101)	(0.104)
Breath assets				0.15***	0.15***
				(0.022)	(0.021)
Breath assets*09				-0.06**	-0.06**
				(0.020)	(0.021)
Constant	-3.58***	-3.67***	-3.70***	-3.33***	-3.31***
	(0.288)	(0.279)	(0.265)	(0.290)	(0.303)
Observations	10,768	10,768	10,768	10,768	10,768

District controls comprise a series of district dummy variables.
Education is included in the model as a 1-8 variable. See Table 5.1 for details
Robust standard errors are in parentheses. ***p<0.001, **p<0.01, *p<0.05

The conclusion from this is relatively profound. Over the period 2006 to 2009 Kenya experienced a uniquely high rate of bank branch expansion, unlikely to be replicated at the same level in other sub-Saharan African countries. The fact that the Kenyan expansion in branches did not help overcome the tyranny of distance suggests that penetration of formal banking services into rural areas will most likely have to wait until demand side factors, such as incomes, levels of formality etc., improve.

In line with the results in Chapter 3 and Chapter 4, I find that greater levels of education and financial sector knowledge are associated with a higher probability of being formally banked. In previous analyses the relationship

between monthly personal income and financial status was quantified. In this chapter, in the absence of income data, I find that monthly expenditure has a significant positive relationship with financial status.

As previously discussed, the mobile banking revolution offers the potential to improve financial inclusion without the need for 'bricks and mortar' branch expansion in rural areas. Table 5.4 (columns 6 to 10) presents the results of the multivariate probit regression on the determinants of M-Pesa usage (mobile phone banking). While a negative relationship is found between distance from bank branch and use of mobile banking in basic specifications, when household expenditure and assets, including having a mobile phone, are controlled for, this relationship holds no statistical significance. When mobile phone is excluded as a control variable, the equivalent estimation to Table 5.4, column 10 produces a marginally statistically significant coefficient that is half the size of the coefficient for the equivalent formally banked estimation (Table 5.4, column 5). However, the fact that the coefficients from either specification are smaller than the model for the formally banked respondents, suggests that greater distances from bank infrastructure do not reduce the likelihood that an individual is a mobile bank user as much as it does for formal bank account holders. Indeed, when household expenditure, assets and having a mobile phone are controlled for, I find no evidence of a statistically significant relationship, suggesting that distance from bank infrastructure does not change the likelihood that an individual is a mobile bank account holder. Importantly, no relationship is found between time to bank branch and the likelihood of being mobile banked in regressions with or without district controls (Table 5.5, columns 8 to 10) and whether mobile is included as a control variable or not. This provides further evidence that the likelihood of being mobile banked is not determined by proximity to bank branch.

The results in Tables 5.4 and 5.5 show that higher income (proxied for by expenditure) increases the probability of being mobile banked. This is consistent with observations made by Morawczynski (2009), who, from ethnographic fieldwork, finds evidence that M-Pesa is less likely to be used by those without mobile phones, those who do not engage in internal remittances and by the poorest residents in the rural regions in Western Kenya.

While peripheral to the central hypothesis of this chapter, the wider determinants of use of mobile banking were also uncovered. I find that both the formally banked respondents and M-Pesa users enjoy higher levels of education relative to the financially excluded, and that the formally banked are characterised by higher levels of financial sector knowledge than M-Pesa users. This suggests that mobile banking may open up opportunities to save and transact to those with lower levels of knowledge about finance.[20] There is evidence to suggest that the formally banked enjoy a higher standard of living, as measured by household expenditure, and live in more formal accommodation; these results are robust to whether proximity to banking services is measured as distance or time to branch. Importantly, I find clear evidence that M-Pesa users have lower levels of monthly expenditure than the formally banked, suggesting that M-Pesa has reached Kenyans with lower consumption levels.

5.5.2 Heterogeneous Effects

The suggestion that tyranny of proximity to bank infrastructure may only be overcome for those with higher levels of personal expenditure and assets was explored further in a series of regressions with specific sub-groups of the population and separately using a series of interaction terms. The expectation is that both approaches will produce similar results.

First, an additional series of models were estimated for each of four personal expenditure quartiles and four different levels of education. The results are presented in Table 5.8. There is robust evidence to suggest that distance and time to banking services are both statistically significant constraints for middle income individuals, defined as those in expenditure quartiles two and three. Unsurprisingly, there is no statistically significant relationship between distance or time to bank branch for those with the highest level of monthly expenditure. This suggests that the additional costs of lack of proximity to banking services can be overcome by those with high incomes. Negative coefficients for both measures of proximity are found for quartile one, the low expenditure group, although neither are statistically significant.

[20] Of course the causality may be the opposite direction where having a bank account improves an individual's financial sector knowledge.

When the sample is divided by education level there is some evidence to suggest that distance to banking services is important for those with completed primary and completed secondary education. Conversely, there is evidence to suggest that distance is not a binding constraint for those with less than primary or those with above second level education. In addition, the model is estimated for sub-groups of the sample with different wealth levels, as proxied by the breadth of asset ownership. Reading from Table 5.8, there is evidence to suggest that for those with non-zero asset levels, distance and time to bank branch are negatively related with the likelihood of being formally banked. Table 5.8 also presents the results of this segmented analysis for M-Pesa users. Importantly, no evidence was found to suggest that the non-relationship between distance or time to bank branch and mobile banked in the main results is overturned for any personal expenditure quartile, breadth of assets or education level. The only contrary evidence to this is the mildly significant and negative coefficient on distance to bank branch for those with completed secondary education.

An alternative approach to checking for a different impact of distance among various population sub-groups involves re-estimating our main models (from Table 5.4), this time including interaction terms between our distance variables and dummies capturing each of the sub-groups of interest (expenditure quartiles, education levels and assets). The objective is to estimate the changes in the marginal effect on distance or time to bank for different levels of expenditure, education level or level of assets. First, there is evidence to suggest that the interaction terms, combining distance and time to bank with dummy variables for expenditure quartile, education level and level of assets, do not explain much variation in the dependent variable as evidenced by the lack of significance on interaction term coefficients. Table 5.9 presents the marginal effects from separate probit regressions with formally banked and M-Pesa user as the dependent variables and with distance to branch and time to store interacted with expenditure, education and asset dummies.[21]

Similar results to the segmented sample approach are found. There is evidence to suggest that distance to bank is a stronger constraint to financial inclusion for those in the second and third income quartiles, suggesting again

[21] It is worth noting that the average marginal effects are not the same as the coefficients on the interaction terms and are calculated following estimation of the models.

Table 5.8: **Segmented Sample Bivariate Probit Results 2006 Full Specification with District Controls**

	Formally Banked		Mobile Banked	
VARIABLES	Distance	Time to Bank	Distance	Time to Bank
Expenditure Level				
Quartile 1	-0.20	-0.01	-0.17	0.05
	(-0.122)	(-0.08)	(-0.17)	(-0.11)
Quartile 2	-0.24*	-0.09	-0.12	0.01
	(-0.105)	(-0.07)	(-0.13)	(-0.06)
Quartile 3	-0.38***	-0.15*	-0.10	-0.10
	(-0.099)	(-0.06)	(-0.08)	(-0.07)
Quartile 4	-0.02	0.03	0	0.03
	(-0.086)	(-0.05)	(-0.07)	(-0.049)
Asset Level				
No Assets	-0.1	0.02	-0.12	-0.09
	(-0.165)	(-0.11)	(-0.11)	(-0.06)
Asset $\geq$1	-0.23***	-0.07*	0.00	0.03
	(-0.062)	(-0.03)	(-0.06)	(-0.03)
Education Level				
LCPE	-0.17	-0.14**	-0.01	0.00
	(-0.089)	(-0.05)	(-0.08)	(-0.04)
CPE	-0.24**	0.00	-0.06	0.06
	(-0.09)	(-0.05)	(-0.09)	(-0.04)
CSE	-0.38***	-0.11	-0.21*	-0.10
	(-0.10)	(-0.08)	(-0.11)	(-0.06)
ASE	-0.06	-0.18	0	0.07
	(-0.11)	(-0.10)	(-0.09)	(-0.08)

District controls comprise a series of district dummy variables.
Education variables include Less than Completed Primary Education (LCPE), Completed Primary Education (CPE), Completed Secondary Education (CSE) and Above Secondary Education (ASE).
Robust standard errors are in parentheses. ***p<0.001, **p<0.01, *p<0.05

that for the wealthier group distance is not a barrier to financial services and that for the lowest income quartile distance is not the binding constraint. Similarly, it is found that for those with completed secondary school education and with one or more household asset, greater distances from banking infrastructure reduce the likelihood that these individuals are banked. Crucially, I find that greater distances or time to bank infrastructure are not statistically related to being mobile banked for any expenditure, education or asset group. This provides evidence that mobile banking is breaking the tyranny of distance (or time to bank) for all economic groups in Kenya.

5.5.3 Frequency of M-Pesa Usage

Further analysis was conducted into the role that proximity plays in the frequency of use of mobile banking services. Intuitively, one might expect users of

Table 5.9: **Average Marginal Effects from Probit Regression with Interaction Terms, 2009**

	Formally Banked		Mobile Banked	
VARIABLES	Distance	Time to Bank	Distance	Time to Bank
Expenditure (Q1)	-0.162	-0.055	0.010	0.011
Expenditure (Q2)	-0.380*	-0.016	-0.297	0.000
Expenditure (Q3)	-0.400**	-0.018	-0.246	-0.165
Expenditure (Q4)	-.0.345	0.009	0.002	0.188
LCPE	-0.276	-0.024***	-0.011	0.000
CPE	-0.033	-0.003	-0.013	0.011
CSE	-0.045***	0.310	-0.237	-0.015
ASE	-0.027	-0.037	0.16	0.01
Household Assets = 0	-0.030	-0.007	-0.019	-0.007
Household Assets $\geq$ 1	-0.032**	-0.013*	-0.008	0.004

Full 2009 specification with district controls.
Education variables include Less than Completed Primary Education (LCPE), Completed Primary Education (CPE), Completed Secondary Education (CSE) and Above Secondary Education (ASE).
***p<0.001, **p<0.01, *p<0.05

mobile bank accounts who are further away from banking infrastructure, to use M-Pesa for transactions more frequently than those who are closer to banking infrastructure, even if they also have access to a formal bank account. This could occur if the costs associated with travelling to and from the nearest bank branch were high. Alternatively, the need to use transaction services is likely to be higher in urban areas. Table 5.10 presents the results of the multivariable probit regression assessing the role played by ease of access measures on frequency of M-Pesa use. I find no evidence that frequency of M-Pesa use is associated with distance or time to bank branch. Of particular note is the result that frequency of M-Pesa usage is increased with level of engagement with consumerism as measured by household expenditure and level of breadth of household assets.

Table 5.10: **Frequency of M-Pesa Use and Proximity to Bank Branches, OLS Regression**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Distance	-0.03	-0.01	-0.02	0.02	-0.01					
	(0.054)	(0.055)	(0.048)	(0.056)	(0.053)					
Time to Bank						0.03	0.04	0.04	0.06	0.05
						(0.056)	(0.055)	(0.049)	(0.055)	(0.051)
Urban	0.31*	0.27*	0.09	0.08	-0.04	0.39**	0.32*	0.16	0.11	0.04
	(0.120)	(0.114)	(0.096)	(0.110)	(0.106)	(0.121)	(0.124)	(0.084)	(0.120)	(0.090)
Female	-0.31***	-0.23***	-0.17**	-0.24***	-0.20**	-0.31***	-0.23***	-0.17**	-0.24***	-0.19**
	(0.057)	(0.058)	(0.061)	(0.062)	(0.067)	(0.055)	(0.054)	(0.059)	(0.058)	(0.065)
Age/100	3.89***	3.04***	3.37***	0.66	0.90	3.87***	3.02***	3.37***	0.66	0.86
	(0.763)	(0.678)	(0.674)	(0.679)	(0.713)	(0.752)	(0.670)	(0.664)	(0.668)	(0.705)
Age/100 sq	-4.29***	-3.45***	-3.53***	-1.21	-1.24	-4.28***	-3.44***	-3.54***	-1.22	-1.23
	(0.831)	(0.738)	(0.713)	(0.729)	(0.766)	(0.813)	(0.723)	(0.701)	(0.715)	(0.761)
Completed Primary	0.27**	0.12	0.11	0.05	0.06	0.28**	0.13	0.12	0.06	0.07
	(0.089)	(0.091)	(0.088)	(0.091)	(0.088)	(0.091)	(0.092)	(0.088)	(0.093)	(0.089)
Completed Secondary	0.65***	0.35*	0.35*	0.17	0.20	0.67***	0.36*	0.36*	0.18	0.21
	(0.099)	(0.132)	(0.133)	(0.141)	(0.137)	(0.104)	(0.135)	(0.135)	(0.142)	(0.138)
Above Secondary	1.15***	0.75***	0.71***	0.38**	0.40***	1.16***	0.76***	0.72***	0.39**	0.41***
	(0.106)	(0.132)	(0.124)	(0.125)	(0.114)	(0.108)	(0.131)	(0.123)	(0.123)	(0.114)
FSKnow		0.10***	0.12***	0.07**	0.08**		0.11***	0.12***	0.07**	0.08***
		(0.021)	(0.024)	(0.020)	(0.023)		(0.021)	(0.024)	(0.019)	(0.023)
Risk Aversion		-0.05	-0.00	-0.04	0.00		-0.05	0.00	-0.04	0.00
		(0.054)	(0.057)	(0.054)	(0.058)		(0.054)	(0.057)	(0.055)	(0.059)
Log Expenditure				0.21***	0.22***				0.21***	0.22***
				(0.049)	(0.048)				(0.049)	(0.048)
Mobile phone				0.48***	0.44***				0.48***	0.44***
				(0.063)	(0.059)				(0.064)	(0.063)
Breath assets				0.08***	0.06***				0.08***	0.07***
				(0.019)	(0.017)				(0.018)	(0.017)
Constant	0.82***	0.46	0.39	-1.05**	-0.97*	0.64*	0.29	0.23	-1.18**	-1.16**
	(0.218)	(0.247)	(0.271)	(0.385)	(0.392)	(0.257)	(0.280)	(0.299)	(0.414)	(0.422)
District Controls										
Observations	2,534	2,534	2,534	2,533	2,533	2,516	2,516	2,516	2,515	2,515
R-squared	0.13	0.15	0.22	0.21	0.26	0.13	0.15	0.22	0.21	0.26
Adj. R-squared	0.13	0.15	0.20	0.20	0.24	0.13	0.15	0.20	0.20	0.24

District controls comprise a series of district dummy variables.
The omitted education category is less than primary education completed.
Robust standard errors, clustered by district in parentheses. ***p<0.001, **p<0.01, *p<0.05

5.6 Conclusion

The mobile banking revolution in sub-Saharan Africa offers the potential for countries to leapfrog the need for expensive bank branch networks to deliver savings and transactions products to their citizens. This chapter presents evidence that mobile banking is not only opening up banking opportunities for lower income customers who engage is small scale transactions, but that mobile banking in Kenya has flattened geographical constraints to access.

The next step for the mobile banking revolution is to extend to more sophisticated financial services such as access to credit and insurance. Only then will mobile banking offer the complete set of banking services and serve as a full rather than partial substitute for the formal banking system.

The speed of the success of M-Pesa in Kenya may prove the exception rather than the rule in sub-Saharan Africa. Among the reasons for the success of M-Pesa are higher and more rapid urbanisation among its African peers, the poor quality of previous mediums of domestic remittances, a supportive financial regulator and perhaps most importantly, a dominant mobile phone operator (Mas and Radcliffe, 2010). Not all of these factors will be present in Kenya's neighbours across sub-Saharan Africa. For example, in 2008 M-Pesa was launched in Tanzania and the initial results were poorer than expected due to a variety of reasons, chief among them was greater competition in the mobile phone market. Despite the slow beginning, however, changes to the marketing, distribution and price plans have resulted in nearly 10 million M-Pesa registered users in Tanzania. It remains possible that mobile banking, if successfully adapted to local conditions, can revolutionise access to banking for all in sub-Saharan Africa and make a significant contribution to reducing poverty and the risk profiles of poor households.

Chapter 6

Conclusion

This thesis contributes to the literature on access to formal financial services in several ways as outlined in the introduction. Chapter 3 generates comparable estimates of financial inclusion for eleven Sub-Saharan Africa, helps our understanding of the determinants of financial assess both at the individual and national level, and investigates the possible causal link between personal access to financial services and income. Chapter 4 investigates the relative importance of barriers to financial services in Nigeria by developing a non-mutually exclusive framework to categorise respondents self reported constraints, before assessing the role played by informality in financial exclusion. Chapter 5 quantifies the evolving importance of distance as a constraint to access during a significant period of bank branch expansion in Kenya, and asks the question as to whether mobile banking, M-Pesa in particular, is overcoming the importance of proximity to financial services for financial inclusion.

The Finscope surveys greatly expand the information available on the use of financial services in sub-Saharan Africa, and provide a platform for increased research on financial access in some of the poorest countries in the world. The contribution of the surveys will only be strengthened when the remaining countries in Sub-Saharan Africa are included and repeat surveys are completed. The pooled dataset developed in Chapter 3 can continue to play a role in future research efforts when combined with other data sources such as bank level data.

In Chapter 3, a multivariable probit model, with a series of country and

district level controls to control for the significant heterogeneity between and within countries, is employed to uncover the determinants of personal financial access. The results confirm the important of education and financial literacy in the likelihood of being banked. It is found, for example, that there is a 43 percent increase in the likelihood of being banked for those with above second level education compared with the omitted category of less than primary education or illiteracy. In similar fashion, increasing financial sector knowledge by one unit is associated with an increase in the likelihood of being formally banked by 3 percent. While the role of gender is confirmed as an important correlate of personal financial access in summary statistics and univariate tests, it is revealing that when psychometric variables and financial sector knowledge are controlled for gender is not statistically significantly related to financial status.

For the majority of explanatory variables, the direction of the relationship is consistent across all ten countries in the pooled dataset but the magnitude of the effects can differ significantly. One example of this is the role played by income in determining banking status. While it is found that a 1 percent increase in monthly personal income increases the chances of being banked by 3 percent in the pooled dataset, large difference in the magnitude of the relationship exist. In Namibia, South Africa, Tanzania and Botswana it is found that a 1 percent increase in monthly personal income is associated with increases in the chances of being banked by 14 percent, 11 percent, 11 percent and 10 percent respectively compared with a less sizeable relationship in some of the poorer countries in the sample such as Mozambique, Zambia and Nigeria.

This result adds weight to the reasonable suspicion of potential two way causality between formally banked and income. The channel whereby passing a threshold level of income opens up the opportunity for an individual to personally access formal banking service is perhaps as convincing as the likely mechanism where access to financial services influences income. In parallel, an additional form of bias in OLS estimates caused by unobserved heterogeneity at the individual level such as ambition, ability or conscientious which influence incomes and access to banking services was also reflected upon.

While developing an instrument from within a survey is by definition challenging, trust in banks is proposed as a potential instrument. It is argued that

there is at least some component in an individual's trust in banks that is exogenous to other characteristics, and sufficient control variables have been included to strengthen the validity of the exclusion restriction. Under this approach there is evidence to suggest that personal access to formal banking services increases individual monthly income by 1.67 percent.

By combining data from the 2008 Finscope survey, supply side data from Oxford Policy Management 2010 and data from Afrobarometer Nigeria 2008, Chapter 4 examines the determinants of financial exclusion. The unbanked four-fifths have lower incomes, lower education, are less likely to have a mobile phone, have lower levels of financial sector knowledge and a lower number of formal documents in their name than the remainder of the population. In terms of psychometric characteristics, the unbanked four-fifths display low levels of trust in banks and higher risk aversion than the population.

To understand the characteristics of respondents who face different barriers to formal financial services a multivariate probit model is employed. The analysis is further deepened by using three separate multivariate probit models for the specific constraints cited as one moves down the barriers framework presented in Figure 4.2. Emanating from this estimation two key points worthy of reemphasis emerge. First, there is evidence to suggest that individuals who cite supply constraints have higher income and a higher number of formal documents, suggesting that to be aware of supply constraints such as high cost, safety concerns and poor service, an individual is likely not to be among the poorest in Nigeria. Second, while those who cite informality reasons tend to be educated and rurally based, they do not display any greater levels of informality over the wider unbanked population. This suggests that education helps individuals understand the role played by formality in access to banking services; indicating a potential downward bias in the proportion of self reported responses that cite informality as a constraint.

The final contribution of Chapter 4 is to identify the role played by informality in personal financial access. To overcome concerns over reverse causality and endogeneity, two instrumental variables are employed in the identification strategy; type of refuse collection and time to water source. While the instruments pass the necessary weak instruments and over identification econometric

tests, we make the case that there is some exogenous component in these proxies of formality that can help instrument for number of formal documents. The results show that number of documents is statistically significantly related to financial access and when we calculate the marginal effects for each level of formal documents, it is found that when an individual possesses four and five documents an additional document increases their probability of being banked by 17 percent and 15 percent respectively.

Chapter 5 takes a look at the recent expansion in bank branches and the mobile banking revolution (M-Pesa) in Kenya. By combining GPS data on the locations of bank branches and GPS data on the home location of banked and unbanked respondents from the 2008 FinAccess survey, the distance between the nearest branch and survey respondents was calculated. With distance, and the self reported time to store bank branch as independent variables, a bivariate probit was employed to estimate the relationship between financial status (formally banked and M-Pesa user) and proximity to bank branch. After computing the marginal effects it is found that that a 1 percent increase in the distance from a bank branch is associated with a decrease in the chances of being banked by 3 percent. When a similar model is estimated for 2006, there is evidence to suggest that the tyranny of distance for financial inclusion has strengthened between 2006 and 2009. This could be for a variety of reasons such as urbanisation, the expansion of bank branches into density populated areas and the role played by M-Pesa played as a substitute for formal banking services for those in remote areas.

While a negative relationship is found between distance from bank branch and use of mobile banking in basic specifications, when household expenditure and assets this relationship holds no statistical significance. Importantly, little evidence was found to suggest that the non-relationship between distance or time to bank branch and being an M-Pesa user in the main results is overturned for any personal expenditure quartile, breadth of assets or education level. As a result, this chapter argues that mobile banking is not only opening up banking opportunities for lower income customers who engage is small scale transactions, but that mobile banking in Kenya has flattened geographical constraints to access.

Throughout this thesis, a focus on drawing the strongest possible inferences from the wealth of information contained in the Finscope surveys was pursued. However, this dependency on a series of cross sectional surveys has natural limitations. Some of the questions posed in this thesis may be better suited to panel or experimental datasets that allow for more sophisticated identification strategies and this is where options for fruitful future research exist.

To assist with the financial inclusion agenda, future research should continue attempts to identify, not only the magnitude of the effect of personal financial access on important socio-economic outcomes, but to decipher the relative importance of the different channels of causation at the individual and household level by developing studies to test theoretical predictions. Variations in product and service design will also lead to different outcomes, and an opportunity exists to evaluate the impact of innovative savings and credit products on welfare outcomes.

Separately, research should be pursued to help identify the binding constraints to financial access. In Chapter 3 for example, a relationship between financial literacy and the likelihood of being banked was found. While this suggests that financial literacy programmes may be effective interventions for greater financial inclusion, further research is required to precisely quantify the nature of these relationships.

Chapter 4 considers the possibility of increases in financial inclusion from efforts to improve levels of formality. The chapter finds an important role for informality in financial exclusion. It now remains for future research to further substantiate this conclusion using different methodologies and data sources.

Finally, as noted the mobile banking revolution in sub-Saharan Africa offers the potential for significant increases in access to financial services in isolated rural areas without the need for 'bricks and mortar' branch expansion into areas of low population density. While there is an emerging literature on the impacts of M-Pesa in Kenya, as noted in Chapter 5, the impact of further roll-out in the spectrum of products available through the mobile phone, and indeed the longer term impacts of M-Pesa, will continue to be an interesting research question.

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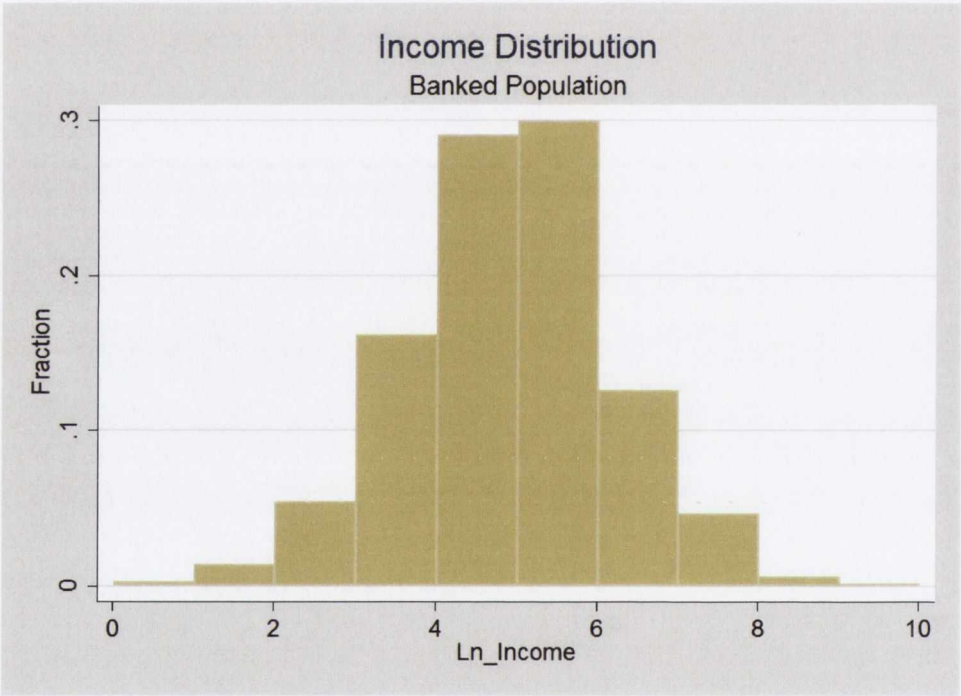
Appendix A

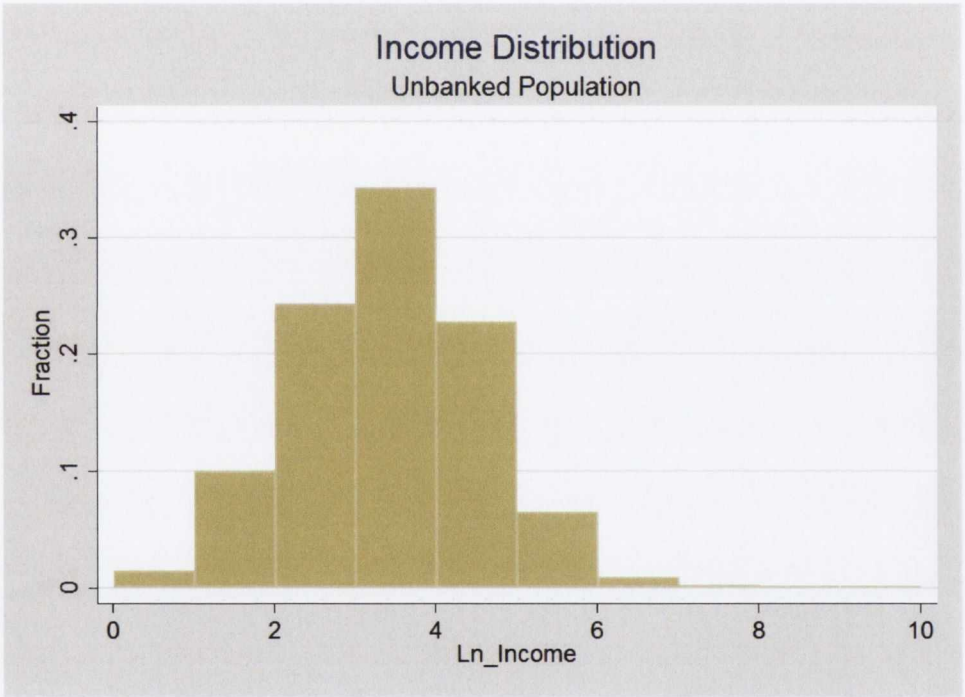
Chapter 3 Appendix: Pooled Dataset

Figure A.1: *Distribution of Natural Log of Monthly Income, Formally Banked Population*



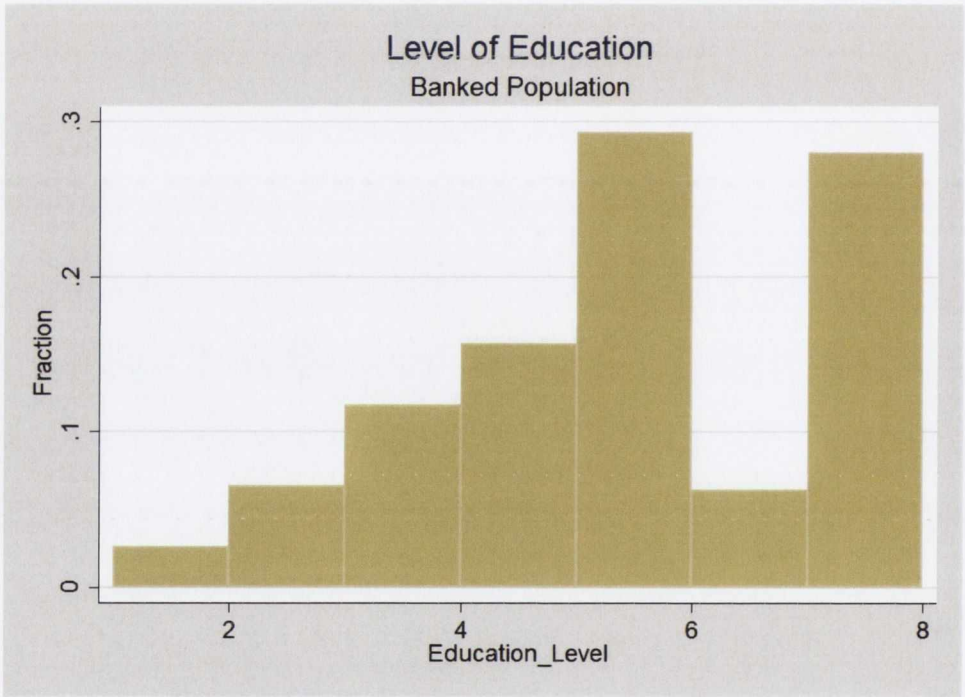
Source: Graphed by Author. Data from Finscope Surveys.

Figure A.2: *Distribution of Natural Log of Monthly Income, Unbanked Population*



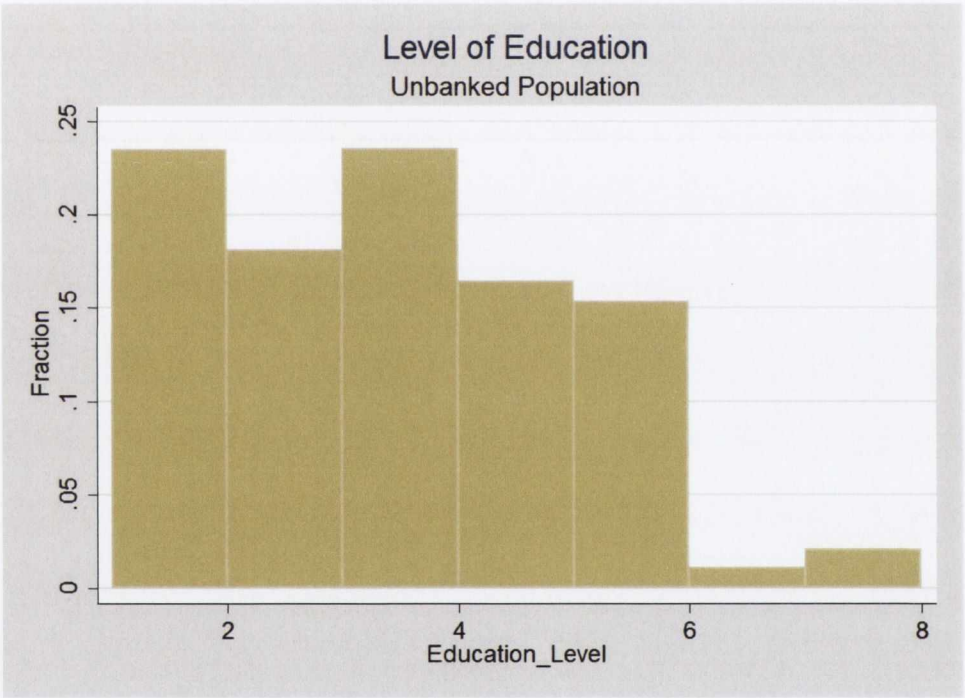
Source: Graphed by Author. Data from Finscope Surveys.

Figure A.3: *Level of Education, Formally Banked Population*



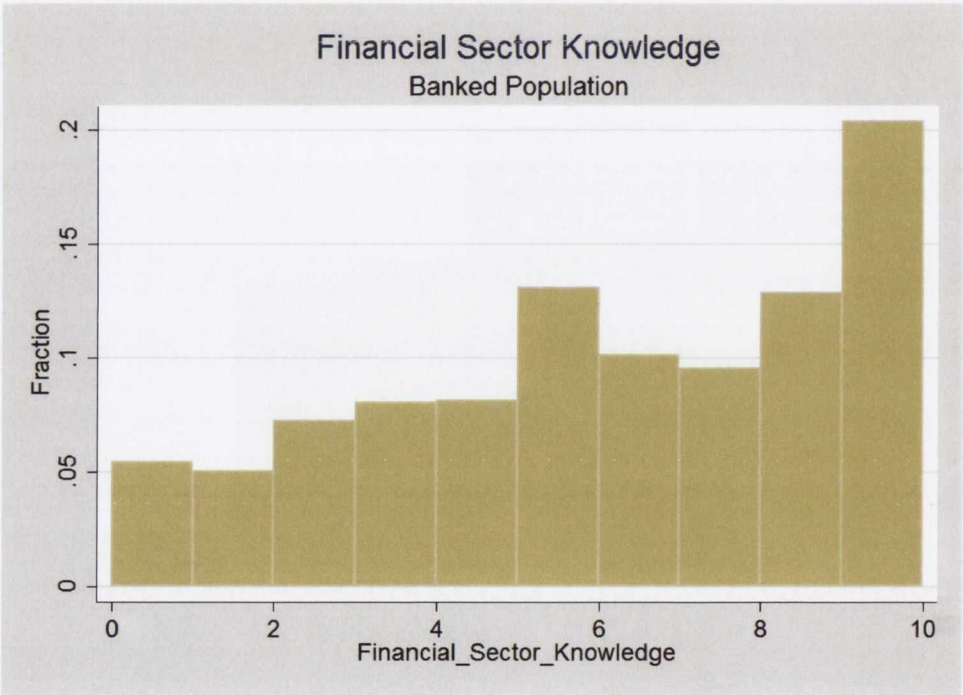
Source: Graphed by Author. Data from Finscope Surveys.

Figure A.4: *Level of Education, Unbanked Population*



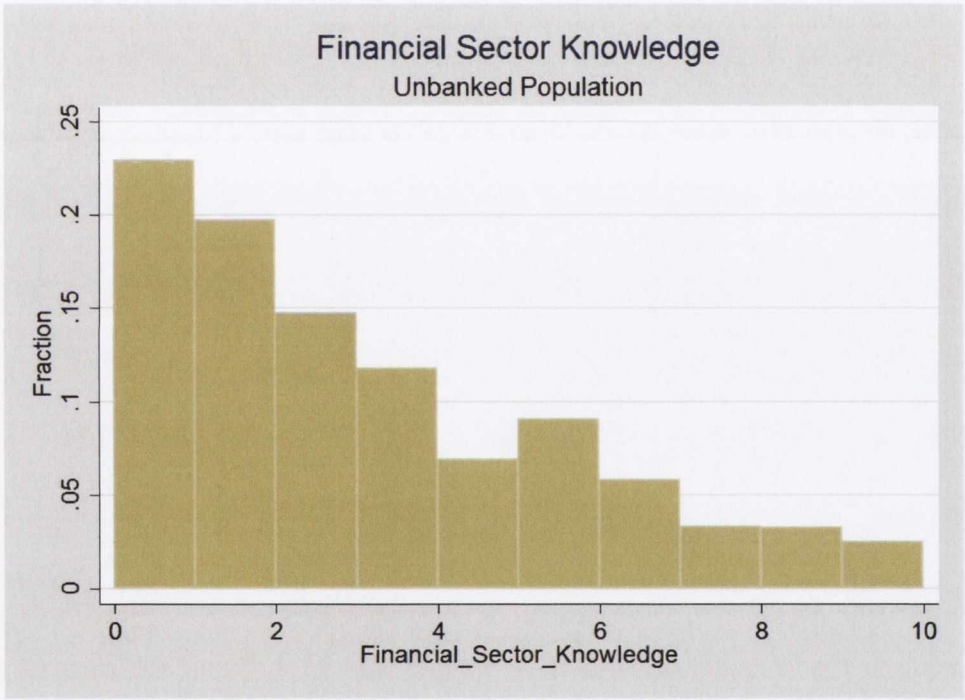
Source: Graphed by Author. Data from Finscope Surveys.

Figure A.5: *Distribution of Financial Sector Knowledge, Formally Banked Population*



Source: Graphed by Author. Data from Finscope Surveys.

Figure A.6: *Distribution of Financial Sector Knowledge, Unbanked Population*



Source: Graphed by Author. Data from Finscope Surveys.

Figure A.7: *Time to Grocery Store, Formally Banked Population*

Source: Graphed by Author. Data from Finscope Surveys.

Figure A.8: *Time to Grocery Store, Unbanked Population*

Source: Graphed by Author. Data from Finscope Surveys.

Table A.1: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Age	Botswana	2004	Exact age.	1,200	100.00	35.09 (36.73)	15.15	18	87
Age	Kenya	2006	Exact age.	4,418	100.00	36.48 (36.69)	15.54	16	90
Age	Malawi	2008	Exact age.	4,957	99.28	36.01 (36.10)	14.87	18	93
Age	Mozambique	2009	Exact age.	5,028	100.00	34.60 (34.65)	15.17	16	94
Age	Namibia	2004	Exact age.	1,193	99.42	34.70 (34.30)	15.13	16	85
Age	Nigeria	2008	Exact age.	21,110	100.00	36.14 (35.62)	14.54	18	99
Age	Rwanda	2008	Exact age.	2,000	100.00	37.87 (38.23)	15.75	18	91
Age	South Africa	2006	Exact age.	3,883	99.72	39.19 (37.57)	15.86	16	92
Age	Tanzania	2006	Exact age.	4,959	99.94	35.36 (35.19)	15.22	16	99
Age	Uganda	2006	Exact age.	2,801	94.66	35.40 (35.47)	14.70	18	95
Age	Zambia	2005	Exact age.	3,990	99.80	30.42 (30.17)	12.49	16	89
Bank Trust	Botswana	2004	Agree with the statement "I trust Banks".	1,200	100.00	0.48 (0.47)	0.50	0	1
Bank Trust	Kenya	2006	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bank Trust	Malawi	2008	Agree with the statement "I trust Banks".	4,993	100.00	0.23 (0.23)	0.42	0	1
Bank Trust	Mozambique	2009	Agree with the statement "Banks can be trusted".	5,028	100.00	0.13 (0.10)	0.34	0	1
Bank Trust	Namibia	2004	Agree with the statement "I trust Banks".	1,200	100.00	0.35 (0.37)	0.48	0	1
Bank Trust	Nigeria	2008	Agree with the statement "I trust Banks in general".	21,110	100.00	0.34 (0.36)	0.47	0	1
Bank Trust	Rwanda	2008	Agree with the statement "I would trust banks with my money".	2,000	100.00	0.81 (0.81)	0.39	0	1
Bank Trust	South Africa	2006	Agree with the statement "I trust Banks".	3,894	100.00	0.61 (0.58)	0.49	0	1
Bank Trust	Tanzania	2006	Trust in banks is defined as "Banks are my ideal financial service provider" and "I don't use banks at the moment but would really like to" minus those who say that their lack of trust in banks is the reason they don't have a bank account or the reason they don't save with banks.	4,962	100.00	0.64 (0.61)	0.48	0	1
Bank Trust	Uganda	2006	Agree with the statement "I trust formal commercial banks."	2,959	100.00	0.57 (0.57)	0.49	0	1
Bank Trust	Zambia	2005	Agree with the statement "I trust Banks".	3,998	100.00	0.38 (0.38)	0.49	0	1

Table A.2: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Educ	Botswana	2004	1 = No formal education, 2 = Some primary school, 3 = Primary school completed, 4 = Some high school, 5 = High school completed, 6 = Any other post-matric qualification not university, 7 = Some university, 8 = University completed.	1,200	100.00	3.92 (3.83)	1.90	1	8
Educ	Kenya	2006	1= None, 2 = Some primary (class 1-5), 3 = Primary completed (class 6-7), 4 = Some secondary (class 8-10), 5 = Secondary completed (class 11-12), 6 = Technical training, 8 = University.	4,402	99.64	3.14 (3.14)	1.70	1	8
Educ	Malawi	2008	1 = No formal education, 2 = Primary Standard 1-5, 3 = Primary Standard 6-8, 4 = Secondary 1-2, 5 = Secondary 3-4, 7 = Vocational training Institute, 8 = University / Other higher education.	4,931	98.76	2.87 (2.78)	1.52	1	8
Educ	Mozambique	2009	1= None, 2 = Some primary, 3 = Primary completed/Literate, 4 = Some secondary, 5 = Secondary completed, 6 = Technical training, 8 = University.	5,028	100.00	2.73 (2.67)	1.29	1	8
Educ	Namibia	2004	1 = No formal education, 2 = Incomplete Primary School, 3 = Primary School. (completed), 4 = Incomplete Secondary School, 5 = complete secondary school, 7 = Incomplete Tertiary Level, 8 = Tertiary level (completed).	1,197	99.75	3.76 (3.84)	1.59	1	8
Educ	Nigeria	2008	1 = Illiterate/None, 2= Primary Incomplete, 3 = Primary completed, 4 = Secondary incomplete, 5 = Secondary complete, 7 = University/Polytechnic OND, 8 = University/Polytechnic HND, Post-University incomplete, Post-University complete.	21,110	100.00	3.61 (3.80)	2.14	1	8
Educ	Rwanda	2008	1 = No formal education, 2 = Primary grade A, 3 = Primary grade B, 4 = Secondary 4 = Secondary 1-3, 5 = Secondary 4-6, 6 = Vocational training, 7 = University or other higher education.	2,000	100.00	2.53 (2.50)	1.29	1	7
Educ	South Africa	2006	1 = No formal education, 2 = Some primary school, 3 = Primary school completed, 4 = Some high school, 5 = Matriculated, 6 = Any other post-matric qualification, Some technical training, e.g. carpentry, motor mechanics, Credits from a technikon or other tertiary education, Completed apprenticeship 7 = Some university, 8 = University completed.	3,894	100.00	4.34 (4.14)	1.52	1	8
Educ	Tanzania	2006	1 = No formal schooling, 2 = Pre-primary, 3 = Primary, 4 = Post primary training, 5 = Secondary, 6 = Post secondary training, 8 = University.	4,844	97.62	3.28 (2.95)	1.50	1	8
Educ	Uganda	2006	1 = Did not complete P1, 2 = Completed P1, P2, P3, P4, P5, P6, 3 = Completed P7, 4 = Completed S1, S2, S3, S4, S5, 5 = Completed S6, 6 = Specialised training or certificate, Specialised training or diploma, 8 = Completed degree and above.	2,485	83.98	3.17 (3.15)	1.45	1	8
Educ	Zambia	2005	1 = No formal education, 2 = Some primary school, 3 = Primary school completed, 4 = Some secondary school, 5 = Secondary school completed, 6 = Professional Qualification or equivalent, 7 = Some College, Some College completed, Some University, 8 = University Completed.	3,986	99.70	3.76 (3.80)	1.77	1	8

Table A.3: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
FSKnow	Botswana	2004	Normalised score achieved in financial sector knowledge quiz. Heard of 14 banks and understand 6 types of financial institution; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	1,200	100.00	2.41 (2.36)	1.56	0	10
FSKnow	Kenya	2006	N/A	-	-	-	-	-	-
FSKnow	Malawi	2008	Normalised score achieved financial sector knowledge quiz. Q: 20 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	4,529	90.71	2.29 (2.11)	2.79	0	10
FSKnow	Mozambique	2009	Normalised score achieved financial sector knowledge quiz. Q: 20 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	5,028	100.00	3.03 (2.72)	2.39	0	10
FSKnow	Namibia	2004	Normalised score achieved financial sector knowledge quiz. Q: 16 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	1,200	100.00	2.53 (2.62)	2.56	0	10
FSKnow	Nigeria	2008	Normalised score achieved financial sector knowledge quiz. Q: 33 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	21,109	100.00	3.59 (3.76)	2.78	0	10
FSKnow	Rwanda	2008	Normalised score achieved financial sector knowledge quiz. Q: 17 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	2,000	100.00	5.74 (5.79)	1.84	0.31	10
FSKnow	South Africa	2006	Normalised score achieved financial sector knowledge quiz. Q: 16 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	3,894	100.00	3.76 (3.06)	2.66	0	10
FSKnow	Tanzania	2006	Normalised score achieved financial sector knowledge quiz. Q: 9 different financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	4,962	100.00	5.04 (4.55)	2.83	0	10
FSKnow	Uganda	2006	Answer to question on inflation: Increase in prices - what is it called? Answers and scores: Inflation = 20, Cost of living = 16, Consumer Price Index = 16, Scarcity = 14, Price fluctuation = 12, Tax = 10, Poor financial management = 8, Price legislation = 6, Development = 6, Budget = 4, Removal of graduated tax = 2, Interest = 2, Population increase = 2, Corruption = 2, Privatization = 2, Third term = 0, Don't know = 0.	2,959	100.00	4.25 (4.04)	3.82	0	10
FSKnow	Zambia	2005	Normalised score achieved financial sector knowledge quiz. Q: 28 different financial financial products/terms mentioned; 2 points for "understand", 1 point for "heard of", 0 for "never heard of/ don't understand".	3,628	90.75	4.62 (4.68)	2.91	0	10

Table A.4: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Female	Botswana	2004	Female = 1, Male = 0.	1,200	100.00	0.51 (0.53)	0.50	0	1
Female	Kenya	2006	Female = 1, Male = 0.	4,418	100.00	0.56 (51.69)	0.50	0	1
Female	Malawi	2008	Female = 1, Male = 0.	4,993	100.00	0.52 (0.52)	0.50	0	1
Female	Mozambique	2009	Female = 1, Male = 0.	5,028	100.00	0.57 (0.55)	0.49	0	1
Female	Namibia	2004	Female = 1, Male = 0.	1,200	100.00	0.50 (0.49)	0.50	0	1
Female	Nigeria	2008	Female = 1, Male = 0.	21,110	100.00	0.48 (0.48)	0.50	0	1
Female	Rwanda	2008	Female = 1, Male = 0.	2,000	100.00	0.64 (0.57)	0.48	0	1
Female	South Africa	2006	Female = 1, Male = 0.	3,894	100.00	0.50 (0.50)	0.50	0	1
Female	Tanzania	2006	Female = 1, Male = 0.	4,962	100.00	0.47 (0.52)	0.50	0	1
Female	Uganda	2006	Female = 1, Male = 0.	2,959	100.00	0.52 (0.53)	0.50	0	1
Female	Zambia	2005	Female = 1, Male = 0.	3,998	100.00	0.50 (0.49)	0.50	0	1
Banked	Botswana	2004	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	1,200	100.00	0.43 (0.43)	0.50	0	1
Banked	Kenya	2006	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	4,418	100.00	0.18 (0.17)	0.39	0	1
Banked	Malawi	2008	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	4,993	100.00	0.16 (0.16)	0.37	0	1
Banked	Mozambique	2009	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	5.028	100.00	0.10 (0.08)	0.31	0	1
Banked	Namibia	2004	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	1,200	100.00	0.45 (0.47)	0.50	0	1
Banked	Nigeria	2008	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	21,110	100.00	0.20 (0.21)	0.40	0	1
Banked	Rwanda	2008	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	2,000	100.00	0.15 (0.15)	0.36	0	1
Banked	South Africa	2006	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	3,894	100.00	0.62 (0.54)	0.48	0	1
Banked	Tanzania	2006	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	4,962	100.00	0.16 (0.14)	0.37	0	1
Banked	Uganda	2006	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	2,959	100.00	0.26 (0.26)	0.49	0	1
Banked	Zambia	2005	Formally Banked = 1, Unbanked =0. See Appendix A2 for details.	3,998	100.00	0.15 (0.14)	0.35	0	1

Table A.5: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
LnIncome	Botswana	2004	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.2066. Please note that $1 has been added before the log transformation.	1,023	85.25	3.50 (3.53)	2.43	0	8.44
LnIncome	Kenya	2006	N/A	-	-	-	-	-	-
LnIncome	Malawi	2008	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00724. Please note that $1 has been added before the log transformation.	4,650	93.13	3.22 (3.17)	1.59	0	9.45
LnIncome	Mozambique	2009	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.0371. Please note that $1 has been added before the log transformation.	3,728	74.14	3.14 (3.07)	1.19	2.17	7.90
LnIncome	Namibia	2004	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.1525. Please note that $1 has been added before the log transformation.	1,022	85.17	3.85 (3.87)	1.89	0	10.04
LnIncome	Nigeria	2008	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00854. Please note that $1 has been added before the log transformation.	21,110	100.00	2.54 (2.48)	1.21	0	9.05
LnIncome	Rwanda	2008	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.001796172. Please note that $1 has been added before the log transformation.	1,894	94.70	2.27 (2.28)	1.23	0	8.78
LnIncome	South Africa	2006	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.14046. Please note that $1 has been added before the log transformation.	3,249	83.44	4.01 (3.57)	2.44	0	9.21
LnIncome	Tanzania	2006	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00082. Please note that $1 has been added before the log transformation.	3,427	69.06	2.75 (2.86)	1.43	0	5.42
LnIncome	Uganda	2006	Natural log of recorded annual household income, where monthly income is derived from adding responses from the following two questions: "What was the household's income from crop farming enterprises during the past 12 months?" and "What was the household's income from other economic activities which are not agricultural in the past 12 months?". This is then translated into US dollars with exchange rate 0.00055. Please note that $1 has been added before the log transformation.	606	20.48	2.83 (2.80)	1.06	0.60	6.02
LnIncome	Zambia	2005	Natural log of midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00028. Please note that $1 has been added before the log transformation.	3,158	78.99	2.60 (2.45)	2.12	0	8.26

Table A.6: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Income	Botswana	2004	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.2066.	1,023	85.25	219.65 (226.68)	446.92	0	4,649
Income	Kenya	2006	N/A	-	-	-	-	-	-
Income	Malawi	2008	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00724.	4,650	93.13	107.82 (115.37)	639.82	0	12,670
Income	Mozambique	2009 2009	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.0371.	3,728	74.14	53.72 (48.71)	143.74	7.73	2,705
Income	Namibia	2004 2004	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.1525.	1,022	85.17	182.00 (192.62)	777.91	0	22,875
Income	Nigeria	2008 2008	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00854.	21,110	100.00	69.24 (68.96)	189.96	0	8,540
Income	Rwanda	2008 2008	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.001796172.	1,894	94.70	28.57 (24.89)	170.55	0	6,511
Income	South Africa	2006	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.14046.	3,249	83.44	315.38 (216.93)	612.03	0	9,972
Income	Tanzania	2006	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00082.	3,427	69.06	33.03 (32.16)	41.96	0 0	226
Income	Uganda	2006	Recorded annual household income, where monthly income is derived from adding responses from the following two questions: "What was the household's income from crop farming enterprises during the past 12 months?" and "What was the household's income from other economic activities which are not agricultural in the past	606	20.48	31.93 (30.00)	56.57	0	413
Income	Zambia	2005	Midpoint of personal monthly income, recorded as a categorical variable and translated into US dollars with exchange rate 0.00028.	3,158	78.99	65.15 (62.02)	177.93	0	3,850

Table A.7: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Risk Aversion	Botswana	2004	Fail to agree with statement "To get ahead in life, one needs to take some risks".	1,200	100.00	0.21 (0.21)	0.41	0	1
Risk Aversion	Kenya	2006	N/A	-	-	-	-	-	-
Risk Aversion	Mozambique	2009	Fail to agree with statement "To get ahead in life, one needs to take some risks".	5,028	100.00	0.47 (0.48)	0.50	0	1
Risk Aversion	Malawi	2008	Name the big threats to your household. Risk averse if number of risks named is 3 or above. Not risk averse if number of big risks is 2 or less. The risks are: Drought or loss of access to water for farming, Flooding, Death of or loss of income from main income earner, Death of other family member excluding main income earner, Illness within your household or family, Separation or divorce, Theft, Fuel shortages or fuel price increases, Rise in prices, Rise in interest rates, Loss of your land or access to land you use, Loss of natural resources or loss of access to them e.g. forest, rivers, lake etc, Increase in household size (more dependents on household income), Fire, Jealousy of others towards me, Harvest failure or losses of crop after harvest, Death or illness of livestock, Corruption, Loss of employment, Loss of your business, Loss of your home, Loss of savings.	4,993	100.00	0.46 (0.48)	0.50	0	1
Risk Aversion	Namibia	2004	Fail to agree with statement "To get ahead in life, one needs to take some risks"	962	80.17	0.33 (0.32)	0.47	0	1
Risk Aversion	Nigeria	2008	Fail to agree with statement "To get ahead in life, one needs to take some risks"	21,110	100.00	0.16 (0.16)	0.36	0	1
Risk Aversion	Rwanda	2008	Thinking about things that happen to people from time to time that could cause problems with your income, which of the following, if any, do you think would pose the a risk to you? List of 18 risks provided. Risk averse = 1 if 7-18 risks mentioned, Not Risk averse if 6 or less mentioned. Risks include: Rwanda, Drought, Fire, Death of main income earner or loss of income from income earner, Death of family member: note this excludes main income earner, Earthquake, War or unrest in Rwanda, War or unrest in neighbouring countries, Fuel shortages or fuel price increases, General rise in prices, Rise in interest rates, Loss of land, Loss of home, Increase in household size: this is the number of relatives or household members dependent on household income), Loss of livestock or crops or plantation, Harvest failure, Loss of employment, Loss of assets, Loss of savings.	2,000	100.00	0.60 (0.61)	0.49	0	1
Risk Aversion	South Africa	2006	Fail to agree with the statement "To get ahead in life, one needs to take some risks".	3,453	88.67	0.26 (0.30)	0.44	0	1
Risk Aversion	Tanzania	2006	Proxy: Have insurance policy or agree with statement "I would like to have insurance but I cannot afford it".	4,962	100.00	0.77 (0.73)	0.42	0	1
Risk Aversion	Uganda	2006	Fail to agree with statement "To get ahead in life, one needs to take some risks".	2,959	100.00	0.21 (0.22)	0.41	0	1
Risk Aversion	Zambia	2005	Fail to agree with statement "To get ahead in life, one needs to take some risk".	3,531	88.32	0.28 (0.28)	0.45	0	1

Table A.8: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Time to Store	Botswana	2004	How long does it take you to get to your nearest food and grocery store?. Coding: 0 = 0 minutes, 1 = under 10 minutes, 2 = between 10 and 20 minutes, 3 = between 20 and 30 minutes, 4 = between 30 and 45 minutes, 5 = between 45 and 60 minutes, 6 = between 60 and 90 minutes, 7 = between 90 and 120 minutes, 8 = between 120 and 180 minutes, 9 = between 180 and 300 minutes and 10 = 300 minutes and above.	1,193	99.42	2.77 (2.76)	2.08	1	7
Time to Store	Kenya	2006	N/A	-	-	-	-	-	-
Time to Store	Malawi	2008	How would you get to the nearest market if you had to visit it? Coding: Same as above.	4,702	94.17	3.57 (3.59)	1.92	1	8
Time to Store	Mozambique	2009	N/A	-	-	-	-	-	-
Time to Store	Namibia	2004	How long does it take you to get to your nearest food and grocery store? Coding: Same as above.	1,171	97.58	3.65 (3.59)	2.36	1	10
Time to Store	Nigeria	2008	Exact length of time spent to get to your nearest food and grocery store? Answers between 0 and 245 minutes. Coding: Same as above.	21,110	100.00	1.74 (1.68)	1.17	0	9
Time to Store	Rwanda	2008	If you had to go to the bank, how would you get there?, How long does it take you to get there? Coding: Same as above.	1,912	95.60	4.57 (4.67)	2.18	1	10
Time to Store	South Africa	2006	How long does it take you to get to your nearest food and grocery store? Coding: Same as above.	3,768	96.76	2.17 (2.57)	1.55	1	7
Time to Store	Tanzania	2006	What is the average time you take travelling to get to the place where you undertake your business transactions? I am talking about (going and coming back). Coding: Same as above.	2,634	53.08	6.02 (6.19)	2.70	2	10
Time to Store	Uganda	2006	Time to store data available for banked and informally banked subgroups only. -	-	-	-	-	-	
Time to Store	Zambia	2005	How long does it take you to get to your nearest food and grocery store? Coding: Same as above.	3,939	98.52	2.75 (2.63)	2.02	1	10

Table A.9: **Data Appendix**
Weighted means for these countries are in parentheses.

Variable	Country	Year	Coding	Obs	% of Total	Mean	Std. Dev.	Min	Max
Mobile phone	Botswana	2004	Personally have access to mobile phone = 1, Don't have access to a mobile phone = 0.	1,200	100.00	0.44 (0.43)	0.50	0	1
Mobile phone	Kenya	2006	Have own mobile phone and use it = 1, Do not have own mobile phone = 0.	4,418	100.00	0.27 (0.26)	0.44	0	1
Mobile phone	Malawi	2008	Personally have one or more mobile phone = 1, Don't have mobile phone = 0.	4,993	100.00	0.33 (0.32)	0.47	0	1
Mobile phone	Mozambique	2009	Personally have access to a mobile phone = 1, Do not have access to = 0.	5,028	100.00	0.27 (0.21)	0.45	0	1
Mobile phone	Namibia	2004	Make use of a pre-paid, contract or business mobile phone = 1, Do not = 0.	1,200	100.00	0.45 (0.45)	0.50	0	1
Mobile phone	Nigeria	2008	Regular use of pre-paid or contract mobile phone = 1, Do not make regular use of a pre-paid or contract mobile phone = 0.	21,110	100.00	0.42 (0.46)	0.49	0	1
Mobile phone	Rwanda	2008	One or more mobile in household = 1, Do not have = 0.	2,000	100.00	0.15 (0.13)	0.36	0	1
Mobile phone	South Africa	2006	Personally use a pre-paid, contract or business mobile phone = 1, Do not = 0.	3,894	100.00	0.57 (0.53)	0.49	0	1
Mobile phone	Tanzania	2006	You have a pre-paid, contract or business mobile phone = 1, Do not = 0.	4,962	100.00	0.19 (0.14)	0.39	0	1
Mobile phone	Uganda	2006	Personally use a mobile phone = 1, Don't use mobile phone = 0.	2,959	100.00	0.28 (0.26)	0.55	0	1
Mobile phone	Zambia	2005	Have access to or regularly use a mobile phone = 1, Do not = 0.	3,998	100.00	0.26 (0.28)	0.44	0	1
Urban	Botswana	2004	Urban = 1, Rural = 0.	1,200	100.00	0.33 (0.33)	0.47	0	1
Urban	Kenya	2006	Urban = 1, Rural = 0.	4,418	100.00	0.32 (0.24)	0.47	0	1
Urban	Malawi	2008	Urban = 1, Rural = 0.	4,993	100.00	0.19 (0.16)	0.39	0	1
Urban	Mozambique	2009	Urban = 1, Rural = 0.	5,028	100.00	0.53 (0.34)	0.50	0	1
Urban	Namibia	2004	Urban = 1, Rural = 0.	1,200	100.00	0.37 (0.40)	0.48	0	1
Urban	Nigeria	2008	Urban = 1, Rural = 0.	21,110	100.00	0.24 (0.28)	0.42	0	1
Urban	Rwanda	2008	Urban = 1, Rural = 0.	2,000	100.00	0.26 (0.15)	0.44	0	1
Urban	South Africa	2006	Urban = 1, Rural = 0.	3,894	100.00	0.40 (0.38)	0.49	0	1
Urban	Tanzania	2006	Urban = 1, Rural = 0.	4,962	100.00	0.55 (0.28)	0.50	0	1
Urban	Uganda	2006	Urban = 1, Rural = 0.	2,959	100.00	0.29 (0.25)	0.45	0	1
Urban	Zambia	2005	Urban = 1, Rural = 0.	3,998	100.00	0.32 (0.35)	0.47	0	1

Table A.10: **Products that Determine Formally Banked Status of Respondent**

* = additional products over FinScope official methodology.

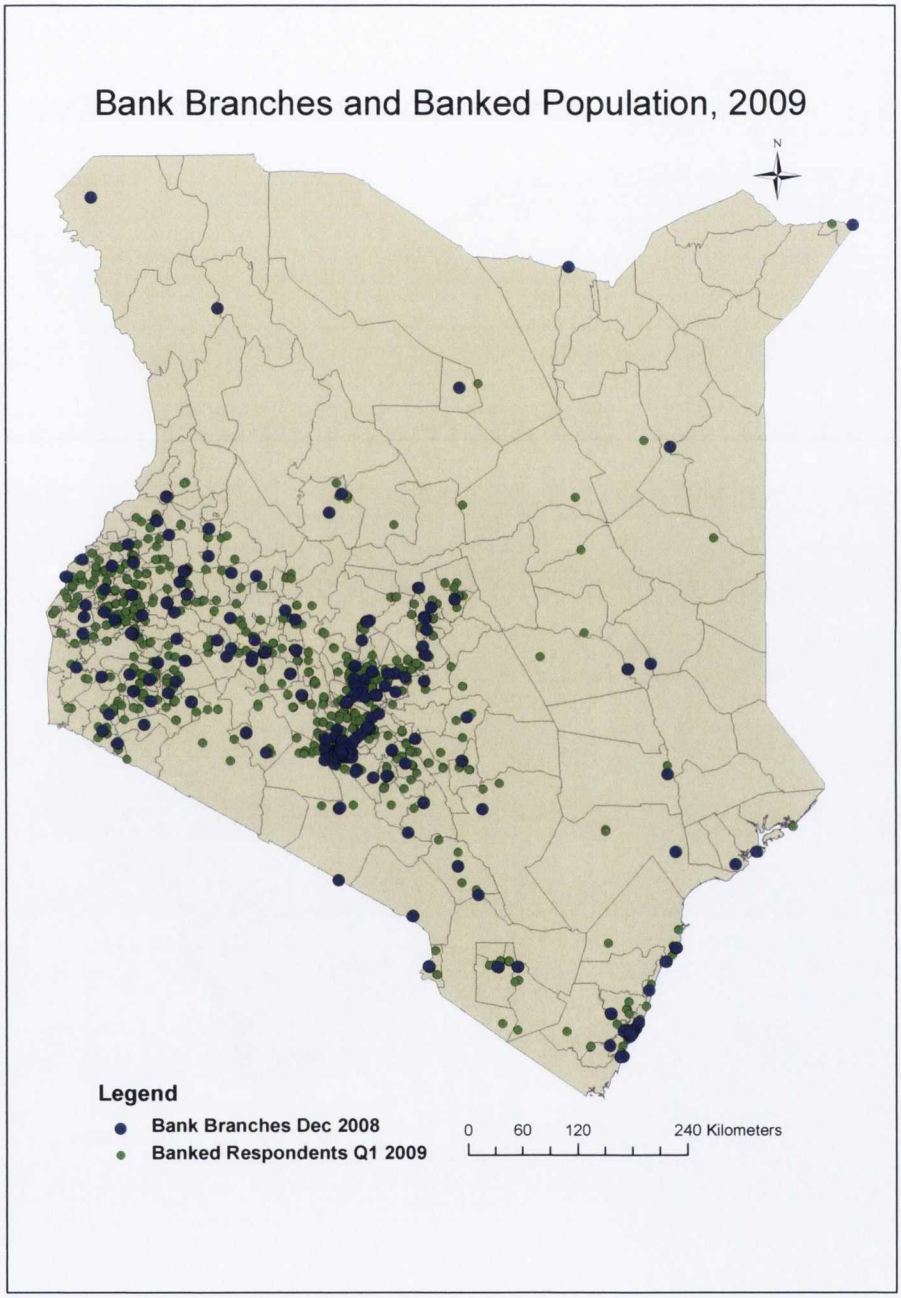
[a] Exact FinScope official methodology not available for Mozambique, Tanzania and Uganda.

Botswana	Kenya	Malawi	Mozambique	Namibia	Nigeria	Rwanda	S. Africa	Tanzania	Uganda	Zambia
ATM card	ATM card	Current account with cheque book	Current account	Debit card	ATM card	Bank account	Mzansi account	ATM card	ATM card	ATM card
Debit card/ Cheque card	Debit card	Current account with ATM card	Term deposit	Savings book at a bank	Debit card	Savings book at a bank	ATM card	Debit card	Debit card/ Cheque card	Visa electron account
Savings book at a bank	Post Bank account	Debit card	Savings account	Nampost savings bank account	Credit card	Savings account at a bank	Debit card/ Cheque card	Post Bank account	Current or cheque	Savings account
Savings/ Transaction account	Savings account	Credit card	Savings plan	Savings account	Savings/ Transaction account	ATM card	Savings book at a bank	Savings account	Credit card	Current or cheque account
Current or cheque account	Current account	Malswitch card/ Cash card	Salary account	Transaction account	Current or cheque account	Debit card	Post Bank account/ savings account	Current account	Fixed deposit bank account	Credit card
Credit card	Credit card	Savings account :Fixed term deposit/Call account	Loan account	Current or cheque account	Fixed deposit bank account	Cheque card	Savings/ Transaction account	Fixed deposit bank account	Home loan from bank or bond/ mortgage to pay for a house	Fixed Deposit bank account
Fixed deposit bank account	Fixed deposit bank account	Savings account with ATM card	Debit card	Credit card	Mortgage or housing loan	Current or Cheque account	Current or cheque account	Personal loan from a bank	Personal loan from a bank	24 hour call account
Personal garage card/ Petrol card	Loan to buy/build house from bank	Overdraft on bank account	Credit card	Fixed deposit bank account	Personal loan from a bank	Overdraft facility	Credit card		Overdraft facility	Overdraft facility
Money market account	Loan to buy/build house from building society	*Savings in Treasury bills or Gov. bonds	Cheque book	Personal garage card /Petrol card	Vehicle finance	Credit card	Fixed deposit bank account	Remittances through FI where account held		Debit card
Home loan from bank or bond	Personal loan from a bank	*Money held in shares/Stock market	Overdraft facility	Money market account	An overdraft	Foreign bank account	Personal garage card/Petrol card	Loan from FI to buy a house		Unit trust account
Personal loan from a bank	Overdraft facility	*Savings at a bank	Bank check account mortgage to buy a house	Home loan from bank or bond/	Islamic loan Treasury bonds	*Capital/stock market, including	Money market account			High interest savings account
Vehicle finance through bank			Standing order	Personal loan from a bank	Islamic financing investment	*Savings at a post office	Cell phone banking e.g. MTN, Banking, Wizzit, FNB/			US dollar account
Overdraft facility				Vehicle or car finance through bank or dealer		*Loan from Bank e.g. Bank Kigali, BCR, BNR	Home loan from bank or bond/ mortgage to pay for a house			Bank account outside of Zambia
Treasury bills				*Overdraft facility			Home loan from bank or bond/ mortgage to build, extend or improve a house			credit card
Offshore investment							*Personal loan from a bank			Standing order *Loan from bank to buy a house *Personal loan from bank *Treasury bills

Appendix B

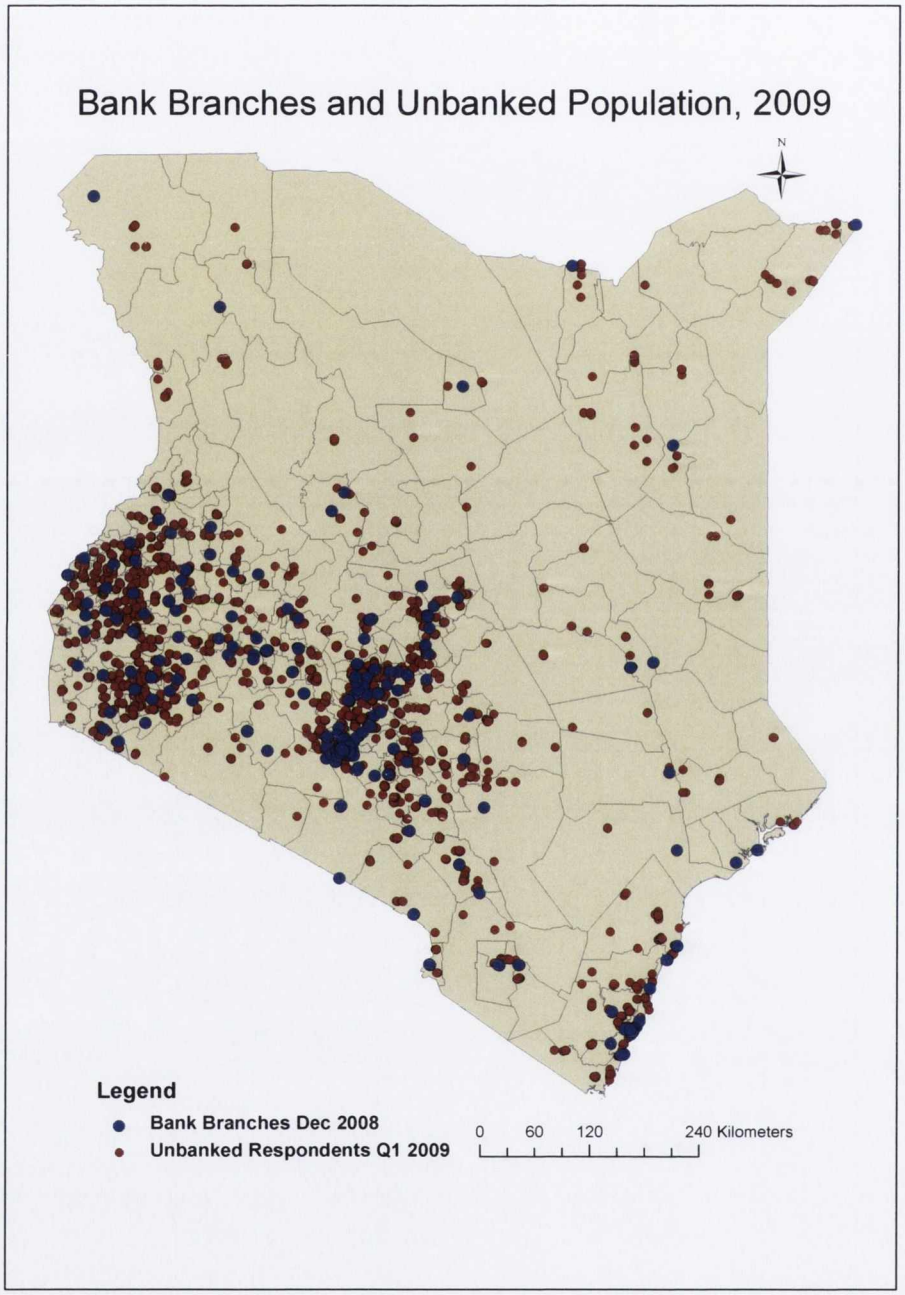
Chapter 5 Appendix: Kenya Maps

Figure B.1: *Distribution of Bank Branches and Banked Respondents in 2009*



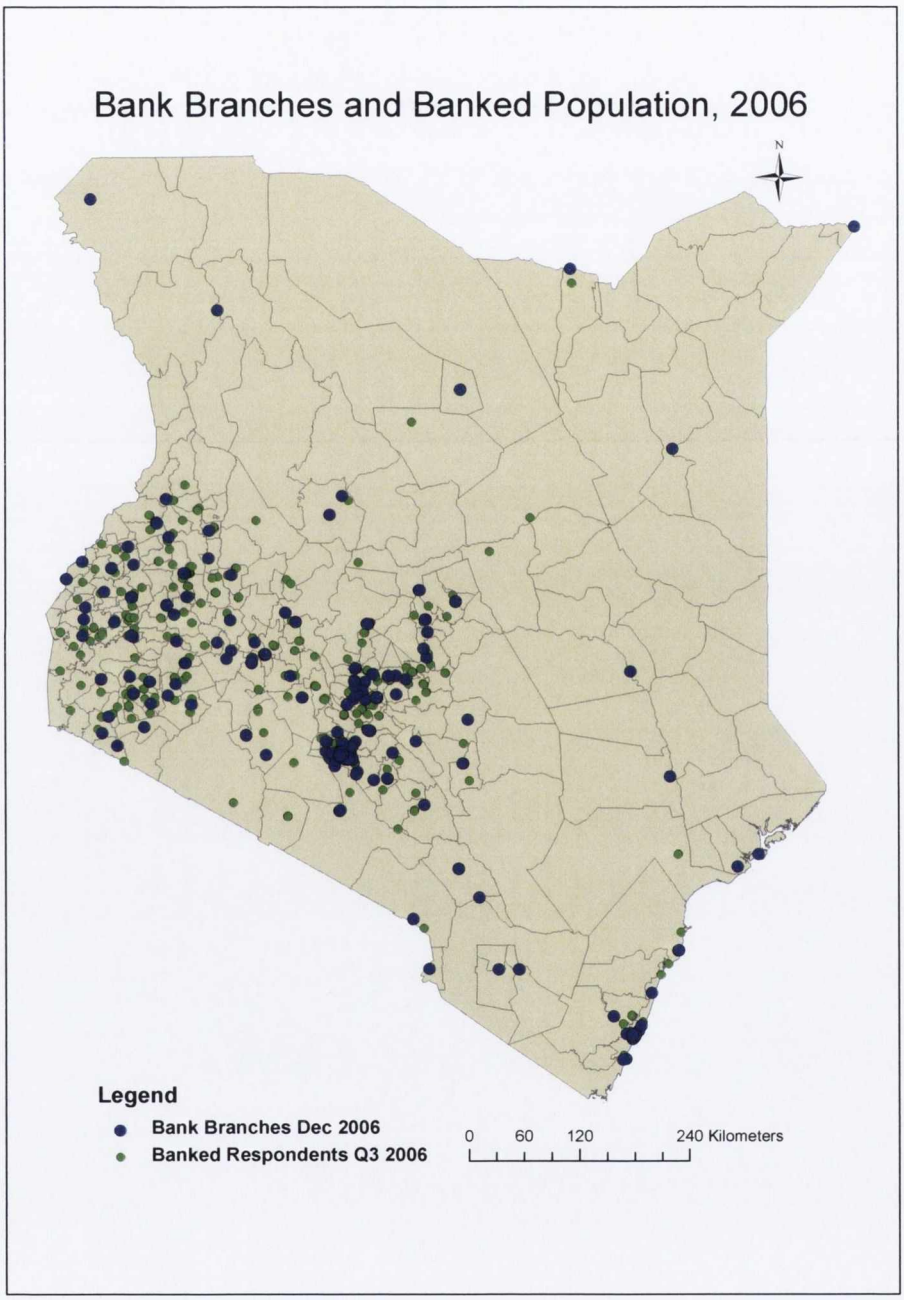
Sources: Graphed by Author. FinAccess 2009 and Central Bank Data 2009.

Figure B.2: *Distribution of Bank Branches and Unbanked Respondents in 2009*



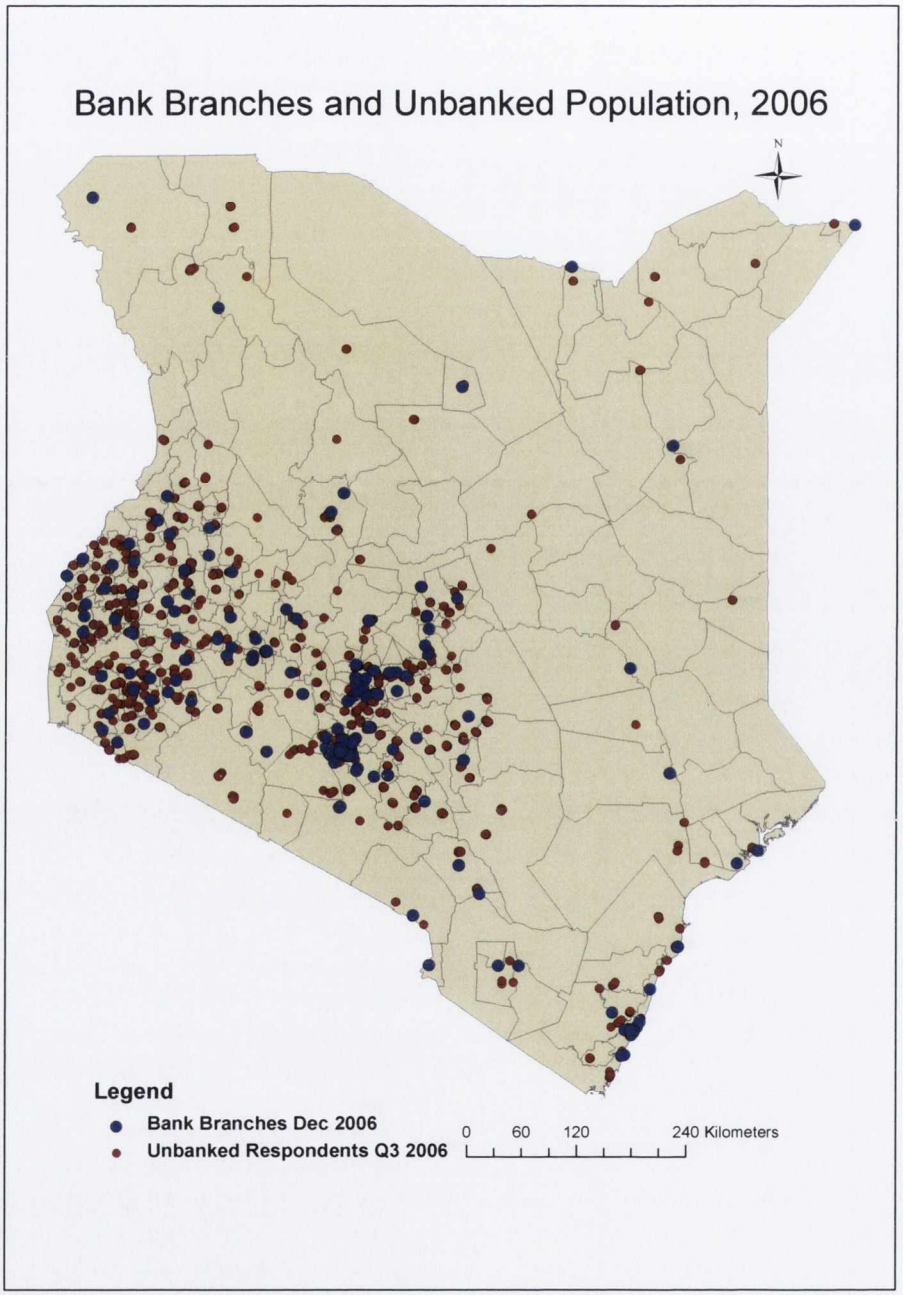
Sources: Graphed by Author. FinAccess 2009 and Central Bank Data 2009.

Figure B.3: *Distribution of Bank Branches and Banked Respondents in 2006*



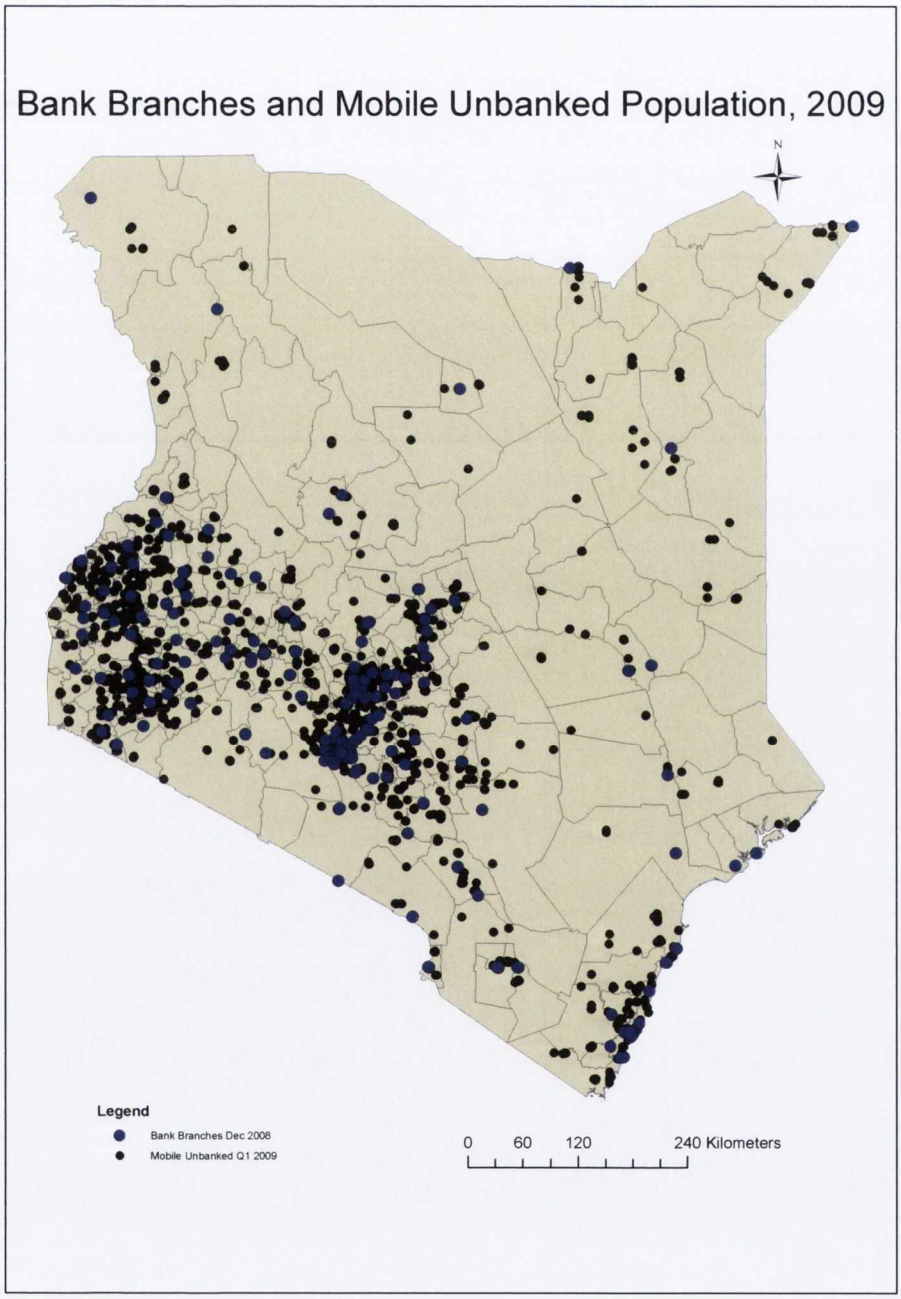
Sources: Graphed by Author. FinAccess 2006 and Central Bank Data 2007.

Figure B.4: *Distribution of Bank Branches and Unbanked Respondents in 2006*



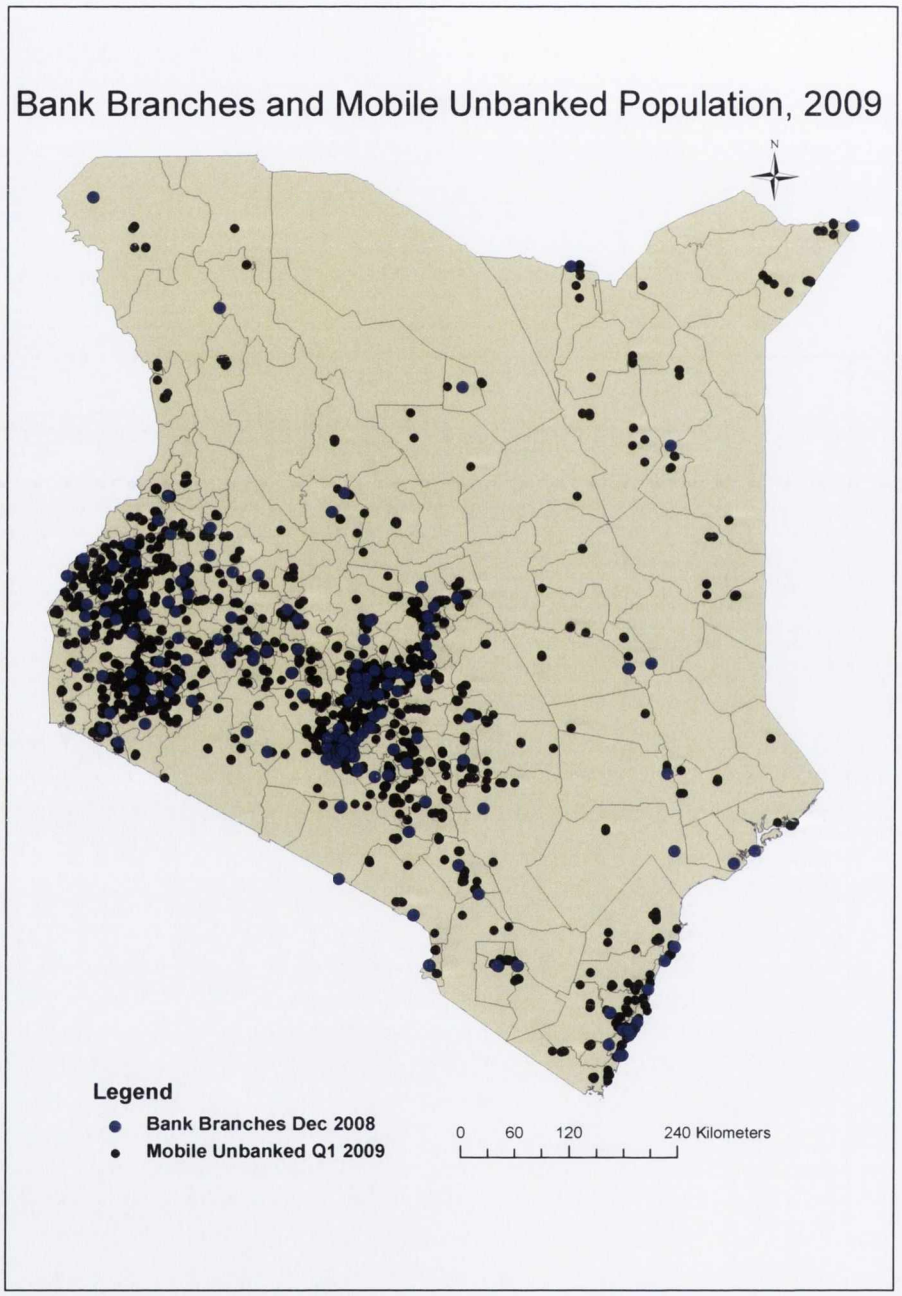
Sources: Graphed by Author. FinAccess 2006 and Central Bank Data 2007.

Figure B.5: *Distribution of Bank Branches and M-Pesa Users in 2009*



Sources: Graphed by Author. FinAccess 2009 and Central Bank Data 2009.

Figure B.6: *Distribution of Bank Branches and non-M-Pesa Users in 2009*



Sources: Graphed by Author. FinAccess 2009 and Central Bank Data 2009.