DYNAMICS OF FINANCIAL INCLUSION AND WELFARE IN KENYA

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Declaration

This thesis is my original work and has not been presented for a degree in any other University.

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Dedication

I dedicate this work to my lovely wife, Ruth Ngima and my two beautiful daughters Amara Wamuyu and Arianna Wanjiru for their invaluable support, love and encouragement throughout the PhD programme.

Acknowledgement

Abbreviations and Acronyms

AFI   Alliance for Financial Inclusion

CBK   Central Bank of Kenya

CMA   Capital Markets Authority

DFID   Department for International Development

DTM   Deposit Taking Microfinance

DTS   Deposit Taking SACCOs

ERS   Economic Recovery Strategy

FI   Financial Inclusion

FSD   Financial Sector Deepening

FSP   Financial Service Providers

GDP   Gross Domestic Product

IRA   Insurance Regulatory Authority

KDHS   Kenya Demographic Health Survey

KIHBS   Kenya Integrated Household Budgetary Survey

KNBS   Kenya National Bureau of Statistics

MDG   Millennium Development Goals

MFI   Microfinance Institution

MTP   Medium Term Plan

OECD   Organization for Economic Cooperation and Development

PCA   Principal Component Analysis

RBA   Retirement Benefits Authority

SACCO Savings and Credit Cooperative Society

SASRA SACCOs and Societies Regulatory Authority

WMS   Welfare Monitoring Survey

Definition of Terms

Transaction Account - An account which is not perceived to be savings by a consumer and accrues no interest

Credit - Any form of debt on which an economic agent pays interest for the facility

Savings - A store of monetary value for which some interest accrues to the consumer

Investment - A financial product for which money is spent either to buy stocks, property or for business

Insurance - A financial product on which premium is paid by a consumer in return for compensation when a risk occurs

Pension - A form of deferred savings where benefits only accrue to an economic agent upon retirement

Prudential regulation - Operation guidelines issued by statutory government agencies to regulate the financial system

Formal strand - Financial Inclusion channel offering prudentially regulated financial products from banks, insurance firms, mobile financial service providers, DTMs, DTSs and pension funds

Informal strand - Financial inclusion channels whose operations are not governed by prudential guidelines but are governed by informal agreements

Financial Inclusion - use of credit, savings and investments, transactionary and insurance and pension financial products from prudentially regulated institutions

Financial Exclusion - Inability to access mainstream financial services

Unbanked - Persons whose information on where they seek financial services is unknown

Mobile banking - Access to banking services such as account based savings, payment systems and other products through an electronic mobile device

Financial Deepening - Increased provision of financial services

Index of Financial Inclusion - Aggregated portfolio usage of financial services

Stochastic Dominance - Ordering of possible outcomes in a probability distribution based on individual preferences

Kolmogorov-Smirnof Test - A stochastic test that compares two cumulative distributions based on the largest vertical distance between two cumulative distributions

Per adult equivalent consumption expenditure - Money metric measure of welfare capturing overall per capital monthly consumption spending expressed in Kenya shillings

Welfare – Proxied using the money metric measure (consumption expenditure per adult equivalent) as well as vulnerability to poverty

Headcount Poverty - Living below a minimum a preset poverty line

Vulnerability as Expected Poverty - Probability that a household will fall or remain in poverty in the next period

Abstract

Financial inclusion (FI) is not an objective in itself, but only to the extent that it helps improve welfare. Evidence linking FI and welfare is however less conclusive despite growing interest. Understanding this link is often hampered first by, lack of a substantive and universally acceptable measure of FI comparable across time and geography and secondly by lack of empirical evidence. To address this gap, an empirical examination on Kenya using GMM was preceded by the modeling of FI to establish its determinants. The inter-temporal variation in household consumption to generate vulnerability as expected poverty was also analyzed to inform on the impact of FI on household vulnerability to poverty. Financial Access surveys (2006, 2009, 2013 and 2016) organized into 126 cohorts provided a solid empirical basis for tracking FI and its impact on welfare. Per capita income was found to be one of the main drivers of FI pointing to operation of the demand following hypothesis in Kenya. In terms of welfare impacts, transactionary, credit, insurance and portfolio usage of financial services significantly raise consumption expenditure per adult equivalent by 74.3, 81.6, 39.8 and 3.473 percent respectively all things held constant. This welfare impact is also extended towards poverty reduction. Safe for vulnerability to poverty in rural areas, FI was found to significantly lower vulnerability to poverty among urban households as well as headcount poverty in both rural and urban areas. The study recommends a reduction in transactionary costs by financial service providers to consolidate gains from financial inclusion, increased investment in human capital development by the government to supplement financial inclusion, employment creation and increased provision of basic services by government to enable households release part of their income towards improving household welfare.

Key words: Pseudo panel estimation, financial inclusion, welfare, vulnerability, transition matrix, dynamic regression

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1.1 Introduction

This thesis aimed at developing both single product and composite measures of financial inclusion (FI) and to establish how it links to welfare and vulnerability to poverty[1] in Kenya. This is motivated by the need to raise FI to the universal level even though the attainment of this goal is impaired by lack of an appropriate measure of FI. Global Partnership for Financial Inclusion (2011) recognizes the critical role FI setting play in monitoring and evaluation of policies and targets. Latest figures from the 2016 FinAccess report reported increased uptake of formal financial services among Kenyan adults from a mere 25 percent in 2006 to 75 percent in 2015. Total financial exclusion appears to have dipped to 17.4 percent, marking significant expansion of financial services (CBK, KNBS & FSD, 2016).

This pace of FI however does not match the speed of poverty (living below $2 a day) reduction, raising policy questions on the contribution of FI in lowering poverty which averaged 39.9 percent in 2016 (OPHI, 2016) down from 45.9[2] percent in 2005 (KIHBS 2005/06). Failure to halve the number of people living in abject poverty relative to the 1990 levels under MDG1 has put into question the effectiveness of the existing policy initiatives. This calls for a broadened approach that not only targets the poor ex-ante but one that targets the vulnerable ex-post.

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[1] A multidimensional fact of life manifested through low income, illiteracy, premature death, early marriage, large families, malnutrition and illness and injury which locks them to low standards of living (World Bank, 2000a).

[2] http://data.worldbank.org/country/kenya

Linking FI to household welfare is critical in shaping policy initiatives to improve livelihoods through enhanced financial service provision. This link is evidenced by the work of Demirguc-Kunt and Klapper, 2012; Beck et al., 2004; Sarma, 2008; and Honohan, 2008; McKinnon, 1974; Kalunda, 2014; Aduda & Kalunda, 2012 and Gurley and Shaw, 1955. However, not all studies associate FI with positive welfare impacts. They include; Diagne & Zeller, 2001; Bernejee et al., 2009; Crepon et al., 2014; Angelucci, Karlan & Zinman, 2013 among others.

Kenya's Vision 2030, Welfare Monitoring Surveys, Millennium Development Goals (MDGs) and Financial Sector Medium Term Plan (MTP), 2012-2017 recognize the need to adopt newer strategies aimed at tackling poverty. KNBS (2006) in the KIHBS 2005/2006 singled out poverty as a major impediment to the improvement of welfare among rural dwellers.

Despite lack of a universally acceptable definition of FI, most of the definitions appear to converge on access. The World Savings Bank Institute (2009) ostensibly defined FI as enhanced access to appropriate, convenient, usable, valuable and affordable financial services and products to the widest part of the population through delivery of basic banking services to the low income population and the unbanked as a way out of poverty. Deb and Kubzansky (2012) definition associates FI with financial access, financial capability and engagement with the financial system. McKillop and Wilson (2009) define FI from an exclusion angle as the inability, reluctance or difficulties that deny people access to mainstream financial services. FI in the context of this study is defined as the delivery of prudentially regulated financial services to a vast majority of the adult population without frills and encompasses use of credit, savings, transactionary and insurance

products as defined in AFI[3] (2014). The domain of FI is considerably huge and varies from country to country impairing comparability.

Some of the theories invoked in studies on FI include; capital market imperfections theory seen as a critique to Fama (1970) efficient market hypothesis (EFM), modern development theories by Mckinnon and Shaw (1973) and Bagehot (1873), financial repression theories by Keynes (1936) and Tobin (1965) among others. Keynes (1936) and Tobin (1965) financial repression arguments had for a long time advocated for a strong government to maintain low interest rates and inflationary monetary policies though at the expense of financial development. Savings and investments fall while credit rationing rise in a financially repressed regime since the range of financial products available is not only limited but is also characterized by controlled interest rates.

Financial development theories also revolve around the demand following hypothesis; supply leading hypothesis; or independent hypothesis. The demand following hypothesis of financial development in Latin America and the Caribbean (LACs) linked low FI to reduced demand for financial services where usage of credit and deposit accounts among poor households appeared fell by 4.5 and 10 percent respectively. At the macro level LACs credit to private sector as a percentage of GDP averaged 33.9 percent against 105.3 percent for OECD and 73.6% for East Asian countries (Bebczuk, 2008). Even though the data allude to a higher financial exclusion among the poor, their study poked holes on the use of aggregated figures for policy in financial markets. This result supports IMF (2012) on Kenya where persons in the highest income quintile enjoyed four times higher probability of using a formal account compared to the poorest quintile.

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[3] FI as a state where all working age adults including those currently excluded from the financial system have effective access to formal financial services, credit, savings, payment and insurance

Given that most financial institutions situate their businesses in non-poverty zones in order to maximize profits, testing whether the demand following hypothesis on Kenya's financial system holds could offer insights on places where the government can come in to promote FI since financial service providers may avoid them. Empirical evidence on the link between FI, welfare and vulnerability to poverty at the micro level in Kenya remains scanty hindering the formulation of effective policies to enhance growth and poverty alleviation (World Bank, 2014). This study extends this debate to capture the role of FI on vulnerability to poverty.

Introspection into vulnerability to poverty dates back to the early 1980's in Sen (1981) monograph on "Poverty and Dynamics" where landless agricultural labourers were found to have a higher vulnerability risk. It would appear that no such study has been conducted in Kenya using a pseudo panel framework to provide evidence based examination of the link between FI and welfare based on repeated cross sections at the micro level hence this study offers unique solutions for policy.

In addition, there is no study in Kenya that has made an attempt at invoking Sarma (2008) formulae to develop an index of FI (IFI) based on portfolio usage of financial services or has made effort to rank counties on the basis of their FI status since the introduction of the county governance structure in Kenya following the promulgation of the new constitution in 2010. This ranking is considered important since superimposition of welfare indicators on the FI map can help draw solutions that factor in peculiarities in counties due to their heterogeneity. This thesis is based on the four waves of FinAccess survey data which captures the financial access landscape, usage of financial services by individuals in Kenya and impact. Quality of financial services therefore falls outside the purview of this study.

1.2 Overview of Kenya's Financial Sector and Poverty Reduction Policies

The evolution of the financial sector in Kenya has been fast since the late 1980s. This is motivated by the need to enhance stability in the financial markets and efficiency in the supply of financial services at the least cost and to a vast majority. The reforms in the financial sector are mainly geared towards improving welfare of the entire population through increased consumption spending and poverty reduction. FSD (2015) states that the main objective of FI is to create a competitive, highly efficient, stable, safe and more inclusive financial system to enhance inclusive growth, savings and investments through Kenya's development blueprint, the Vision 2030 (GoK, 2007). This section narrates the developments in the financial sector before and after 2006 when the first major survey on the profile of Kenya's financial landscape was launched in Kenya. The section also discusses the programs rolled out in post-independence Kenya towards poverty reduction and welfare improvement. Since poverty values are derived from the consumption expenditure variable, we use the multidimensional poverty indicators across sub-national regions to illustrate the strides made in improving welfare in Kenya.

1.2.1 Evolution of Kenya's financial landscape

The first major effort in instituting reforms in the financial sector dates back to 1989 when the World Bank extended a $170 million adjustment credit (World Bank, 1990). This coincided with the 1986-1990 reform package popularly known as the Structural Adjustment Program (SAPs) whose main objectives were to liberalize financial markets, establishment of a Capital Markets Authority to monitor and develop equity markets among other requirements. The Basel I guidelines were issued in 1988 by the Basel Committee to enhance capital adequacy among banks to minimize credit risks. This was followed by the enactment of Basel II guidelines in 2004 whose main objective was to ensure that

commercial bank reserves match the risk profile from a bank's lending and investment practices. Basel II is founded on three pillars targeting minimum capital requirements, supervisory review process and market discipline (CBK, 2013).

More prudential guidelines (Basel III) were issued in 2010 in response to the 2008 global financial crisis with a sharp focus on capital adequacy, liquidity and countercyclical macro-prudential issues. In a bid to enhance the vibrancy and the global competitiveness of the financial sector to promote increased savings and investment needs in line with Kenya's Vision 2030, the Government of Kenya identified a number of strategies that would help achieve this in its national blueprint launched in 2008. These include; proper legal and institutional reforms, a reformed banking sector with few strong banks and deepened financial markets (GoK, 2007). This has led to the introduction of credit reference bureaus, streamlined informal finance, savings and credit cooperative societies (SACCOs) and microfinance institutions (MFIs).

The Vision 2030 recognizes the financial sector as key among the six sectors driving the economy (GoK, 2007). Huge expansion of the financial sector has led to the licensing of at least 3 credit reference bureaus, amendment of the MFI Act to govern Deposit Taking Microfinance (DTMs) formation, introduction of a regulatory framework for SACCOs by SACCOs and Societies Regulatory Authority (SASRA) which led to the creation of Deposit Taking SACCOs (DTSs) among other reforms. The minimum capital requirement for banks was raised from Ksh 500 million to Ksh 2 billion to enhance protection of customer deposits and investments and encourage small banks to consolidate into fewer, larger and stronger ones (CBK, 2013). In 2005, the Department for International Development (DFID) helped establish Kenya's Financial Sector Deepening

programme (FSDK) to stimulate wealth creation and lower poverty through FI targeted at the low income population segment and small businesses (FSD, 2014).

Kenya's financial sector as at 31st December 2015 comprised of 42 licensed commercial banks (26 locally owned and 14 foreign owned private commercial banks and 3 government owned), 8 representative offices of foreign banks, 12 Deposit Taking Microfinance (DTMs), 15 Money Remittance Providers (MRPs), 80 foreign exchange bureaus, 1 postal savings bank, 3 licensed credit reference bureaus (CRBs) and 1 mortgage finance company (CBK, 2015). Kenya's financial system is classified into three broad strands namely; formal (commercial banks, mobile payment systems and deposit taking SACCOs and prudentially regulated Microfinance institutions (MFIs)), other formal (unregulated SACCOs and MFIs registered under the law) and informal lenders (FSD, 2011). DTMs are governed by the revised Microfinance Act No. 19 of 2006 which enable them to accept deposits while the DTSs are governed by the SACCO societies Act No. 14 of 2008 to strengthen and regulate deposit taking credit unions[4].

Other reforms undertaken in the sector include the licensing of Credit Reference Bureaus (CRBs) in February, 2009 to collect and share information on credit worthiness of potential borrowers with three bureaus having been licensed by 2016; roll-out of mobile money transfer service M-PESA in 2006 and Yu Cash in 2009, Orange money, Mobikash and Mshwari; licensing of currency centers by CBK to facilitate cash transfers with an aim of lowering money transfer costs, regulatory framework governing consumer protection and the introduction of agency banking by commercial banks and DTMs in 2010 and 2012 respectively (CBK, 2014). These developments are summarized in figure 1.1.

Fig 1.1: Financial Inclusion Initiatives in Kenya since 2006

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[4] National Council for Law Reporting

2006	2007	2008
FinAccess 2006,MFI Act No. 19.	MPESA	Vision 2030, SASRA Act No14.

2012	2011	2010	2009
Licensing DTMs, Prudential guidelines	Airtel MoneyNPS Act	Agency Banking,MKESH O-Equity	FinAccess 2009, CRB's licensing, Yucash,AML/CFT Act

2013	2014	2015
FinAccess 2013, Anti-money laundering guide	Review of CRBs to share positive information	FinAccess 2016 (Financial Access Report)

Source: Author, 2017

FI is largely dominated by mobile banking which has evolved from the initial cash in/cash out money transfer service to the now more integrated mobile banking platform with money transfer, payments, and savings and credit products. Mobile financial services (MFS) got a boost in 2013 when the Africa Mobile Phone Financial Services Policy Initiative (AMPI) was established to launch and expand existing MFS policies, regulatory initiatives and strategies to deepen its penetration along the countries policy agenda, country priorities and commitment to the Maya Declaration which sought to lower the unbanked 2.5 billion population globally (AFI, 2013). Policies governing mobile banking have had a major implication on the velocity of money since 2010. The decline in the velocity marks a paradigm shift from reliance on the traditional economy largely dominated

by cash outside banks (M3) to a modern non cash economy largely attributed to the increased FI due to internet and mobile banking (Mbiti & Weil, 2013).

Between 2012 when DTMs were licensed and 31st December 2015, the number of licensed DTMs had grown to 12. The net advances accounted for 66 percent of the DTMs total assets (Ksh. 69.5 billion). The number of deposit and loan accounts averaged 932,000 and 342,000 respectively with a value of Ksh 40.6 billion and 47.1 for deposits and outstanding loans respectively. The agency banking model developed in 2010 had by 31st December, 2015 seen the establishment of 40,592 and 1,154 agents by 17 commercial banks and 3 DTMs respectively. This is attributed to the increased confidence and acceptance of the agency banking model as an efficient and effective financial service delivery channel.(CBK, 2015). The agency banking model enables commercial banks and DTMs to contract nonbank retail agents such as pharmacies, petrol stations, and supermarkets among other outfits as outlets of financial services especially in areas with few or no bank branches (CBK, 2014).

In relation to credit information sharing (CIS), a total of 11.2 million and 163,614 credit report requests had been made by subscribing banks and customers respectively between 2010 when CIS was launched and 31st December, 2015 (CBK, 2015). This information sharing is very critical in reducing information asymmetry on the risk profile of potential borrowers. Locally, the country witnessed the establishment of Financial Sector Regulators Forum in 2009 under a memorandum of understanding signed between CBK, RBA, CMA, IRA and SASRA to foster cooperation, share information and enhance policy coordination between the five financial regulators (CBK, 2015).

Regionally, the East Africa Community (EAC) Monetary Union (EAMU) on January, 2015 ratified a protocol[5] with partner states to harmonize the regulatory framework governing the financial system in the region with the promotion of financial deepening and inclusion as one of the objectives. Plans are underway to roll out the East Africa Financial Services Commission (EAFSC) to manage financial and banking services among member states (CBK, 2015).

Consumer protection which has received overwhelming support in recent times is motivated by the huge uptake of financial services and surge in financial innovation which doesn't match the level of financial education of users of financial products. Users of new products are disadvantaged by the information asymmetry hence the need for laws protecting them. Legislation of consumer protection is considered as a counter mechanism to market failure due to its ability to correct the information asymmetry problem through disclosures (CBK, 2014).

The CBK has since 2015 published the interest rates charged by all commercial banks as a way of reducing the information asymmetry and ensuring that consumers are well informed before they even seek financial services. This is aimed at reducing the interest rate spread in the country and lower idiosyncratic risks associated with new financial products. The frustration on the part of consumers of banking services is evidenced by the recent enactment of a new law through Parliament to cap interest rates[6] in Kenya, with effect from September 2016.

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[6] Amendment of the Banking Act, 2016 sets Kenya's interest rate cap at 4 percent above the base rate and 70 percent of the base rate payable to savers

Assessment of the contribution of FI on welfare outcomes in a manner that mostly benefits the poor require a FI strategy which goes beyond access, to one that focuses on developing a reliable measure of financial usage to inform policy. Access to financial access points (mobile money agents, bank agents, insurance service providers and stand-alone ATMs) in Kenya is by far considered to be much deeper than that of its peers, Tanzania and Uganda having grown from 59 percent in 2013 to 73 percent in 2015 as measured by the population living within a three kilometer radius to a financial access touch point[7]. Kenya's population living within a 5 kilometer radius proximity to a financial access point in 2013 was approximately 77 percent as compared to 35 percent and 43 percent for Tanzania and Uganda respectively (FSD, 2014).The report however cited skewness in the distribution of financial services as a major drawback since 69 percent of the access points were found to be located in areas with low poverty incidence.

Given this development, Kenya's FI model is seen to follow the demand following hypothesis where demand for financial services is triggered by economic growth and profit motive for the financial institutions which lead to the emergence of a myriad financial access points. The report emphasizes the need to introduce a geospatial dimension to the demand side data to map household access to financial services across the country. This model however limits the efficacy of FI in reducing poverty since financial access points mostly find their way to developed regions which mostly are dominated by population with least poverty likelihood.

1.2.2 Poverty Reduction Policies

Since gaining independence in 1963, Kenya's struggle with illiteracy, disease and poverty identified in the Sessional Paper No. 1 on African Socialism and its Application to Planning in Kenya (GoK, 1965) as key development challenges has

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[7] FSD (2015). 2015 FinAccess geospatial mapping survey key findings

persisted. These issues have shaped policy debates for the last half century. Despite the protracted efforts in fighting these problems, the eradication of poverty has remained elusive to date hindering national development. Poor formulation and implementation of policy related to poverty could be blamed for the rise in multidimensional poverty which manifests itself in form of; increased deprivation of health, education, water and housing (OPHI, 2013). After the Basic Needs Approach of 1970, then came the District Focus for Rural Development (DFRD) launched in 1983 its main focus being enhancing economic activities in the rural areas followed by the introduction of Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth.

The Bretton Woods institutions (IMF and World Bank) got more involved in the 1980s to push the government to up its fight against poverty which had started gaining momentum across the country. Top on their agenda was the implementation of the Structural Adjustment Programs (SAPs) to stimulate economic recovery within 18 months through tight fiscal and monetary policies. However, the programs failed for advocating for financial liberalization and huge cuts in government spending and especially on labour force, leaving a vast majority more impoverished and poorer (GoK, 2000).

To counter the worsening poverty, the government adopted the Social Dimensions of Development (SDD) policy in 1994 to cushion the poor against the adverse effects of the SAPs. Another initiative undertaken in 1990 was the enactment of the Non-Governmental Coordination Act (NGCA) to coordinate NGO efforts in reducing poverty. The DFRD strategy was implemented alongside the five year development plans since 1966. These strategies however didn't achieve the desired results since poverty continued to escalate having shot up to 47 percent and 29 percent in rural and urban areas respectively in 1994 (WGoK, 1994). This was followed by the establishment of the District Poverty Alleviation Secretariats, the

main objective being the harmonization of poverty eradication programmes at the grassroots.

In 1999, the Participatory Poverty Assessment Reports (PPARs) and the National Poverty Eradication Plan (NPEP 1999-2015) were also rolled out the agenda being poverty eradication. The fight against poverty got a boost after 2000 when the Poverty Reduction Strategy Paper (PSRP 2000-2003) was launched. The establishment of these outfits was meant to enhance coordination of efforts to counter poverty across the country to minimize duplication and fix the weak linkages between institutions involved in poverty eradication programmes (GoK, 2008).

The measures of poverty have also witnessed a paradigm shift with absolute poverty line rising from Ksh. 980 and Ksh. 1,490 per capita per month to Ksh. 1,562 and Ksh. 2913 in 2016 for rural and urban areas respectively. The food poverty line currently stands at Ksh. 988 and Ksh. 1,474 for rural and urban areas respectively (KNBS, 2006). Since the 1990s, economic aggregates reveal that poverty only reduced by 17 percent from 57 percent in 2000 to 39.9 percent in 2016 (OPHI, 2016) a far cry from the MDG halved poverty projection. Oxford Poverty and Human Development Initiative (OPHI) based on the 2008-2009 Kenya Demographic Health Survey (KNBS, 2008) and 2013-2014 Kenya Demographic Health Survey (KNBS, 2014) portrayed a 39.9 percent overall poverty incidence down from 47.8 percent in 2013 and a 28.3 percent vulnerability to poverty probability up from 27.4 percent in 2013 for the entire population (OPHI, 2016).

This marks a marginal improvement in welfare from the 45.9 percent incidence of poverty reported in 2005 (KNBS, 2006). Deeper interrogation of the data revealed that headcount poverty for Kenya averaged 17.3 and 51.4 percent for urban and rural areas respectively while vulnerability to poverty averaged 21.3 and 31.9

percent respectively signaling serious welfare disparities across the country. A household residing in a rural setup has a higher probability of succumbing to poverty as compared to a household in the urban setup. A closer look at regional performance revealed a very high poverty incidence in North Eastern province standing at 83.3 percent up from 56.5 percent in 2013 followed by Western 50.0 percent down from 56.5 percent in 2013 and Nyanza 47.7 percent down from 52.2 percent over the same period. Nairobi reported the least poverty incidence rate at 4.8 percent though slightly higher than the 3.9 percent reported in 2013 (OPHI, 2016).

In terms of vulnerability to poverty, Western, Eastern and Nyanza lead the pack with a vulnerability probability of 36.6, 31.0 and 30.8 percent respectively. Vulnerability to poverty in 2016 was lowest in Nairobi averaging 12.6 percent again signaling serious disparities in terms of vulnerability to poverty between rural and urban residents. This could partly be explained by the ease of accessing vital installations such as banks, hospitals, and schools among other infrastructure in urban areas. Poverty severity and inequality was also highest in North Eastern province averaging 64.3 percent and 0.26 respectively while it was lowest in Nairobi region averaging 1.0 percent and 0.03 for severity and inequality respectively. Of interest to this study is to assess how financial inclusion may have impacted on the poverty reduction in the country and particularly in the urban areas where significant progress has been made. This is represented in Table 1.1.

Table 1.1: Vulnerability to Poverty by Region

J. Multidimensional Poverty across Sub-national Regions

Region	MPI (H x A)	H (Incidence) k ≥ 33.3%	A (Intensity)	Percentage of Population:			Inequality Among the MPI Poor	Population Share
				Vulnerable to Poverty k = 20%-33.3%	In Severe Poverty k ≥ 50%	Destitute		
Kenya	0.187	39.9%	47.0%	28.3%	14.5%	12.9%	0.151	100%
Urban	0.076	17.3%	43.6%	21.3%	4.8%	-	-	33.8%
Rural	0.245	51.4%	47.5%	31.9%	19.5%	-	-	66.2%
Nairobi	0.020	4.8%	41.9%	12.6%	1.0%	0.0%	0.032	8.8%
Central	0.075	18.2%	40.9%	30.1%	2.8%	2.0%	0.056	10.8%
Eastern	0.190	41.9%	45.3%	31.0%	13.1%	10.1%	0.131	14.7%
Rift Valley	0.205	42.4%	48.3%	30.4%	17.4%	15.2%	0.174	26.7%
Nyanza	0.211	47.7%	44.2%	30.8%	13.2%	14.7%	0.084	14.3%
Western	0.223	50.0%	44.5%	36.6%	13.5%	17.1%	0.089	12.0%
Coast	0.242	49.5%	48.8%	22.1%	22.6%	16.2%	0.162	9.8%
North Eastern	0.509	83.3%	61.1%	10.8%	64.3%	48.8%	0.257	2.8%

Source: OPHI (2016)

Even though poverty appear to have stagnated in rural areas, the marginal gains achieved in terms of headcount poverty and vulnerability to poverty could be attributed to the existing social protection programmes such as the cash transfer programs[8] which targeted Orphans and Vulnerable Children (OVCs), Persons with Severe Disability (PWSD) and the elderly in 21 sub-counties of Kenya. These programs were revised in 2013 through an Act of Parliament leading to the enactment of the Social Assistance Act, 2013 to strengthen the social support at both the national and county levels. Some of the reforms initiated so far include the establishment of the National Safety Net Program (NSNP), the Older Persons Cash Transfer (OPCT), Cash Transfer for Orphans and Vulnerable Children (CTOVC), Hunger Safety Net Program (HSNP), Urban Food Subsidy Cash

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[8] National Gender and Equality Commission (2014). Participation of Vulnerable Populations in their Own Programmes: The Cash Transfers in Kenya

Transfer (UFSCT), Persons with Severe Disability Cash Transfer (PWSDCT) among others.

Geospatial analysis of and superimposition of poverty statistics on FI indicators, offer insight on the link between FI and poverty. FSD (2014) report revealed a skewed distribution of financial access points where 69 percent are located in areas with the lowest incidence of poverty serving paltry 30 percent of the population. Only 1 percent of all financial access points is located in the poorest areas limiting the effectiveness of FI as a poverty alleviation tool.

1.3 Problem Statement

The overarching goal of financial inclusion is to draw the unbanked population into the formal financial system where they can enjoy unlimited access to appropriate and affordable financial services. Kenya has witnessed tremendous growth in the use of financial services since 2006. Usage of formal financial services averaged 75.3 percent (CBK, FSD, KNBS, 2016) in 2015. Despite this protracted growth, concerns abound on the computation of FI and the ability of the financial system to pull the underprivileged segments of the population within the ambit of the formal financial system.

The incidence of poverty in the country currently average 39.9 percent (OPHI, 2016). Theory and empirical evidence predict a reduction in poverty and income inequality from increased access to financial services (Beck, 2016; Aghion and Bolton, 1997; Kaboski and Townsend, 2012). Beck (2016) asserts that lack of appropriate; payment, saving, credit and insurance services by the poor limit full participation in the modern economy to improve lives. This also limits their response to transitory changes in income lowering their financial strength to improve wellbeing as economic agents resort to the more expensive informal financial services.

World Bank (2012) considers FI to be integral in reducing vulnerability to poverty through increased savings and credit facilities which smoothen the poor's consumption and mitigate against economic shocks. Households use a portfolio of financial services to manage the ebbs and flows from transitory changes in income and build buffer stocks to manage risks (FSD, 2011). Vulnerability risks often cause significant irreversible losses in the absence of sufficient assets or insurance to smooth consumption that locks households into a vicious cycle and perpetual poverty (Jacoby and Skoufias, 1997).

Despite the progress made in promoting financial inclusion, policy design and implementation of policy tools is hampered, first by the lack of a substantive, and quantifiable measure of FI that encompasses all products from the entire financial system and second, by lack of empirical evidence linking FI, welfare, and vulnerability[9] to poverty especially at micro level. Most studies concentrate on the headcount poverty measure because of its ease of computation and simplicity leaving out the dynamic aspects (Columbus, 2001). Understanding household susceptibility to future poverty is critical in policy formulation. This warrants a systematic examination of the link between the different dimensions of financial inclusion and welfare outcomes in Kenya. .

Construction of an index of financial inclusion (IFI) from the different dimensions offers a unique way of analyzing FI in the entire financial system. Honohan (2008) contends that composite indices face numerous challenges. However, despite their shortcomings, composite indices provide a good approximation of certain phenomena which can be improved upon as more data become available. Composite measures should however be supplemented by single product measures

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[9] Actual usage of financial services and products captured in terms of; regularity, frequency and duration of time used (AFI, 2011)

since reliance on nationally aggregated FI indicators risk masking significant exclusion of finance at both individual and county levels. .

This study is unique in that it pioneers an autoregressive examination of financial inclusion welfare nexus based on repeated cross sections organized in cohorts to track the dynamics of FI and welfare.

1.4 Research Questions

i. What is the extent of and the distribution of financial inclusion in Kenya?

ii. What are the determinants of financial inclusion in Kenya

iii. Does financial inclusion affect household consumption expenditure in Kenya?

iv. Does financial inclusion affect ex-post and ex-ante poverty?

1.5 Research Objectives

1.5.1 General Objectives

The broad objective of the study is to measure FI, assess its distribution and estimate its impact on welfare and vulnerability to poverty among households in Kenya.

1.5.2 Specific Objectives

The guiding specific objectives for the broad research objectives are as follows:

i. To construct single and composite measures of financial inclusion and establish their stochastic distribution at the national and county levels

ii. To examine the determinants of financial inclusion in Kenya

iii. To estimate the impact of financial inclusion on household consumption expenditure in Kenya

iv. To estimate the impact of financial inclusion on both ex-post and ex-ante poverty among Kenyan households

1.6 Scope of the study

This study is limited to the dynamics of FI and welfare in Kenya from 2006 to 2016. In this study welfare refers to the money metric measure (consumption expenditure per adult equivalent) as well as vulnerability to poverty. In particular, the study generated both single product FI measures as well as a composite measure (IFI) for each county to map and compare FI across Kenya. This was followed by an estimation of the impact of financial inclusion on household welfare. The study used the FinAccess, 2006, 2009, 2013 and 2016 data with the household head as the unit of analysis. The analysis is limited to the usage and impact dimensions of FI. Future studies should focus on the quality dimension.

1.7 Organization of the Study

The remaining chapters are organized as follows. Chapter two delves into the measurement of FI and its stochastic distribution. Chapter three investigates the determinants of FI. Chapter four explores the impact of FI on the money metric measure of welfare. Chapter five focused on measurement of vulnerability to poverty, the role of FI and the poverty transition matrix for the Kenyan households between 2009 and 2016 while chapter six presents a summary of findings, conclusions and policy recommendations from the study.

Chapter Two: Measures and Extent of Financial Inclusion in Kenya

2.1 Introduction

This chapter explores financial inclusion (FI) in Kenya based on single product usage and Sarma (2008) composite index of FI (IFI). A composite IFI reduces multiple dimensions of FI into a single measure for effective policy formulation. This essentially offers a valuable instrument for ranking the FI status of the various counties. The county with the highest FI index is used as a reference point to benchmark with as a best practice. This study suggests that targeting composite indices could be easier than targeting a multitude of single product usage indicators. Persons using a wide range of financial services at their disposal would be considered to be highly financially included as opposed to those using a single financial product.

Recent years have witnessed a surging interest in the measurement and determination of FI at the global front. AFI (2011) however contends that while there is consensus on the need to intensify the compilation of FI data, no standard has been set on what to measure and how to go about it. Management of transitory changes in income through building of buffer stocks is impaired by lack of consensus on a proper measure of FI. Countries use different methodologies to collect similar indicators due to differences in sophistication something which led to the establishment of the FIDWG to harmonize this (FSD, 2011). The framework is credited with the collection of the core set of FI indicators along the access and usage dimension. These indicators capture the most basic and fundamental aspects of FI in a standardized format across countries to enhance comparability.

Chakrabarty (2014) and Honohan (2008) posit that development of an IFI is however not without challenges. First, the IFI is sensitive to geographical sampling

and second the index varies with the number of dimensions included. However, in spite of the challenges, the IFI measure provides a better approximation of certain phenomena creating room for further improvement subject to data availability. Financial exclusion could either be voluntary or involuntary (Amidzic, 2014). Voluntary financial exclusion can arise if individuals who meet the minimum requirements for FI opt not to participate in financial markets on personal, cultural or religious grounds.

Involuntary financial exclusion stems from the imposition of barriers such as high interest rate, discrimination, lack of collateral and non-developed markets. Stiglitz and Weiss (1981) cite indiscriminate lending and information asymmetry as some of the factors behind involuntary exclusion. Other barriers cited in the literature include; limited income, poor credit rating, credit unworthiness, geographical location, population characteristics and cultural factors (Kempson and Whyley, 1999; Hannig and Jansen, 2010).

Barriers to financial access have also been classified in the literature along macroeconomic factors namely; macroeconomic fundamentals, developments in the financial sector and political factors or microeconomic factors namely; firm profile, technology, religion, culture among others (Rau, 2004). Supply of financial services enhances access while demand enhances usage. The authors also posit that expansion of financial services creates affordability, security, competitiveness and efficiency leading to low transaction costs, increased investment and safe and secure customer deposits. Financial services assume a geographical dimension through provision of financial products to the underserved segments of the population especially in rural areas; a product dimension in form of accessible and affordable services tailored to the needs of the low income population and a time dimension through maintenance of a permanent relationship with households towards stable and sustainable policies.

The various measures of FI are subjected to stochastic dominance analysis to establish their dominance on the basis of household characteristics, dimension of usage and geographical distribution. Claessens (2006) results posit that FI is far from becoming universal especially in developing countries as evidenced in the 2012 Global Findex data by Demirguc-Kunt and Klapper (2012) where hardly a quarter African adults hold an account in a formal institution. Claessens (2006) attributes this to failure by countries to include FI in the public policy agenda. Statistics on savings also paint a dark picture of the savings culture in sub Saharan Africa where only 14 percent of the 40 percent adults with a savings product obtain it from the formal access channel.

FI helps bring the lower segments of the population within the ambit of the formal financial system while the government and policy makers use the FI indicators to set national targets and strategies to achieve them. Vision 2030 recognizes the financial sector as part of the six main economic drivers in Kenya (GoK, 2008). FI is considered to be critical in the implementation of monetary policy given that it operates under the formal access channel. The effectiveness of monetary transmission can only succeed if the largest segment of the population is financially included. Where only a small segment of the population is financially included, only policies that operates under the informal access channel where the majority can succeed.

The Global Partnership for Financial Inclusion (2011) and the Alliance for Financial Inclusion (AFI) which established the Financial Inclusion Data Working Group (FIDWG) for peer to peer exchange to promote and share information on the measurement of FI also cite FI as being instrumental in informing financial inclusion policy, providing a basis for the measurement, monitoring and evaluation of financial inclusion policies and targets both locally and internationally. An innovation in the measurement of FI in Kenya is captured by incorporating the

number of transactionary products held, savings and investment, credit and insurance and pension in the IFI.

The main objective in this chapter was to generate measures of financial inclusion and establish their stochastic dominance. These dominance tests are used to compare distributions of FI indicators both inter-temporally and spatially to draw an ordinal assessment of FI changes over several measures. A stochastic dominance testing of FI is done to establish the cumulative distributions and dominance of the various measures of FI along the household characteristics. This broad objective was broken down into the following specific research objectives:

1) To construct financial inclusion measures and examine their nature based on Kenya's FinAccess survey data

2) To conduct a geo spatial mapping of financial inclusion across Kenya

3) To apply stochastic dominance analysis to establish relative degree of financial inclusion among population subgroups

This study provides a measure of FI following Sarma (2008) formula on Kenyan data to aggregate usage of financial products from the formal access channel. Subjecting the FI measure to stochastic dominance analysis establishes its distribution along the household's demographic profile. Proximity to a financial access point does not automatically translate to increased uptake of financial services. About 77 percent of Kenya's population lived within a 5km radius to a financial access point (FSD, 2014). The chapter emphasizes the need to introduce a geospatial dimension to the demand side data to establish FI gaps in Kenya.

2.2 Literature on Measurement of FI

Kenya's economic blueprint, the vision 2030 recognizes the critical role that the financial sector plays in accelerating economic growth and improving livelihoods.

Interest in this topic is also motivated by both theory and empirical evidence which associate growth in FI with accelerated economic growth and poverty reduction (World Bank, 2002). This is echoed by DFID (2004) where developments in the financial sector are considered to be a key building block to private sector development. This section summarizes the key theoretical underpinnings and a review of the main empirical literature on measurement of FI. Measurement of economic variables such as financial inclusion is founded on the application of the social inclusion, insider outsider models and classical and modern measurement theories in finance.

2.2.1 Theoretical Literature

Financial inclusion thinking is mainly shaped by financial development theories. FI forms a key tenet of financial development[10] as one of its main indicators even though the twin concepts manifest the 'chicken and egg' problem. Nobel laureate Sen (1981) consider FI as a consequence of development. This makes it possible to impose theories of financial development in studies on FI. Raza et al. (2014) presents size, depth, access, efficiency and stability of the financial system as some of the indicators of financial development. Earlier theories of development however focused on labour and capital with little mention of finance which is perceived to be responsible for lowering income inequality and accelerating economic growth. Rajan and Zingales (1998) through cross country comparisons established the causal link between finance and economic growth.

Emerging theories are now focusing on the growth in modern finance and its composition. These include; Greenwood and Scharfstein (2013) who attributes the observed growth in finance to asset management and provision of household

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[10] Factors, policies and institutions that promote effective financial intermediation and markets as well as deep and broadened access to capital and financial services (Financial Development Index, 2008).

credit. The biggest portion in the growth of assets is attributed to the growth in its value. Household credit expansion is attributed to growth in residential mortgage and consumer debt such as credit cards. Besides consumption smoothing, access to credit leads to overinvestment in housing and consumption. Shadow banking where non-bank financial entities offer traditional banking services such as a credit in a less stable way if not checked can lead to a financial crisis like the one witnessed in 2007. Merton and Bodie (1995) considers shadow banking model as one that runs contrary to the tenets of traditional banking whose primary role was to dampen effects of risk through intermediating financial services to parties that can bear risks most easily.

Measurement of usage of financial services borrows heavily from the classical theory and the modern measurement theories. Classical theory of measurement by Campbell (1953) argues that measurement entail assignment of numbers to represent properties based on physical laws discovered through the derived measurement processes. Measurement is merely the assignment of numbers to reality. Derived measures of certain phenomena such as financial inclusion are therefore obtained through the indirect process. While challenging Campbell (1953) definition of measurement, Stevens (1959) provided a broader definition linking measurement to the assignment of numerals to objects on the basis of predefined rules now popularly known as the modern measurement theory by Abdel-Magid (1979). Measurement however presupposes what is to be measured hence one must in the first place know what needs measurement.

One other theoretical strand used to motivate measurement of financial inclusion is theory of banking and intermediation. Financial intermediation theories provide means through which financial services flow from the surplus units to the deficit units. Philippon, T. (2015) argues that intermediation is organized in two ways. One, financial intermediation occurs under one roof in traditional banking where a

bank for example makes a loan, keeps it on its books and earns a net interest income. This income is what compensates for the screening costs, monitoring costs and for risk management. Secondly, under the originate and distribute model, financial intermediation occurs as a daisy chain where transactions occur inside the roof. Origination fees, asset management fees and trading profits are also considered.

To understand financial intermediation better the author raises three key considerations which include; measurement of the income of financial intermediaries, definition and construction of the quantity of the intermediated asset and computation of the unit cost of intermediation and quality adjustments. In the context of this chapter, the definition and construction of the quantity of intermediated assets is key. Greenwood and Jovanovic (1990) contends that financial intermediaries facilitate migration of funds to areas where social returns are higher.

The theory of social inclusion also plays a key role in the measurement of financial inclusion by enhancing inclusion of all into the financial system, equally and without discrimination. Social inclusion theory helps in informing about; social bases of collective action, risk management, legitimacy of change processes and inequality and exclusion. The foundations of effective institutions are governed by the expanded sense of 'we' plus the social norms and an inclusive social structure (Woolcock, 2013). Social inclusion is increasingly being viewed as an essential tool in fighting poverty and increasing wellbeing. Sen (1981) hypothesized exclusion in poverty terms by looking at it in terms of relative deprivation of basic needs. Social inclusion therefore provides the capability to maximize one's welfare from access to a wide array of financial services.

Lindbeck and Snower (2001) insider outsider model bends on the notion of economic inclusion. This theory shows how certain economic agents in the market

enjoy more privileges than others. This explains the observed disparities in the degree of FI in financial markets. Insiders command a higher economic rent or surplus as compared to the outsiders. The insider outsider status helps in explaining why certain population segments are financially excluded while others are more financially included.

Lastly the legal structures as posited by Porta (1997; 1998) counts when designing financial products. Formal financial services are subject to prudential regulation. The existing legal framework in the financial sector governs the establishment of financial sector regulators as well as the formulation of prudential guidelines. Porta (1998) argues that strong institutions for protecting and matching the investor needs enhance financial development. The decision about the dimensions of FI to consider and the product categories in the context of this study was informed by the set rules that classify financial service providers under the formal channel.

2.2.2 Empirical Literature

2.2.2.1 Measurement of FI

While existing literature suggests several approaches for the construction of an index of FI (IFI), no consensus has been reached on the most appropriate measure. The first attempt at measuring FI is attributed to Beck et al., (2005) using the dimensions of physical access, affordability and eligibility to inform on banking sector outreach. This was later followed by indices of FI developed by Sarma (2008), Honohan (2008), Chakravarty and Pal (2013), Sarma (2012), Amidzic et al., (2014) among others.

While Sarma (2008) emphasize the need to incorporate the dimensions of usage, availability and accessibility in developing the FI index, there is need to pay close attention to each dimension so as to ensure consistency before aggregation of

individual products is done. It's on this premise that this study focuses on the generation of the IFI on the basis of the usage dimension in the formal strand. In most countries today, challenges of access and availability have been reduced significantly with the emergence of mobile and internet banking. The dimensions of FI have recently been redefined to capture; access, usage, quality and impact (Hannig and Jansen, 2010 and FSD, 2013).

Demirguc Kunt and Klapper, 2013; Hannig and Jansen, 2010 FI measures focused on ownership of an account, saving or loan product. While Amidzic et al., (2014) relied on the percentage of regulated deposit and loan accounts to proxy the usage dimension, this study finds the two indicators to be insufficient since it locks out savings, investment, insurance and pension products. Inclusion of these products from the formal channel provides a more encompassing measure of FI usage.

Amidzic et al., (2014) recommended the inclusion of mobile banking data when measuring financial outreach where data is available. A household with a current account, postbank account and a mobile money account is considered to be more sophisticated financially, than one with only one transactionary product say, a current account. The same applies to usage of more than one product under credit, transactionary, savings and insurance. It's on the basis of this that household usage of financial services from the four dimensions of FI is aggregated.

Uptake of financial services in Sub Saharan Africa remain low (34.2 percent compared to developed world where FI exceeds 90 percent (World Bank, 2014). This, points to a 65.8 percent departure from the much touted universal access. South Africa however appears to be doing much better as compared to its peers. World Bank (2015) economic update on South Africa places the country in the same category with high income economies with respect to indicators of financial access. This is however dampened by over 12 million South Africans who remain unbanked and under-banked.

On the analysis of formal payments, savings and credit, the report concludes that FI in South Africa is not only pro-growth but also pro poor and with great potential to lower inequality. The report raises the need for disaggregation of data since the aggregated data which reported a strong access to financial services could be masking significant inequalities in access. Less than universal access in developed countries could be rationalized by low demand rather than inadequate access to financial services (World Bank, 2015).

Thorsten et al. (2010) asserts that biases in FI is also prevalent among urban dwellers whose mean financial exclusion stood at 15.8 percent compared to 30.6 percent for rural dwellers. Demirguc-Kunt and Klapper (2012) found financial exclusion to be highest in the lowest income quintile (77 percent). The number of formal accounts held by adults, account for 41 percent (24 percent in sub Saharan Africa) against a global target of 90 percent and 89 percent for the developing and developed countries respectively. This discrepancy creates two reinforcing inequities for the poor. First it limits their financial strength to improve their wellbeing through participation in financial markets and second, it aggravates the marginalization of the poor from the formal economy.[11] This adversely affects their response to transitory changes in income as they resort to more expensive credit facilities from money lenders, substitute savings with livestock or gold pending any emergencies where they pawn assets[12].

Lack of a composite measure of FI limits understanding of the complex nature of FI as well as the link between FI and welfare outcomes. Measurement of FI requires a multidimensional approach to aggregate information from several dimensions. The multidimensional approach was used in constructing the Ease of

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[11] Dan Radcliffe and Rodger Voorhies, Bill & Melinda Gates Foundation1 (2012). A digital pathway to financial inclusion

[12] 2014 Global Partnership for Financial Inclusion: Why Financial Inclusion?

Doing Business Index (Doing Business 2012), the Human Development Index (HDI), Multidimensional Poverty Index (MPI), Gender Inequality Index (GII) by the United Nations Development Programme (UNDP) and Sarma (2008) and Chakravarty (2010) FI index. Data collection on FI mainly revolves around access, usage, and quality and impact dimensions. The data is further classified as either demand side (individuals or firms) or supply side (financial service providers).

The Global Partnership for Financial Inclusion (CGAP) established by G20 has helped develop basic and secondary indicators of FI based on the four dimensions. These include; payments, savings, remittances, insurance and point of sale. The International Monetary Fund (IMF) has also intensified the collection of supply side indicators in its Financial Access Surveys (FAS) at the global front to enhance comparability of access and usage indicators among households and non-financial corporation's across countries.

FAS indicators are collected from financial sector regulators and currently stand at 47 indicators from both geographical and usage dimensions in 189 countries (IMF, 2015). The core set of FI indicators by AFI provided a first attempt at generating a common measurement of FI based on basic and fundamental aspects to enhance the dimensions of access and usage (AFI, 2011). AFI (2011) indicates that the dimensions of access and usage are different in that individuals may opt not to use the financial services despite their availability due to socio-economic reasons, costs among others.

The World Bank's Development Research Group spearheaded the Global Financial Inclusion Index (Global Findex) to fill the data gap on the financial inclusion landscape. This initiative led to the creation of the first comprehensive demand side FI indicators based on financial product usage. The data is considered to be rich in enhancing cross country comparability, demographic covariates and tracking countries (148) performance over time on the core set of indicators

namely bank accounts, savings, borrowing, payments and insurance (Demirguc Kunt & Klapper, 2012).

The key indicators are; percentage account holding in formal institutions among adults, percentage share of adults with formal savings account, percentage share of adults using a formal account to borrow and percentage share of adults using an informal source to borrow (family and friends). The measure of financial depth adopted (private sector credit to GDP ratio) in 2010 revealed a sharp disparity between sub Saharan Africa and high income countries at 24 percent and 172 percent respectively. A higher financial depth however does not automatically translate to a broadened access to financial services even though the correlation is positive (Demirguc Kunt & Klapper, 2012).

The proportion of adults with a formal account in Kenya stood at 42 percent compared to 54 percent and 80 percent for South Africa and Mauritius respectively (Demirguc Kunt & Klapper, 2012). While aggregate borrowing in sub Saharan Africa stood at 47 percent borrowing from the formal access channel remained small in Kenya averaging 10 percent compared to Mauritius 14 percent Use of such single indicators has come under criticism for failing to inform on the breadth of FI. Aduda and Kalunda (2012) in review of theoretical and empirical literature on FI and financial stability reinforce the pivotal role played by FI in enhancing financial development. Although the paper provides the status of FI in Kenya it does not construct a financial inclusion index based on a portfolio of financial services.

Financial inclusion in Kenya has grown from 25 percent in 2006 to 75 percent in 2016 (CBK, KNBS & FSD, 2016). This aggregated measure however masks significant exclusion of finance at both individual and county levels. For example, Kalunda (2014) established that the uptake of financial services among small scale farmers in Nyeri where usage of bank accounts stood at 93.8 percent. This could

be attributed to ongoing reforms in the financial sector summarized in Fig. 1 which include; changing the regulatory framework to accommodate DTMs, DTSs, agency banking, internet and mobile banking among others.

Kempson and Whyley (1999) argued that quite a large number of households are marginally financially included with one or two financial products as compared with a few who are totally financially excluded from the formal financial services. Claessens (2006) expounds on the measurement of the access dimension using availability of financial services, cost, range type and quality of financial services. Other dimensions considered by the authors included; reliability, convenience, continuity and flexibility of financial services. Failure to attain universal access in the use of financial services was linked to the failure to include financial inclusion in the public policy agenda. Determination of who is banked or not is based on the revealed use rather than access.

Whereas studies on the measurement of FI borrow heavily from the work of Chakravarty and Pal (2010) and Sarma (2008), several other pieces of literature on measurement of FI at micro and macro levels have come up including; Sarma and Pias (2011) and Amidzic et al. (2014) based on factor analysis and Park and Mercado (2015). Chakravarty and Pal (2013) describe FI as the delivery of financial services to its people. The domain of financial services is considered to be very huge and varies from one country to another. Their approach in generating the FI index follows the human development index (HDI) to aggregate several dimensions into a single index of FI.

Chakravarty and Pal (2013) cite sensitivity to geographical sampling and the number of dimensions included as key considerations in the generation of composite indices. The authors targeted sub-National regions (17 states) in India between 1972 and 2009 in developing a FI index to assess the performance of the entire financial system over time and across cross sections. The construction of the

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index was based on six dimensions; geographic penetration demographic penetration; Deposit accounts per 1000 people; Credit account per 1000 people; Deposit income ratio and Credit income ratio. The index of FI increased with the number of households using institutional credits

Honohan (2005) argues that broadly, two main approaches exist whether usage of financial services is derived from household survey data or from inferences drawn on the use of intermediary accounts from existing data. Percentage ownership of a bank account from a formal financial intermediary among adults is the most commonly used indicator of FI (World Bank, 2005). This indicator is however criticized due to its inability to determine the distinct and active accounts in a case where individuals hold multiple accounts (Honohan, 2008). This raises the need to consolidate the multiple accounts to match the number of individuals with accounts. A non-linear aggregation of loan and transactionary deposit accounts is closely correlated with household usage of financial services (Honohan, 2008). The only challenge is that use of the two dimensions rocks out the role of savings and investments as well as insurance and pension.

The use of single indicators to measure FI has been challenged by Sarma (2008) due to their inability to inform on the extent of FI as evidenced by the Indian case where usage of financial services remains high despite a low density of bank branches. A similar picture was observed in Russia which ranked highest on the usage of bank accounts per 1000 adults despite having a lower bank branch density per 100,000 adults as compared to Thailand, Malaysia and Colombia. Albania also ranked 4th in terms of loan income ratio but 85th in terms of bank branches per 100,000 adults in Beck et al., (2007). Individual measures therefore provide an incomplete picture of the level of inclusivity in the entire financial system. Individual measures mainly use categorical variables (1 and 0) to represent financial included and financially excluded persons respectively.

Sarma (2008) recommends the use of a composite index to measure the level of FI based on a combination of various banking sector indicators. The composite index (IFI) lie between 1 (complete financial inclusion) and 0 (complete financial exclusion). The IFI applies a three dimensional approach on macroeconomic data based on banking sector outreach to capture accessibility, availability and usage. Accessibility proxied using bank penetration is measured using the number of bank accounts per 1000 adult population with a -1 weight. The number of bank branches and ATMs per 100,000 adult population measures availability, while the ratio of credit plus deposit to GDP measured usage with each of the dimensions carrying a 0.5 weight.

Using an econometric technique, Honohan (2008) developed a composite cross country FI index based on 160 countries. The main focus was on the use of formal financial intermediaries proxied by the use of services from the formal access channel in this context. Given that certain countries had no household survey data to provide the percentage uptake of bank accounts, an alternative estimation technique was used to estimate the number of bank accounts. While the scholar admits that composite indices are characterized by numerous shortcomings due to the imputation procedures followed in developing the index, he posits that the composite index provides a good approximation which can be improved upon as more data become available.

Amidzic (2014) in assessing countries FI standing based on a composite index cites robust measurement of FI as an outstanding challenge. The authors applied a geometric mean approach to construct an index of FI based on the dimensions of outreach, usage and quality. Key considerations included; geographic and demographic penetration, deposit and lending, dispute resolution, disclosure requirement and cost of usage. The constructed composite index was later used to rank countries hence offering an additional tool for surveillance and policy. The

number of ATM machines and bank branches indicators rescaled by land mass and adult population were used. Measurement of usage was based on the percentage of adults with atleast one type of regulated deposit/loan account. However, the index generation ignored quality indicators due to data limitations.

Demirguc-kunt et al., (2015) posited that measurement of financial inclusion helps in identifying opportunities to remove the barriers to financial access. The authors confirmed that FI is centered on usage rather than access. Their findings established that by 2014, 62 percent of adults globally enjoyed holding an account in a bank or other financial institution or with a mobile money provider up from 51 percent in 2011. This increase in the number of accounts held was attributed to innovations in technology and particularly mobile money especially in developing countries. They also mentioned the huge potential to raise FI among women and the poor. In addition, the authors argued that holding a bank account is not enough; rather, government and private sector should strengthen FI by channeling wages through the accounts as opposed to cash payments. Account usage could also be spurred by digitizing payments such as utility bills and school fees which largely relied on cash.

2.2.2.2 Stochastic Dominance

Stochastic Dominance (SD) is a concept applied in decision theory when confronted with a choice between two phenomena (Bawa, 1982). SD presents a stochastic ordering of possible outcomes in a probability distribution based on individual preferences. The simplest method of testing for stochastic dominance is through a Kolmogorov-Smirnov (KS) dominance test. The KS test provides a comparative analysis of two cumulative frequency distributions at a time. Chakravarty, Laha and Roy (1967) argue that KS test helps decide if a sample was drawn from a population with a specific distribution. The D captures the maximum vertical deviation (supremum) between the two subgroups curves.

A small P value implies that the two subgroups were sampled from populations characterized by different distributions hence may differ in terms of median and distribution curve. If the p value is less than the critical value, the null hypothesis that the two samples were drawn from the same distribution is rejected. Its therefore preferred when rejected at all critical values. The closer the D value is to 0, the more likely the two samples were drawn from the same distribution.

Faced with two samples picked from two distributions say, urban (u) and rural (r), stochastic dominance tests helps in estimating the parameter beta which informs on the dominant stochastic pattern. Assuming $F_u - \exp(s_u)$ and $F_r - \exp(s_r)$, F_u first order stochastically dominates F_r if and only if $s_r > s_u$. A stochastic dominance testing allows households faced with a choice to make judgment on a preference or random variable as more risky compared to another over the entire utility path. Most often, the decision maker has a preference ordering over all possible outcomes. This technique is used to explore the robustness of IFI comparisons on selected household characteristics.

The first order stochastic dominance (FOSD) test provides a comparative analysis of the different cumulative distribution functions of the IFI. This is generated based on regions, cluster, gender, education and marital status. Both a first-order and second-order stochastic dominance (SOSD) tests are carried out to determine the most dominant path. The second order stochastic dominance test is conducted where there is an intersection of the CDF (Ravallion, 1994; Davidson and Duclos, 1998; 2000). The Kolmogorov-Smirnov test based on the largest vertical distance between two cumulative frequency curves is mainly used in measuring first-order stochastic dominance.

Some of the approaches applied in conducting stochastic dominance tests include; receiver operating characteristics (ROC) curves, Lorenz and generalized Lorenz

curves, cumulative distribution functions among others. Generalized Lorenz curve (glcurve) offers better empirical applications as compared to the normal Lorenz curve (Shorrocks, 1983). The Lorenz curve offers minimum variation which conceals interpretation of the observed differences. The larger variation in the mean income makes it easier to explain glcurves hence offering a clearer picture of the dominance relationships. This is generated through scaling up of the Lorenz curve at each point by the population mean of the variable of interest ordered in ascending order.

The cumulative mean $(p \sim_p)$ is plotted against p. Financial product usage for transactionary, credit, savings and insurance assumes a certain cumulative distribution function (CDF). The glcurve generates two new variables with the ordinates for each product at each point. Assuming the CDF for transactionary products is F(t), then the glcurve at each point p (GL(p)) is p=F(t). The GL curve for each product therefore plots the cumulative total product usage divided by the population size against cumulative population share GL(1)=mean(t). This curve helps in testing for dominance along the various segments, say rural urban subgroups.

Other scholars who have successfully used the stochastic dominance technique include; Davidson (2006) and Davidson and Duclos (2000) in the analysis of income distribution.

2.2.3 Overview of literature

Measurement of FI is one issue that has elicited much interest globally in the recent past. However, despite the myriad efforts that have featured in the literature, there's still no consensus on the most appropriate measure. Earlier attempts at measuring FI using single product indicators has been challenged for failing to incorporate the portfolio financial product usage mentality which characterize the

modern day consumer. The main dimensions scholars are focusing on are mainly access, usage, impact and quality. The dimension of access mainly captures the supply side while the usage dimension mainly focuses on the demand side.

The access challenge is considerably low today, thanks to the emergence of mobile and internet banking which have led a financial revolution in how people transact. The mobile banking platform in Kenya especially has transformed Kenya's financial sector to a silicon valley helping in a big way to overcome the geographical barriers to financial access. Focus has shifted towards usage since access does not always guarantee uptake of financial services. The impact and quality dimensions are also slowly gaining momentum owing to the central position held by the financial system in spurring economic growth.

The index of FI (IFI) in the context of this paper is based on Sarma (2008). However, it departs in two ways. First, aggregation is done on the basis of the usage dimension only. Second, indicators of usage are generated from all intermediaries in the formal access channel rather than bank alone. These include; banks, insurance, mobile money, DTMs, DTSs and pension. This approach also differs slightly from Amidzic et al., (2014) where a geometric mean was applied on the dimensions of outreach, usage and quality based on; geographic and demographic penetration, deposit and lending, dispute resolution, disclosure requirement and cost of usage. Aggregation is based on the usage of transactionary, credit, savings & investments and insurance & pension products. . Amidzic et al. (2014) factor analysis approach also excluded usage of insurance services which form part of the IFI in this context. The generated indicator is used to supplement the single product usage indicators.

As to the sufficiency of the usage dimension in informing on the usage of financial services, Honohan (2008) contends that a nonlinear aggregation of loan products and transactionary deposit accounts from household surveys exhibit a high

correlation with the usage of financial services. This study extends this line of thought by including indicators of savings/investment product usage from prudentially regulated financial institutions. An assessment of both the breadth (use of transactionary products) alongside the depth (credit to private sector) using a regression analysis inform on whether access/usage of financial services is independent. A positive but imperfect correlation signals a distinct access to financial services dimension which could be skewed. The literature also established that Kolmogorov-Smirnov test computed from the largest vertical distance between two cumulative frequency curves is applied to measure first order stochastic dominance.

Literature related to FI lacks a comprehensive measure of FI which can be relied upon in drawing a comparative analysis across the counties. Even the little data available has not been subjected to stochastic dominance tests to establish which frequency distribution is dominant. This study is the first of its kind in Kenya to employ Sarma (2008) index of financial inclusion (IFI) formulae based on repeated cross sectional survey data. The need to measure FI is motivated by Claessens (2006) argument that the profile of a household with a credit facility differs from that of a household with a savings or bank account. A stochastic dominance analysis is then pursued to establish the dominance structures of financial product usage based on the individual demographic profile.

2.3 Theoretical Framework

The theoretical framework employed in the construction of FI indicators is the modern measurement theory (1979) where assignment of numerals to objects is based on predefined rules. Sarma (2008) provides the aggregation formulae for the construction of IFI. This framework is considered to be superior in the construction of IFI since it provides a formula that easily aggregates sub-indices from various FI dimensions hence offering a unique reference point in the index

generation. The framework uses single product indicators to aggregate portfolio usage of financial services among households based on the utility attached to each product. The derived measures of FI are then subjected to a stochastic dominance test.

2.3.1 Constructing the Index of Financial Inclusion

In terms of methodology, the IFI measure borrows heavily from leading scholarly work by Sarma (2008; 2012), Chakravarty & Pal (2013) and Amidzic et al. (2014) three step procedure; normalization of indicators, determination of sub-indices for each dimension and aggregation of the sub-indices. We assumed that the financial system has $k \geq 1$ dimensional activities drawn from transactionary, credit, savings and insurance. One's financial sophistication is evidenced by the number of financial instruments chosen rationally (Collins, Murdoch, Rutherford, and Ruthven, 2009).The attained FI level from each dimension is denoted by x_i whose lower and upper bounds are defined by m_i and M_i, that is, $x_i \in [m_i, M_i]$. Functioning i is represented by a real valued function $A(x_i, m_i, M_i)$, which is continuous in its arguments and associated with each $x_i[m_i, M_i]$. The difference from the real valued function $(1 - A_r)$ yields the shortfall from the actual value of the index. The index of FI (IFI) is derived from the averaging of the individual indicators.

The normalization process is expressed as follows;

$$nx_{ki} = \frac{x_{ki}}{M_k}$$

Where; x_{ki} is the raw value of the kth indicator for individual i, M_k the maximum possible value of the indicator across cross sections while nx_{ki} is the normalized value of the indicator. The construction of the IFI in the context of this study

follows a nonlinear aggregation of mobile financial services and formal prudential financial services which include; transactionary, credit, savings and investments, insurance and pension accounts. The sub-indices from the four dimensions are aggregated based on the Sarma (2008) framework expressed as;

$$FI = 1 - \frac{\sqrt{\sum_{k=1}^{j} \left((M_k - x_k)/(M_k - m) \right)^2}}{\sqrt{j}}$$

Where; M_k is as earlier defined (upper bound), m the lower bound, k the number of dimensions under investigation. The ratio $(M_k - x_k)/(M_k - m)$ yields the shortfall from the maximum possible value. Once the index is generated, a ranking of all counties in Kenya is done to inform on disparities of FI across the country. The IFI is used to supplement single FI indicators since its only through an index that the overall performance of the entire financial system can be assessed.

2.3.2 Stochastic Dominance Testing

Given two distributions and with the same mean, the distribution $F(FI)$ is said to first-order stochastically dominate distribution $G(FI)$ if, for every non-decreasing concave function $u: R_+ \to R.$ we have $\int u(FI)dF(FI) \geq \int u(FI)dG(FI)$ and $F(FI) \leq G(FI)$ for all FI (Mas-Colell, Whinston and Green, 1995; Foster & Shorrocks, 1988). $F(.)$ could for example be representing the distribution of FI among male households while $G(.)$ could be representing the distribution for females.

Where two CDF lines cross each other in the first order stochastic dominance, there arise a need to conduct second order stochastic dominance test to generate the IFI deficit curve where an integral function is drawn on the CDF up to every IFI value. This is done to establish whether there is a dominant distribution curve

between the two financial products. All the curves start together at point 0 and later converge to a similar point. Immediately after point 0 under the cluster category, F1(r) is less than F2(r) hence flatter for small ordinates. Since the slope of the CDF yields the probability density function (PDF), the density f1(r) is higher than the density f2(r) for ordinates closer to 1.

Second-order stochastic dominance extends the "higher/better" vs "lower/worse" off states under first-order stochastic dominance to include a comparative analysis based on relative riskiness or dispersion.

2.4 Conceptual Framework

Fig 2. 1 Conceptual Framework
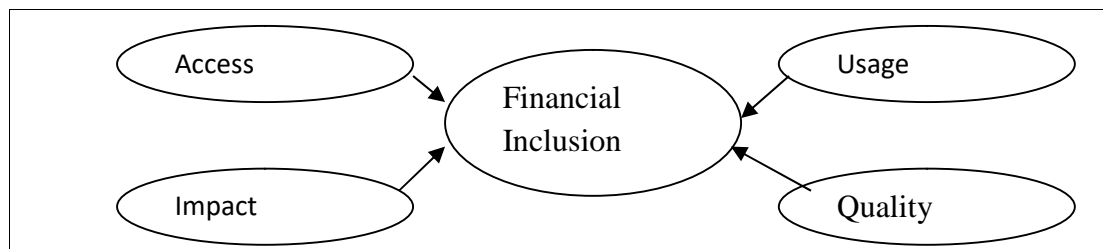
Source: Author, 2017

FI is categorized along four main dimensions namely; access, usage, impact and quality. The access dimension focuses on the financial access channels from a supply side perspective. Usage dimension takes this further by focusing on the demand side where household demand for financial services is established. The impact dimension extends this further by assessing how access to and the usage of financial services affects people's livelihoods. The quality dimension investigates whether the designed products meet the intended objective. Fig 2.1 therefore provides the components (dimensions) of FI. The arrows therefore indicate that all the four dimensions feed into the FI hence the need to unpack each component.

This chapter focuses on the usage dimension which has been used in constructing the measures of FI.

2. 5 Data

Both the cohort and yearly full sample data have been used in constructing the measures of FI. This technique of forming panels using repeated cross sectional survey data is used to overcome scarcity of panel data in developing countries. Repeated cross sectional surveys are less prone to attrition and non-response bias (Meng et al. 2014). Population subgroups were formed based on time invariant characteristics namely; gender, place of residence and birth year from the four FinAccess survey datasets (2006, 2009, 2013 and 2016) totaling 504 observations.

The pseudo panel targeted households born between 1934 and 1994. The 2006 survey includes individuals aged 18 to 62, the 2009 survey, 21 to 65 (3 years older), the 2013 survey, 24 to 68 (6 years older after 2006) and the 2016 survey, 27 to 71 year olds (9 years older after 2006). The first observation, which is cohort one therefore captures individuals aged 18 to 22 in 2006, 21 to 25 in 2009, 24 to 28 in 2012 and 27 to 31 in 2016. This methodological framework by Deaton, 1986 was also used by Ackah et al. (2007) in Ghana. The short age bands may however lead to fewer respondents in a cohort despite the large cross section dimension. Large age cohort bands may also not be good since they reduce the cross section dimension.

Gender variable is disaggregated to generate panels for males and females respectively while the geographical aspect is captured by the seven regions (44 counties), formerly provinces with the exception of North Eastern region which has 3 counties namely; Mandera, Wajir and Garissa for missing in the 2013 wave due to logistical constraints. A key consideration in cohort analysis is the tradeoff between the number of cohorts and number of observations for each cohort.

McKenzie (2004) posits that a large number of cohorts minimize errors associated with small samples.

2.6 Discussion of Findings

Construction of FI indicators relied on both the single and composite measures. Quite a number of households were found to use a portfolio of financial services at the counties. This necessitated the construction of the aggregated portfolio usage (IFI) to capture their level of financial sophistication. Table 2.1 captures the measures of central tendency and measures of dispersion for the five FI measures.

Table 2.1 Summary of FI indicators by County

	Credit				Transactionary				Insurance				Savings			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
KERICHO	0.19	0.39	0	1	0.73	0.45	0	1	0.39	0.49	0	1	0.36	0.48	0	1
NAIROBI	0.12	0.33	0	1	0.68	0.47	0	1	0.28	0.45	0	1	0.29	0.45	0	1
NAKURU	0.13	0.33	0	1	0.82	0.38	0	1	0.24	0.43	0	1	0.21	0.41	0	1
EMBU	0.05	0.22	0	1	0.73	0.45	0	1	0.28	0.45	0	1	0.26	0.44	0	1
THARAKA	0.13	0.33	0	1	0.59	0.5	0	1	0.33	0.47	0	1	0.28	0.45	0	1
KAJIADO	0.06	0.24	0	1	0.75	0.44	0	1	0.2	0.4	0	1	0.16	0.37	0	1
BOMET	0.09	0.29	0	1	0.55	0.5	0	1	0.21	0.41	0	1	0.24	0.43	0	1
KIAMBU	0.06	0.24	0	1	0.56	0.5	0	1	0.17	0.37	0	1	0.2	0.4	0	1
MACHAKOS	0.06	0.25	0	1	0.73	0.45	0	1	0.19	0.39	0	1	0.15	0.36	0	1
NYERI	0.05	0.23	0	1	0.59	0.49	0	1	0.17	0.38	0	1	0.2	0.4	0	1
MOMBASA	0.06	0.25	0	1	0.55	0.5	0	1	0.17	0.38	0	1	0.24	0.43	0	1
LAIKIPIA	0.08	0.27	0	1	0.51	0.5	0	1	0.16	0.37	0	1	0.25	0.43	0	1
KIRINYAGA	0.07	0.26	0	1	0.45	0.5	0	1	0.13	0.34	0	1	0.24	0.43	0	1
MAKUENI	0.06	0.24	0	1	0.62	0.49	0	1	0.07	0.26	0	1	0.13	0.34	0	1
KISUMU	0.07	0.25	0	1	0.43	0.5	0	1	0.15	0.36	0	1	0.13	0.34	0	1
NYANDARUA	0.03	0.18	0	1	0.51	0.5	0	1	0.15	0.36	0	1	0.14	0.35	0	1
BARINGO	0.07	0.26	0	1	0.38	0.49	0	1	0.11	0.31	0	1	0.23	0.42	0	1
MURANG'A	0.05	0.21	0	1	0.4	0.49	0	1	0.13	0.34	0	1	0.22	0.41	0	1
KITUI	0.04	0.2	0	1	0.64	0.48	0	1	0.08	0.28	0	1	0.08	0.27	0	1
UASIN GISHU	0.05	0.23	0	1	0.39	0.49	0	1	0.16	0.36	0	1	0.16	0.37	0	1
NYAMIRA	0.05	0.22	0	1	0.47	0.5	0	1	0.07	0.25	0	1	0.17	0.38	0	1
NANDI	0.03	0.18	0	1	0.4	0.49	0	1	0.13	0.34	0	1	0.15	0.36	0	1

MERU	0.05	0.22	0	1	0.32	0.47	0	1	0.11	0.31	0	1	0.14	0.35	0	1
TAITA TAVETA	0.02	0.13	0	1	0.36	0.48	0	1	0.05	0.22	0	1	0.13	0.34	0	1
KISII	0.06	0.23	0	1	0.33	0.47	0	1	0.1	0.3	0	1	0.11	0.31	0	1
MIGORI	0.04	0.18	0	1	0.35	0.48	0	1	0.08	0.27	0	1	0.11	0.31	0	1
ELGEYO-MARAKWET	0.04	0.19	0	1	0.29	0.46	0	1	0.09	0.28	0	1	0.16	0.37	0	1
BUSIA	0.04	0.2	0	1	0.33	0.47	0	1	0.07	0.25	0	1	0.08	0.27	0	1
TRANS NZOIA	0.02	0.15	0	1	0.36	0.48	0	1	0.07	0.25	0	1	0.08	0.28	0	1
KAKAMEGA	0.02	0.15	0	1	0.34	0.47	0	1	0.1	0.3	0	1	0.1	0.3	0	1
BUNGOMA	0.04	0.19	0	1	0.34	0.47	0	1	0.08	0.27	0	1	0.1	0.3	0	1
SIAYA	0.04	0.19	0	1	0.31	0.46	0	1	0.07	0.26	0	1	0.09	0.28	0	1
KILIFI	0.02	0.15	0	1	0.3	0.46	0	1	0.05	0.21	0	1	0.13	0.34	0	1
NAROK	0.02	0.13	0	1	0.38	0.49	0	1	0.09	0.28	0	1	0.05	0.22	0	1
TANA RIVER	0.03	0.17	0	1	0.28	0.45	0	1	0.07	0.26	0	1	0.09	0.28	0	1
VIHIGA	0.03	0.16	0	1	0.31	0.46	0	1	0.06	0.24	0	1	0.08	0.27	0	1
HOMA BAY	0.04	0.19	0	1	0.32	0.47	0	1	0.05	0.22	0	1	0.06	0.24	0	1
KWALE	0.02	0.15	0	1	0.26	0.44	0	1	0.03	0.16	0	1	0.11	0.31	0	1
WEST POKOT	0.03	0.16	0	1	0.16	0.37	0	1	0.08	0.27	0	1	0.09	0.29	0	1
LAMU	0.01	0.11	0	1	0.3	0.46	0	1	0.07	0.25	0	1	0.04	0.2	0	1
ISIOLO	0.03	0.16	0	1	0.23	0.42	0	1	0.04	0.21	0	1	0.07	0.25	0	1
SAMBURU	0.02	0.14	0	1	0.2	0.4	0	1	0.04	0.19	0	1	0.09	0.28	0	1
TURKANA	0.04	0.19	0	1	0.1	0.29	0	1	0.08	0.26	0	1	0.07	0.26	0	1
MARSABIT	0.02	0.14	0	1	0.18	0.38	0	1	0.03	0.17	0	1	0.05	0.21	0	1

Source: Author, 2017

Table 2.2: County Index of FI (IFI) Ranking

`	SD	Min	Max	IFI_Full sample	IFI_Cohort
Kericho	0.1	0	0.36	0.11	0.06
Nairobi	0.1	0	0.51	0.1	0.13
Nakuru	0.09	0	0.48	0.09	0.05
Embu	0.09	0	0.38	0.09	0.05
Tharaka	0.08	0	0.43	0.08	0.02
Kajiado	0.09	0	0.51	0.08	0.05
Bomet	0.09	0	0.36	0.07	0.04
Kiambu	0.09	0	0.62	0.07	0.09
Machakos	0.08	0	0.43	0.07	0.05
Nyeri	0.08	0	0.48	0.07	0.05
Mombasa	0.08	0	0.53	0.07	0.07
Laikipia	0.07	0	0.38	0.06	0.06

Kirinyaga	0.08	0	0.46	0.06	0.05
Makueni	0.07	0	0.42	0.05	0.02
Kisumu	0.09	0	0.59	0.05	0.03
Nyandarua	0.06	0	0.45	0.05	0
Baringo	0.08	0	0.45	0.05	0.05
Murang'a	0.07	0	0.53	0.05	0.03
Kitui	0.06	0	0.35	0.05	0.03
Uasin gishu	0.07	0	0.54	0.05	0.03
Nyamira	0.07	0	0.46	0.05	0.08
Nandi	0.06	0	0.29	0.04	0.02
Meru	0.07	0	0.49	0.04	0.04
Taita taveta	0.06	0	0.32	0.04	0.01
Kisii	0.07	0	0.53	0.04	0.01
Migori	0.06	0	0.41	0.04	0.06
Elgeyo-marakwet	0.06	0	0.34	0.04	0.14
Busia	0.07	0	0.48	0.03	0.04
Trans nzoia	0.06	0	0.41	0.03	0
Kakamega	0.06	0	0.6	0.03	0.03
Bungoma	0.06	0	0.39	0.03	0.05
Siaya	0.06	0	0.45	0.03	0.05
Kilifi	0.05	0	0.26	0.03	0.02
Narok	0.05	0	0.22	0.03	0
Tana river	0.06	0	0.27	0.03	0.05
Vihiga	0.05	0	0.37	0.03	0.03
Homa bay	0.06	0	0.44	0.03	0.01
Kwale	0.05	0	0.36	0.03	0.02
West pokot	0.07	0	0.4	0.02	0
Lamu	0.04	0	0.21	0.02	0.04
Isiolo	0.05	0	0.35	0.02	0.01
Samburu	0.05	0	0.38	0.02	0.03
Turkana	0.06	0	0.35	0.02	0
Marsabit	0.04	0	0.3	0.02	0

Source: Author, 2017

2.6.1 Correlation Coefficients

Coefficient of correlation statistics helps in establishing pairwise association between variables. Of importance is to establish whether the two variables move in the same direction, opposite direction and don't move together at all. Where the obtained value is negative, then the variables move in opposite direction while a positive statistic shows that the variables move in the same direction. Where the statistic is zero, there is no association at all. This is formulated as follows:

$$r = \frac{\sum \left(Y_i - \bar{Y} \right)\left(X_i - \bar{X} \right)}{\sqrt{\sum \left(Y_i - \bar{Y} \right)^2 \sum \left(X_i - \bar{X} \right)^2}}$$

A correlation matrix of the various financial products and access channels revealed a high correlation coefficient between transactionary products, the index for FI as well as formal product usage. Except under transactionary and formal usage, the correlation coefficients for all other categories rules out perfect multicollinearity meaning that the various categories of financial products are independent hence the need to interrogate each of them. The correlation matrix for the various financial products is expressed in Table 2.3.

Table 2.3: FI correlation matrix

	Trans	Credit	Savings	Insurance	IFI	Formal	Other formal	Informal
Transactionary	1.00							
Credit	0.26	1.00						
Savings	0.38	0.43	1.00					
Insurance	0.36	0.37	0.40	1.00				
IFI	0.65	0.51	0.65	0.59	1.00			
Formal	0.93	0.27	0.47	0.38	0.65	1.00		
Other formal	0.27	0.29	0.33	0.57	0.42	0.27	1.00	
Informal	0.10	0.08	0.09	0.08	0.08	0.10	0.13	1.00

Source: Author, 2017

The 0.93 correlation coefficient for transactionary and formal usage present a near perfect multi-collinearity case. It simply indicates that transactionary product holding and formal usage of credit have a 0.93 postive relationship. This coefficient however does not depict any causal relationship but only indicates that the two variables move in a positive direction. Formal financial product usage is dominated by transactionary products. Notable though is that a correlation coefficient is not a sufficient evidence of multicollinearity. This necessitated the use of the variance inflation factor (VIF) to test for multicollinearity in panel data. Multicollinearity problem causes standard errors to be large even with a correct underlying specification.

Fig. 2.2 Financial Access Channels (Mobile money in formal)
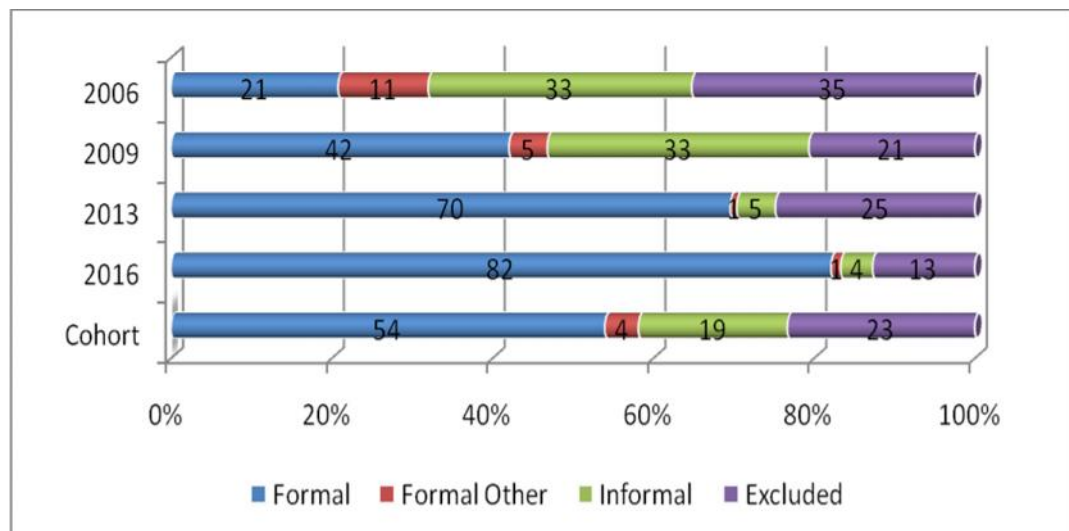
Source: Author, 2017

As defined earlier, usage of financial services in the context of this thesis is limited to the use of prudentially regulated financial services and mobile financial services which operate under the banking platform. Formal financial usage increased sharply from 2006, rising from 21 percent to 82 percent in 2016 courtesy of surge in mobile financial services (MFS). The Informal channel has shrunk

tremendously from 32.8 percent in 2006 to only 3.97 percent in 2016. The excluded category has also fallen sharply from 35.2 percent in 2006 to 12.7 percent in 2016. Formal and other Formal channels combined, FI now stands at 83 percent up from 32 percent in 2006 reflecting a massive 160 percent increase attributable to reforms undertaken in the financial sector, such as the introduction of MFS in March 2007, introduction of Agency Banking in 2010, introduction of DTMs, introduction of CRBs, amongst others.

2.6.2 Disaggregated Financial Product Usage

Usage of single financial product varies with individual preferences often motivated by the expected utility attached to each. As such it is important to disaggregate each product to its components to understand the contribution of each to the particular dimension. Figure 2.2 in the appendix provides the financial usage trends between 2006 and 2009 along the various access channels. Figure 2.3 in the appendix on the other hand presents a cross tabulation of FI channels and gender while Figure 2.4 presents a cross tabulation between FI and location of the household. Figure 2.5 presents the performance of the various FI products between 2006 and 2016.

Fig. 2.5 Formal Financial Product Usage
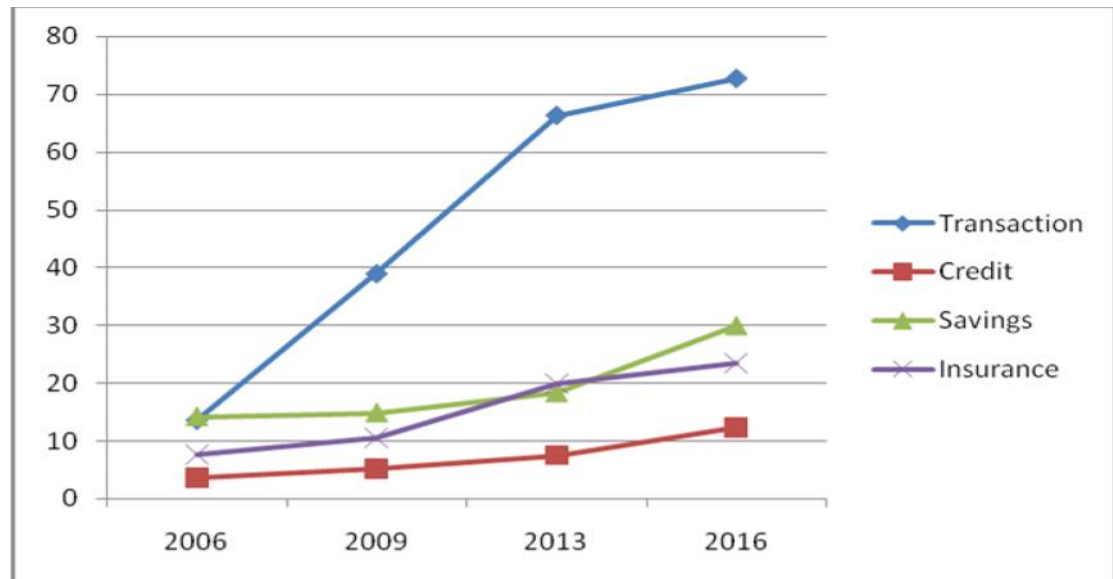
Source: Author, 2017

Usage of formal financial products recorded an upward trend since 2006. This led to the shrinking of the non-formal channel (formal other and informal) from over 80 percent in 2006 to 25 percent in 2016 as more people are pulled into the formal channel. Transactionary products take the lion's share having grown from 13.64 percent in 2006 to over 70 percent in 2016. This spike in the uptake of transactionary products is largely attributed to change in FI policy that triggered the introduction of mobile money products in 2007 leading to a revolution in the payments systems as people shift from reliance on the traditional payment channels such as banks which required one to cover long distances to the cash-lite, more convenient and modern payment platform run through the mobile phone infrastructure. Usage of credit from formal access channels increased marginally even though it remains low at below 15 percent while savings averaged 30 percent in 2016. Uptake of insurance products averaged 23.41 percent in 2016. Households were particularly found to use a portfolio of financial services. This is represented in figure 2.6.

Fig 2.6: Financial Inclusion Overlap in 2016
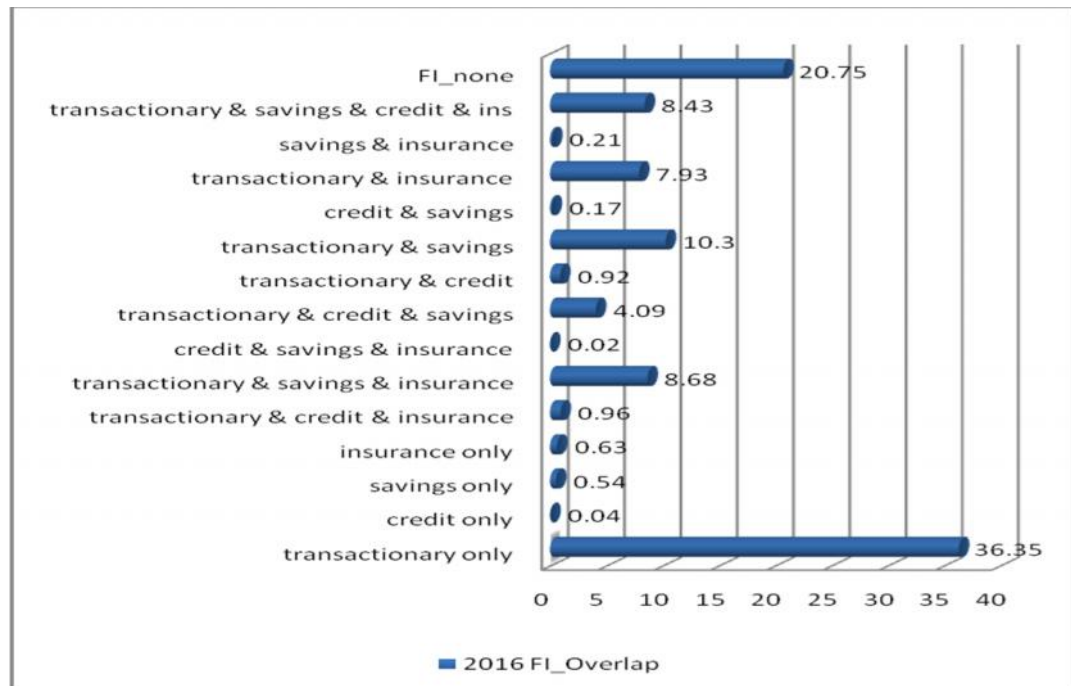
Source: Author, 2017

Fig 2.6 shows that the proportion of the population using a portfolio of financial services from all the four financial categories (transactionary, credit, savings and insurance) in 2016 averaged 8.43 percent. This values offers a good estimate of FI in the entire financial system. Transactionary financial product usage exhibited a higher degree of independence recording 36.35 percent usage. Exclusive usage of credit, savings and insurance was fairly low (below 1 percent). There is a high likelihood that a household holding a credit, savings or insurance product will also go for a transactionary product bringing in the notion of financial product complemetarity. This notion however may need to be investigated further. Figure 2.7 summarizes the nature of financial products under each FI category.

Fig 2.7: Single Financial Product Usage by Category
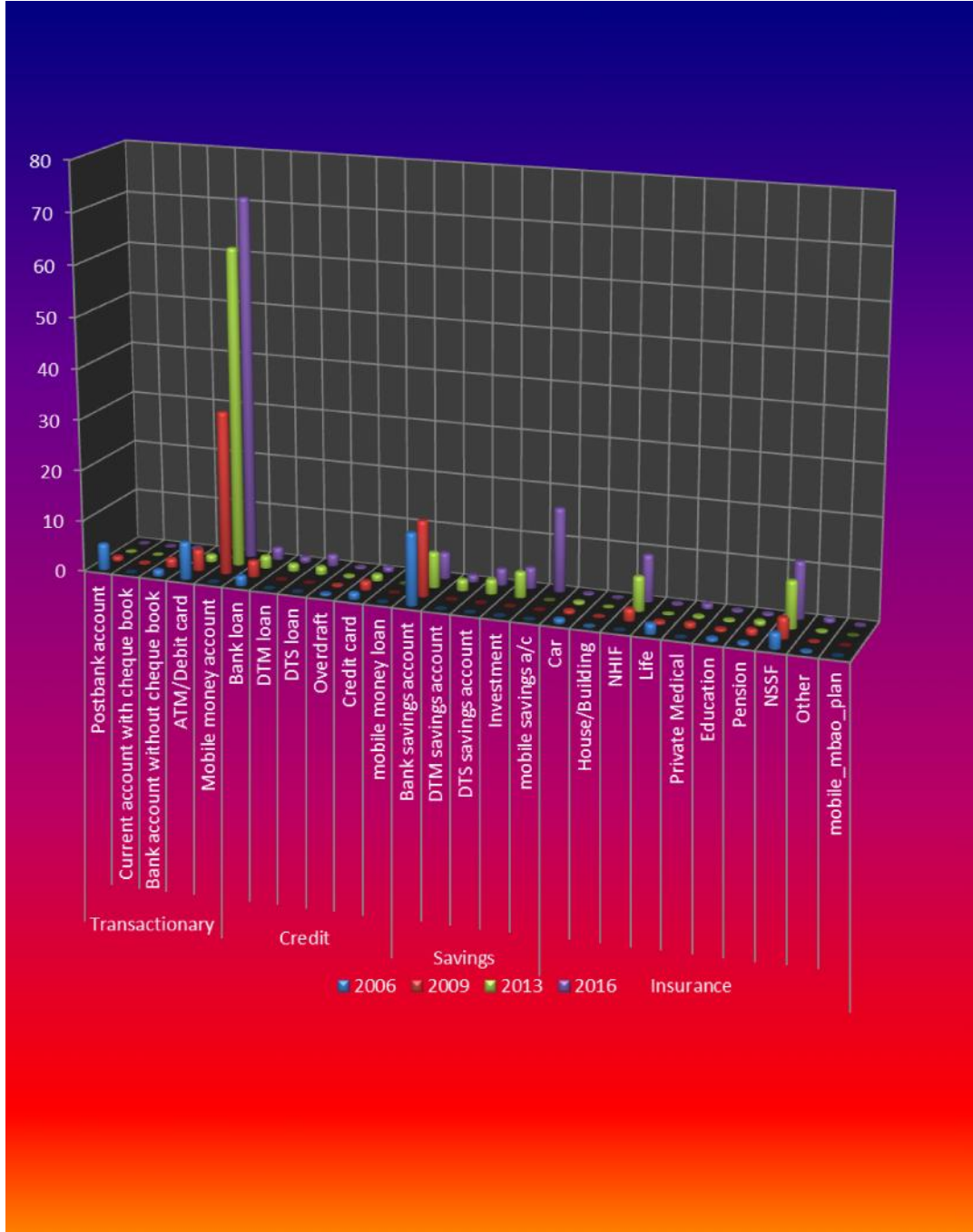
Source: Author, 2017

Transactionary products are dominated by mobile money accounts which despite its non-existence in 2006 have risen sharply from 32.03 percent in 2009 to 71.14 percent in 2016. This modern banking system appears to encroach the traditional banking channels where ATM/Debit cards among other products used to dominate. Use of formal ATM/Debit cards by 2016 averaged 1.05 percent down from 7.32 percent and 4.14 percent in 2006 and 2009 respectively. The spike in the uptake of mobile money account explains the speed at which households embrace financial innovations. Mobile money products are considered to be more convenient, affordable and highly accessible in comparison to the traditional banking services. These mobile banking products appear to have peaked also in the savings category courtesy of products such as Safaricom's Mshwari, Yu-Cash, Orange Money, Mobicash among others.

Credit product usage from the formal channel remains low in Kenya standing at below 15 percent throughout the period. The main contributor in 2016 was mobile money loans (5.6) followed by loans from commercial banks (2.32), DTSs (2.16) and DTMs (1.05) in that order. Credit cards and overdraft facilities trailed at 0.94 percent and 0.35 percent respectively. This marks a shift in the uptake of credit products from the traditional formal banking products to the newly introduced and more flexible mobile money, DTM and DTS products. DTMs which were hived off from the populous micro finance institutions are considered to have less stringent rules as compared to commercial banks.

Savings product usage is also considerably low in Kenya and may fall further if interventions are not formulated to counter the downward trend being observed. Bank savings for example appear to have dropped from 14.19 percent in 2006 to 5.12 percent by 2016. This however could be rationalized by the emergence of DTMs and DTSs whose savings products averaged 1.3 percent and 3.18 percent respectively. Investment products stood at 4.05 percent by 2016. The demands for

savings appear to have shifted towards mobile savings accounts whose uptake since its inception has risen to 16.35 percent.

Usage of insurance and pension products remain low but have been rising following the improvement of government/employee funded medical schemes. The National Social Security Fund (NSSF) appears to dominate accounting for 11.09 percent followed by the National Hospital Insurance Fund (NHIF) at 9.11 percent. All other products scored below 1 percent. Financial product usage when looked at along gender dimensions reveal disparities in the uptake since 2006. Uptake of transactionary products by both genders appears to be on the rise. This has seen the proportion of non-users fall from over 80 percent in 2006 to below 30 percent in 2013. However the change is minimal when it comes to credit and savings products where non usage by both genders stabilized around 86 and 69 percent for credit and savings products respectively. In almost all the four categories, males appear to record higher financial product usage than their female counterparts. Penetration of mobile money based insurance plan is far from universal with its market share remaining below 1 percent. The survey findings portray a fall in the uptake of investment products since 2006 for both genders. The geographical distribution of the various categories of financial services in the counties is summarized in figure 2.8.

Fig 2.8 Geospatial mapping of single financial product usage
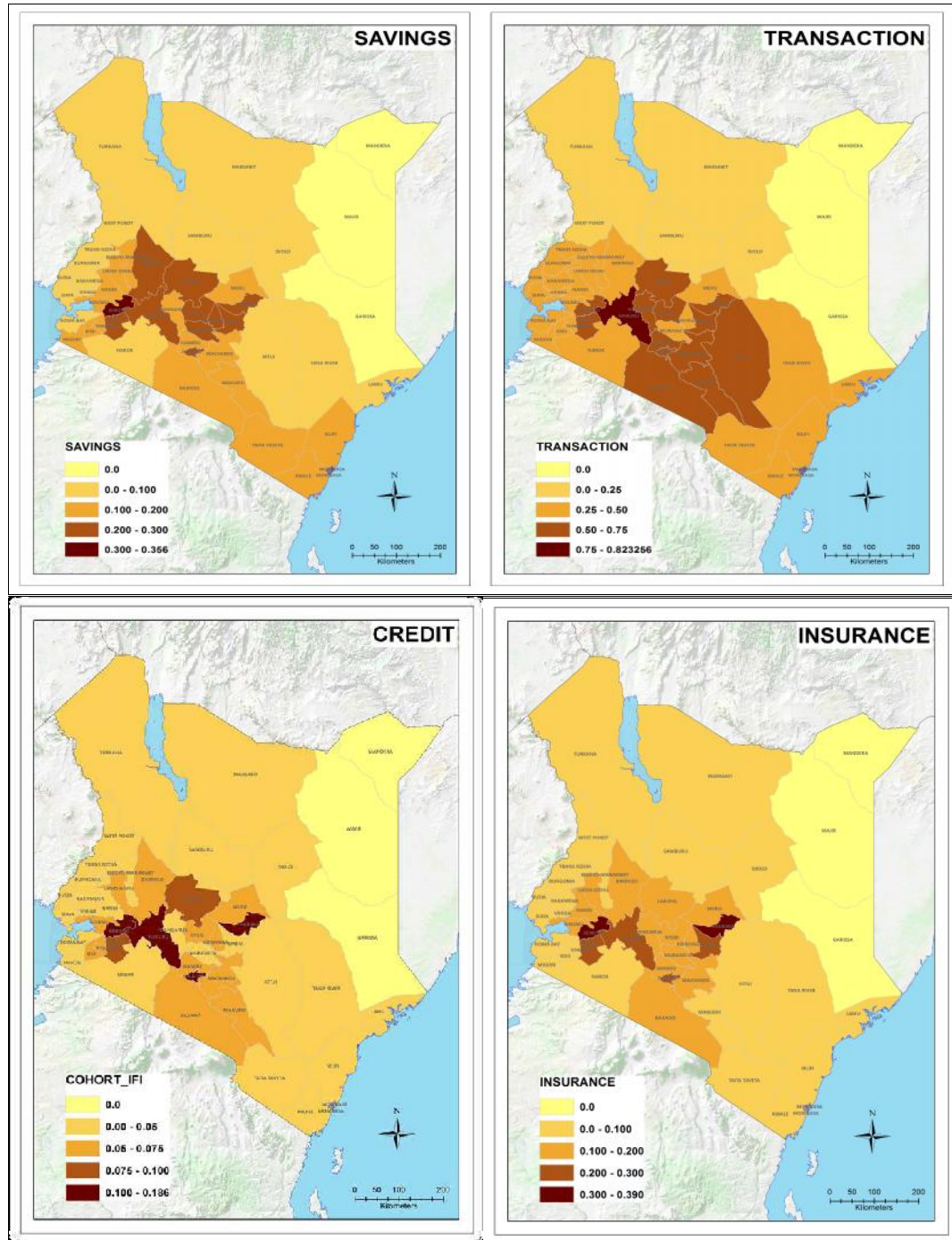
Source: Author, 2017

Kericho reported the highest uptake of savings, credit and insurance products in the country while Nakuru County ranked highest in the uptake of transactionary financial services. In general, the uptake of transactionary services dominated the other product categories in most counties with insurance and credit uptake recording low uptake as indicated in the shading. Nairobi County's uptake of financial services was dominated by credit products even though the uptake of transactionary, savings and insurance was also considerable higher as compared to the other counties. Counties in the North Rift and Upper Eastern recorded dismal performance. Narok County which is in the South Rift also performed poorly in the FI ranking.

Geographical separation of households accounts for the differences in the usage of formal financial products in both the rural and urban areas. Individuals excluded from the use of transactionary products in rural and urban areas fell from 92 and 76 percent in 2006 to 35 and 18 percent for rural and urban clusters respectively in 2016. This reduction in the excluded category however appear to widen the transactionary product usage gap between rural and urban areas. Mobile money accounts which takes the lions share in the transactionary product usage since its licensing recorded a higher uptake in the urban areas (79.98 percent) than rural areas (63.69 percent).

The market for post bank accounts, bank accounts and ATMs/debit cards appear to have dipped following the introduction of mobile money. Despite the introduction of DTMs and DTSs which has recorded higher uptake in rural areas, the proportion of the population without any form of formal credit product has stabilized around 87 percent. This low uptake of formal products is also experienced in the savings and insurance markets and especially among the rural populace. Given that most formal jobs are in the urban areas, NSSF and NHIF which are a statutory deduction are skewed towards the urban populace.

Fig 2.9 portrays how education influences the uptake of formal financial products. Education mirrors uptake of formal financial services pointing to the central position held by human capital development on the financial sector. Prior to year 2009, usage of transactionary products was dominated by ATMs/debit cards. A paradigm shift from sharp reliance on traditional banking products to mobile banking was orchestrated by the introduction of both internet and mobile banking. Higher education and especially tertiary level top this uptake. Individuals with no education recorded no uptake along all the four categories of formal financial product usage. Recent introduction of DTM and DTS loans appear to be encroaching into the market for bank loans, credit cards and overdraft facilities. This also applies to the savings products. NHIF and NSSF appear to take the lions share when it comes to the usage of insurance services and especially among the skilled persons. This is illustrated in fig 2.9.

Fig 2.9: Product usage based on Education

Transactionary

Credit

Savings

Insurance

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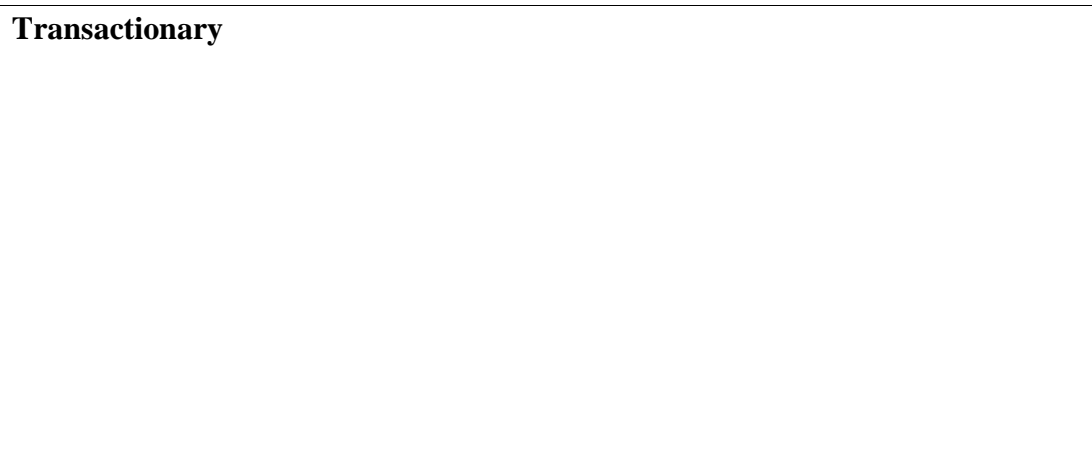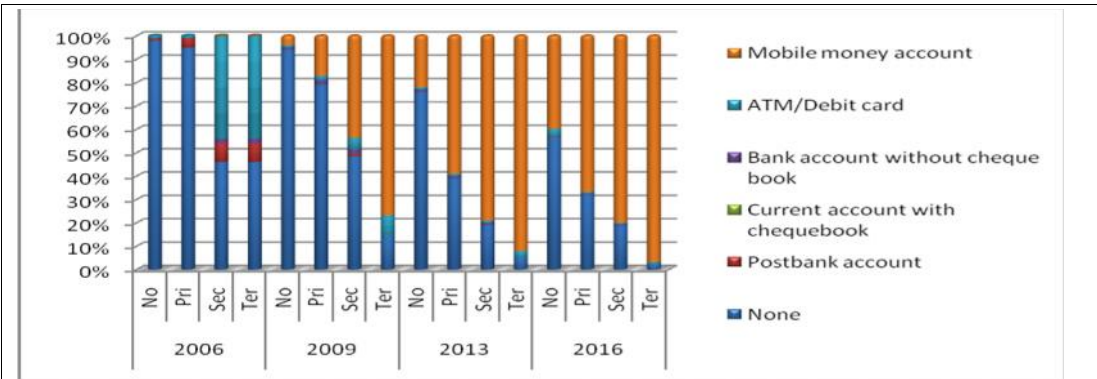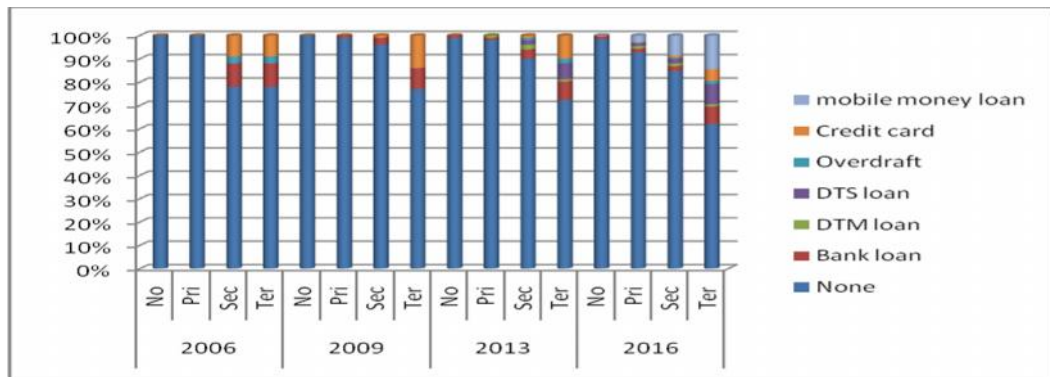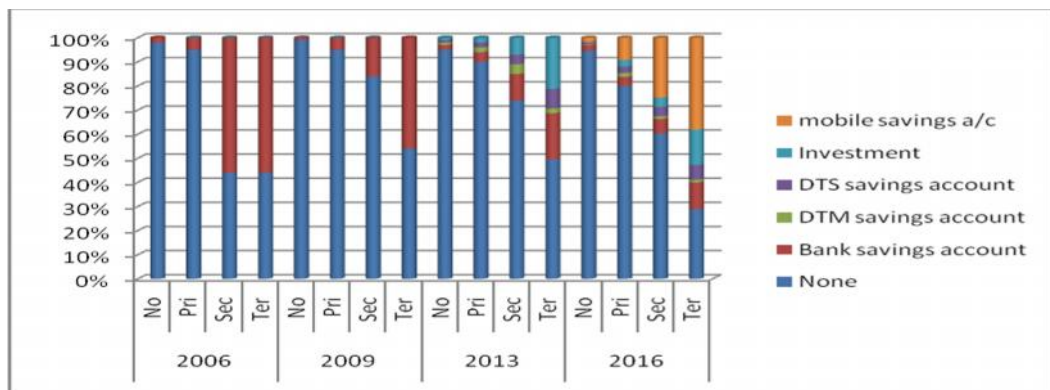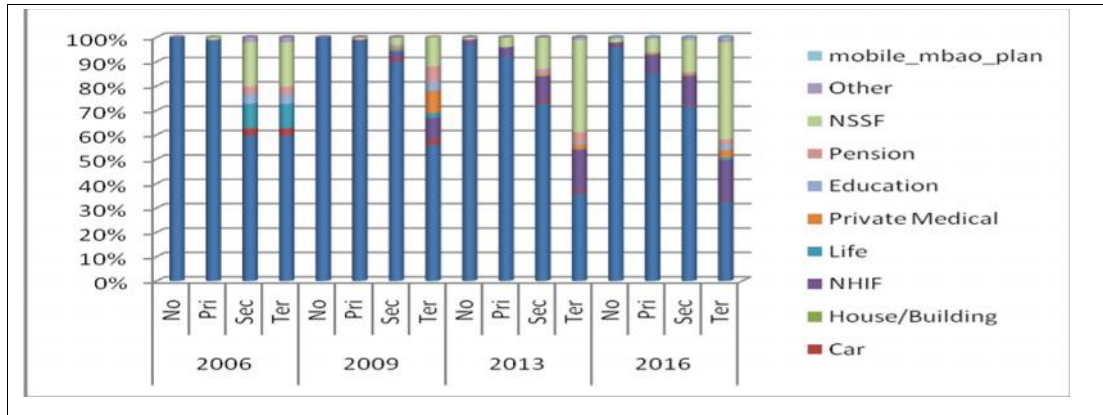
Source: Author, 2017

2.6.3 Index of Financial Inclusion (IFI)

Sarma (2008) formulae was employed in developing Kenya's IFI for the period 2006 and 2013 using repeated cross sectional survey data. The index is generated from the usage of formal prudential financial products and mobile financial service. These products were broadly classified under; transactionary, credit, savings and investment, insurance and pension and aggregated following a three step process namely; normalization of indicators, decomposing the various products into their components and aggregation of the sub-indices. This was followed by a ranking of all the 44 counties based on their IFI score. The ranking however excluded North Eastern region whose 2013 FI data was unavailable due to security concerns. Appendix Table 2.2 presents the county IFI and a ranking of the counties in an ascending order.

The graphical presentation of the generated full sample IFI is presented in figure 2.10. The cohort IFI is superimposed to show the level of FI based on the tracked cohorts.

Fig 2.10: Index of FI (IFI)

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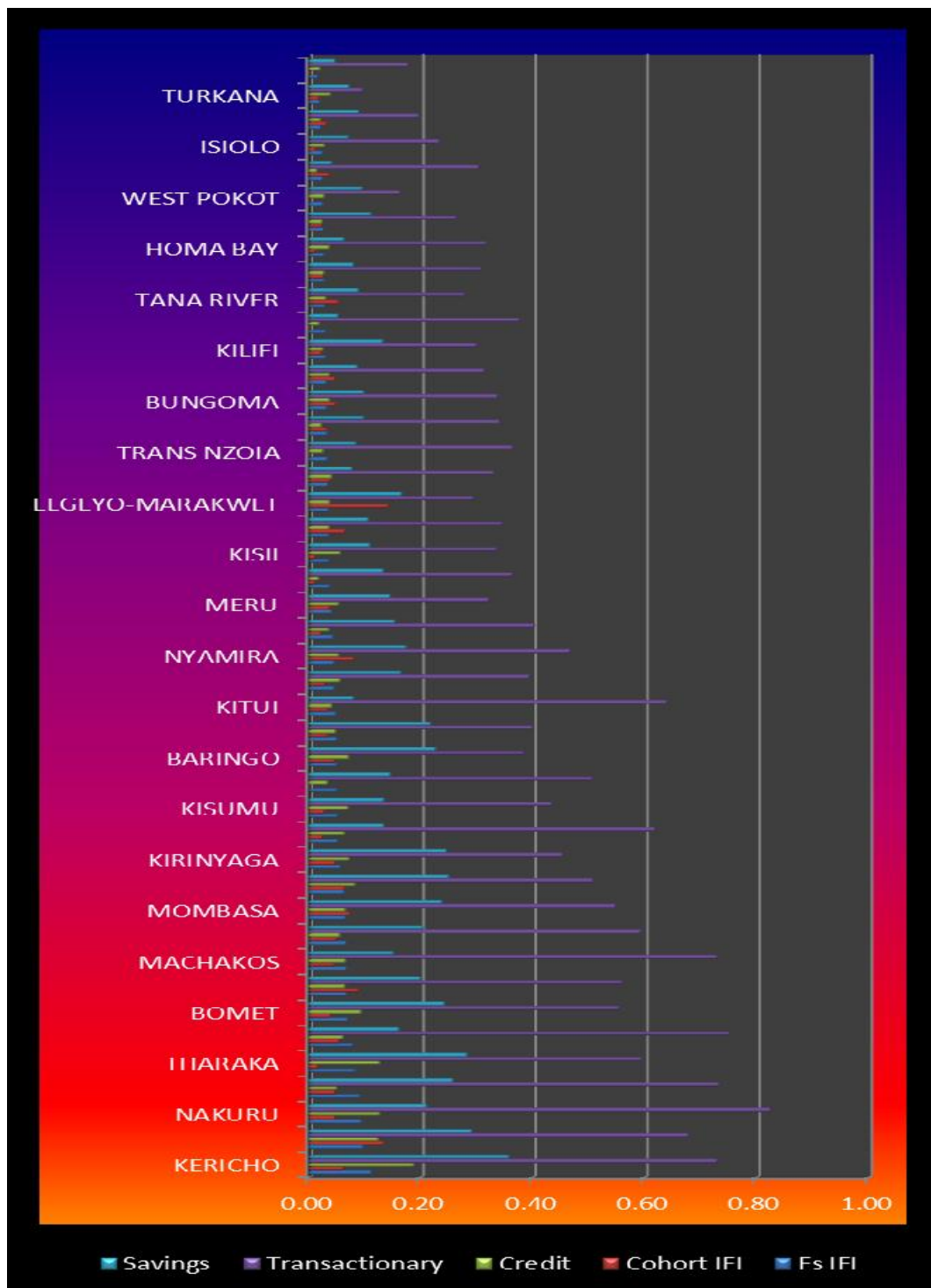
Source: Fin Access 2006, 2009, 2013 series

Figure 2.10 clearly shows the distribution of the IFI across the 44 counties from the highest to the lowest since 2006. Based on full sample data from 2006 to 2016, Kericho County was ranked highest in IFI across the country, followed by Nairobi and Nakuru counties. Marsabit, Turkana and Samburu took the bottom three positions. However on the basis of the cohorts generated, Nakuru, Elgeyo Marakwet and Nairobi counties took the top three positions while West Pokot, Trans Nzoia and Nyandarua trailed (bottom three). The cohort data tests for robustness and consistency in the use of financial services among Kenyan adults since it's based on a tracking of households who exhibited similar characteristics over time. It also helps to track progress over time through a trend analysis.

The mean value of the IFI generated from the entire financial system (transactionary, credit, savings and investments, insurance and pension) was found to be 10.35 percent and 11.90 percent based on the full sample and cohort data respectively. This clearly confirms that defining FI in terms of holding of atleast one formal financial product such as regulated deposit account could be too broad leaving out much information on the nature of the formal product held. This justifies a deeper interrogation of the components under each category of FI. Individual FI sophistication rises with the number of financial products held under each category.

The constructed IFI is motivated by Collins, Murdoch, Rutherford, and Ruthven (2009) who argued that one's financial sophistication is evidenced by the number of financial instruments chosen rationally. An individual with more than one transactionary product, say, mobile money account, commercial bank account and deposit taking microfinance (DTM) account would be considered to be more financially included than one with just a single product. The disaggregated representation unmasks the aggregated position offering a more accurate and

reliable measure of the performance of the entire financial system and a ranking of counties often characterized by huge peculiarities.

Figure 2.10 also provides a county summary of single financial products usage based on the uptake of transactionary, credit, savings and investment, insurance and pension products from the formal financial system. It's evident that while most counties on average scored highly in terms of transactionary uptake, the low credit, savings and insurance scores reduced the overall performance (IFI) significantly. The single measures were based on holding atleast one financial product from a particular category. Counties with high transactionary product usage scores also perfomed better in aggregate terms. Uptake of credit services trailed in all counties over the study period. The criss crossing of the savings and insurance curves in certain counties signals a substitution effect. Figure 2.11 lays bare the progression in the usage of financial access channels in the rural/urban clusters.

Fig 2.11: Rural /Urban Progression of Financial Access Strand:2006-2016
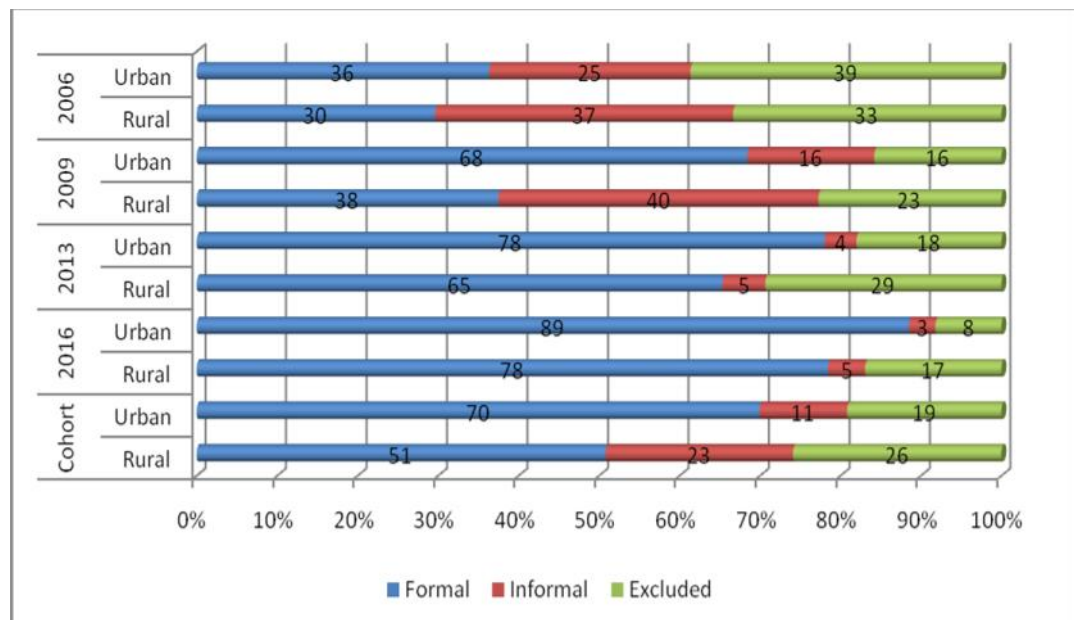
Source: Author, 2017

Financial Inclusion has improved in both rural and urban areas currently standing at 78 and 89 percent respectively. This reflects achievements in the uptake of mobile financial services (MFS), which overcomes distance and difficult terrains to deliver services in remote areas. Mobile banking is seen as a solution to cream skimming due to the shared infrastructure by the creamy and non-creamy population segments in both rural and urban areas. The Informal sector has seen dramatic decline in rural and urban FI from a high of 37 percent and 25 percent in 2006 respectively to less than 10 percent in 2016, a reduction of over 270 percent. However, the excluded have not dropped dramatically from 2006 to date since almost a third of the rural population and almost 20 percent of the urban population has no access to financial services, formal or informal. Gender and education progression of financial access strands is presented in figure 2.13.

Fig 2.12: Gender/Education Progression of Financial Access:2006-2016
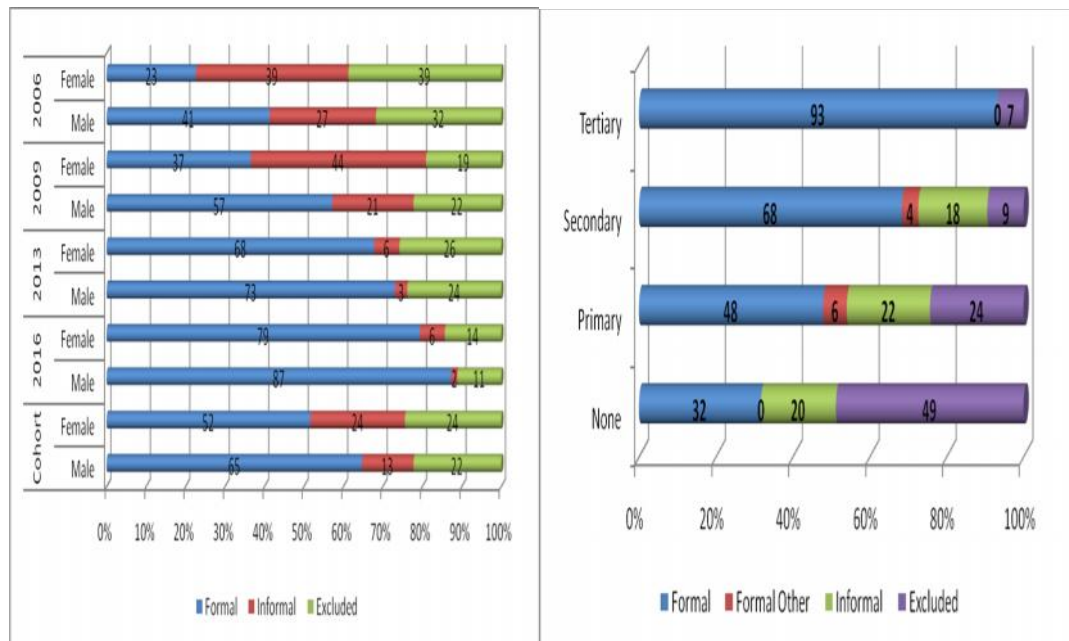
Source: Author, 2017

Formal financial inclusion has increased sharply for both males and females, rising from 41 percent and 23 percent in 2006 to 87 percent and 79 percent respectively in 2016. Access to informal financial services for both gender declined from a high of 27 percent and 39 percent to a low of 2 percent and 6 percent for males and females respectively. Holders of tertiary education level recorded the highest formal product usage at 93 percent and the least financial exclusion at 7 percent. Conversely, zero education accounted for the least usage of formal financial services at 32 percent and the highest exclusion at 49 percent. This clearly shows that the impact of education on FI is progressive with usage of formal financial products rising with years of schooling. The impact of education on informal usage is mixed initially rising upon attainment of primary education before falling with advancement in the years of schooling.

2.7 Stochastic Dominance Tests of FI

This section presents stochastic dominance test results based on the various approaches to create a better understanding. Figure 2.13 represent the GL curve for the four major categories of formal product usage to illustrate the stochastic dominance along the seven major regions in Kenya. In all the categories, Nairobi region appears to be dominating while western trails. The five other regions Coast, Central, Nyanza, Eastern and Rift Valley appear to be moving together in relation to the usage of the four financial products.

Fig 2.13: Generalized Lorenz curves (Cohort vs Full sample)
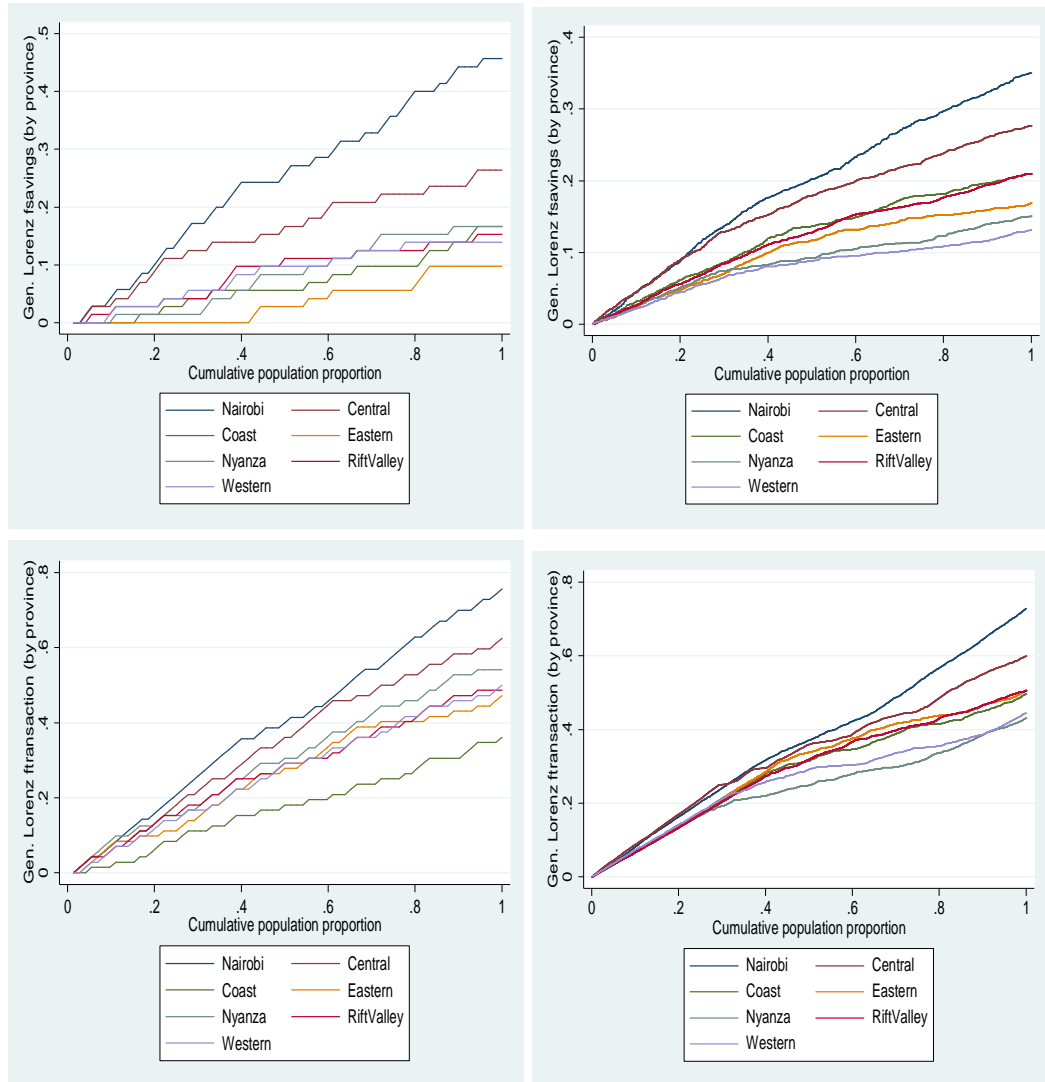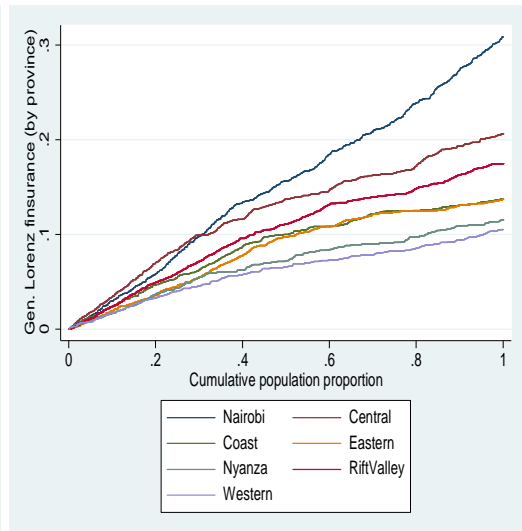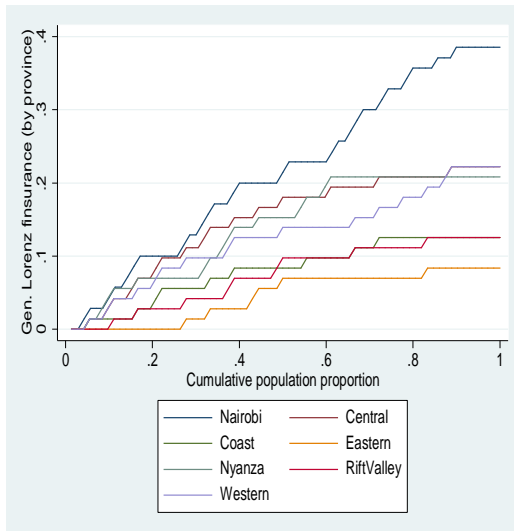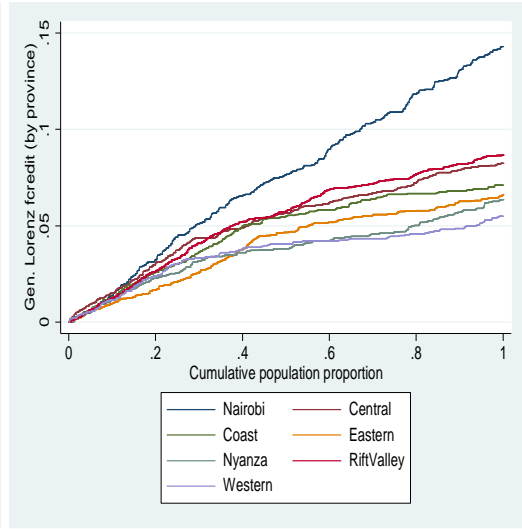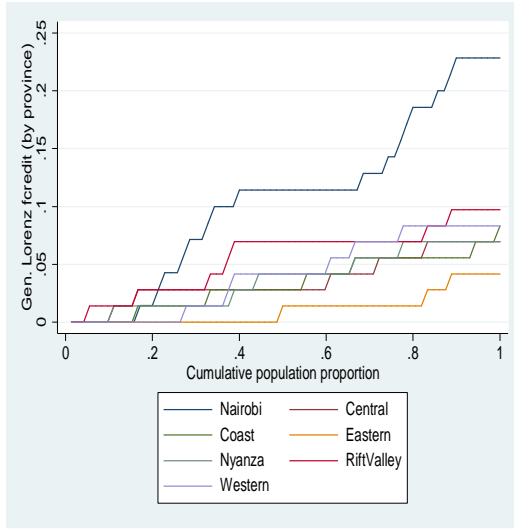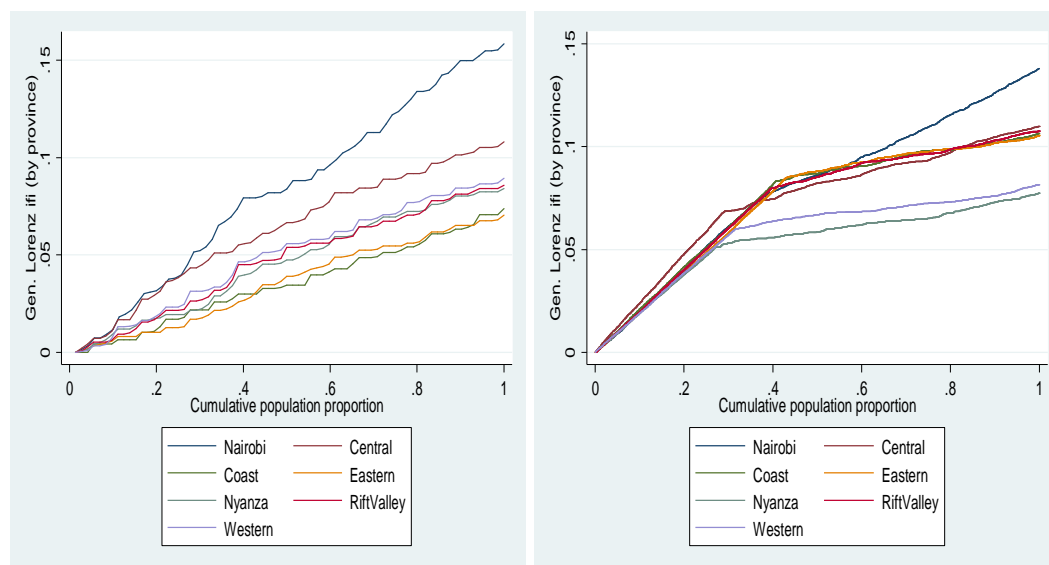
Source: Author, 2017

The first column in Fig 2.14 represents a generalized Lorenz curve based on cohort data while the second column represents the full sample generalized Lorenz curve. The figure revealed huge regional disparities in the dominance structure of formal financial products.

In terms of the index of FI (IFI) generated from the data, an interesting distribution is observed for Nairobi where the gap widened initially before converging at the 65 percent cumulative population. This happened even as the gap widened in Western and Nyanza regions and the rest of the country. The distribution normalized after 80 percent cumulative population proportion. The CDF for the IFI by region, cluster, gender, education and marital status is represented in figure 2.14. The observed stochastic dominance in Nairobi could be rationalized by the high degree of urbanization which places the population in those areas at an advantage due to high proximity to financial service providers besides the high access to the range of financial services. The infrastructure in this region is

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therefore more advanced as compared to that of other regions. This infrastructural difference is also the cause of the widening gap in the usage of financial services in Western, Nyanza and other part of the country.

Fig 2.14: IFI Cumulative Distribution Functions (FOSD and SOSD)

Regional   **Cluster**

CDFs for Nairobi and other regions

Gender   **Education**

CDFs for Male and Female Gender
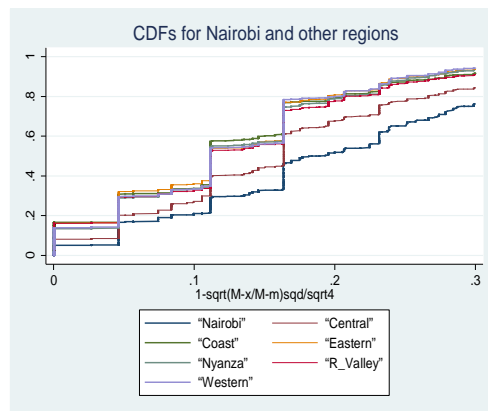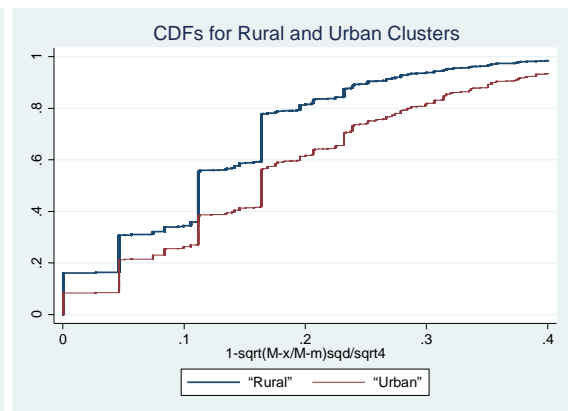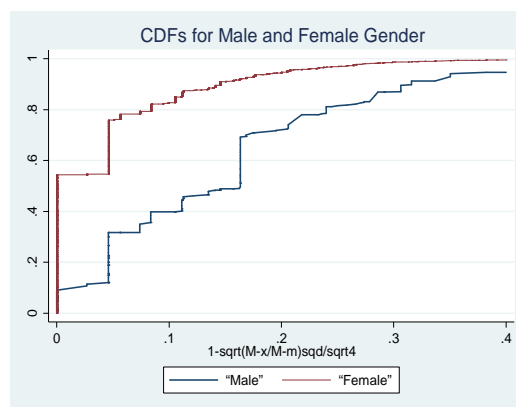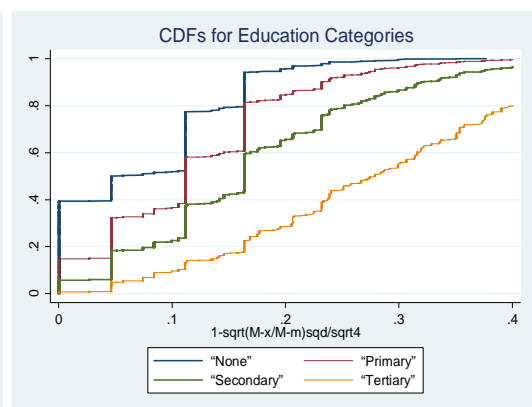
IFI Deficit Curve (SOSD)   **Marital Status**

68
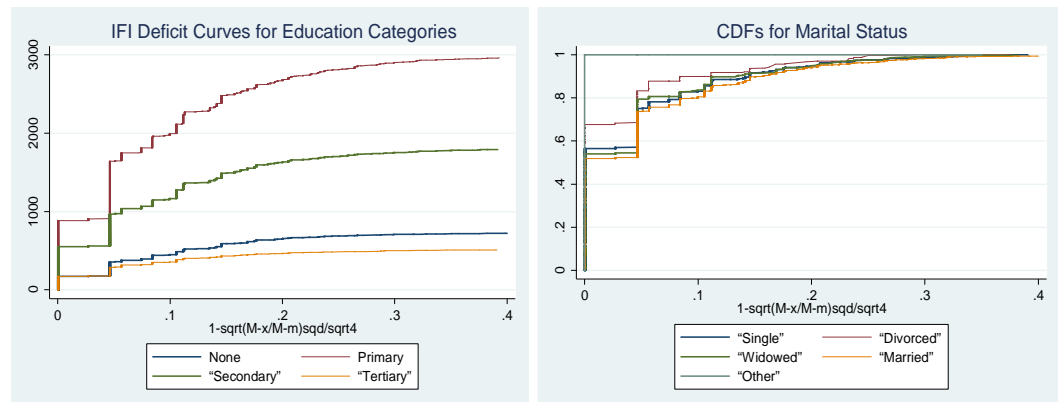
Source: Author, 2017

In line with the stochastic dominance technique by Levy (1998) which explains the relationship between a pair of distributions, figure 2.14 reveals some stochastic dominance in the uptake of formal financial products based on individual demographic profile. The Kolmogorov-Smirnov test results indicate that the cumulative distribution of the male gender stochastically dominates that of the female gender. Due to the crisscrossing of the cumulative distributions for the various education levels, a second order stochastic dominance test had to be conducted to bring out the differences. Most male households appear to enjoy a higher uptake of financial services given their high participation in the job market compared to females. In addition, the computed single usage indicators show that men took a lion's share in the usage of transactionary, credit, savings and insurance services.

2.8 Conclusions and Policy Implications

The objective of this chapter was to develop a reliable measure of FI based on repeated cross-sectional data from the four waves of Fin Access surveys, 2006, 2009, 2013 and 2016. These datasets capture household data on developments in FI. The study established that there is a large variation in the uptake of the various categories of FI products with transactionary products taking the lions share (52.49

percent) followed by savings and investment (21.65 percent), insurance (16.9 percent) and credit (8.96 percent) in that order. The disparity is also evident along the different counties where Kericho, Nairobi and Nakuru accounted for the lions share in terms of the index of financial inclusion (IFI) as compared to the rest of the country. Marsabit, Turkana and Samburu trailed all other counties by recording the lowest IFI. In terms of regional uptake, out of the seven regions considered, Eastern region trailed in the usage of formal financial services hence stochastically dominated by all other regions. Nairobi region which is predominantly urban was ranked highest. This could be rationalized by the proximity of the urban population to financial access channels.

The study findings signaled a paradigm shift from the over reliance on traditional transactionary banking products such as debit/ ATM cards, bank accounts among other to the more flexible and readily accessible mobile money accounts. Policy on mobile financial services led to a revolution in the financial sector leading to deepened financial markets. A similar picture was observed in the uptake of savings following the amendment of the Microfinance Act and the SACCO Act that brought in DTM and DTS savings which appear to be encroaching into the market for traditional bank savings and investments to increase its market share. The same picture is reflected in the use of credit products where uptake of bank loans is falling. But even with the introduction of new products, savings and credit usage has remained low since 2006 and more particularly among the rural populace.

Gender disparity in the uptake of financial products since 2006 persists. The FI distribution of the male gender stochastically dominates the female distribution across all financial products. The distribution of the urban cluster also dominates usage of the more flexible mobile financial products as compared to the distribution of the rural population. The distribution of insurance services on the

other hand is stochastically dominated by that of NHIF and NSSF products which takes the lions share. In all the categories of formal product usage, that is; transactionary, credit, savings and insurance, the distribution for tertiary education to a large extent appear to stochastically dominate the other education levels.

This chapter recommends that the government should encourage even distributions of financial services to all counties to minimize the dominance by certain segments of the population. With the low credit counts reported, the government through the credit information sharing (CIS) Kenya should intensify the compilation of credit reports by extending it to the agriculture sector which is the mainstay of our country's economy to ensure that the rural population mainly involved in agriculture benefit from low cost credit products. In addition, more effort should be put to ensure that DTMs and DTMs get the necessary support to increase their market share in the supply of financial services. Given the sharp focus accorded on the access and usage of financial inclusion in this chapter, it will be interesting to see how the impact and quality dimensions of FI plays out in future.

Chapter Three: Determinants of Financial Inclusion in Kenya

3.1 Introduction

Access to financial services forms a key tenet of financial inclusion (FI). Demirguc-Kunt and Klapper (2012) posits that close to 3 billion people face exclusion from formal financial services globally. This exclusion is more pronounced in Africa, Asia, Latin America and the Middle East where 2.2 billion of the unbanked adults are found. Usage of formal services is mainly skewed towards the wealthy triggering a surge in the global efforts to unearth barriers to FI especially among the less privileged who rely on informal mechanisms such as holding savings in form of assets such as livestock and other risky and more expensive credit from informal money lenders (Collins et al., 2009; Susan and Zarazua, 2011).

Enhanced access to a broad range of prudentially regulated financial services devoid of both price and non-price barriers are often linked to improved livelihoods (Collins et al., 2009). Rochadi (2010) breaks down the objectives of FI into four distinct goals namely; affordable access to a wide range of financial services, choice and security institutions, financial and institutional sustainability and competition.

Despite the growing interest in FI, literature specific to determinants of FI at the micro level remains scanty (Allen et al., 2012). Susan and Zarazua (2011) study on Kenya and Uganda singled out agro-ecological and socio-cultural factors as some of the barriers to FI. A huge uptake of financial services is an indicator that the war against price and non-price barriers to financial access and usage is being won. Financial exclusion due to frictions in the financial system (Galor and Zeira, 1993) only serve to worsen the plight of the poor as they resort to disposing their limited

assets to meet their basic needs. This challenge is aggravated by the presence of imperfections in the market which manifest in form of; information asymmetry (Stiglitz and Weiss, 1981), adverse selection and moral hazard. These imperfections force the players to charge high interest rates among other requirements such as collateral in order to cushion themselves against default risks.

Total market failure occurs when lenders keep on adjusting the interest rate on loans to factor in the risk profile of borrowers. The interest charged reaches a point where only high risk borrowers can participate. At this rate, not even the lender is comfortable to offer credit facility since they are not sure of recouping their returns. Lack of this collateral, poor credit history, lack of guarantors and high interest rate charge on loans limit access to financial services leading to persistent poverty and poor welfare.

Banerjee and Newman (1993) explain the process of economic development where poor human capital development and particularly occupational choice is linked to initial resource constraints. This in turn affects the source of livelihood by individuals and the overall economic growth and welfare state. Addressing moral hazard is mainly done through monitoring or incentivizing borrowers so that they declare the true outcome. This is captured in the state verification models (Diamond, 1984). The full impact of market imperfections can only be understood through studies on financial products usage and barriers to usage. Persons subjected to non-price barriers such as geographical location or lack of markets face a vertical supply curve at the origin with demand curves which never intersect creating another access problem.

World Bank (2008) posits that without an inclusive financial system, poor individuals and small enterprises have to rely on their own limited savings and earnings to build their human capital and pursue growth opportunities. The point

of intersection between the supply and demand curve depends on the relative cost of providing financial services and income of users of financial services. Strengthening of the institutional infrastructure, market liberalization, increased competition and technological innovations offer solutions to an improved uptake of financial services.

Even though remarkable progress has been recorded in the uptake of financial services, lack of a proper understanding of the drivers of FI from a household perspective poses serious challenges to expanding financial services to the less privileged in the society. Its only through an empirical study that barriers to FI can be identified and mitigation strategies developed to reverse the trend. The disaggregation of FI measures to the county levels is expected to bring out the peculiar features that characterize the various counties.

National mitigation strategies to minimize financial exclusion should therefore be tailored to the specific barriers faced by each county. Financial exclusion which is mainly dominated by the bottom of the pyramid population (extremely poor) can be unlocked through intensive research of the determinants of FI (FSD, 2013). Data on FI reveals a huge segment of the population without any form of access to financial services. An inclusive financial system accelerates growth and development through increased supply of financial services as well as increased access and usage of a range of financial services.

The main objective of this chapter was to explore the determinants of financial inclusion in Kenya from both a single and composite measurement perspective. The specific objectives as derived from the broad objectives for this chapter include;

1) To examine the determinants of single financial product usage in Kenya

2) To examine the determinants of usage of a portfolio of financial services

3) To examine the determinants of choice of financial access channel

3.2 Literature on Determinants of FI

Studies on the determinants of FI invoke theories of financial development. Sen (1981) argued that FI is a consequence of financial development. Both supply side and demand side factors act as barriers to FI. They include; gender (Demirguc-Kunt et al., 2013; Hoyos et al., 2014; Camara and David, 2015); human capital development (Demirguc-Kunt and Klapper, 2012; Nelson and Phelps, 1996); institutions (Acemoglu et al., 2001; La Porta et al., 1997; Mayer and Sussman, 2001), interest groups (Rajan and Zingales, 2003), inflation (Huybens and Smith, 1999; Boyd et al., 2001), autarky (Do and Levchenko, 2004; Bekaert et al., 2002), geographical barriers (Acemoglu et al., 2001; Sachs, 2003; Levine, 2003), resource endowment (Diamond, 1997; Easterly and Levine, 2003), income per capita (Greenwood and Jovanovic, 1990; Levine, 2005; Jaffee and Levonian, 2001), culture (Stulz and Williamson, 2003). Kempson and Whyley (1999) cite credit unworthiness, geographical location, and cultural factors.

Other barriers include; both cost and non-cost factors, the main one being lack of money as cited by an average of 80 percent of all non-account holders (AfDB, 2013). 30 percent of the adult non account holders cited ; cost, distance and insufficient documentation as barriers to financial access in Africa (Demirguc-Kunt and Klapper, 2012).

3.2.1 Theoretical Literature

The role of institutions in enhancing financial development is well established in literature. Financial development according to Acemoglu et al. (2001) trail areas where institutions were established by the colonialists. These institutions shape the path of development. The settler mortality hypothesis explains how colonizers established extractive states in areas that they felt were not fit for settlement

probably due to the malaria scourge. Geographical location which largely operates from the demand side appears to define the kind of institutions to be established. Development of the financial system takes place faster under the Common Law setting as compared to the French civil law. Acemoglu et al. (2001) further states that economic institutions are the ones which inform the incentives and constraints that shape human interaction and economic outcomes.

Porta (1997; 1998) in his legal origin seminal contribution argues that the source of the legal code matters in enhancing efficiency in contract enforcement. This knowledge is what informed the establishment of financial sector regulators and also the formulation of prudential guidelines to govern the formal financial sector. Porta (1998) further argues that strong institutions for protecting and matching the investor needs enhance financial development.

Countries governed by the Common Law from the British for example appear to value private property ownership while the French Civil Law advocates for state property ownership since inefficiency impairs financial development. The law and finance theory posit that legal traditions which shape differences in financial development differ on the basis of their emphasis on either private or state property ownership rights as well as their ability to adjust to the dynamics of the commercial and financial conditions. This implies that the pace of financial development is determined by past legal traditions. The political channel opines that legal traditions vary depending on how they prioritize private property rights and those of investors in firms. The international differences in financial development are therefore informed by how private property and investors are protected. This rationale is what gave birth to the English common law.

The legal adaptability channel on the other hand shows that differences in legal traditions are shaped by the ability to adapt to changing commercial and financial conditions. Those legal systems that adapt quickly to minimize friction between

the economy's needs and the legal system's capabilities are considered to be more effective in promoting financial development (Beck et al., 2001). It's difficult however to establish the exact channel through which legal traditions influence financial development.

The political and finance theory also recognizes the critical role played by the political process and interest groups in shaping financial development (Ranjan and Zingales, 2003). This theory challenges the significance of the legal traditions in shaping financial development by arguing that whereas financial development has changed significantly over the last century, the legal traditions across countries appear not to have changed at all. Legal traditions are therefore more of a fixed factor compared to political factors which change over time.

Pagano and Volpin (2001) associates politically closed economies with low reliance on external funding for fear that it may end up diluting their political power. Kenya in the 1991 for example, broke ranks with the Breton woods institutions leading to withdrawal of external finance for failing to comply with some of the recommendations under the structural adjustment programs (SAPs) of reducing the size of the public service. Economic reforms in the early 2000 renewed Kenya's relations with the Bretton Woods institutions weakening the political pressures. This led to the opening up to international trade and finance in line with Rajan and Zingales (2003) predictions leading to accelerated financial system development. Political interests often shape the manner in which a country opens up its economy hence affecting the pace of financial development.

The role of policy frameworks such as fiscal and monetary policy has also been mentioned in the literature as being key in influencing the direction of financial development. This is in the context of macroeconomic policies, openness of the financial markets as well as financial liberalization. Christensen (2004) associates poor management of fiscal policy and particularly increased government

borrowing to a crowding out effect of private investors. This hinders the development of the financial system which is mainly driven by the private sector.

While openness of the economy to the outside world is considered to be a key determinant of financial development, Chinn and Ito (2006) argued that opening the financial sector only works well in an environment where there are strong institutions and legal systems. Advocates of financial liberalization further argue that it works best in an environment of economic stability devoid of many uncertainties. Inflation was also mentioned as one of the macroeconomic variables that affect financial development (Huybens and Smith, 1999). Economic uncertainties especially in the macroeconomic fundamentals lead to a surge in inflation and reduced participation in the financial market. This limits the expansion of the financial sector curtailing development (Boyd et al., 2001).

The endowment theory also challenged the efficacy of the legal traditions in shaping financial development and instead advocated for the role played by geography, topology and disease environment of a country as being critical in shaping the development of legal and financial institutions. Geography shapes financial development through proximity to the equator. Countries closer to the tropics are likely to experience low crop yields and high disease prevalence hindering large scale farming which is critical for specialization, innovation and institutional development (Sachs, 2003). Landlocked countries also limit international trade.

Other theoretical frameworks consider the role of economic growth (income per capita), population, religion, ethnicity, culture among others as being critical in determinants of FI (Huang (2011). Culture and finance for example associate Catholiscm and Islam with xenophobia and close-mindedness which inhibit competition in financial markets due to the presence of strong hierarchical political structures. Huang (2010) however conceives that existing theories do not offer

solutions as to which variables play a primary role in determining financial development.

This model uncertainty problem according to Levine and Renelt (1992) pushes economic thinking to fragile and non-robust results when a cross section model is estimated. The authors therefore recommend the use of an extreme bounds analysis and the Bayesian method to counter the model uncertainty problem. This study introduces a new innovation to tackle model uncertainty problem by applying repeated cross sectional survey data (pseudo panel) to estimate the determinants of financial inclusion on a small sample made of cohort panels.

3.2.2 Empirical Literature

Despite the orchestrated growth in financial inclusion in Kenya, usage of financial services and especially for the rural poor remains a mirage. This is especially so in Kenya and other sub Saharan African countries where access to financial services trail the high income economies. Campero and Kaiser (2013) categorize determinants of FI into either supply side (distance, cost among others) or demand side (individual specific factors such as income, education and age as well as behavioral traits and perceptions). The study however mentions a number of non-financial factors such as telecommunications development, individual characteristics, and culture and policy implementation as potential barriers to FI.

World Bank (2015) echoes these sentiments by arguing that attitudes and perceptions held by individuals shape the choice of financial services. Tuesta et al., 2015; Honohan and King, 2012; Allen et al., 2012 associate usage of formal financial services to education level, income, gender, urbanization and age. Alliance for Financial Inclusion (2014; 2010) asserts that barriers to financial inclusion vary from country to country the main ones being; high transaction costs in the delivery of small scale financial services across large geographic distances, lack of data, infrastructure constraints such as poor road and communication

network, poor security systems, trust, low financial literacy and information asymmetry. Emergence of formal and semi-formal financial services targeting the poor has contributed heavily to the changing financial landscape[13].

Using the financial access survey data for Kenya and Uganda, Johnson and Nino-Zarazua (2011) singled out age, employment, education and gender as some of the determinants of FI. The authors challenged the notion that urban areas enjoy higher access to financial services in comparison to rural areas. They established that what matters most are region specific characteristics. More women than men accounted for a higher overall financial exclusion. In trying to link poverty with financial inclusion, the authors adopted food security as an indicator of poverty. Estimation using a logistic technique established that those individuals experiencing food shortages sometimes reported a lower probability of financial inclusion although the risk of financial exclusion remained low.

A regional assessment of the geographical spread of financial services could help bring out the role of other socioeconomic and cultural factors besides physical proximity. In terms of regional spread, North Eastern and Coast provinces reported a much higher probability of financial exclusion compared to Nairobi. Nyanza and Eastern are half as likely while Central is less likely. The study further established that formal financial inclusion is not significantly associated with province or rural when other factors are held constant (Johnson and Nino-Zarazua, 2011).

Honohan and King (2012) applied multivariate probit and OLS regressions on the financial access survey data for selected African countries. Their research on cause and effect of financial access in banking the world established that FI increased with urbanization, male gender, education, and age. The variable gender however produced a non-significant relationship with FI. The authors also associated access

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[13] The 2014 Alliance for Financial Inclusion (AFI) Global Policy Forum

to formal financial services with improved incomes especially where access to finance changed gradually. Financial literacy, ownership of mobile phone and trust in commercial banks exhibited a positive relationship with financial access.

Chithra and Selvam (2013) in a study on determinants of FI in China using Sarma (2008) index singled out socioeconomic factors, income, literacy and population as some of the main determinants. They also established a very close link between FI and banking variables, mainly deposit and credit penetration. The ratio of credit to deposits and investment ratio was however not significant in explaining FI. Singh and Kodan (2012) appeared to support the role of income per capita in influencing FI in addition to the level of urbanization. The findings however differed with Chithra and Selvam (2013) in relation to literacy which was found not to significantly explain FI. Sex ratio and unemployment were also found not to be significant.

Sarma, 2008; Honohan, 2008; Sarma and Pias, 2011 identified low income groups, ethnic minorities, immigrants and the aged as leading in financial exclusion but also argued that the rural poor located far away from the FSPs bore a higher risk of being excluded. Other factors include; adult literacy, urbanization, infrastructure and especially communication development, distance, cost and identity proof (Agrawal, 2008). Park and Mercado (2015) cited per capita income, rule of law and demographic characteristics as the main constraints to FI in developing countries.

With the advent of mobile and agency banking for both commercial banks and DTMs, the distance covered to reach a FSP has been falling especially for the urban leaving it as a barrier only associated with the rural poor due to poor infrastructural facilities. Hannig and Jansen (2010) argue that policy makers are currently involved in developing mechanisms to overcome barriers to access through narrowing the gap between documentation threshold required by banks

and quality of documentation prevalent among low income clients. Regulators are expected to decide on the level of risk they can take to promote financial inclusion. Most risks to the financial sector are attributed to the large number of vulnerable clients with limited balances and small value transactions. The authors associate greater FI with improved financial stability.

Demirguc-Kunt et al. (2013) presents a very strong case of gender differences in the use of financial services based on individual level data covering 98 developing countries. The analysis of the Global Findex data established significant gender gaps in the usage of financial services. This echoes IMF (2012) Financial Access Survey which indicated that usage of accounts among men was higher than that of women even though the disparity was not so pronounced. Cross country variation in the use of financial services to is associated with legal discrimination of women and gender norms (Demirguc-Kunt et al., 2013). These legal restrictions include; the ability to work and head a household while gender norms include; violence against women and early marriage. Lack of systematic indicators of financial inclusion is seen as the main drawback to the enhancement of gender parity in the formal financial system.

Findings from Allen et al. (2014) in their analysis of financial development and financial inclusion in Africa singled out population density as one of the most important variable shaping FI in Africa. Using the Global Findex data, the authors classified FI into three broad measures namely; percentage of adults with a formal account; percentage of adults with a formal loan and percentage of adults using mobile banking. The study asserted that considerable barriers associated with infrastructural handicaps have been overcome by mobile banking.

Whereas a formal access to credit gap was established for Africa, a statistically significant financial inclusion gap along formal accounts could not be established even though it was consistent with the emergence of alternative delivery channels

such as bank branch expansion to underserved areas in Kenya (Allen et al., 2014). The paper acknowledges that in spite of the huge success of mobile banking in Kenya, the success was only limited to sending and receiving money calling for a different approach such as agency banking to promote financial inclusion especially along the savings and credit channel. Proper identification of barriers to financial inclusion helps in shaping policy formulation through a targeted approach.

Adult literacy rate averages 87.4 percent in Kenya (Kippra, 2012). However, low levels of human capital development as captured by the level of education may be a contributing factor to financial exclusion. The FinAccess survey (2013) show the proportion of financially excluded among those with no education averages 60.7 percent compared to only 1.8 percent among those with tertiary education. Improved human capital development through education can therefore have lasting impact on financial inclusion which will in turn promote growth and improved welfare. This is echoed by IMF (2012) where progression towards formal FI appeared to rise with age (25-64) and level of education (tertiary education).

Han and Melecky (2013) on formal financial inclusion in 123 countries covering 124,000 persons contend that low costs and close proximity to financial intermediaries promote high usage of formal accounts. Elimination of barriers to operation of formal accounts holds the key to increased financial inclusion.

Akudugu (2013) in estimating a logit model on determinants of FI in formal financial markets in Ghana using the World Bank, 2012 Global Financial Inclusion Index found a 40 percent level of inclusion along the formal strand with money poverty being one of the determinants. The study cites rules and regulations in operations which hinder them from enrolling the rural populace as the main challenges facing formal financial markets. Formal financial access in Ghana is considered to be a preserve of the financially well up people. This explains why

participation in formal financial markets by the poor was 62 percent less than that of the rich.

Fadun (2014) and Ayyagari (2013) examined the role of financial inclusion and outreach in Nigeria and India respectively and established that financial inclusion is dominant in urban areas with the highest concentration of formally included persons being recorded in South West Nigeria (49 percent against 19 percent for North West). A whopping 80.4 percent of the financially excluded adults reside in rural Nigeria the main determinants being; geographical separation from banks, low economic activity and poor literacy rates. Similar findings were reported in Clarke, Xu and Zou (2006). Kempson and Whyley (1999) cited credit unworthiness, geographical location and culture as some of the barriers to FI. It would be interesting to see how issues discussed in these studies play out in Kenya.

3.2.3 Overview of literature

Some of the theoretical foundations used to motivate this chapter included the role of institutions in enhancing financial development, political and finance theories that shape financial development through political processes and interest groups, openness of economies, endowment theories, fiscal and monetary policies, among others. Empirical literature on the determinants of FI has identified a number of socioeconomic factors which shape household choice of financial services. Access to a broad range of financial services is considered to be instrumental in shaping key economic outcomes such as household income, consumption expenditure and poverty eradication. However, the attainment of this objective is often complicated by the limited access to a broad range of financial services which is approximated to be in the range of 3 billion adults globally. This huge proportion of the financially excluded adults poses a serious threat to the attainment economic development and poverty eradication.

Beck et al. (2014) argue that financial intermediation only stabilize the economy in the medium term in low income countries. The issue of costs and the risk of missing targeted markets pose a major challenge to government organs trying to broaden access. Morduch (1999) dimensions of access comprise of; reliability, convenience, continuity and flexibility of financial services. Financial exclusion could either be voluntary (cultural or religious reasons) or involuntary (external factors such as lack of education, income, price, weak contract enforcement, discrimination among others) (Amidzic et al., 2014).

Key barriers cited in the literature include; limited income, financial illiteracy and gender discrimination. The barriers however appear to vary with the financial product. Much of the literature reviewed dwelt largely on the determinants of single product usage without concerning itself with the determinants of FI from a composite index perspective. In addition, the categorization of formal financial products along transactionary, credit, savings and insurance offers an exhaustive way of capturing access to a broad range of financial services in Kenya. None of the reviewed literature has incorporated the four dimensions of FI in their analysis hampering investigation of the performance of the entire financial system. This broad spectrum helps in drawing a quick comparative analysis to inform on what drives FI from the demand side. This in turn guides financial service providers in designing products that are tailored to customer needs.

3.3 Empirical Framework

Deaton (1985; 1986) and Christiaensen and Subbarao (2004) pseudo panel technique was used in analyzing the determinants of FI in this chapter. This technique provides a mechanism through which household relationships are analyzed on the basis of cohort means from repeated cross sections in the absence of true panel. In a case where the data has a small T and a large N, Econometrica (1981) suggests that use of a one way fixed effects model could lead to a Nickel

bias where the demeaning process creates a correlation between the regressor and the error term. Anderson-Hsiao estimator which uses the second lag of the dependent variable to instrument the dependent variable in first differences also despite being consistent fails to factor in all potential orthogonality conditions (Arrelano and Bond, 1991).

The more powerful Arellano and Bond estimator which allows for the use of lagged values of the instrumented variable is considered to be more robust where T is small and N large. This estimator sets up a GMM with a system of equations carrying different instruments in each equation. This estimator is however weakened by stating that the lagged levels offer weak instruments for first differenced variables and especially those close to a random walk (Arellano and Bover (1995) and Blundell and Bond (1998)).

Arellano and Bover (1995) and Blundell and Bond (1998) therefore recommends the inclusion of both the lagged levels and lagged differences now the so called system GMM which is an improved version of the original differenced GMM. Arellano and Bover (1995) forward orthogonal deviations transforms each observation by subtracting the average of all future observations for all observations except the last irrespective of any existing gaps (Roodman, 2006). This helps overcome the magnified gaps in the first differenced transformation where one period of missing data is replaced with two missing differences.

Given that single product measures of FI are binary, panel estimation for binary data is applied based on both fixed effects and random effects. The determination of the most consistent method of estimation is done using Haussmann specification test. Estimation of single product usage of financial services (categorical) applies both fixed (FE) and Random effects (RE) estimation for binary data to bring out the drivers and barriers to FI. The index of FI (IFI) is subjected to GMM

estimation. The relationship between FI and its regressors is expressed in figure 3.1.

Fig 3. 1: Conceptual Framework
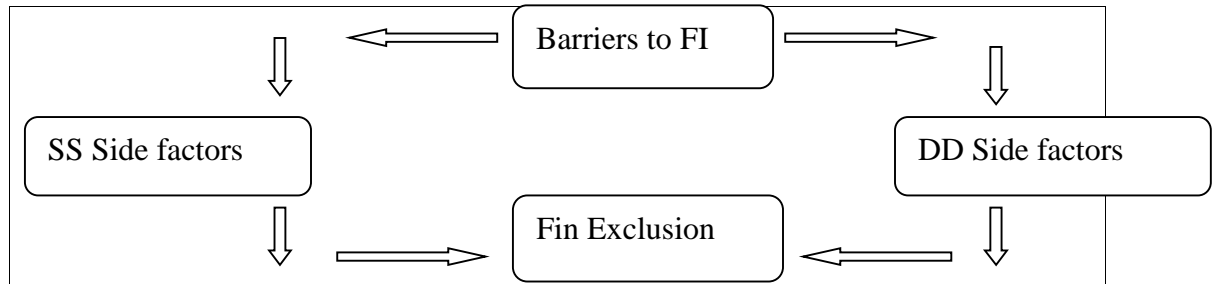
Source: Author, 2017

This conceptual framework offers insights on the factors behind financial exclusion. These factors are considered to be the barriers to FI and are categorized under supply and demand side factors. Demand side factors are what influences the uptake (usage) of financial services from a consumers perspective based on household characteristics. Demand for these vital services is directed at transactionary; credit, savings and investments and insurance and pension services from the formal strand. Supply side factors on the other hand mainly focus on the channels through which financial services are offered from the provider's perspective. In this context, focus is on the formal, formal other and informal channels. This financial exclusion is considered to be either voluntary or non-voluntary. Voluntary exclusion arises when a consumer who has the ability to take up a financial service opts not to while involuntary exclusion arises from external factors such as lack of collateral, high interest rates among others reasons which lead to rationing of financial services by financial service providers.

3.3.1 Empirical Model

The empirical model used in this section borrows heavily from the work of Allen, Franklin, Elena Carletti, Robert Cull, Jun Qian, Lemma Senbet, and Patricio

Valenzuela (2014) which focused on the determinants of FI in Africa. The estimable model can be stated as follows;

$$FI_i = \text{S} X_i + \text{V}_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where; FI_i captures the constructed financial inclusion measure (single product and composite measure).

  S represents the parameter estimates

  X_i represents a vector of explanatory variables which include; age, gender, location, education

  V_i represents the error term

Given the panel setup, households with similar characteristics are tracked in successive surveys to establish the dynamic relationship of parameters in a linear model The error component structure is assumed to have zero mean and constant variance The GMM is applied to derive the parameters after which lagged values of the endogenous variable from an auxiliary regression are used as instruments in a dynamic model (Mckenzie, 2004). The static model is expressed as;

$$fi_{it} = \text{r} + \text{S}_1 income_{it} + \text{S}_2 age_{it} + \text{S}_3 agesq_{it} + \text{S}_4 hhsize_{it} + \text{S}_5 hhsqrd_{it} + \text{S}_6 male_{it} + \text{S}_7 education_{it} +$$
$$\text{S}_8 married_{it} + \text{S}_9 banktrust_{it} + \text{S}_{10} socialcapital_{it} + \text{S}_{11} finlit_{it} + \text{S}_{12} urban_{it} + \text{S}_{13} dis\tan ce_{it} + u_{it} \dots (2$$

The instruments included in the model are subjected to the Sargan-Hansen test of over identified restrictions to assess whether the instruments are jointly exogenous. This is in addition to the autoregressive test for autocorrelation to check for the presence of serial correlation among residuals. Deeper lags help overcome the serial correlation problem.

The main weakness associated with this model is that it assumes that repeated observations of the households are independent hence ignoring the unmeasured or unobservable differences. To factor in both cross sectional and time heterogeneity, the households are organized into cohorts. The constructed pseudo panel is estimated using cohort (c) means rather than individual observations.

The estimable model includes robust standard errors derived using generalized least squares (GLS) estimation. It's good to note that GMM estimation method makes use of orthogonality conditions to allow for efficient estimation in the presence of heteroscedasticity of unknown form. The model assumes that instrumental variables are orthogonal to the errors (Roodman, 2006). The instrumental variable regression is also unbiased in the presence of autocorrelation since the reported standard errors allow for asymptotically correct inference in the presence of autocorrelation of almost any form. Besides, the estimation corrects the variance covariance matrix for heteroscedasticity and autocorrelation (Roodman, 2006). The determinants of FI are estimated using panel regression for binary outcomes in the case of single product measures while GMM estimation is applied on the estimation of determinants of IFI (Arrelano and Bover, 1995). Random effects estimators (RE) which captures a weighted average of fixed and between effects leads to consistent estimators if individual effects are uncorrelated with the other regressors. However in a case where individual effects are correlated with regressors, then fixed effects estimators (FE) are more consistent since RE will be inefficient. Results from the panel estimation with robust standard errors are compared with those from a pooled estimation based on a full sample. These results may however not be sufficient for policy since a static cohort panel assumes independence between the response variables given the covariates justifying the need for a dynamic estimation with a lagged dependent variable as a regressor.

3.3.2 Description of variables and Apriori Expectations

Variable	Description	Expected sign	Studies reporting evidence of this sign
Financial Inclusion	Dependent Variable: Measured using both single FI measures (transactionary, credit, savings and investment, insurance and pension) and composite FI indicator (IFI)		
Log Income	A continuous variable capturing monthly per capita income of household head in Kshs	+	FSD, 2014; Demirguc-Kunt and Klapper, 2012; DFID, 2004
Age	Measured as a continuous variable from household response which forms the basis of forming cohorts	+	Honohan and King, 2012; Allen et al., 2012
Age squared	A continuous variable with square age values	-	Honohan and King, 2012; Allen et al., 2012
Gender	A dummy variable taking the value of 1 if male and 0 otherwise female	+	Demirguc-Kunt, 2013; Hoyos et al., 2014; Camara et al., 2014
Household size	A continuous variable capturing the number of family members	+	Honohan and King, 2012; Allen et al., 2012
Household size squared	A continuous variable with squared household size variable	-	Honohan and King, 2012; Allen et al., 2012
Education	Number of schooling years; primary - 8; secondary - 12; tertiary - 14	+	Agrawal, 2008; Nelson and Phelps, 1996; Chithra and Selvam, 2013
Urban	A dummy variable taking the value of 1 for urban and 0 for rural	+	FSD, 2014; Kempson and Whyley, 1999; Honohan and King, 2012; Allen et al., 2012
Married	A dummy variable taking the value 1 if married 0 otherwise	+	Zaman, 2004
Social capital	A dummy variable taking the value of 1 if group member in a *chama* 0 otherwise	+/-	Rajan and Zingales, 2003; Mwangi and Shem, 2012
Financial Literacy	A dummy variable taking the value of 1 if financially literate 0 otherwise	+	AFI, 2014; Agrawal, 2008
Distance	A dummy variable taking the value of 1 if it takes long time to access the nearest bank and 0 otherwise	-	AFI, 2014; Sarma and Pias, 2011; Agrawal, 2008; Kempson and Whyley, 1999;

Bank Trust	A dummy variable taking the value 1 if perception about the bank as being trustworthy is high 0 otherwise	+	AFI, 2014

Source: Author, 2017

To control for the unobserved heterogeneity, we included; fc Cohort fixed effect, } the fixed effect for geographical location and x the fixed effect for the survey year shocks such as technological change

3.3.3 Data

The estimation of the determinants of FI is based on cohort data comprising of 378 cohorts drawn from the 2009, 2013 and 2016 FinAccess survey data. The pooled full sample results are considered to be biased for failing to control for the unobservable individual heterogeneity and assuming that repeated observations on each household are independent which may not always be the case. Survey year fixed effects are therefore included in the cohort data to absorb technological innovations and reforms in the financial sector while regional dummies are included to control for regional specific effects even as cohort fixed effects control for the unobserved heterogeneity.

The pseudo panel targeted households born between 1934 and 1997. The 2006 survey includes households aged between 18 to 62, the 2009 survey, 21 to 65, the 2013 survey, 24 to 68 and the 2016 survey, 27 to 71 (9 years older after 2006) in line with Deaton (1986). The data covers seven regions (44 counties), formerly provinces with the exception of North Eastern region which has 3 counties namely; Mandera, Wajir and Garissa for missing in the 2013 wave due to logistical constraints.

3.4 Econometric Results and Discussion

This section provides a detailed account of the determinants of FI based on a panel estimation using both FE and RE as well as GMM estimation. Interpretation of the determinants is based on the odds ratios since coefficients only inform on the signs. The odds ratio informs on the ratio between the probability that an event will occur (success) and the probability that an event doesn't occur (failure). The odds ratio is therefore a monotonic transformation of probability of events occurrence hence increase with the increase in probability and vice versa.

3.4.1 Diagnostic Tests

Bias in FI elasticities could emanate from errors of specification, measurement or omission of variables. Differencing individual panels was used in GMM estimation to control for this. On the other hand, heteroscedasticity is corrected by decomposing data into between and within dimensions and computing the exact heteroscedasticity on both dimensions. The main problem that characterizes repeated cross sectional data is its failure to track same individuals over time limiting the use of historical attributes in computing deviations from the mean.

Establishing which model between FE and RE is consistent in panel estimation requires a Haussmann specification test. This was applied in the five autoregressive dynamic models of FI and the three autoregressive models of financial access channels. The difference in the estimated coefficients is bigger when RE is efficient and smaller otherwise. On the other hand, FE model is consistent when individual effects are correlated with other regressors. However if that assumption doesn't hold, both FE or RE estimators are consistent but RE being more efficient is adopted. In our case, the Haussmann test results (Appendix Table 3.1) reported a large test statistic with a huge difference between RE and FE estimation only under the transactionary and formal transmission channels. This justifies the use of FE estimation in the two autoregressive models. RE estimation

is therefore used to estimate FI in the IFI, credit, savings, insurance, savings, and other formal and informal autoregressive models.

The only weakness associated with FE estimation is the Nickel bias which arises from the differencing operation to remove unobserved heterogeneity through a demeaning process. Subtracting the individual mean value of FI and each regressor from the respective variable creates a correlation between regressors and the error term. Where the error term is independently, identically distributed, lags in FI will be highly correlated with the dependent variable and its difference but uncorrelated with the composite error process. Deeper lags are applied where the error term are found to follow an autoregressive process of order one (AR (1)). FE estimation was followed by system GMM to estimate the determinants of FI to control for this Nickel bias. The Arrelano Bond test for the autoregressive process of order one (AR (1)) in first differences reported a Z statistic of 0.586 with a 0.08 P value signaling the presence of serial correlation at 5 percent but no serial correlation at 10 percent confidence level. This serial correlation is corrected by using deeper lags to improve efficiency.

GMM being an instrumental variable technique where lagged differences are used as instruments to control for both endogeneity and unobserved heterogeneity, a test for the validity of the instruments was conducted to check for the presence of over identified restrictions using Hansen (1982) J. test. The test for over identified restrictions (H0: Exactly identified) in the IFI model reported a non-significant test, (Hansen's J $X^2(1) = 0.01$ (p = 0.385)) an indication that the instruments used were valid. An exactly identified model also rules out the presence of covariance between FI and the error term in the second step of the GMM estimation hence there is significant exogenous variation in FI. Sargans & Basman assume that the error terms are independently, identically distributed. A violation of this

assumption means we use heteroscedasticity robust standard errors. This is captured in Table 3.1a.

Table 3.1a: Test for over identified restrictions

Panel 1: IFI Model			
Sargan test of overid. restrictions: chi2(4) = 4.16 Prob > chi2 = 0.385			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(4) = 4.15 Prob > chi2 = 0.386			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
GMM instruments for levels			
Hansen test excluding group: chi2(2) = 0.51 Prob > chi2 = 0.774			
Difference (null H = exogenous): chi2(2) = 3.64 Prob > chi2 = 0.162			
Panel ii: Formal Access Strands Model			
Sargan test of overid. restrictions: chi2(2) = 3.03 Prob >		chi2	0.22
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(2) = 3.43 Prob >		chi2	0.18
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
GMM instruments for levels			
Hansen test excluding group: chi2(0) = 0.96 Prob >		chi2	.
Difference (null H = exogenous): chi2(2) = 2.47 Prob >		chi2	0.29

Source: Author, 2017

Multicollinearity test was carried out on the determinants of IFI among Kenyan households. Multicollinearity arises from a violation of the Ordinary Least Squares (OLS) assumption due to a correlation of explanatory variables in a model. Where the multicollinearity score is high, an inflation of the variance of OLS estimates occurs leading to a reduction in the t-statistic hence a Type-2 error where the researcher ends up accepting the null hypothesis which otherwise ought to have been rejected. Under extreme cases of perfect multicollinearity, the estimated parameters are indeterminate and their standard errors infinite. The test results for multicollinearity based on variance inflation factor (VIF) are summarized in Table 3.1b.

Table 3.1b: Multicollinearity Test

Variable	VIF	1/VIF
age	277.13	0.003608
agesqrd	110	0.009091
lninc	30.49	0.032799
hhsize	29.5	0.033904
hhsizesqrd	11.22	0.0891
fl_provheard	10.96	0.091208
married	3.96	0.252748
male	2.47	0.404059
urban	2.46	0.407114
educ	2.11	0.473587
_Isurvyear~2	2.11	0.474732
bank_trust	2.09	0.479075
mem_group	2.03	0.493076
Agr	1.97	0.508454
L1.ifi	1.74	0.575138
distc_bank	1.58	0.63144
Mean VIF	30.74	

Source: Author, 2017

The variables causing multi-collinearity in a model are those with VIF values greater than the mean VIF value. The 30.74 mean Variance Inflation Factors (VIF) which also determines the speed at which the variance and covariance increase ruled out the problem of perfect multicollinearity. This is because the VIF for most variables except age and age squared falls below the mean VIF in the model.

Policy formulation from econometric estimates derived from a model characterized by endogeneity bias may lead to wrong inferences. To test for endogeneity, the Durbin Wu-Haussmann test was conducted by first running an income model on the four transmission channels (transactionary, credit, savings, insurance) as well as the aggregated FI channel (IFI). The residuals from each FI channel were predicted and included in a reduced form equation as regressors. Wooldridge (2012) suggests that failure to reject the null hypothesis (exogeneity

assumption) rules out the presence of endogeneity bias. Table 3.1c provides a summary of the endogeneity test results.

Table 3.1c: Durbin-Wu Haussmann Test for Endogeneity

Dependent	log income	log income	log income	log income	log income
Channel	IFI	Transaction	Credit	Savings	Insurance
FI Measure	2.55	9.13	1.89	1.97	-2.53
	(3.30)	(44.08)	(12.14)	(6.36)	(12.25)
Log consumption	0.783**	0.681**	1.225**	0.798***	0.700***
	(0.35)	(0.31)	(0.56)	(0.11)	(0.12)
Age	0.02	0.04	0.03	0.02	0.00
	(0.09)	(0.24)	(0.07)	(0.04)	(0.04)
Agesqrd	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hhsize	-0.18	-0.12	0.16	-0.14	-0.216*
	(0.19)	(0.45)	(0.36)	(0.10)	(0.12)
Hhsizesqrd	0.01	0.00	-0.01	0.00	0.01
	(0.02	(0.03)	(0.02)	(0.01)	(0.01)
Hhhead	-0.29	-0.18	0.08	-0.283*	-0.28
	(0.49	(0.59	(0.39)	(0.17)	(0.31)
Education	0.41	0.38	1.48	0.717*	0.55
	(0.56	(0.71	(1.24)	(0.38)	(0.45)
Married	-0.03	0.01	0.10	0.06	0.15
	(0.31	(0.89	(0.14)	(0.14)	(0.20)
Social capital	0.01	-0.07	-0.04	0.13	-0.03
	(0.40	(0.61	(0.16)	(0.16)	(0.16)
Own residence	0.15	0.07	-0.12	-0.04	-0.21
	(0.48	(1.09	(0.25)	(0.44)	(0.37)
Predicted residuals	-3.05	-9.80	-10.63	-4.17	1.31
	(3.86	(43.63	(7.11)	(5.81)	(13.08)
Constant	0.32	2.31	-2.24	1.75	2.760**
	(9.01	(6.52	(6.13)	(1.22)	(1.31)
Observations	248	346	346	346	346
R-squared	0.04		0.58	0.51	0.13

Source: Author, 2017

Since the predicted residuals in the structural equation are not statistically significant, we fail to reject the null hypothesis that there is endogeneity. This rule out the need to instrument the various FI channels since log income is exogenous. This is followed by an estimation of the determinants of FI. But before that, an an interrogation of the nature of the estimation variables is conducted.

3.4.2 Descriptive Statistics

The descriptive statistics of the variables of interest in this chapter are represented in Table 3.2 to establish the characteristics of variables. This helps in informing on the means and standard deviation as well as the minimum and maximum values of the variables. It also helps in determining the distribution of the variables, frequencies and whether the variables are continuous or discrete.

Table 3.2 Summary Statistics and Measurement of Variables

Variable	Observations	Mean	Std. Dev.	Min	Max
IFI	378	0.12	0.12	0	0.72
Credit	378	0.11	0.31	0	1
Transactionary	378	0.63	0.48	0	1
Savings	378	0.22	0.41	0	1
Insurance	378	0.24	0.43	0	1
Gross income	378	5133	13918	0	166,667
Household size	378	5	2.81	1	20
Age	378	43.02	13.16	18	68
Education	378	8	4.76	0	14
Male	378	0.50	0.50	0	1
Urban	378	0.40	0.49	0	1
Financial literacy	378	0.78	0.41	0	1
Social capital	378	0.46	0.50	0	1
Distance	378	0.24	0.43	0	1

Bank trust	378	0.50	0.50	0	1
Agriculture	378	0.37	0.48	0	1
Employed	378	0.34	0.47	0	1
Business	378	0.11	0.32	0	1
Bank trust	378	0.50	0.50	0	1
Married	378	0.66	0.47	0	1

Source: FinAccess survey 2009, 2013 & 2016

Mean yields a method of deriving the mean measure of central tendency of a sample space. The term arithmetic mean is often used to distinguish it from other means such as geometric and harmonic means. Consumption expenditure in this case gives an approximation of the arithmetic average consumption expenditure of a country's population and is expressed as $\bar{X} = \dfrac{\sum\limits_{i=1}^{n} X_i}{n}$. On the other hand, standard deviation measures variability in the observed variables. Otherwise stated, it explains how much variation or dispersion there is from the mean or expected values. A small standard deviation indicates that data points are closer to the mean values whereas a large standard deviation shows that data is spread over a large range of values. With this statistic, we can be able to show how many observations fall within one standard deviation, two standard deviation of the mean and so on.

The total number of observations in this chapter is 378 drawn from 126 cohorts for each survey year from 2009 to 2016 FinAccess surveys. The dependent variable (Financial Inclusion) is measured in two different ways. One, as a single FI measure in binary terms (1 or 0) depending on whether a household head is using a transactionary, credit, savings or insurance product from the formal channel, Secondly as a continuous measure based on the constructed index of FI (IFI).

The average household size for the tracked cohorts averaged 5 members per household with the household with the highest number being 20. The breakdown

of age revealed that the average age for the sampled households averaged 43 years falling between 18 and 68 years for the youngest and oldest member of household respectively. Education variable which is measured in terms of schooling years of the representative household in the cohort averaged 8 years meaning that a majority of the sampled households only went as far as primary education is concerned (8 years of schooling). Secondary school attainment is represented using 12 schooling years while tertiary education level is represented using 14 years of schooling.

The male population and the urbanized population captured as 1 and 0 averaged 0.5 and 0.4, signaling equitable distribution of the sampled population. The study identified a number of financial related terms to test households' financial literacy levels. 78 percent of the households were found to be conversant with the listed financial inclusion terms. The study also incorporated the role of social capital in shaping FI from both the demand and supply side. This variable was captured by assessing whether a household is a member of atleast one *chama* (investment group). 46 percent of the adult population was found to have subscribed to a group membership.

Per adult equivalent income of the representative household was found to average Ksh. 5,133 lying between Ksh 13,918 and Ksh. 166,667. This is captured as log per capita income in the econometric estimation. The distance variable captured as 1 if distance is long and 0 otherwise showed that 24 percent of the sampled households felt that the distance covered to get to the nearest financial service provider was long. The challenge of travelling long distance to the nearest bank especially among the poor appears to have been largely addressed by mobile financial services which enhance a shared infrastructure for both creamy and non-creamy households mainly in urban and rural households respectively. 57 percent of the sampled households were also found to hold a perception that interest

charged by commercial banks is high. 66 percent of the household heads were also found to be married.

3.5. Determinants of Financial Inclusion and Access channels

Understanding the determinants of FI from both a demand (usage) and supply (access) perspective is what shapes policy discussions.

Given that three waves of the financial access survey are considered, econometric estimation of the determinants of FI includes three survey year dummies to capture unobservable time effects for each wave. Other variables included are the demographic and socioeconomic characteristics of the representative households. This chapter provides a cohort estimation of the determinants of both the composite and single financial product usage as well as the choice of financial access channel using panel estimation techniques.

3.5.1 Econometric results of the static and dynamic model of FI

Results from the full sample econometric estimation of the determinants of FI from the product usage and access channels based on the 2006, 2009, 2013 and 2016 data is presented in Appendix Tables 3.3 and 3.4 respectively. As mentioned earlier, pooled full sample estimation assumes that households are independent hence ignore both cross sectional and time heterogeneity inherent in the data. Econometric results on the static and dynamic estimation of the determinants of FI usage (transactionary, credit, savings, insurance and IFI) and financial access channels using cohort data are presented in Appendix Tables 3.5 and 3.6 followed by Arrelano and Bover (1995) system GMM estimation to correct for Nickel bias associated with FE models (Econometrica, 1981). A dynamic analysis of FI informs on the impact of past decisions made by households on financial deepening. Static results made use of the 504 observations (126 cohorts multiplied by 4 survey years) while dynamic estimation made use of 378 observations (126

cohorts multiplied by 3 survey years) since a lagging of the dependent variable leads to a loss of one survey year. RE in the results table stands for Random Effects while FE stands for Fixed Effects whose selection was informed by Haussmann specification test.

Omission of a lagged dependent variable in a static model limits a correlation between the demeaned lagged dependent variable and the demeaned lag process. This justifies use of a dynamic estimation to assess whether households past actions have any bearing on current choices.

The R-squared which shows the degree of variation in the dependent variable explained by the model ranged between 34 percent and 71 percent for transactionary, credit, savings and insurance models. These values imply that the model explains between 34 and 71 percent of the variation in FI.. This being a pseudo panel, the model is well cast hence a good fit. Log per capita income is instrumental in driving access to FI along access transmission channels except under the informal access channel. However, as mentioned earlier panel estimation of FI using FE model has its own limitations. This arises from the Huwicz/Nickel bias associated with fixed effects estimation with a small time dimension on many cross-sections. Literature shows that this problem leads to the underestimation of the autoregressive coefficient and proposed the use of system GMM for dynamic panels with a small T and a large N (Arrelano & Bover, 1995; Arrelano & Bond, 1991). The next section therefore runs an econometric estimation of the determinants of financial inclusion using system GMM. GMM is also considered to be superior in that it's able to control for endogeneity assuming that per capital income and FI are potentially endogenous. This is represented in Table 3.7a.

Table 3.7a Determinants of FI (Model Corrected for Nickel/Huwicz bias)

	IFI	Transaction	Credit	Savings	Insurance
Lag FI	-0.08	-0.02	0.11	-0.12	-0.04
	(0.07)	(0.07)	(0.10)	(0.10)	(0.11)
Log income	0.02***	0.02	0.05***	0.08***	0.08***
	(0.00)	(0.03)	(0.02)	(0.02)	(0.02)
Age	0.00	-0.02	0.01	0.01	0.01
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Agesqrd	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hhsize	0.01*	-0.03	0.05**	0.06**	0.03
	(0.01)	(0.03)	(0.02)	(0.03)	(0.04)
Hhsizesqrd	0.00	0.00	0.00	-0.00*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male	0.01	0.10*	-0.04	0.01	0.08**
	(0.01)	(0.05)	(0.03)	(0.05)	(0.04)
Education	0.06***	0.22***	0.08	0.20***	0.19***
	(0.01)	(0.07)	(0.05)	(0.07)	(0.06)
Married	0.02	0.10	-0.02	0.01	0.02
	(0.01)	(0.06)	(0.04)	(0.06)	(0.05)
Bank Trust	0.02**	0.12**	0.04	0.06	0.08
	(0.01)	(0.05)	(0.04)	(0.06)	(0.06)
Social capital	0.01	0.105*	0.02	0.08	0.05
	(0.01)	(0.06)	(0.04)	(0.06)	(0.05)
Finliteracy	-0.03**	-0.03	-0.11**	-0.02	0.04
	(0.02)	(0.07)	(0.06)	(0.07)	(0.06)
Agriculture	0.00	0.01	-0.03	0.02	-0.10**
	(0.01)	(0.07)	(0.03)	(0.05)	(0.05)
Urban	0.01	-0.02	0.06	0.05	0.01
	(0.01)	(0.08)	(0.04)	(0.07)	(0.07)
Distance	-0.01*	-0.08	-0.01	-0.08	-0.04
	(0.01)	(0.07)	(0.03)	(0.05)	(0.05)

Central	-0.02	-0.18**	-0.07	0.00	-0.09
	(0.02)	(0.09)	(0.07)	(0.10)	(0.10)
Coast	-0.01	-0.09	0.04	0.06	-0.16
	(0.02)	(0.08)	(0.08)	(0.13)	(0.10)
Eastern	-0.03	-0.19*	-0.03	-0.04	-0.09
	(0.02)	(0.10)	(0.07)	(0.11)	(0.09)
Nyanza	-0.02	-0.21**	0.03	-0.06	-0.07
	(0.02)	(0.09)	(0.08)	(0.11)	(0.09)
R. Valley	-0.02	-0.27***	0.00	0.01	-0.04
	(0.02)	(0.09)	(0.08)	(0.11)	(0.09)
Western	-0.01	-0.13	0.03	-0.06	-0.13
	(0.02)	(0.10)	(0.07)	(0.12)	(0.10)
2009	-0.18***	0.67*	-0.64**	-0.87**	-0.93***
	(0.05)	(0.35)	(0.26)	(0.39)	(0.32)
2013	-0.12**	1.02***	-0.53**	-0.75**	-0.73**
	(0.05)	(0.34)	(0.25)	(0.37)	(0.32)
2016	-0.01	1.09***	-0.49*	-0.64	-0.76**
	(0.05)	(0.37)	(0.26)	(0.39)	(0.34)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Dynamic panel-data estimation,	two-step	system	GMM	
Group variable: cohort			Number of obs	347
Time variable : Survey year			Number of groups	126
Number of instruments = 22			Obs per group: min	1
Wald chi2(17) = 597.41			avg	2.75
Prob > chi2 = 0.000			max	3

Source: Author, 2017

Table 3.7a represents the GMM estimation of the determinants of FI. Since FI and per capita income are potentially endogenous, GMM style instruments helps control for endogeneity. The huge uptake of transactionary product reveals a shift from the traditional cash economy where trading was purely in cash to a modern cash-lite economy dominated by mobile and internet banking. Per capita income, household size, education, bank trust, financial literacy and distance to the nearest commercial bank were found to be significant in driving IFI. The coefficient of log

per capita income (proxy for money income) and its relationship with FI supports the demand following hypothesis which predicts that increased growth of the economy creates demand for financial services.

Increase in household income per capita was found to have a positive impact on credit (5.3 percent), savings (7.6 percent), insurance (7.7 percent) and portfolio usage of financial services (IFI) by 2.1 percent at 1 percent confidence level. Acemoglu et al. (2001) argued that financial development trails economic development hence increase in per capita income per capita boost access to financial services. This finding elucidates the pivotal role economic growth plays in driving the uptake of formal financial services reaffirming the existing causal relationship (Kunt and Klapper, (2012); Sarma, (2008); Honohan, (2008); Sarma and Pias, (2011); Park and Mercado, (2015); Akudugu, (2013) and IMF, (2012). These studies predicted a positive link between money income and FI. This result raises a question as to whether FI also exhibits a reverse causality with per capita income. This question will be answered in the next chapter when we estimate the welfare function to establish whether FI influences household welfare.

Transactionary usage of financial services was however found not to be sensitive to per capita income. This could be rationalized by the domination of transactionary products by mobile financial services whose infrastructure is enjoyed almost equally by both the rural and urban households irrespective of their level of income.

Empirical work by Tuesta et al., (2015) and Honohan and King (2012) identified gender, education level and income as some of the drivers of formal access. In this study, male headed households recorded a 9.29 and 7.99 percent higher uptake of transactionary and insurance products as compared to female headed households. Similarly, higher education largely reinforced the uptake of formal financial services given that portfolio usage of financial services (IFI), transactionary,

savings and insurance rose by 6.3, 21.6, 20 and 18.5 percent respectively at 1 percent confidence level. This positive impact between schooling and FI builds on Kalunda (2014) who found a positive link between level of education and FI.

Financial literacy was found to lower the uptake of IFI and credit products by 3.16 and 11 percent respectively at 5 percent confidence level. This negative coefficient indicates that financially literate households are cautious when it comes to the uptake of formal financial services and especially credit and savings. Nowadays, most financial institutions practice what is popularly known as indiscriminate lending which forces many households to practice impulse borrowing. Those who are financially literate are slow when it comes to this uptake as evidenced by the negative coefficient. While involvement in Agriculture is largely insignificant in relation to the uptake of financial services, it lowers the probability of accessing insurance services by 10.1 percent at 10 percent confidence level. This is mainly because most insurance products in the market target housholds who are formally employed locking out those engaging in informal activities such as agriculture.

In relation to age of the household head, IMF (2012) survey on financial access established that young adults enjoyed increased access to financial services. This is supported by the positive coefficient of age variable in our model which portray a quadratic relationship even though no significant relationship was established. Financial institutions often ration credit to persons approaching or falling above retirement age because of their limited capacity to service the loans. Young person's often enjoy more affordable and cheaper financial services and especially credit since they have a longer lifespan allowing them to negotiate for more flexible repayment installments.

Household size exhibited a quadratic relationship with respect to IFI, credit and savings usage initially raising FI by 0.8, 5.1 and 5.8 percent respectively before assuming a decline as household size increased further. What this study is however

not able to tell is the turning point which gives room for further research to establish the optimal household size for each transmission channel. Social capital was also found to be instrumental in influencing the uptake of transactionary products at 10 percent raising transactionary usage of financial services by 10.5 percent.

Except under transactionary transmission channel where the coefficient of FI was was negative, urbanized population exhibited a positive though non-significant relationship with all other transmission channels, that is IFI, transactionary, credit and insurance. This could be rationalized by the proximity to financial services by urban residents as compared to the rural residents who rely on cashless money transfer services such as mobile money dues to the limited formal financial services in rural areas. Kempson and Whyley (1999) singled out geographical location especially among rural dwellers as a barrier to FI. Commendable progress towards reducing financial exclusion in rural areas has been made especially following the high penetration of internet and mobile banking. Johnson and Nino-Zarazua (2011) argued that urban dwellers are not always more financially included. Uptake of formal financial services grew much slower between 2009 and 2013 as compared to the period 2006 to 2009 (FSD, 2013). Urban residents are more likely to use bank services while their rural counterparts are more likely to use mobile money products to overcome the distance. This is because it takes considerably less time for a rural resident to get to a mobile agent than to a bank branch or bank agent.

Any comprehensive study on the demand (usage) for financial services cannot be complete without looking at the other side of the coin which is the determinants of choice of a financial access strand (supply) which comprise; formal, formal other and informal financial access strands. This is represented in Table 3.7b.

Table 3.7b Determinants of Financial Access Strands (Model Corrected for Nickel/Huwicz bias)

	Formal	Other formal	Informal
Lag FI strand	0.021	0.131	-0.047
	(0.064)	(0.094)	(0.068)
Log income	0.021	0.0793***	0.001
	(0.027)	(0.020)	(0.026)
Age	-0.008	0.008	0.015
	(0.013)	(0.011)	(0.015)
Agesqrd	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Hhsize	-0.021	0.000	0.019
	(0.028)	(0.023)	(0.030)
Hhsizesqrd	0.001	0.001	-0.002
	(0.002)	(0.002)	(0.002)
Male	0.065	0.007	-0.063
	(0.053)	(0.038)	(0.050)
Education	0.241***	0.199***	0.016
	(0.062)	(0.047)	(0.079)
Married	0.082	0.073	0.069
	(0.059)	(0.052)	(0.064)
Bank Trust	0.158***	0.134***	0.065
	(0.048)	(0.042)	(0.065)
Social capital	0.0932*	-0.019	0.631***
	(0.054)	(0.040)	(0.053)
Finliteracy	-0.003	-0.017	-0.029
	(0.066)	(0.066)	(0.086)
Agriculture	0.015	0.0886**	0.006
	(0.067)	(0.042)	(0.074)
Urban	-0.061	0.041	0.007
	(0.081)	(0.060)	(0.079)
Distance	-0.132**	-0.118*	0.043
	(0.063)	(0.062)	(0.065)
Central	-0.179**	0.024	0.060
	(0.087)	(0.093)	(0.111)
Coast	-0.081	0.075	0.118
	(0.075)	(0.072)	(0.105)
Eastern	-0.158*	0.125*	0.018

	(0.095)	(0.073)	(0.102)
Nyanza	-0.185**	0.133	0.045
	(0.084)	(0.094)	(0.127)
R. Valley	-0.207**	0.117	-0.058
	(0.092)	(0.094)	(0.125)
Western	-0.107	0.036	-0.003
	(0.097)	(0.088)	(0.120)
2009	0.422	-0.964***	-0.073
	(0.337)	(0.320)	(0.444)
2013	0.790**	-1.018***	-0.238
	(0.329)	(0.328)	(0.432)
2016	0.848**	-0.839**	-0.186
	(0.362)	(0.339)	(0.446)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Dynamic panel-data estimation,	two-step	system	GMM	
Group variable: cohort			Number of obs	347
Time variable : Survey year			Number of groups	126
Number of instruments = 22			Obs per group: min	1
Wald chi2(17) = 597.41			avg	2.75
Prob > chi2 = 0.000			max	3

Source: Author, 2017

The formal classification comprise of those financial services managed through prudentially regulated service providers and are also supervised by independent statutory bodies namely; CBK, CMA, IRA, RBA and SASRA. Mobile financial services are included in the formal strand since they also operate on a bank platform and were licensed by CBK. The range of products considered under this includes; mobile bank accounts usage, commercial bank products usage, insurance and pension usage, DTM and DTS products usage.

The other formal channel comprise of financial services offered through service providers who are not subjected to prudential guidelines by government departments but are registered to provide financial services. They include; credit only microfinance institutions (MFIs), Non Deposit Taking SACCOs, Hire Purchase companies such as ART, Development finance institutions such as AFC,

HELB, ICDC among others. Lastly, the informal strand targets financial services that are not subjected to regulation despite having relatively well defined organizational structures. They include; shopkeepers/supply chain credit, employers, shylocks and other informal money lenders as well as groups like chamas, ROSCAs, ASCAs among others. Any household who doesn't fit in any of the listed classification is considered to be financially excluded from all access strands. Given the differences in the various access strands, this chapter extends the debate on the determinants of FI to inform on factors that influence a household decision on the most suitable access strand.

The main objective of FI as discussed earlier is to enhance universal FI by pulling all households into the formal channel. This is analyzed using a static model as well as a dynamic estimation. Given that choice of a financial access channel is informed by both present and past information, a static analysis yields necessary but not sufficient condition for the determination of demand for a financial access channel. Appendix Table 3.4 columns 6 to 8 represent the static estimation of determinants of financial access strands in Kenya while a lagged dependent variable is included as a regressor in the dynamic panel.

GMM dynamic estimation in Table 3.6 revealed that per capita income promote the uptake of financial products from other formal channel at 1 percent significance level. The positive coefficient for income implies that growth in per capita income leads to a 7.93 percent increase in the uptake of other formal financial services. These other formal financial services include non-deposit taking SACCOs and MFIs among others. The positive but insignificant coefficient under the informal strand suggests that the demand for financial services from this strand is not dependent on income. This further confirms that formal financial service providers consider the income of households in their target markets when

designing their products. This qualifies the operation of the demand following hypothesis in the financial markets.

One very important variable in driving usage of the informal channel is the social capital which was found to have a 63.1 percent positive and significant impact on the informal strand. The effect of social capital on the formal strand was small raising it by a mere 9.32 percent at 10 percent confidence level. Social capital is quite strong among rural households who form themselves into small groups whose membership helps in providing guarantorship whenever a member wants to apply for a specific financial product. These informal mechanisms are often adopted by players in the informal markets to counter the stringent requirements often imposed by formal financial service providers leading to credit rationing. The distance to the nearest commercial bank was also found to significantly explain the reduced demand for the formal strand at 5 percent level of significance. Long duration taken by a household to get to the nearest bank acts as a disincentive the pursuit of financial services from the formal strand leading to a substitution effect as households resort to informal financial service providers. The estimated model associate increase in the distance to the nearest bank to a 13.2 and 11.8 percent reduction in the uptake of formal and other formal financial services.

Education in this model accounts for a 24.1 and 19.9 percent increase in the uptake of formal and other formal financial services in Kenya at 1 percent confidence level. This shows how important education is in shaping financial decisions on uptake of various financial services. Bank trust which was used to instrument FI was also found to be highly significant at 1 percent in explaining formal and other formal financial services. Trust in commercial banks raises the uptake of the formal and other formal strand 15.8 and 13.4 percent respectively. Involvement in agriculture which is considered to be the mainstay of Kenya's economy by the

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household head only raises the chances of accessing other formal financial strand by 8.86 percent.

In terms of regional dummies, households living in Central, Eastern, Nyanza and Rift Valley recorded a 17.9, 15.8, 18.5 and 20.7 percent lower probability of accessing the formal strand than households living within Nairobi.

3.6 Conclusions and Policy Implications

This chapter aimed at investigating the determinants of FI in Kenya. A logistic estimation of single product usage based on a full sample static and a dynamic cohort panel was used. This was followed by a GMM estimation of the determinants of FI to correct for Nickel/Huwicz bias due to the small T and large N (Econometrica, 1981). Given the difficulties faced in getting a true panel for tracking same households over time, repeated cross sectional survey data was used to form the pseudo panel with 126 cohorts totaling to 378 observations for three waves of FinAccess survey. The dynamic panel estimation results based on the generated cohort data is used to supplement the full sample static estimation. The FinAccess 2006, 2009, 2013 and 2016 surveys capture FI developments in Kenya during the period.

The coefficient of the lagged dependent variable was found to be strongly negative and significant in influencing FI under the IFI and savings functions in the FE/RE panel estimation. This significant relationship however disappears upon controlling for Nickel bias in the GMM model. Lagged transactionary product holding reinforces the uptake of FI. This cements the adaptive expectations theory where past actions shape future happenings. A static estimation is therefore a necessary but insufficient condition while estimating FI. Failure to capture the lagged dependent variable could lead to biased inference while formulating policies. Per capita income was also found to have a positive and significant impact on FI in all categories except under the transactionary and informal access

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channel. The same applies to years of schooling which exhibited a strong positive and significant relationship on IFI, transactionary, savings and insurance product uptake and formal and other formal access channels. The positive coefficients indicate that human capital development through education is critical in enhancing household welfare.

The positive and significant coefficient for log per capita income on the formal and other formal financial access channel shows that formal access channels are sensitive to reforms in the financial sector as compared to the informal strand. Increase in the level of education also reinforces the uptake of formal financial services while the impact of social capital on informal access channel was much greater than that of formal access channel. The urbanized population also reported a significant increase in the uptake of insurance, formal other and informal financial access channels implying that proximity to financial service providers facilitate access to financial services hence a higher FI score.

This chapter therefore recommends economic empowerment of masses through increased economic activities which would raise per capita income found to be a significant in promoting FI. Secondly, human capital development through education and literacy programs should be included in school curriculum given its positive impact. Lastly, mainstream financial service providers should factor in social capital when designing credit products given its significant positive contribution in driving access to financial services from the informal strand.

Chapter Four: Impact of FI on Consumption Expenditure

4.1 Introduction

The economic pillar of Vision 2030 and financial sector Medium Term Plan (MTP), 2012-2017 has identified financial inclusion as a core pillar for the promotion of economic growth and poverty alleviation (GoK, 2003). A vibrant financial sector is expected to mobilize savings for financing productive investments. This vision was preceded by Welfare Monitoring Surveys introduced in 1992, 1994 and 1997 to monitor activities aimed at alleviating poverty; Millennium Development Goals (MDGs) which aimed at halving the population locked in poverty by 2015 (UN, 2000); and the Economic Recovery Strategy for Wealth and Employment Creation (GoK, 2008) introduced to jumpstart the economy with emphasis on the significance of credit in enhancing economic growth, employment and alleviation of poverty.

Recent literature by Amidzic et al., 2014; Demirguc-Kunt and Klapper, 2012; Beck et al., 2004; Sarma, 2008; Honohan, 2008 associate access to a broad range of financial services to improved welfare. A more inclusive financial system is associated with immense welfare benefits. In particular, an inclusive digital financial system yields; enhanced financial services, connections to peers and institutions as well as providing a basic account where individuals can build up their savings for transactionary, precautionary and speculative purposes. This is evidenced by a randomized control trial (RCT) conducted in Western Kenya where traditional savings account led to a 45 percent increase in productive investment and 27-40 percent higher personal expenditures (Dupas and Robinson, 2013). Access to a range of financial services helps people invest in income generating

activities thus work their way out of poverty through reduced transaction costs and vulnerability to poverty shocks and also through provision of reliable services[14].

Use of consumption expenditure to measure welfare is considered to be important for policy and particularly while measuring poverty and testing response mechanisms and preparedness in the wake of income fluctuations. This is besides assessing interactions between individual consumption expenditure and changes in the demographic and socioeconomic characteristics. The determinants of consumption expenditure such as income, asset base, price, capital gains among other variables captured in the consumption theories by Keynes, 1936; Friedman, 1957; Modigliani, 1963 and Duesenberry, 1949 help shape the overall economic growth through the consumption channel. The huge multiplier effect of consumption on national income is what elevates the need to understand consumer behaviour both in the short run and in the long run. A comprehensive analysis of its determinants can go a long way in accelerating the overall economic growth through increased income.

The broad objective of this chapter is to extend the existing literature on the link between financial inclusion and welfare through evidence based examination from Kenya. The specific research objectives as generated from the broad objectives include;

1. To estimate the effect of single product measures of FI on consumption expenditure in Kenya

2. To estimate the effect of composite FI index on consumption expenditure in Kenya

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[14] United Nations Secretary Generals Special Advocate for Inclusive Finance for Development: Financial Inclusion in Post 2015 Development. It cites a global 90% target in the usage of a formal financial account

This chapter is motivated by earlier theories of financial development to represent the link between financial inclusion and poverty. The use of the money metric measure in Kenya dates back to the late 90's (GoK, 1997; 2000). The non-money metric measures such as the asset index is suitable for measuring long term welfare since its computation mainly relies on ownership of durables. The asset index measure is challenged for failing to control for differences in the utility values attached to various items by individuals in different localities. Consumption expenditure which is more of a flow variable is therefore a better measure of changes in social welfare.

4.2 Literature Review

4.2.1 Theories on the link between FI and Welfare

The main theories linking finance and economic development where this study falls include; theories on direct and indirect transmission channels, the finance growth hypothesis, theories of investment, the modern development theories, the finance intermediation theories and the efficient markets hypothesis (EMH) based on information asymmetry in the financial markets (Fama, 1970).

The causal link between financial inclusion and welfare is captured in the existing financial development theories. Theories linking financial inclusion and welfare are transmitted through either the direct or indirect channels. Under the direct channel, increase in financial inclusion improves household welfare by reducing income inequality and poverty through broadened access to transactionary, credit, savings and insurance products. This raises income of the underprivileged population through investment in productive activities and interest earnings from savings.. Copestake (2007) suggests that financial inclusion provides a platform for reducing poverty especially in the low income countries.

Growing literature reveal that the financial system help avail the necessary resources for meeting the day to day transactions towards consumption, investment and overall economic growth (King and Levine, 1993; Rajan and Zingales, 1998). This literature stream extends early theories linking growth, development and finance based on capital, labour and institutions where finance is captured as a regressor in a growth function.

This direct effect between financial intermediation through broadened supply of financial services is however not without challenges. Most developing countries are characterized by information asymmetry which leads to adverse selection and moral hazard especially in credit markets (Stiglitz and Weiss, 1981). These imperfections act as a barrier to formal access to financial services for the poor leading to persistent poverty (Levine, 2008). Aghion and Bolton (1997) associate market imperfections in the financial with adverse effects on the poor who lack collateral often required to access credit.

Keynes (1937) recognized the critical role played by financial intermediaries in his theory of demand by stating that they are a source of profitable savings which helps in building capital and provide a source of credit from the pooled savings. Greenwood and Jovanovic (1990) however in their nonlinear inverted U hypothesis argue that financial development does not impact on the population uniformly. They argue that initially, financial development increases income inequality since only the rich are able to take advantage of the demand for financial services. However, as benefits from the financial development spread out across the economy, the poor also benefit lowering income inequalities.

On the other hand the indirect channel of financial development linking financial inclusion and welfare works through the finance growth nexus of financial development theory. This indirect effect theory which works through the growth stimulating effect is traced back to Schumpeter, 1934 and Mckinnon, 1973. Romer

(1986) on endogenous growth theories argued that accumulation of savings and capital mobilization by financial intermediaries lead to improvement in technology and economic growth. Developed financial markets lead to increased savings, capital mobilization, technological improvement and economic growth.

This indirect theory is also supported by the Financial Structuralist theory which associates a well-developed financial system and increased saving and economic growth (Aghion & Bolton, 1997). The Financial Repressionist theory advocates for the liberalization of financial markets to promote savings, investments and economic growth. This indirect effect theory is also supported by the trickledown theory which associates poverty reduction with economic growth as wealth is redistributed from the rich to the poor (Aghion and Bolton, 1997).

The finance growth nexus revolves around four major theoretical underpinnings namely; supply leading or finance led growth hypothesis Schumpeter (1911); McKinnon (1973); Merton (1988); Chuah and Thai (2004), demand following hypothesis or growth led finance Robinson (1952); Lucas (1988); Demetriades and Hussein (1996); bi-directional causality hypothesis (Greenwood and Jovanovic (1990) and the independent hypothesis by Lucas (1988) and Stern (1989). Nobel Laureate Robert Lucas (1988) and Stern (1989) however consider finance as an overstressed determinant of economic growth, even though recent literature has helped build a consensus that the finance-growth nexus holds. The operation of the finance growth nexus in the indirect channel of FI transmission offers insight on the concentration of FI on the 'haves' and the 'have nots'.

The finance growth nexus stem from the Schumpeterian (1911) school; Modigliani Miller theory and Fama (1970) Efficient Markets Hypothesis (EMH). Schumpeter (1934) emphasized the role of banks in spurring economic development. Schumpeter (1934); Greenwood and Jovanocovic (1990); Kind and Levine (1993)

associate financial development to increased productivity from the savings allocative efficiency.

The finance led growth theory or supply leading hypothesis perceive growth and development as a consequence of financial development which includes financial inclusion often transmitted through a supply leading effect. Levine (2005; 1997; Merton and Bodie (2005); Rajan and Zingales (1998) describe finance as the heart that drives economic growth using aggregated data. The human capital theory (HCT) in support of this hypothesis asserts that people require access to financial services in order to be able to invest in their human capital through schooling.

It is the returns to schooling that help individuals to lead better lives from the incremental wages. Levine (1997) and King and Levine (1993) recognizes the immense role played by financial intermediation theory in linking deficit units (borrowers) with surplus units (lenders). In particular, the study acknowledges the role played by financial intermediaries, both formal and informal in mobilizing savings among other financial services and argues that a first order relationship exists between financial development and economic growth.

On the other hand, the growth led finance theory or demand following theory developed by critics of the supply leading theory implies that financial development arises from accelerated growth. An economy experiencing high growth rates releases surplus responsible for financial development (Robinson 1952; Lucas, 1988; Demetriades and Hussein, 1996). The demand following hypothesis alluded that the demand for financial services is triggered by increase in financial development while the supply leading hypothesis argued that economic growth is induced by increase in the supply of financial services from the traditional to the modern sectors of the economy.

This latter hypothesis founded on financial intermediation dominates in the early stages of development hence relevant for most developing economies which are

still in the precondition to take off stage. It describes developed countries and developing countries which are in the take off stage of development. Emergence of financial markets is therefore a consequence of a thriving economy which stimulates demand for financial services by other sectors of the economy.

Greenwood and Jovanovic (1990) bidirectional causality hypothesis characterized by non-diminishing returns to capital presents a possibility of multiple equilibria from the reciprocal externalities in the finance growth nexus. The lower equilibrium is observed in the early stages of development characterized by low risk less productive investments while the upper equilibrium emerges where markets are fairly developed and sophisticated by recent technology. Economic growth enhances FI as financial intermediation identifies persons with great potential for technological innovation in the financial sector. Both finance and consumption expenditure per adult equivalent in this model is endogenous hence defined from within the model.

Ncube[15] (2016) posits that the link between financial system development and economic development draws from the functions of the system. Aspects such as liquidity, turnover, and efficiency in pricing have a positive impact on current and future economic growth and productivity. The authors associate liquidity in financial markets with accelerated investment growth.

Modern theories of development mainly focus on the evolution of growth, income inequalities, their persistence and benefits associated with an efficient financial system[16]. Financial market imperfections in the capital accumulation theories for example shape key decisions on human and physical capital accumulation through credit channels where economic agents borrow to build this capital. These

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[15] Digital Financial Services and Regulatory Policies in Africa

[16] Chapter One: Access to Finance and Development, Theory and Measurement

financial market imperfections also influence the extent to which poor talented individuals can raise funds to initiate projects in theories touching on entrepreneurship.

An efficient payment system facilitates better integration into modern market economies which increase income earning opportunities of the poor. Access to savings and credit on the other hand enable the poor to overcome poverty through investment in human capital development and microenterprises as well as asset accumulation to increase income generating. Access to efficient savings, credit and insurance facilitate consumption smoothing among the poor in the wake of transitory changes in both income and expenditure (Beck, 2016).

Institutional quality is associated with welfare improvement through the indirect channel which feeds into household welfare through the economic growth channel. The literature suggest that the quality of institutions shapes the incentives for investment in both physical and human capital, technological progress and innovations. The institutions also determine property rights and transaction costs which have serious implications on market size, specialization and technological progress (Dhrifi, 2013).

IMF (2015) presents four classifications of growth and development channels namely; endogenous growth model by Arrow (1962); Romer (1986) and Lucas(1962) where savings promote growth through the investment channel; capital allocation channel which tackles the information asymmetry problem through financial markets, institutions and instruments model where financial inflows are channeled to the domestic economy through the external sector and lastly the theoretical model which ties together financial constraints, economic growth, wealth inequality and poverty.

4.2.2 Causality and Impact of FI on welfare

The role of finance on welfare outcomes and economic growth has been cited heavily in the literature. Much of the available evidence on the impact of FI on welfare is mixed with some literature establishing a significant effect even as others find no link. Whereas access to a wide range of financial services is not a panacea to economic development, it acts as a prerequisite to poverty eradication and sustainable economic development. Gupta (1987) contends that economic growth is either determined via the financial structuralist approach or the financial repression approach. The former approach highlights financial depth and the composition of aggregate finance while the latter recognizes the critical role played by price in influencing growth. The trickle down effects of finance and economic growth on welfare outcomes such as consumption is huge (Todaro, 1997).

Randomized control trials (RCTS) are based on individual product categories since the impact varies by product. Focusing on the counterfactual to establish what would have happened without FI have been widely adopted in the literature. Gine and Townsend (2004) on the difference in welfare among intermediated wage earners and non-intermediated wage earners established a positive and significant impact between access to financial services and welfare. Firms which were previously constrained were found to gain more in terms of efficiency in the scale of operations. Expansion in the financial sector was found to lead to a huge increase in household income by between 17 - 201 percent. This is echoed by Jeong and Townsend (2007) model of occupational choice and financial deepening where positive gains to credit market expansion has been established.

A recent study by Buera et al. (2012) established that the consumption measure of welfare grows by approximately 10 percent with the expansion in credit limit by up to one and a half times the annual wage. This study provides vital information

on the welfare impacts between the rich and the poor. In particular, the study established that the welfare gains of FI are larger among the poor rising by approximately 8 percent of their permanent consumption in a general equilibrium framework. In a similar fashion, Kaboski and Townsend (2012) established a very strong relationship between financial intermediation and consumption.

However, the impact appeared to vary with households' participation in investment activities and whether one was a borrower or not. However, despite the personal income and business income rising with the increased intermediation, actual business startups stalled. Karlan and Zinman (2009) study on South Africa revealed that even though access to credit raised borrower wellbeing as well as income and food consumption, they were subjected to high stress levels. Bauchet et al., (2011), Attanasio et al., (2011), Pitt and Khandker (1998) also found a positive effect on household welfare.

A recent RCT in the rural Western Kenya on female market vendors by Dupas and Robison (2013) established a significant link between savings and household expenditure. Again, private expenditure for the users of a savings product increased by 13 percent. Research indicates that results from studies focusing on the link between savings and household welfare are more positive and consistent as opposed to those focusing on the impact of credit usage. Notable though is that the impact also varies with the sampled population given that a similar RCT on rickshaw drivers conflicting results. Commitment savings in Malawi were also found to exhibit a positive relationship with consumption expenditure (Brune, Gine, Goldberg and Yang, 2016).

Not all studies however link financial intermediation with positive welfare effects (Bernerjee et al., 2015; Crepon et al., 2014; Angelucci, Karlan and Zinman, 2013). Bernerjee et al., (2015) for example in their randomized control trial on the role of micro credit failed to establish any positive link on average monthly consumption

expenditure per capita 15 to 18 months later. Instead, households' expenditure on durables increased significantly leading to an increase in profitability. Crepon et al. (2014) posit that even though access to microcredit led to a significant increase in asset investment and profit, the gains were offset by a reduction in casual labour income hence neutralizing the overall consumption effect. Although credit to Mexican households revealed a general increase in their wellbeing, no significant effect was established between FI and household consumption, (Angelucci et al., 2013).

Tanzania's National Panel Survey (TzNPS), 2011 which mainly collects data on livings standards presents a direct link between a range of financial services such as use of SACCO, formal bank, and mobile money on household consumption which is used in this chapter as a measure of welfare. The two wealthiest quintiles were found to take a lion's share in the access to financial services. Access also appeared skewed towards urban households. The report further claims that usage of savings, insurance and mobile financial services can help households escape poverty and mitigate against risks hence lower their vulnerability to poverty.

4.2.3 Theories of consumption

Welfare estimation informs on policies relevant to boosting consumption and improved living standards. Such analysis draws heavily from the standard consumer theory drawn from the traditional demand theory where an individual's main objective is to maximize utility from the consumption of various goods and services subject to certain constraints. Due to the unobservable nature of utility, an observable measure of utility (consumption expenditure) is adopted as an indicator of individual welfare.

This is also informed by; Ravallion, 1992; Murkherjee and Benson, 2003 who view consumption expenditure as a smoother and less erroneous measure of welfare as compared to income besides providing a more accurate measure of the

standard of living. By duality, expressing consumer decisions in terms of expenditure (cost) functions simply provides a measure of the amount of money required to derive a given level of utility by a rational consumer hence a good money metric measure of welfare. FI is included as a treatment variable in a conventional welfare function to establish its impact in addition to other control variables.

Consumption forms a key component of aggregate demand. Branson (1989) projects consumption expenditure to be two thirds of the aggregate expenditure in the whole world. Consumption expenditure per adult equivalent is employed as a proxy for consumer income in line with Keynes (1936) absolute income hypothesis (AIH) which captures consumption as a function of disposable income (psychological law). Increase in income leads to an increase in consumption expenditure though not by as much as the increase in income (increases at a decreasing rate). The marginal propensity to consume (MPC) is lower than the average propensity to consume (APC) despite APC falling with income.

The relative income hypothesis (RIH) developed by Duessenbery (1949) to counter AIH posits consumption is not just a function of absolute income; rather it's also a function of the average income of the surrounding environment. This theory states that an individual's consumption level is influenced by the environment in which they stay hence citing interdependence in consumer behaviour rather than the independence of individual consumption argued by Keynes. Where consumption is high in the surrounding environment, there is a tendency for the people around to also consume more. Milton Friedman (1957) also another critic of Keynes AIH in his permanent income hypothesis (PIH) argued that consumption is a function of permanent income hypothesis rather than current income. Transitory changes in income therefore have no effect on

consumption. This is because consumers smooth their expenditure patterns through borrowing and lending.

Ando, Modigliani and Blumberg (1963) life cycle hypothesis (LCH) posits that consumption is a function of lifetime expected income. An individual's consumption is expressed as a function of the available resources, rate of return of capital employed (ROCE), spending plan and its age. The model also assumes constant prices, stable interest rates, and no bequest hence production is driven by savings. It's on the basis of this theory that age is seen to assume a quadratic relationship with income and consumption. Young people who are yet to attain a working age are said to earn little or no income at all. After they reach the working age, income is seen to rise with experience while it starts falling upon attaining the retirement age. This theory has however been criticized for assuming price stability and the absence of bequest since market prices are known to be volatile and bequests are common.

Decisions on consumer expenditure are influenced by a range of factors which include; income, price, education, occupation, age, household size, macro variables (Deaton, 2001; Zeldes, 2005; Eswaran and Kotwai, 2006) such as interest rates, capital gains, savings, unanticipated shocks, consumer attitudes, liquidity constraints, expectations among others. An individual decision on where to spend their income is informed by the objective of maximizing utility subject to the resource constraints. A rational consumer faced with a basket of goods will therefore go for that commodity bundle which yields maximum utility. The differences in the choices made can be traced back to the factors that characterize individual consumers. This knowledge is what shapes policy formulation on how welfare can be enhanced.

Modeling all the information about individuals is however not easy but every effort is made to capture the main influencing factors besides age, education,

marital status, gender, which profile the demographic structure of the sampled individuals. The geographical location is described as one very important variable in explaining welfare by Burney et al. (1991). This literature revealed that the urbanized population enjoys higher welfare since their consumption expenditure is considerably higher than that of the rural population.

Expenditure per capita is usually high for small families but keeps falling as the aggregate consumption expenditure is shared over a bigger family (Gupta, 1986). Lanjouwand Ravallion (1995) echoed these sentiments by providing evidence of a negative relationship between household size and consumption expenditure in developing countries. The middle age group is associated with a higher expenditure pattern but it evens out as they approach old age. The high middle age expenditure is explained by their desired to build their asset base through purchase of consumer durables in both rural and urban areas. Consumption expenditure also increases with level of education (Knight, Shi and Quheng, 2010).

Occupational differences when looked at from an agricultural, salaried and business perspective is said to have varying effects on consumption expenditure (Jain, and Tendulkar, 1973). Professionals and salaried people in both rural and urban areas are associated with a higher consumption expenditure pattern as compared to those in business and agriculture. The urban population involved in agriculture also has a higher expenditure pattern as compared to those in business due to their adoption of modern technology. Consumption expenditure among businessmen is however higher among the rural populace as compared to those involved in agriculture. This sectoral difference in consumption expenditure can be traced back to the level of FI of the household head. FI for business people is expected to lead to higher consumer welfare.

4.2.4 Overview of literature

The reviewed literature on the estimation of a welfare function revealed lack of a consensus on the real impact of FI on welfare. This raises the need to conduct more empirical based evidence on the impact in Kenya. It was found that the best way to understand the implications of FI on welfare is to look at the whole issue from a counter factual to establish what effect a lack of FI would have. The review also established that the impact varies with the individual financial products. Usage of savings product was found to have a positive significant and more consistent impact as compared to credit facilities.

The literature also discussed the effect of control variables in a conventional welfare model. Studies carried out in Kenya in rural Western province targeting female market vendors and rickshaw drivers using RCT reported conflicting impacts an indication that the impact of FI varies with a number of considerations. The twin tests yielded mixed evidence leaving the researcher with a number of questions as to the real effect of FI. This makes this study worthy to be investigated to respond to this research gap.

In terms of theoretical framework, the chapter reviewed several consumption theories including Keynes (1936) absolute income hypothesis, Duessenberry (1949) relative income hypothesis and Ando, Modigliani and Blumberg (1963) life cycle hypothesis. The absolute income hypothesis that places consumption as a function of disposable income was found to be suitable for this study with consumption expenditure per adult equivalent being employed as a proxy for consumer income.

The impact of FI is conceptualized in figure 4.1 to show its relationship with various outcomes.

Fig 4.1 Conceptual Framework
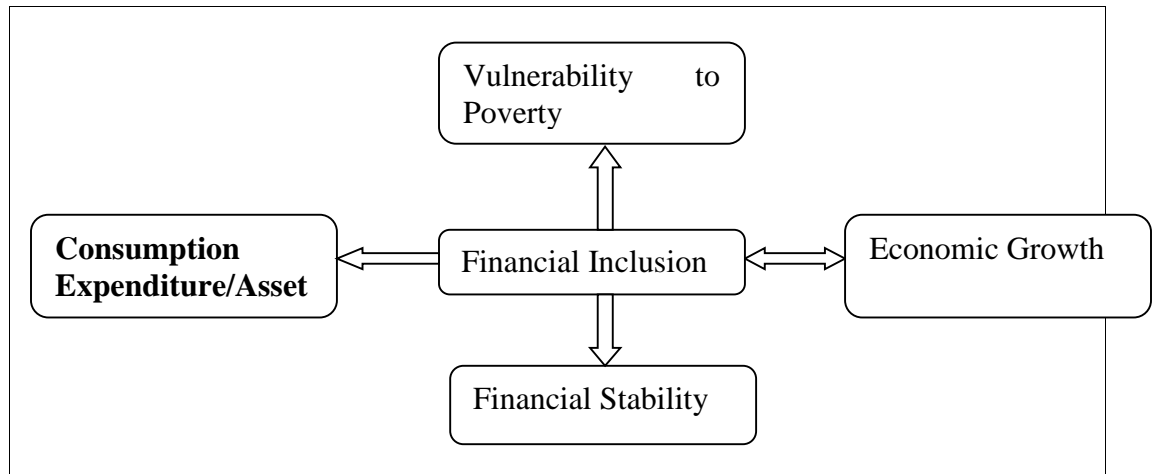
Source: Author, 2016

The impact dimension of FI is summarized from the various linkages. FI is associated with a number of welfare outcomes such as increased consumption expenditure as well as reduction in vulnerability to poverty. The linkages also indicate a bi-directional causality between FI and economic growth. This chapter mainly focuses on the impact of FI on household consumption expenditure per adult equivalent.

4.3 Theoretical/Empirical Framework

4.3.1 Welfare Determination

In the case of money metric measure of consumer welfare, the level of expenditure captures a consumers' willingness to pay based on the utility attached by each economic agent (consumer) to the expenditure item. Use of consumption per adult equivalent measure is borrowed from the welfare theoretical approach founded on the notion of rationality among economic agents. Economic welfare being latent is proxied using either income or expenditure data. Consumption per adult equivalent is considered to be fairly stable compared to household income which is prone to short term fluctuations.

Borrowing from the theory of consumer behavior (Keynes, 1936), an individual maximizes utility from the consumption of a combination of physical goods, Z_i and a range of financial services, FI_i (treatment variable) subject to their disposable income, Y^d. Since FI enhances pro poor growth, increase in consumption spending raises individual welfare through a reduction in poverty. Individual welfare captured by consumption per adult equivalent is therefore expressed as a function of a vector of regressors, X_i and financial inclusion (FI) which combines a portfolio of assets held by a household. The difference in the expected utility from the various alternatives is what determines the ultimate choice of financial services (McFadden's random utility (RUM)).

4.3.2 Empirical Model

Following Keynes (1936) consumption framework, the semi logarithmic consumption function can be expressed as follows:

$$\ln C_{i,t} = X'_{j,i,t} S + u_{j,i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where; C – Consumption in Ksh per adult equivalent; i – Household index; j – Group cohort; t – time dimension; X – Vector of regressors and u – Stochastic error term. The error term is assumed not to be homoscedastic but varies with cohort based on individual characteristics. Log consumption is considered to be a smoother measure of welfare as compared to income which is more seasonal (Murkerjee and Benson, 2003).

Let x_{ij} be a vector of household characteristics observed in survey j where j= Survey 1, 2 or 3 by household i, represented by identified cohort, c_{ij} represents household consumption per adult equivalent in survey j where j= Survey 1, 2 or 3 and z_{ij} represents the poverty line. The linear projection of household consumption in the three waves of FinAccess is expressed as;

$$C_{i1} = s_1' x_{i1} + v_{i1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

$$C_{i2} = s_2' x_{i2} + v_{i2}$$

$$C_{i3} = s_3' x_{i3} + v_{i3}$$

The error term $v_{i1}, v_{i2} \, and \, v_{i3}$ are assumed to follow a bivariate normal distribution characterized by a ... correlation coefficient and $\dagger_{v1}, \dagger_{v2} \, and \, \dagger_{v3}$ standard deviations.

The main assumption is that the sampled population in the three FinAccess survey datasets is identical. The beta parameters are estimated using GMM in a differenced consumption function where the lagged dependent values are used as instruments (Arrelano & Bover, 1995). The dynamic relationship of parameters in a consumption function is expressed as follows.

$$C_{it} = \Gamma C_{it-1} + x_{it}' s + v_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

Where i ranges from 1.....N households capturing the cross sectional dimension while t ranges between 1....T capturing the time dimension in the panel, c captures the endogenous variable of interest while x captures the vector of regressors. The error component structure is assumed to have zero mean and constant variance and is expressed as;

$$v_{it} = u_i + v_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

Where; v captures the idiosyncratic error term with zero mean while u captures the fixed effect. The GMM is applied to derive the parameters after which lagged values of the endogenous variable from an auxiliary regression are used as instruments in a dynamic model (Mckenzie, 2004). Estimating the dynamic model of welfare using grouped cohorts follows Verbeek and Vella (2005).

Dynamic estimation of panel data follows the GMM estimator and includes the lagged dependent variable as a regressor due to the small T and a large N panel. Where T is large, the dynamic panel bias is insignificant.

The Arellano and Bond framework is expressed in the following equation where current value of the dependent variable is a function of the previous value.

$$C_{it} = x_{it}' \mathsf{s}_1 + C_{i(t-1)} \mathsf{s}_2 + \mathsf{r}_i + \mathsf{v}_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

Use of a conventional linear panel data estimation yields biased and inconsistent estimates due to the endogeneity bias where time invariant unobservable components are related to the independent variables. This problem is overcome through instrumenting using second lags of the dependent variable, a process that yields a set of moment conditions expressed as;

$$E\left(\Delta y_{i(t-2)}\Delta \mathsf{v}_{it}\right) = 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(6)$$

$$E\left(\Delta y_{i(t-3)}\Delta \mathsf{v}_{it}\right) = 0$$

....

$$E\left(\Delta y_{i(t-j)}\Delta \mathsf{v}_{it}\right) = 0$$

The above process is what gives rise to the number of GMM instrumental variables depending on the T.

The specific model for the estimation of household welfare using consumption expenditure is expressed as;

$$\ln consumption_{ct} = \mathsf{r} + \mathsf{s}_1 \ln income_{ct} + \mathsf{s}_2 age_{ct} + \mathsf{s}_3 agesq_{ct} + \mathsf{s}_4 hhsize_{ct} + \mathsf{s}_5 hhsqrd_{ct} +$$
$$\mathsf{s}_6 femhhead_{ct} + \mathsf{s}_7 education_{ct} + \mathsf{s}_8 married_{ct} \mathsf{s}_9 residown_{ct} + \mathsf{s}_{10} socialcapital_{ct} + \mathsf{s}_{11} FI_{ct}$$
$$+ \bar{f}_{ct} + \bar{\}}_{ct} + \bar{\mathsf{x}}_{ct+} \bar{\mathsf{v}}_{ct} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(7)$$

The observed cohorts means ('bars on variables') are used to represent the population mean (Deaton, 1986). A lagged dependent variable is included in the model to capture the effect of past consumption spending on current consumption.

The FI variable measures both the single product (transactionary, credit, savings and insurance) and the composite measure of FI (IFI). Five autoregressive dynamic panels are estimated each representing a particular FI measure. The cohort panels used in the dynamic estimation represents all households since for each survey; the households are grouped in a cohort based on time invariant characteristics.

The money metric measure of welfare (consumption per adult equivalent) was expressed in logarithmic form to capture the elasticity. Alternative measures of welfare suggested in literature include; the asset index based on the assets owned by the households though it falls outside the purview of this paper.

Given the potential endogeneity bias between FI and per adult equivalent consumption expenditure, the variable bank trust (Bertrand, Mullainathan & Shafir, 2004) is included in the first step estimation to minimize biasedness arising from the residuals.

4.3.3 Description of variables and Apriori Expectations

Variable	Description	Expected sign	Studies reporting evidence of this sign
Welfare	Dependent Variable: Proxied by a money metric measure, that is, consumption expenditure per adult equivalent		
Log Income	A continuous variable capturing monthly per capita income of household head in Kshs	+	FSD, 2014; Cull, Robert, Tilman Ehrbeck, and Nina Holle, 2014; Beck et al, 2007; Demirguc-Kunt and Klapper, 2012
Age	Measured as a continuous	+	Honohan and King, 2012;

	variable from household response which forms the basis of forming cohorts		Allen et al., 2012
Age squared	A continuous variable with square age values	-	Honohan and King, 2012; Allen et al., 2012
Household head	A dummy variable taking the value of 1 representing male and 0 for female household head	-	Demirguc-Kunt, 2013
Household size	A continuous variable capturing the number of family members	+	Honohan and King, 2012; Allen et al., 2012
Household size squared	A continuous variable with squared household size variable	-	Honohan and King, 2012; Allen et al., 2012
Education	Number of schooling years; primary - 8; secondary - 12; tertiary - 14	+	Honohan and King, 2012; Allen et al., 2012
Urban	A dummy variable taking the value of 1 for urban and 0 for rural	+	McCullouch and Calandrino, 2003; Bidani and Richter, 2001; Dang and Raghbendra, 2009
Married	A dummy variable represented by 1 if household head is married and 0 otherwise	+	Zaman, 2004
Social capital	A binary variable represented by 1 if group member in a *chama 0 otherwise*	+	Rajan and Zingales, 2003; Mwangi and Shem, 2012
Financial Inclusion	Proxied using both single FI measures (transactionary, credit, savings and investment, insurance and pension) and composite FI indicator (IFI)	+/-	Diagne and Zeller, 2001; Bernerjee et al., 2009, Honohan and King, 2012; Demirguc-Kunt et al., 2015; Jovanovic et al., 1990
Financial Literacy	A dummy variable taking the value of 1 if financially literate 0 otherwise	+	AFI, 2014; Agrawal, 2008
Own Residence	A dummy variable taking the value of 1 if dwelling unit is owned and 0 otherwise	+	Dercon and Krishnan, 2004; Jalan and Ravallion, 1998
Occupation	A 1 0 dummy variable representing sector where household head works; employed, agriculture or business	+/-	McCullouch and Calandrino, 2003; Larson and Plessman, 2002

Bank Trust	A dummy variable taking the value 1 if perception about the bank as being trustworthy is high 0 otherwise	+	AFI, 2014

Source: Author, 2016

To control for the unobserved heterogeneity, we included; fc Cohort fixed effect, } the fixed effect for geographical location and ^{x} the fixed effect for the survey year shocks such as technological change

4.3.4 Data

The cohort panel approach applied in this study exhibits superior methodological advantages in dynamic estimation compared to cross sectional or time series data estimation based on a full sample. This technique of forming panels using repeated cross sectional survey data is used to overcome scarcity of panel data in developing countries. Repeated cross sectional surveys are less prone to attrition and non-response bias (Meng et al. 2014). Subgroups were formed based on time invariant characteristics namely; gender, place of residence and birth year from the four FinAccess survey datasets (2006, 2009, 2013 and 2016) totaling 504 observations.

The pseudo panel targeted households born between 1934 and 1997. The 2006 survey includes individuals aged 18 to 62, the 2009 survey, 21 to 65 (3 years older), the 2013 survey, 24 to 68 (6 years older after 2006) and the 2016 survey, 27 to 71 year olds (9 years older after 2006). The first observation, which is cohort one therefore captures individuals aged 18 to 22 in 2006, 21 to 25 in 2009, 24 to 28 in 2012 and 27 to 31 in 2016. This methodological framework by Deaton, 1986 was also used by Ackah et al. (2007) in Ghana. The short age bands may however lead to fewer respondents in a cohort despite the large cross section dimension. Large age cohort bands may also not be good since they reduce the cross section dimension.

Gender variable is disaggregated to generate panels for males and females respectively while the geographical aspect is captured by the seven regions (44 counties), formerly provinces with the exception of North Eastern region which has 3 counties namely; Mandera, Wajir and Garissa for missing in the 2013 wave due to logistical constraints. A key consideration in cohort analysis is the tradeoff between the number of cohorts and number of observations for each cohort. McKenzie (2004) posits that a large number of cohorts minimize errors associated with small samples.

Deaton (1986) and Bourguignon, Goh and Kim's (2004) recommends the use of a cohort mean based approach to track the effect of FI on the household welfare. Cull et al. (2013) posits that the channel where access to financial services influence income is at least as plausible as the likely mechanism where passing a threshold level of income opens up the opportunity for an individual to access formal banking services. The main problem in estimating a welfare function is endogeneity. This problem is associated with omission of variables, measurement errors as well as simultaneity bias. Failure to control for this may lead to the rejection of a true null (Type I error) or failure to reject a false null (Type II error). The reviewed literature pointed to a bidirectional causal relationship between the FI and welfare which may lead to wrong inferences if the endogeneity problem is not corrected.

The study employed the cohort approach discussed in chapter three due to its methodological advantages in dynamic estimation. The estimation is however based on the last three FinAccess survey datasets (2009, 2013 and 2016). Despite the significant role played by the 2006 survey data, the dataset was omitted since this study rides on the money metric measure of welfare (consumption expenditure) which is missing in the 2006 FinAccess survey data. The year

however offers a reference point since it's the first time when the FinAccess round of surveys was first implemented in Kenya.

The observed cohort means represent the population mean (Deaton, 1986). A key consideration in cohort analysis is the tradeoff between the number of cohorts and number of observations for each cohort. McKenzie (2004) posits that a large number of cohorts minimize errors associated with small samples.

The subgroup means were tracked over time using the repeated cross sections (Deaton, 1985) to inform on the dynamic transformation of both FI and household welfare. This method of estimating using subgroups is similar to the method of using instrumental variables to represent a certain phenomenon where the group indicators serve as instruments. Verbeek-Nijman (2005) estimator yields the best estimators when cross sections are fewer while Deaton's (1986) estimator is recommended for larger surveys. Verbeek and Vella (2005) justify the use of fixed effects estimators in pseudo panel estimation for as long as a lagged dependent variable is included. Pooled estimation using the full sample leads to biased estimates since it's not able to control for unobserved heterogeneity since it assumes household independence in the repeated cross sections.

4.4 Discussion of Results

This section first interrogates the descriptive statistics of the variables used in the analysis of FI impact on household welfare. This includes measures of central tendencies, dispersion and cross tabulations of key variables.

4.4.1 Descriptive Statistics

Table 4.1 provides a snapshot of the means and standard deviation of variables relevant to the estimation of a welfare function. A descriptive statistics table helps inform on the distribution of the variables, their frequencies and nature, that is, whether the variables are continuous or categorical. Consumption per adult

equivalent is expressed in Kenya shillings while education is expressed both in levels as well as number of schooling years. Appendix Tables 4.2 presents the level of consumption expenditure by survey year while Appendix Table 4.3 presents the aggregated distribution of income by education.

Table 4.1 Summary Statistics on Household Characteristics

Variable	Observations	Mean	Std. Dev.	Min	Max
Household size	378	5	2.81	1	20
Age	378	43	13.16	18	68
Education	378	8	4.76	0	14
Female hh head	378	0.26	0.44	0	1
Urban	378	0.40	0.49	0	1
Financial literacy	378	0.78	0.41	0	1
Social capital	378	0.46	0.50	0	1
Consumption exp	378	6810	19864	0	263933
Gross income	378	5133	13918	0	166668
Own residence	378	0.65	0.48	0	1
Married	378	0.66	0.47	0	1
IFI	378	0.12	0.12	0	0.72
Credit	378	0.11	0.31	0	1
Transactionary	378	0.63	0.48	0	1
Savings	378	0.22	0.41	0	1
Insurance	378	0.24	0.43	0	1
Agriculture	378	0.37	0.48	0	1
Employed	378	0.34	0.47	0	1
Business	378	0.11	0.32	0	1

Source: FinAccess survey 2009, 2013 & 2016

The descriptive statistics table represents the demographic profile of the 378 observations from the 2009, 2013 and 2016 FinAccess surveys. Year 2006

provided the first financial access survey data for Kenya forming the base year for the analysis. The number of schooling years averaged 8 an indication that a majority of the sampled population are primary completed. The 0.40 mean in the urban variable signify dominance by rural respondents while the 0.66 mean in the married category imply that a majority are married. The mean household size for the tracked cohorts stood at 5 persons. In a bid to understand the profile of sampled households, the study further analyzed the main economic activities on the basis of main income source. The main economic activity of the household head is represented in Appendix Table 4.4.

4.4.2 Consumption Expenditure across the Country

Cumulatively, residents of Nairobi region in aggregate terms spend relatively more on consumption (Ksh 50,000 per month) compared to other regions probably due to the high number of well-paying income generating opportunities available plus most of the highest paid employees are situated in Nairobi. Fig 4.6 represents the regional distribution of consumption spending across the country over time. Geospatial mapping of the consumption points is done using the GPS coordinate for the sampled households. This is presented in Appendix Table 4.5

Fig 4.2: Consumption Expenditure across the Country
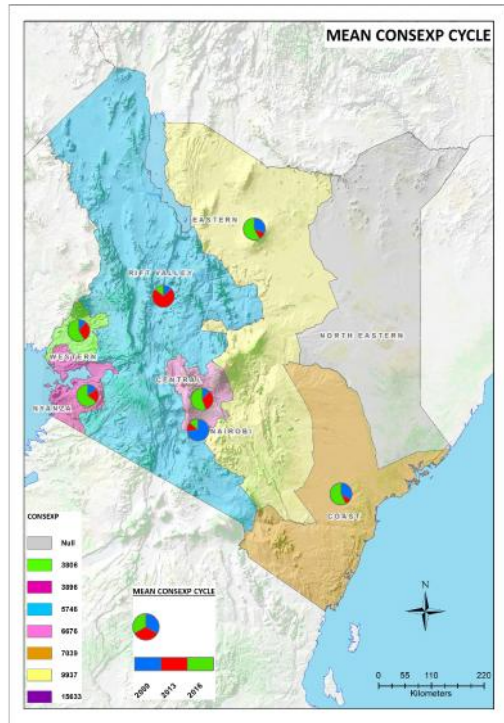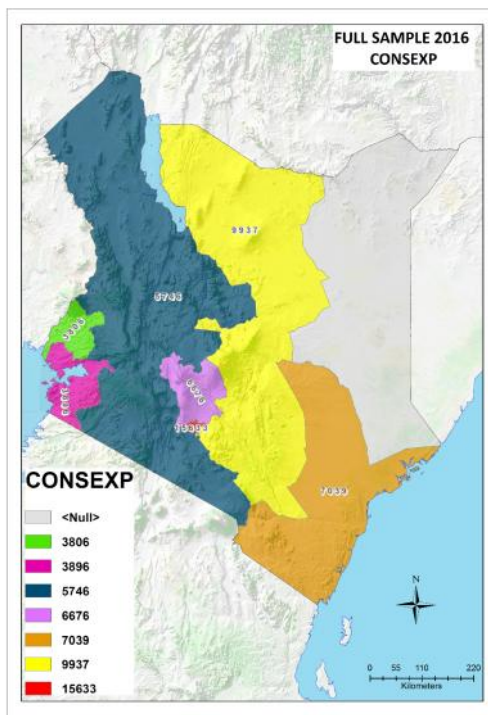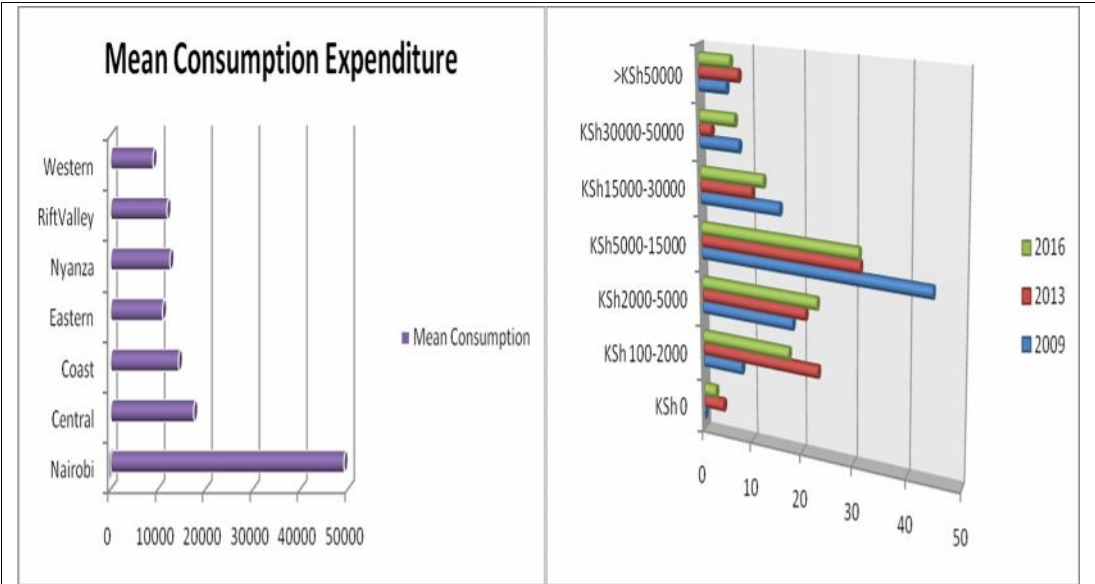
Source: Author, 2016

Fig 4.2 represents the average consumption expenditure for the seven regions in Kenya based on the 378 cohorts for the 2009, 2013 and 2016 survey. North Eastern region is excluded due to missing 2013 data. Western region trails other regions with its average consumption expenditure per month falling below Ksh 10,000. This finding appears to corroborate OPHI (2016) findings based on the KDHS 2013-2014 data where Western region recorded dismal performance in terms of poverty incidence while Nairobi outshined all other regions. Urban households stand a higher chance of enjoying improved living standards as compared to rural households who face deprivation from many fronts.

An interesting observation from the expenditure distribution by survey year is that in 2009, everyone experienced expenditure in excess of Ksh 100. However as time progressed, the percentage population spending between Ksh 0 - 100 rose sharply in 2013 before stabilizing in 2016. A majority in 2009 spent an average Ksh 30,000 - 50,000 while in both 2013 and 2016 consumption expenditure averaged Ksh 5,000 - 15,000. The inscribed pie charts present the progression of per adult equivalent consumption expenditure over the three waves.

The geospatial maps show that consumption expenditure has been trailing in Western region but is highest in Nairobi region. In aggregate terms, consumption expenditure has improved in 2016 (green shading) in the pie chart.

4.5. Econometric Results and Discussion

This section delves into the impact of FI on consumption per adult equivalent among Kenyan households. The indirect channel of financial development recognizes the pivotal role played by economic growth in reducing poverty and income inequalities. The usefulness of FI in improving welfare largely depends on the circumstances surrounding the uptake of financial products as well as the degree of financial literacy. The issue as to whether growth is pro-finance emerged

justifying the inclusion of per capital income (money income) as one of the regressors in a FI model to establish causality.

The difference in the estimated coefficients is wider when Random effects (RE) estimation is not efficient and smaller when it's efficient. Fixed Effects (FE) model is consistent when the individual effects are correlated with other regressors. However if that assumption doesn't hold, both FE and RE are consistent even though RE is more efficient. A Haussmann test on each of the FI channels selected FE estimation for the portfolio usage (IFI) and transactionary channel and RE for savings, insurance and credit channels. Given that individuals assign utility differently to each of the financial products, this section employed five autoregressive dynamic panel data models (Arrelano and Bover, 1995) of consumption expenditure per adult equivalent to analyze the impact of transactionary, credit, savings, insurance and IFI) in Kenya. The estimation is carried out both before and after controlling for the unobserved heterogeneity from survey year and region specific effects.

4.5.1 Diagnostic Tests

The main weakness associated with pseudo panel data estimation is that it diminishes the efficiency of the cross sectional dimension while at the same time introducing heteroscedasticity in the time dimension (Deaton, 1986). Specification errors, measurement or omission of variables could also trigger bias in consumption expenditure elasticities. This is partly solved through differencing of the individual panels. Any heteroscedasticity inherent in the model is corrected by decomposing the data into between and within dimensions and computing the exact heteroscedasticity on both dimensions. Failure of repeated cross sectional data to track same individuals over time, limits computation of mean deviations over time. Conventionally, the Breusch Pagan test is conducted to check if the model is suffering from heteroscedasticity. Under the two step robust procedure,

the standard covariance matrix is robust to panel specific autocorrelation and heteroscedasticity. Use of robust standard errors was also applied to correct for potential correlation between household errors over time.

Use of orthogonality conditions in GMM estimation facilitates efficient estimation in the presence of heteroscedasticity of unknown form. The orthogonality conditions assume that all instrumental variables are orthogonal to the errors hence uncorrelated with errors in the original regression. The instrumental variable approach is also unbiased since the reported standard errors allow for asymptotically correct inference in the presence of autocorrelation of almost any form (Roodman, 2006). Testing for serial correlation was done using the autoregressive test for autocorrelation of residuals. The Arrelano & Bond AR (1) test reported Z = -0.57 with Pr > Z = 0.5656. This rules out the problem of serial correlation.

The instruments used in this chapter were subjected to the Sargan-Hansen hypothesis test to assess whether they are jointly exogenous. The dependent variable (per adult equivalent log consumption expenditure) is specified in lagged differences. Since focus is to establish the dynamics of consumption expenditure, the lagged dependent variable in first differences is instrumented using the second lag of per adult equivalent consumption expenditure. The instruments set include survey year dummies and other individual characteristics. The autoregressive test for autocorrelation is used to check for the presence of serial correlation among residuals.

A test for the validity of the instruments was conducted Hansen (1982) to establish if the model is over identified. The test for over identified restrictions (H0: Exactly identified) reported a non-significant test, (Hansen's J X^2(5) = 3.71002 (P = 0.5919)) an indication that the instruments used were valid. An exactly identified model also rules out the presence of covariance between consumption expenditure

and the error term in the second step of the GMM estimation hence there is significant exogenous variation in FI. Two step GMM estimated coefficients are unbiased and able to correct the variance covariance matrix for both heteroscedasticity and autocorrelation.

The model for estimating the effect of IFI on consumption expenditure per adult equivalent was also subjected to the multicollinearity test. Multicollinearity which is a violation of Ordinary Least Squares (OLS) is attributed to the correlation of explanatory variables in a model. An inflation of the variance of OLS estimates occurs where the multicollinearity score is high, leading to a reduction in the t-statistic. This leads to Type-2 error where the researcher ends up accepting the null hypothesis which otherwise ought to have been rejected. This may also lead to indeterminate parameter estimates and infinite standard errors. This is summarized in Table 4.5.

Table 4.5: Multicollinearity Test

Variable	VIF	1/VIF
L1.lnexp	30.82	0.032452
lninc	90.25	0.01108
age	516.65	0.001936
agesqrd	174.7	0.005724
hhsize	34.49	0.028996
hhsizesqrd	12.28	0.081414
femhhhead	2.58	0.38815
educ	5.57	0.179455
married	5.23	0.191147
mem_group	6.67	0.149886
resid_own	5.25	0.190493
fcredit	1.56	0.64151
ehat	31.2	0.032055
Central	3.94	0.253558
Coast	3.97	0.25177
Eastern	4.07	0.245981
Nyanza	3.82	0.261791

R.Valley	2.82	0.354758
Western	2.96	0.337568
Agriculture	3.87	0.258615
Employed	3.47	0.28846
Business	1.85	0.541982
2013	4.69	0.213326
Mean VIF	41.42	

Source: Author, 2017

Multi-collinearity in a model is associated with those variables whose VIF values exceed the mean VIF value. The 41.42 mean Variance Inflation Factors (VIF) which also determines the speed at which the variance and covariance increase ruled out the problem of perfect multicollinearity. This is because the VIF for most variables except age and age squared fell below the mean VIF in the model.

Financial inclusion is considered to be potentially endogenous either due to omission of variables, measurement errors or simultaneity bias (Woldridge, 2012). Econometric estimation using endogenous regressors could bias the results leading to wrong inferences. The Durbin Wu-Haussman test was conducted by first running a FI model on the four transmission channels (transactionary, credit, savings, insurance) as well as the aggregated FI channel (IFI). The residuals for each FI channel were predicted and included in a reduced form equation as regressors. Wooldridge (2012) suggests that failure to reject the null hypothesis (exogeneity assumption) rules out the presence of endogeneity bias. Table 4.6 provides a summary of the endogeneity test results.

Table 4.6: Durbin-Wu-Haussmann Test for Endogeneity

Dependent Variable	(Transactionary)	(IFI)	(Credit)	(Savings)	(Insurance)
Log income	-12.97	-45.10	-28.88	32.54	-8.06
	(31.41)	(117.3)	(92.76)	(222.5)	(26.24)
Age	0.52	0.67	0.9	0.68	0.48

	(0.67)	(0.52)	(1.33)	(1.65)	(0.52)
Agesqrd	0.03	-0.00	-0.02	0.09	0.01
	(0.27)	(0.19)	(0.40)	(0.71)	(0.14)
Hhsize	-0.00	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Hhsizesqrd	-0.14	-0.07	0.33	-0.00	-0.15
	(0.42)	(0.38)	(1.80)	(1.29)	(0.25)
Femhhhead	0.01	0.00	-0.02	-0.00	0.07
	(0.03)	(0.02)	(0.09)	(0.07)	(0.01)
Education	0.26	0.27	0.70	-0.10	0.29
	(1.05)	(0.80)	(2.53)	(2.92)	(0.62)
Married	0.22	0.43	1.06	0.85	0.03
	(1.90)	(1.15)	(2.77)	(4.97)	(1.43)
Distance	0.73	0.58	0.96	0.36	0.42
	(1.49)	(0.98)	(2.51)	(2.15)	(0.59)
Bank trust	0.23	0.33	0.91	0.51	0.30
	(1.19)	(0.75)	(2.85)	(3.24)	(0.53)
Social capital	-1.43	-1.25	-3.01	-1.99	-0.86
	(2.70)	(2.12)	(8.19)	(10.79)	(1.59)
Fin literacy	13.18	43.99	21.45	-34.50	9.67
	(32.74)	(116.3)	(70.22)	(236.7)	(25.57)
Predicted residuals	3.71	2.96	1.33	1.65	3.78
	(6.85)	(5.56)	(11.05)	(19.25)	(4.20)
Observations	378	378	378	378	378

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2017

Since the predicted residuals in the structural equation are not statistically significant, we fail to reject the null hypothesis. This rule out the need to instrument the various FI channels since FI is exogenous. This was followed by a panel estimation of the impact of FI on household welfare from a per adult

equivalent consumption expenditure approach. As mentioned earlier, fixed effects estimation of panel data may lead to Hurwicz/Nickel bias (Wooldridge, 2012) when the data has a short time dimension and many cross sections. FE estimation ends up underestimating the autoregressive coefficient leading to a bias of order 1/T. Arrelano and Bover (1995) therefore recommends the use of a system GMM estimation to carry out an autoregressive dynamic estimation of the model parameters. The dependent variable is log consumption expenditure per adult equivalent while the independent variables include the household characteristics.

4.5.2 Static Analysis of FI impact on Consumption Expenditure

A GMM estimation which follows the two step procedure established varying effects of the various categories of FI on consumer welfare. Linear static welfare is estimated using five transmission channels based on cohort data. Pooled estimation from the full sample data assumes that households in the repeated cross sections are independent which may not be the case due to unobserved heterogeneity. The essence of panel estimation is to remove those fixed effects through differencing. The region fixed effects were controlled for to analyze how regional peculiarities affect household welfare.

OPHI (2016) already predicted glaring disparities in household welfare across the eight regions in Kenya. The only weakness associated with a static model is that it ignores the impact of the lagged dependent variable which tests for the presence of adaptive expectations hence the need to estimate an autoregressive dynamic panel with the lagged dependent variable as a regressor. The results for static welfare estimation are captured in Appendix Table 4.7.

4.5.3 Linear Dynamic Estimation

This section mainly focuses on the dynamic estimation of the linear model to assess how FI accounts for differences in household consumption expenditure over

time. The lagged dependent variable in this case reflects the welfare of the representative household in the cohort for the previous survey. This is motivated by the work of Deaton (1992) which introduced time non separable preferences to inform on habit formation among households where utility derived from present consumption is expressed as a function of both present and past consumption behaviour.

Policies formulated to tackle FI or consumption usually operate with a lag hence may take time before their full effects are realized. Both RE and FE estimators for the five autoregressive dynamic models were generated and subjected to Haussmann test which established that estimating per adult equivalent consumption expenditure along the various FI channels would require a mix of both RE and FE as guided by Haussmann so at to yield consistent estimators. RE is superior to FE in terms of efficiency where the individual effects are uncorrelated with regressors.

The estimated model also controls for region specific effects based on the geographical location of a household which is assumed to exhibit certain peculiarities which could have an effect on welfare. Each FI autoregressive dynamic model presents two alternative specifications to compare the effect of FI on consumption expenditure before and after controlling for the region specific effects. Econometric estimation findings from the five autoregressive dynamic models for transactionary, credit, savings, insurance and IFI using log consumption expenditure (Ln Exp) as the dependent variable are presented in Table 4.8.

Table 4.8 Dynamic estimation of Consumption Expenditure

Dependent Variable	(Ln Exp) IFI	(Ln Exp) FE	(Ln Exp) Transctn	(Ln Exp) FE	(Ln Exp) Credit	(Ln Exp) RE	(Ln Exp) Savings	(Ln Exp) RE	(Ln Exp) Insurance	(Ln Exp) RE
FI Measure	5.80*	6.04*	1.77	1.73*	-0.44	-0.68	3.40	2.11	1.46	0.88
	(3.40)	(3.60)	(1.23)	(0.89)	(1.52)	(1.30)	(2.45)	(1.69)	(1.33)	(1.41)

Lag lnexp	-0.17	-0.18	-0.22	-0.46**	0.11*	0.02	0.03	0.02	0.11	0.01
	(0.14)	(0.19)	(0.16)	(0.20)	(0.07)	(0.09)	(0.12)	(0.10)	(0.07)	(0.08)
Log income	0.27**	0.33**	0.36***	0.41***	0.68***	0.69***	0.40*	0.49***	0.54***	0.55***
	(0.13)	(0.16)	(0.12)	(0.13)	(0.10)	(0.11)	(0.22)	(0.16)	(0.13)	(0.17)
Age	0.23	0.34	0.67*	0.76**	0.01	-0.01	0.08	0.10	0.08	0.08
	(0.36)	(0.41)	(0.40)	(0.37)	(0.11)	(0.11)	(0.13)	(0.11)	(0.10)	(0.10)
Agesqrd	-0.00	-0.00	-0.01	-0.01**	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hhsize	-0.21	-0.13	0.01	0.13	-0.21**	-0.15	-0.29*	-0.22*	-0.23**	-0.16*
	(0.17)	(0.21)	(0.16)	(0.17)	(0.10)	(0.11)	(0.16)	(0.13)	(0.10)	(0.10)
Hhsizesqrd	0.01	0.01	-0.00	-0.00	0.01*	0.01	0.01	0.01	0.01*	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Femhhhead	1.63	1.16	1.22	0.20	0.40	0.37	0.16	0.08	0.08	0.05
	(1.10)	(1.21)	(1.34)	(1.33)	(0.49)	(0.46)	(0.49)	(0.37)	(0.38)	(0.37)
Education	1.06***	1.19***	1.04**	1.04**	0.70**	0.74***	-0.10	0.34	0.22	0.56
	(0.37)	(0.41)	(0.41)	(0.42)	(0.29)	(0.27)	(0.67)	(0.44)	(0.47)	(0.37)
Married	0.36	0.10	0.27	-0.35	0.29	0.15	0.10	-0.03	0.07	-0.11
	(0.54)	(0.62)	(0.61)	(0.65)	(0.41)	(0.45)	(0.48)	(0.38)	(0.34)	(0.33)
Social capital	-0.32	-0.522	-0.54	-1.02**	0.09	-0.00	-0.18	-0.08	0.14	-0.10
	(0.34)	(0.41)	(0.45)	(0.48)	(0.32)	(0.37)	(0.36)	(0.31)	(0.25)	(0.24)
Ownresidence	0.32	0.33	0.40	0.34	-0.09	-0.18	-0.21	-0.13	-0.03	-0.00
	(0.54)	(0.62)	(0.59)	(0.60)	(0.30)	(0.38)	(0.46)	(0.42)	(0.30)	(0.38)
Agriculture		0.86		1.08		0.52		0.83		0.82*
		(0.84)		(0.79)		(0.57)		(0.52)		(0.44)
Employed		0.63		1.84**		0.53		0.64		0.62
		(0.92)		(0.91)		(0.46)		(0.49)		(0.38)
Business		0.60		1.81*		0.86		0.30		0.78
		(1.05)		(0.96)		(0.72)		(0.96)		(0.68)
Central		-		-		-0.54		-0.98		-1.01
						(0.52)		(0.65)		(0.78)
Coast		-		-		0.03		0.56		-0.03
						(0.52)		(0.71)		(0.50)
Eastern		-		-		-0.37		-0.41		-0.59
						(0.53)		(0.62)		(0.58)
Nyanza		-		-		0.02		-0.03		-0.52
						(0.60)		(0.64)		(0.82)
RValley		-		-		-1.00		-0.76		-1.50*
						(0.62)		(0.74)		(0.82)
Western		-		-		-0.15		-0.46		-0.65
						(0.58)		(0.69)		(0.87)
2016	-1.19*	-1.42**	-0.58	-1.027**	0.17	0.07	-0.94	-0.60	-0.13	-0.15
	(0.70)	(0.69)	(0.50)	(0.51)	(0.23)	(0.25)	(0.85)	(0.57)	(0.34)	(0.35)

Observations	252	252	252	252	252	252	252	252	252	252
No. of cohort	126	126	126	126	126	126	126	126	126	126
Region RE						YES		YES		YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2017

Consistent with economic theory, FI is positively correlated with per adult equivalent consumption expenditure especially in the transactionary and the IFI channel, Amidzic et al., (2014); Demirguc-Kunt and Klapper (2012); Beck et al., (2004); Sarma (2008); Honohan (2008). Users of transactionary financial products from the formal finance channel and those with a portfolio of financial services reported a 6.04 and 1.73 positive and significant relationship with consumption expenditure at 10 percent confidence level. This means that a 1 percent increase in the IFI and transactionary product usage raises consumption expenditure by 6.04 and 1.73 percent respectively.

Controlling for the unobserved heterogeneity changed the coefficients only marginally. Households should however choose carefully the combination of financial products in their portfolio so as to only go for that combination that yield maximum utility. Transactionary products are considered to be more convenient in facilitating trade since they are dominated by mobile bank accounts whose mode of transaction is swift and timely. The significant role played by FI as a transactionary tool to facilitate payments is also echoed by Levine (1993); Rajan and Zingales (1998).

Relying on the traditional banking platform largely rationed out the rural population limiting their ability to improve welfare. Most Kenyans today use mobile financial services almost on a daily basis raising its impact as compared to the use of non-mobile money related financial services such as banks done mostly on a monthly basis. The use of mobile platform which uses a shared infrastructure often enjoy equally by all whether in the rural or urban areas offers a solution to

cream skimming often practiced by the traditional lending channels. These mobile bank accounts include; KCB M-PESA, MCo-op Cash and M-shwari but excludes Equitel since at the time of data collection it had not been launched.

Being the biggest component of household ownership of transactionary products, mobile bank accounts multiplier effect on welfare on Kenya's population is immense. This also shows that the gains from digital financial services and especially those rolling on a mobile platform are fast. This huge contribution on welfare probably accounts for the positive and significant coefficient in the IFI variable. These findings supports the literature on the operation of the growth led finance hypothesis in Kenya as postulated by Robinson (1952); Lucas (1988); Demetriades and Hussein (1996).

The impact of savings deposit instruments and insurance product which currently average 32.43 percent in the formal sector on household welfare exhibited a positive relationship both before and after controlling for sector and regional specific effects. However the coefficient is not significant in explaining welfare. The impact of savings on economic growth is usually transmitted through technical progress, investment growth size of capital stock and stock of human capital in line with the endogenous growth models prediction by Arrow (1962); Romer (1986) and Lucas (1962). A disaggregation of savings product usage revealed that it was dominated by mobile savings.

The line showing the difference between holding mobile money as a transactionary product and holding it as a savings product is so thin hence could have affected the sign and the coefficient of savings. To a large extent, holding savings in a mobile money account ends up translating to consumption. The theory of consumer behaviour posits that consumption is inversely related to savings since the marginal propensity to save falls with increase in the marginal propensity to consume. The second largest component of savings from the FinAccess data is

bank savings which again closely resembles current accounts in banks mainly used for transactionary purposes. The savings variable may therefore have picked the transactionary motive of households leading to a positive but non-significant effect.

The weak relationship between insurance and pension product usage in the autoregressive dynamic panel could be rationalized by the domination of NSSF product in the insurance and pension category. Pension products including NSSF will most likely deliver, it's intended objective to retirees. Given that majority of the sampled population falls below the retirement age, the welfare gains from such financial product holding could therefore be insignificant in the short run. It's also understood that most pension funds follow a pooling model when choosing investment options which makes them settle for long term investment facilities with longer maturity periods hence may not deliver immediate welfare gains.

The effect of NHIF which accounts for the second largest share in insurance and pension product usage may also not be very significant since despite denting a household monthly income, benefits are only derived when one falls sick. This insurance component mainly affects only 34 percent of the sampled populations who fall in the employed category whose contributions are statutorily deducted from their salary and another smaller segment of non-employed who probably service it voluntarily. Most rural households some of whom pay directly from their informal incomes take long before they visit health centers where the insurance fund can be utilized without paying.

The insurance product is usually embraced due to its ability to cushion against risks from unexpected occurrences but only benefits the insured when the risk occurs. Given this development, the real effect of insurance product holding on welfare may not be significant especially in the short run since the insurance industry operates under the indemnity principle whose sole objective is to restore

the household back to their initial position before the risk occurred. FSD (2016) shows that 32 percent of Kenyans service their insurance obligation in cash while 45.9 percent have their premiums paid directly by employers from the salary or through a check off system. Those who use mobile financial services to pay insurance premiums averaged 15.7 percent.

The effect of credit uptake among households in this model appears to contradict theory which associates credit usage to positive welfare effects. This is because besides the coefficient being non-significant, the coefficient took a negative sign implying that uptake of credit products does not yield the desired results at the end of the day but only aggravates the plight of the poor households. Buera et al. (2012) predicted that the impact of credit on consumption expenditure averages 10 percent. Usage of credit facilities from the formal strand has for a long time been dominated by bank loans, credit cards and overdraft facilities. It will be interesting to see the contribution of DTM and DTS loans on gross loans which for now remain relatively low. The inverse relationship between credit and welfare could be attributed to indiscriminate borrowing arising from the increased aggression on the part of service providers who want to maintain high sales volumes to increase their networth.

In most instances, lenders decision to extend credit to a household is based on a situational analysis only at the point of application. Moral hazard could also pose a serious problem in the credit markets since financial institutions hardly bother to know how beneficiaries conduct themselves once their loan has been approved. It's possible that part of the extended loan is diverted from its intended objective hence lowering the expected utility. The beneficiaries could be also suffering from poor resource management hence end up spending the loans only to smooth consumption at the expense of investment smoothing.

Given that credit recorded a mere 14 percent uptake, its effect on overall welfare could be diminished by the low figures. Beck[17] (2016) recognizes the need to target the increased access to both credit and insurance services more closely through improved institutional framework to ensure a level playing field for all players. This would have positive welfare effects at individual level and also guarantee positive aggregate growth effects. The breakdown of loans indicates that despite banks being the main source of loans, its share remains low. FSD (2016) report indicates that day-to-day household needs (recurrent expenditure) accounts for the highest percentage use of credit services (57.3 percent) followed by education (21.5 percent) and business (15.8 percent) in that order. Loans for agriculture take a paltry 11.5 percent.

This paints a dark picture on the potential of using credit instruments to improve household welfare given that loans for productive activities such as supporting business and agriculture only average 27.3 percent yet 75 percent of Kenya's total population rely on agriculture for living. The analysis further established that only 1.4 and 2.0 percent of households in rural and urban areas respectively borrowed from banks/SACCO to mitigate against major shocks in the last two years (FSD, 2016). Households will therefore not embrace credit facilities from banks to smoothing consumption but would rather apply other mechanisms such as liquidating assets. This explanation offers insight on why the coefficient for savings is positive while that of credit is negative and insignificant.

Similar to transactionary usage, IFI was found to be positive and significant in explaining household welfare at 10 percent confidence level. Given that this variable aggregates portfolio holding of the various categories of FI, its coefficient appear to have picked the dominant effect of transactionary product holding which average 77 percent in the data. This result is consistent with Sarma (2008) finding

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[17] Beck (2016). Financial Inclusion in Africa

of a strong positive relationship between FI and welfare. The big question is on how policy makers can improve the significant relationship between the IFI and transactionary financial product holding.

One way would be to action the government to lower the transaction fees which appear to neutralize gains from the improved payment systems given that mobile and bank accounts dominate the transactionary channel. A single money transaction for example on a mobile platform is often taxed twice for both the sender and the receiver. If these costs can be reduced, the welfare gains from innovations in payment systems could have a bigger multiplier effect given the high uptake of transactionary financial services.

The lagged consumption expenditure among holders of transactionary products at 5 percent confidence level led to a significant reduction in household welfare. The operation of the permanent income hypothesis posits that consumption is maintained at a constant level in all periods regardless of the fortunes. Households who recorded higher consumption patterns in the past are likely to experience lower welfare levels in the future. The lagged consumption expenditure variable was also significant among holders of credit products before controlling for sector and region specific effects. Use of lagged consumption expenditure in a pseudo panel however poses methodological challenges since the households being tracked over time are not the same. However, use of the representative household in the cohort helps correct the problem since the same representative household is used even in previous surveys in the cohort.

Per capita income among Kenyan households was found to have a strong positive and significant relationship on welfare at 10 percent for both single product usage as well as portfolio holding. This result reinforces the theory of consumer behaviour which associates increase in consumption to growth in per capita income. Households who enjoy higher income levels reported higher consumption

levels. Households increase in level of education also exhibited a strong positive and significant relationship on welfare among holders of IFI, transactionary and credit products. Group membership which was used to factor in the role of social capital was found to impact negatively on welfare among holders of transactionary financial products.

The analysis is extended in the next section by interacting a household's highest education level attained with the financial product usage to establish the conditional effects of FI on welfare. Four autoregressive dynamic panels of consumption per adult equivalent were estimated with transactionary-education (no education, primary, secondary and tertiary) interaction effects. The results for each education level are presented in pairs to capture the coefficients before and after controlling for region fixed effects in a random effects (RE) model. This is presented in Table 4.9.

Table 4.9 Consumption function with Transactionary-Education interaction

Dependent Variable	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)
	Transaction	RE	Transaction	RE	Transaction	RE	Transaction	RE
Transactionary FI	2.861*	2.488**	-1.885	-0.428	1.747**	2.024***	1.658	1.342
	(1.673)	(1.046)	(1.815)	(1.836)	(0.864)	(0.753)	(1.591)	(1.166)
Lag lnexp	-0.264	-0.57***	-0.249**	-0.360*	-0.229*	-0.366**	-0.289*	-0.52**
	(0.196)	(0.202)	(0.126)	(0.201)	(0.126)	(0.177)	(0.173)	(0.224)
Log income	0.345**	0.453***	0.568***	0.487***	0.571***	0.556***	0.388***	0.401**
	(0.156)	(0.136)	(0.133)	(0.140)	(0.0987)	(0.122)	(0.144)	(0.156)
Age	0.608	0.545	0.485	0.653*	0.664**	0.763**	0.504	0.494
	(0.504)	(0.381)	(0.315)	(0.335)	(0.322)	(0.341)	(0.504)	(0.452)
Agesqrd	-0.006	-0.006	-0.004	-0.006*	-0.006*	-0.007**	-0.005	-0.005
	(0.005)	(0.004)	(0.0037)	(0.003)	(0.003)	(0.0030)	(0.005)	(0.004)
Hhsize	0.037	0.231	0.008	0.057	0.061	0.118	0.016	0.086
	(0.196)	(0.180)	(0.124)	(0.157)	(0.125)	(0.156)	(0.205)	(0.215)
Hhsizesqrd	-0.000	-0.004	-0.001	-0.002	-0.002	-0.003	-0.002	-0.002
	(0.011)	(0.009)	(0.007)	(0.008)	(0.007)	(0.008)	(0.010)	(0.010)
Femhhhead	0.491	-0.647	1.041	0.618	0.763	0.090	1.129	0.497
	(1.726)	(1.472)	(1.019)	(1.178)	(1.086)	(1.181)	(1.530)	(1.551)
Education		-	-3.123**	-2.304*	3.314***	3.178***	0.211	0.274

			(1.349)	(1.364)	(0.767)	(0.824)	(0.866)	(0.795)
Education*transaction		-3.46***	2.932*	1.694	-2.851***	-2.69***	-	-
		(1.323)	(1.649)	(1.500)	(0.816)	(0.873)		
Married	0.325	-0.0438	0.101	-0.252	0.143	-0.220	0.113	-0.327
	(0.780)	(0.679)	(0.477)	(0.588)	(0.496)	(0.576)	(0.676)	(0.736)
Social capital	-0.683	-1.240**	-0.116	-0.537	-0.283	-0.615	-0.455	-0.781
	(0.584)	(0.544)	(0.357)	(0.522)	(0.337)	(0.442)	(0.533)	(0.582)
Own residence	0.093	1.081	0.202	-0.064	0.265	0.043	-0.041	-0.018
	(0.721)	(0.753)	(0.470)	(0.532)	(0.460)	(0.532)	(0.647)	(0.677)
Agriculture		1.553*		0.501		0.467		0.608
		(0.879)		(0.730)		(0.720)		(0.875)
Employed		3.079***		0.755		0.862		1.552
		(1.118)		(1.034)		(0.865)		(1.072)
Business		0.249		1.643*		1.436*		1.382
		(1.086)		(0.938)		(0.856)		(1.098)
2016	-0.306	-0.626	-0.102	-0.613	-0.426	-0.783	-0.0981	-0.407
	(0.630)	(0.548)	(0.400)	(0.514)	(0.408)	(0.484)	(0.632)	(0.656)
Observations	252	252	252	252	252	252	252	252
Number of cohort	126	126	126	126	126	126	126	126
Region RE		YES		YES		YES		YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2017

Table 4.9 captures the various education levels and their interaction with transactionary usage of financial services. Each level of education is represented using two panels staring with zero education, primary education and last two representing tertiary education. The literature suggests that the impact of transactionary financial product on household welfare could be linear due to differences in human capital development measured by education level. Table 4.9 shows that the direction and magnitude of FI on household welfare indeed varies with differences in the education level of the household head. This effect was captured by including an interaction term between education level of the household head and the transactionary FI score before estimating a welfare function.

The education and transactionary usage interaction variable reflects the non-linearity in the impact of FI policy on household welfare. The coefficient (3.178) of education of a household head with secondary level of education under the RE model was both positive and significant at 1 percent in explaining welfare along the transactionary channel. This means that attaining secondary level of education raises consumption expenditure by 3.178 percent. However, the coefficient capturing the conditional effect from the interaction between secondary level of education and transactionary usage of credit was negative but significant under the RE model at 1 percent (-2.851). The same applies to the coefficient interacting zero education and transactionary usage of financial services (-3.46) which was negative and significant at 1 percent. This implies that while secondary level of education leads to increase in household welfare, FI is not associated with higher welfare conditional on having attained secondary level of education. Similarly, transactionary FI usage is not associated with higher welfare conditional on holding no education. A similar conclusion was drawn from the interaction of IFI and education both before and after controlling for region specific effects in Table 4.10.

Table 4.10 Consumption function with IFI-Education interaction

Dependent	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)
	IFI	RE	IFI	RE	IFI	RE	IFI	RE
FI Measure	2.797*	2.441**	0.235	1.186	1.962*	1.918**	1.503	1.341
	(1.623)	(1.049)	(1.256)	(0.990)	(1.189)	(0.799)	(1.584)	(1.209)
Lag lnexp	-0.247	-0.517**	-0.226	-0.475**	-0.185	-0.449**	-0.271	-0.512**
	(0.205)	(0.214)	(0.143)	(0.207)	(0.158)	(0.189)	(0.171)	(0.238)
Log income	0.345**	0.428***	0.471***	0.438***	0.493***	0.481***	0.351**	0.395**
	(0.156)	(0.139)	(0.121)	(0.134)	(0.123)	(0.130)	(0.148)	(0.168)
Age	0.635	0.569	0.580	0.730**	0.899**	0.910**	0.368	0.478
	(0.506)	(0.382)	(0.355)	(0.367)	(0.415)	(0.371)	(0.475)	(0.475)
Agesqrd	-0.006	-0.006	-0.005	-0.006*	-0.008**	-0.008**	-0.004	-0.005
	(0.005)	(0.004)	(0.003)	(0.003)	(0.0034)	(0.003)	(0.004)	(0.004)
Hhsize	0.031	0.185	-0.021	0.079	0.121	0.184	-0.028	0.077
	(0.198)	(0.189)	(0.143)	(0.170)	(0.157)	(0.168)	(0.196)	(0.227)

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Hhsizesqrd	-0.001	-0.003	-0.000	-0.001	-0.006	-0.006	0.000	-0.002
	(0.011)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)
Femhhhead	0.416	-0.659	1.601	0.266	1.286	0.460	1.331	0.544
	(1.704)	(1.472)	(1.185)	(1.366)	(1.321)	(1.278)	(1.472)	(1.608)
Education	-2.592	-5.451**	-1.702**	-1.534**	1.933***	1.896***	-0.765	0.142
	(2.722)	(2.638)	(0.784)	(0.715)	(0.658)	(0.608)	(1.601)	(1.379)
Education_ifi	4.027	9.023	5.242	4.738	-5.245*	-5.533**	3.234	0.421
	(12.06)	(10.54)	(3.879)	(3.375)	(2.707)	(2.605)	(3.567)	(3.352)
Married	0.298	0.0290	0.127	-0.492	0.312	-0.210	0.218	-0.298
	(0.787)	(0.687)	(0.543)	(0.643)	(0.607)	(0.626)	(0.658)	(0.780)
Social capital	-0.647	-1.093*	-0.273	-0.877*	-0.434	-0.825*	-0.401	-0.764
	(0.596)	(0.577)	(0.407)	(0.489)	(0.449)	(0.468)	(0.518)	(0.601)
Own residence	0.125	1.242	0.332	0.127	0.397	0.275	-0.139	-0.032
	(0.731)	(0.773)	(0.538)	(0.598)	(0.584)	(0.581)	(0.648)	(0.702)
Agriculture		1.201		0.616		0.517		0.580
		(0.975)		(0.781)		(0.794)		(0.926)
Employed		2.819**		1.468		1.551*		1.495
		(1.170)		(0.948)		(0.887)		(1.159)
Business		-0.173		1.910*		1.784*		1.333
		(1.197)		(0.983)		(0.933)		(1.176)
2016	-0.299	-0.557	-0.750	-1.313**	-0.421	-0.784	-0.110	-0.400
	(0.624)	(0.557)	(0.498)	(0.573)	(0.545)	(0.531)	(0.650)	(0.673)
Observations	252	252	252	252	252	252	252	252
Number of cohort	126	126	126	126	126	126	126	126
Region RE		YES		YES		YES		YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2017

4.5.4 Control Function following Durbin-Wu-Haussmann approach

Control functions are applied when panel data models contain unobserved heterogeneity and omitted time varying variables hence best suited for correcting both endogeneity and heterogeneity problems (Wooldridge, 2012). This model is estimated by running the structural form equation including with predicted residuals as part of the regressors and the observed endogenous variable. A control function is useful when estimating nonlinear model(s) with endogenous explanatory variable(s). One other advantage associated with a control function is that a control function in the context of this chapter helps in generating the true

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effect of FI. The variable bank trust (Bertrand, Mullainathan & Shafir, 2004) is included as the instrumental variable for FI in the first step estimation to minimize biasedness arising from the residuals Appendix Table 4.11 presents the static control function which ignores the lagged dependent variable.

Five autoregressive dynamic control functions are estimated to establish the true effect of financial inclusion on household consumption per adult equivalent with each model representing a particular FI product in Table 4.12. The dependent variable is log consumption expenditure.

Table 4.12 Dynamic Control Function of Consumption Expenditure

Dependent	(log consumption) IFI	(log consumption) Transactionary	(log consumption) Credit	(log consumption) Savings	(log consumption) Insurance
Lag lnexp	0.036	0.045	0.048	0.046	0.019
	(0.061)	(0.062)	(0.062)	(0.064)	(0.060)
Ln Income	0.114	0.729***	0.687***	0.508***	0.532***
	(0.330)	(0.068)	(0.074)	(0.105)	(0.135)
Age	0.185*	0.046	0.018	0.093	0.076
	(0.105)	(0.072)	(0.081)	(0.085)	(0.084)
Agesqrd	-0.002*	-0.001	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Hhsize	-0.393***	-0.131*	-0.153**	-0.212**	-0.164**
	(0.152)	(0.071)	(0.073)	(0.088)	(0.079)
Hhsizesqrd	0.018***	0.006	0.008*	0.010**	0.008*
	(0.007)	(0.004)	(0.004)	(0.005)	(0.004)
Femhhhead	0.148	0.097	0.284	0.083	0.028
	(0.194)	(0.225)	(0.331)	(0.211)	(0.237)
Education	0.0759	0.842***	0.795***	0.356	0.509*
	(0.441)	(0.225)	(0.215)	(0.267)	(0.264)
Married	0.143	-0.139	0.0489	-0.0284	-0.122
	(0.219)	(0.222)	(0.278)	(0.192)	(0.202)
Social capital	-0.177	-0.056	-0.057	-0.049	-0.055
	(0.185)	(0.189)	(0.274)	(0.201)	(0.213)
Own residence	-0.0595	-0.158	-0.0280	-0.139	-0.0561

	(0.174)	(0.189)	(0.196)	(0.199)	(0.203)
FI Measure	3.473***	0.743***	0.816***	0.0873	0.398*
	(1.125)	(0.284)	(0.243)	(0.194)	(0.210)
Predicted residuals	13.81	-1.777*	-1.382	1.867*	0.695
	(10.95)	(0.974)	(1.188)	(1.113)	(1.019)
Central	-0.232	-0.453	-0.590**	-0.893***	-1.022**
	(0.406)	(0.307)	(0.301)	(0.328)	(0.436)
Coast	1.366	-0.0336	0.0274	0.592	0.0197
	(0.920)	(0.404)	(0.388)	(0.476)	(0.367)
Eastern	0.351	-0.259	-0.389	-0.321	-0.539
	(0.644)	(0.380)	(0.397)	(0.408)	(0.421)
Nyanza	0.152	0.161	-0.0739	0.0410	-0.520
	(0.394)	(0.373)	(0.365)	(0.347)	(0.491)
R.Valley	-0.229	-1.291**	-1.106**	-0.695	-1.518**
	(0.768)	(0.525)	(0.482)	(0.568)	(0.647)
Western	-0.156	0.0158	-0.210	-0.328	-0.644
	(0.409)	(0.412)	(0.408)	(0.431)	(0.515)
Agriculture	0.329	0.992***	0.695**	0.828***	0.813***
	(0.376)	(0.355)	(0.319)	(0.265)	(0.268)
Employed	0.092	0.891**	0.675**	0.617**	0.558*
	(0.463)	(0.371)	(0.273)	(0.260)	(0.291)
Business	-1.188	1.361**	0.898***	0.305	0.736*
	(1.457)	(0.530)	(0.333)	(0.535)	(0.416)
2013	2.611	-0.175	-0.060	0.502	0.191
	(1.671)	(0.240)	(0.204)	(0.350)	(0.225)
Observations	252	252	252	252	252
R-squared	0.840	0.838	0.837	0.823	0.825

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Author, 2017

The control function in Table 4.12 controls for all the endogeneity that may be inherent in the data leading to biased estimates as a result of omission of variables, measurement errors and simultaneity bias. This model is considered to be more robust due to its ability to hold down or control the unobserved factors in the error term as you vary the policy variable which in this case is financial inclusion. The estimated FI parameter therefore represents the true effect holding all other factors

constant. Differences observed in the welfare are therefore solely attributed to changes in FI. To the extent that the coefficient of the predicted residuals fails the significance test, then OLS estimates are consistent.

Consistent with theory, findings from the econometric estimation of consumption per adult equivalent revealed a strong positive relationship between FI and per adult equivalent consumption expenditure at 1 percent under the IFI (3.473), credit (0.816) and transactionary (0.743)channels, Sarma (2008); Honohan and King (2012). The household head consumption per adult equivalent also improved by 0.398 at 10 percent significance level for the insurance autoregressive dynamic panel.

As expected, per capita income was significant at 1 percent in explaining a household welfare function along the four transmission channels in line with Keynes (1936); Friedman (1957), Modigliani (1963), and Duesenberry (1949) prediction.

Household size exhibited an inverse quadratic relationship on welfare along the five autoregressive dynamic channels (IFI, transactionary, credit, savings and insurance). This inverse relationship implies that having a household with few members may not automatically translate to improved welfare. There is need however to determine the optimal household size.

The coefficient of education variable which simply measures schooling years reinforces the critical role played by the human capital theory in linking education to improved welfare. Skilled people are well able to manage their financial products more efficiently by holding fewer but quality products.

The regression model was based on 97 cohorts from each repeated FinAccess survey (2009, 2013 and 2016). To control for unobserved heterogeneity which could be inherent in the data, we re-estimated the dynamic control function

including an interaction term between the predicted residuals and the FI measure. Unobserved heterogeneity occurs when the unobserved household effects are combined with the policy variable to vary the effects in each model. The coefficient of the predicted residual represents the exaggeration effect of the policy variable. This is illustrated in Table 4.13.

Table 4.13 Dynamic Control Function corrected for Heterogeneity

Dependent	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)
	IFI	Transactionary	Credit	Savings	Insurance
L.lnexp	0.030	0.045	0.049	0.046	0.038
	(0.061)	(0.062)	(0.062)	(0.064)	(0.059)
lninc	0.192	0.729***	0.681***	0.508***	0.494***
	(0.337)	(0.068)	(0.079)	(0.105)	(0.134)
age	0.161	0.045	0.021	0.092	0.112
	(0.107)	(0.073)	(0.081)	(0.085)	(0.089)
agesqrd	-0.001	-0.001	-0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
hhsize	-0.363**	-0.131*	-0.154**	-0.212**	-0.168**
	(0.152)	(0.071)	(0.073)	(0.089)	(0.080)
hhsizesqrd	0.017**	0.006	0.008*	0.010**	0.008*
	(0.007)	(0.004)	(0.004)	(0.005)	(0.004)
femhhhead	0.138	0.098	0.268	0.089	-0.013
	(0.192)	(0.227)	(0.345)	(0.214)	(0.234)
educ	0.172	0.846***	0.787***	0.359	0.447*
	(0.460)	(0.231)	(0.219)	(0.268)	(0.263)
married	0.108	-0.139	0.046	-0.021	-0.178
	(0.227)	(0.222)	(0.279)	(0.195)	(0.193)
mem_group	-0.160	-0.054	-0.085	-0.048	-0.044
	(0.186)	(0.192)	(0.292)	(0.202)	(0.210)
resid_own	-0.056	-0.157	-0.030	-0.142	0.050
	(0.169)	(0.186)	(0.195)	(0.200)	(0.230)
FI Measure	4.772*	0.796	1.002*	0.165	-0.236
	(2.447)	(0.626)	(0.581)	(0.400)	(0.405)
ehat	11.72	-1.679	-1.176	1.895*	0.691
	(11.26)	(1.600)	(1.407)	(1.146)	(0.999)
ehat_cred	-4.015	-0.108	-0.488	-0.145	1.203*
	(5.139)	(1.122)	(1.207)	(0.712)	(0.634)
Central	-0.346	-0.456	-0.598**	-0.891***	-1.160**
	(0.424)	(0.307)	(0.300)	(0.329)	(0.457)

Coast	1.147	-0.028	0.053	0.595	-0.049
	(0.943)	(0.422)	(0.407)	(0.479)	(0.378)
Eastern	0.205	-0.261	-0.384	-0.315	-0.698
	(0.656)	(0.377)	(0.398)	(0.414)	(0.445)
Nyanza	0.094	0.158	-0.0842	0.0443	-0.771
	(0.395)	(0.373)	(0.367)	(0.348)	(0.519)
R.Valley	-0.405	-1.291**	-1.125**	-0.690	-1.675**
	(0.801)	(0.525)	(0.481)	(0.569)	(0.678)
Western	-0.213	0.013	-0.223	-0.332	-0.838
	(0.407)	(0.410)	(0.406)	(0.429)	(0.541)
Agriculture	0.418	0.988***	0.695**	0.828***	0.905***
	(0.391)	(0.365)	(0.319)	(0.266)	(0.265)
Employed	0.214	0.885**	0.660**	0.620**	0.548*
	(0.473)	(0.387)	(0.277)	(0.261)	(0.282)
Business	-0.757	1.355**	0.884***	0.336	0.606
	(1.552)	(0.553)	(0.332)	(0.530)	(0.407)
2013	2.290	-0.176	-0.049	0.502	0.225
	(1.703)	(0.237)	(0.210)	(0.350)	(0.212)
Observations	252	252	252	252	252
R-squared	0.841	0.838	0.837	0.823	0.828

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Author, 2017

4.6 Conclusions and Policy Implications

This chapter aimed at investigating the impact of financial inclusion (FI) on consumption per adult equivalent. Five autoregressive dynamic models were estimated to measure the impact of FI (transactionary, credit, savings, insurance, IFI) since each channel is believed to contribute differently to the consumption per adult equivalent gains. Estimation of both the static and the dynamic welfare functions revealed that unobserved region and sector specific effects were significant in explaining variation in individual consumption expenditure.

Consistent with economic theory, transactionary, credit, insurance and index of FI (IFI) from the dynamic control function exhibited a strong positive impact on household welfare vindicating the ongoing reforms in the financial sector as a

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necessary tool for enhancing household welfare. Even though use of the lagged dependent variable in pseudo panel estimation may not yield robust estimates due to the use of aggregated data organized in cohorts, the technique is often considered to be superior in the absence of longitudinal data for tracking households over time.

Lastly, the conditional effect of FI from the interaction between education and FI implies that while secondary level of education leads to increase in household welfare, FI is not associated with higher welfare conditional on having attained secondary level of education.

Given the significant impact of FI on consumption per adult equivalent, this chapter recommends a bigger government involvement in ensuring that FI is enhanced. Particular, the government should spearhead a campaign aimed at lowering the transactionary costs to raise uptake.

Chapter Five: Impact of Financial Inclusion on Vulnerability to Poverty

5.1 Introduction

Poverty reduction remains a key development challenge the world over despite stepping up the campaign to eradicate poverty and hunger by 2015 under Millennium Development Goals (MDG1). This is in spite of the many programs rolled out to provide a roadmap on how to overcome poverty. Past research has concentrated on demystifying headcount poverty and how best it can be overcome with little or no attention being paid on its dynamic manifestation.

The dynamic structure of poverty draws a distinction between transient (entry or exit) and chronic (re-entry) poverty. Lack of access to formal financial services by the poor is often cited as a key constraint. The poverty question can only be answered if a strong and vibrant financial system which facilitates transfer of financial resources from the surplus units to the deficit units through financial intermediation is established. Chithra (2006) asserts that FI brings the weak and vulnerable population segment within the ambit of the formal financial system often considered to be more organized.

Binswanger and Khandkher (1995) associate access to credit with the poor's ability to smoothen consumption. Similar sentiments were echoed by World Bank (2013) opining that universal access enhances access to a range of financial services to tap opportunities and lower household vulnerability. This is also associated with the poor's ability to improve their livelihoods and spur economic growth.

Collins, Murdoch, Rutherford, and Ruthven (2009) illustrate how poor households manage their finances in their informal economies in order to mitigate against transitory changes in their meager incomes. The yearlong financial diaries

collected in Bangladesh and India illustrate the model used by the poor in countering poverty spells through savings symbolizing a very high demand for financial services. The authors however challenged the use of headcount measure of poverty due to the unpredictability and irregularity of income. Matul et al. (2013) suggest that the uptake of insurance products is strikingly low due to limited trust and liquidity constraints complicating efforts aimed at mitigating vulnerability risks making it increasingly difficult for the poor to escape poverty.

Efforts to address global poverty appear to have paid off. World Bank (2015) reported a decline in the population living on less than $ 1.90 a day in 2015 to a forecast 9.6 percent of the global population. This could be attributed to the rapid economic expansion and myriad intervention programs put in place over the years. MDGs considered the number of persons living on less than 1.25 dollar a day as the best measure of poverty (UN, 2000). This informed the need to reduce poverty by half between 1990 and 2015 and World Banks campaign to reduce extreme poverty to 3 percent by 2030.

Available evidence indicates that poverty in Sub-Saharan Africa declined from 56.5 to 48.5 percent for the period 1990 to 2010 (World Bank, 2011). Odhiambo (2010) on the impact of financial development on poverty reduction in Kenya from 1968-2006 using a trivariate causality model based on co-integration and error correction mechanism established a positive link between financial development and poverty reduction. The study further established a unidirectional causality of financial development on savings and a bidirectional causal relationship between savings and poverty reduction.

Lack of access to financial services, adversely affect economic growth and poverty alleviation by limiting the poor's ability to mobilize savings and acquire assets for

cushioning against risks and investing in income generating projects[18]. FSD (2014) made a revelation that financial access points are mostly located in densely populated areas with the lowest incidence of poverty where 69 percent of total access points serve only 30 percent of the population. With only 1 percent of the financial access points being located in the poorest areas, reliance on FI as a tool for poverty alleviation is bound to fail. Kenya's FI model therefore appears to follow the demand following hypothesis rather than supply leading hypothesis which link financial development and economic outcomes.

KIHBS food poverty lines which is based on the cost of basic needs approach, currently stand at; Ksh 988 and Ksh 1,474 for rural and urban respectively and is computed on the basis of daily consumption of 2250 kilocalories per adult equivalent per day. Overall poverty lines average Ksh 1,562 and Ksh 2,913 for rural and urban clusters respectively (KNBS, 2006). Lack of formal financial services is cited as one of the main constraints to poverty reduction.

Development of financial markets provides avenues for capital accumulation and vital services such as insurance and savings which helps in absorption of risks and coping especially for the poor. This is echoed by DFID (2004) where developments in the financial sector acts as a building block to private sector development leading to increased access to basic needs and reduced vulnerability to poverty. Despite the indiscriminate lending by banks, allocation of productive resources via the finance channel enhances household's welfare, aiding the poor to assimilate themselves.

Development policy has shifted from over reliance on average income/expenditure to incorporate aspects related to vulnerability risks. Sen (1999) argued that it's not enough to eliminate poverty but rather the removal of vulnerability risk to

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[18] The 2014 Alliance for Financial Inclusion (AFI) Global Policy Forum

persistent and endemic deprivation. Chaudhuri (2002) argues that vulnerability assessment must be rooted on explicit models of inter-temporal household behaviour. The negative shocks faced by households however don't necessarily lead to poverty since they can be mitigated against if early warning signs are issued for policy intervention ex ante.

Coping mechanisms if well designed can also reduce the negative effects of poverty ex post. As more and more people are pooled out of poverty, subsequent surveys reveal that new ones enter the poverty trap making it appear like a zero sum game which has only succeeded in maintaining poverty at a constant level. But even with this cycle, the data has revealed that there is a significant proportion that faces the risk of becoming poor in subsequent periods (vulnerable). This creates the need to profile the vulnerable population for effective policy interventions.

The broad objectives in this study revolved around the estimation and determination of vulnerability as expected poverty in Kenya. This study is centered on three specific research objectives derived from the broad objectives namely:

1) To estimate the VEP for Kenya based on the 2009, 2013 and 2016 household survey data

2) To estimate the impact of FI on VEP in Kenya

3) To develop a poverty transition matrix using Kenya's household survey data

An empirical study capturing the depth of vulnerability is critical in setting different policy targets for the moderately and extremely vulnerable segments since its mitigation is done ex ante based on future occurrences marking a sharp departure from policies touching on poverty often mitigated ex post after it strikes.

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In addition, a poverty transition matrix based on an empirical assessment helps in explaining movements across the poverty line. An inclusive financial system is one that goes beyond the usage of financial services to incorporate other aspects related to welfare and vulnerability to poverty at both the national and county levels. Use of repeated cross sectional data provides a more robust technique of capturing the dynamic structure of poverty for policy.

5.2 Literature on Vulnerability to Poverty

The implications of FI on vulnerability to poverty are founded on a number of theoretical linkages which include; the investment theory, human capital theory and firm behaviour theory. Existing literature indicate that FI yields immense benefits to the poor through elimination of barriers to access such as collateral requirements and high borrowing costs. This increased access as explained by the human capital theory in turn helps the populace invest in education which ultimately boosts their payoffs. Firms also benefits from the reduction in cost of capital as funds become readily available and at affordable rates. The firm behaviour theory associates these benefits with increased production and more job creation.

Whereas the strand of literature on poverty has been growing, empirical examination using repeated cross sectional data remains scanty. This section provides a summarized review of literature related to developments on vulnerability assessment pioneered by Amemiya (1977). Alwang, Siegel and Jorgensen (2001) describe vulnerability as a phenomenon characterized by uncertain occurrences which require a forward looking approach to overcome. A household's ability to respond, time horizon and access to assets shape the manner in which a household confronts vulnerability. Vulnerability studies help in distinguishing the structurally poor from the resilient population who would remain non vulnerable even in the absence of consumption vulnerability.

5.2.1 Theoretical Literature Review

The link between financial inclusion and poverty is motivated by the direct and the indirect channels. The direct channel improves the plight of the poor through broadened access to financial services while the indirect channel by Schumpeter (1911) operates through the finance growth nexus to reduce poverty and income inequality. Besides the direct and indirect theories studies on vulnerability to poverty draws heavily from microeconomic theory and especially on decision making under risk and uncertainty. This introduces indifference curves facing risk averse, risk neutral and risk lovers as developed from the theory of expected utility. A risk averse person's utility curve falls with variability in consumption ceteris paribus. The certainty equivalence theorem on consumption fails due to information asymmetry on individual's utility functions from consumption. This is also complicated by lack of longitudinal data in developing countries capturing variability in individual consumption.

Theories on mobility assessment by Shorrocks (1978) and Ok (1999) with their limited requirement of cardinally comparable utility functions offer important insight on the measurement of vulnerability to poverty based on long term income transition from one generation to another. This could include the shift from a poor state to a non-poor state over time. However despite its wide acceptance, this theory is criticized for laying much emphasis on historical patterns at the expense of current or future patterns.

The issue of vulnerability as variability has also been cited in literature where the link between historical shocks and future occurrences is associated with a comparative analysis of consumption standard deviations and income variability. The higher the margin by which the standard deviation of past consumption changes, the more vulnerable the population. This however requires longitudinal data with which also imposes a strong homogeneity assumption on the distribution

of consumption changes in the panels. Exposure to vulnerability is explained by measures of dispersion in this framework. The main weakness in the use of standard deviation to capture vulnerability is in the weighting of the risks where both the downside and the upward risk are weighed the same.

Variability appears to hurt the poor more than it does to the non-poor. On the contrary, the downside risk appears to rise for non-poor households when the average consumption is declining. A more preferred measure is the coefficients of variation though it can blow up for certain cells when some means tend to zero. Besides giving odd results during times of persistent growth, the standard deviation offers no accounting for persistence of downturns or negative serial correlation.

Greenwood and Jovanovic (1990) developed a nonlinear model relating financial development, income inequality and economic development. The theory posits that broadened access to financial services benefits the rich at the early stages of development increasing income inequality since the poor cannot afford the range of financial services in the market. This income inequality however disappears as more financial development is attained. This clearly shows that financial development has to be intensified to ensure there are trickle down effects to the underprivileged. This theory resembles Kuznets (1955) inverted U hypothesis where income inequality widens at the early stages of development but falls as more industrialization is achieved.

Galor and Zeira (1993) corroborates the inequality argument by stating that market imperfections such as information asymmetry disadvantage the poor who lack collateral, credit histories and connections to access financial services. Financial development is therefore thought to be the solution to poverty by disproportionately relaxing credit constraints and reducing income inequality for the poor (Beck et al., 2004). Financial development reduces poverty through the

indirect channel by raising economic growth. This effect may also be transmitted through changes in income distribution.

The trickledown effect theory also associates financial development and poverty reduction. The theory suggests that economic growth reduces income inequality through creation of economic opportunities for the poor (Todaro, 1997). Jalilian and Kirkpatrick (2005) argued that one way of broadening access to financial services among the poor is through elimination of market imperfections which lead to market failures and high transactionary costs. Secondly the poor can be encouraged to take advantage of credit and insurance services in the market to build their asset base to improve their livelihoods.

5.3 Empirical Literature

5.3.1 Measuring Vulnerability to Poverty

Three main approaches have been put forth in the literature on the measurement of vulnerability. Vulnerability in this context is analyzed as the probability of remaining poor or falling into poverty in the future otherwise termed as vulnerability as expected poverty (VEP) by Chaudhuri et al., (2002); Pritchett, Suryahadi and Sumarto (2000); Chaudhuri, Jalan and Suryahadi (2002) and Christiaensen and Subbarao (2005).

The other approaches cited in the literature comprise; vulnerability as expected utility (VEU) by Ligon and Schechter (2003) and vulnerability as uninsured exposure to risk (VER) by Amin, Rai, and Topa (2003); Dercon and Krishnan (2000) and Glewwe and Hall (1998). Given that vulnerability studies dwell on the future, they are usually motivated by theories touching on decision making under risk and uncertainty. This informs why idiosyncratic shocks are included in the estimation of vulnerability to poverty. These among other household characteristics are what explain the vulnerability to poverty transition matrix. To

link FI and VEP, the study invokes a number of theories including; the human capital theory, investment theory and firm behaviour theory.

The VEP approach according to Chaudhuri et al. (2002) defines vulnerability as the probability of remaining poor or experiencing poverty in the near future given one's socioeconomic characteristics. Vulnerability assessment poses challenges since it's an unobservable phenomenon unlike poverty. Its assessment therefore requires drawing some inferences about future outcomes usually captured as probability of future income shortfall below the poverty line. This approach helps estimate the probability of falling into or remaining poor in subsequent periods using repeated survey data in the absence of long longitudinal data for dynamic analysis especially in developing countries.

Studies on vulnerability assume that differences in vulnerability are attributed to observable individual characteristics. Use of repeated cross sectional survey data creates a panel dataset which if well utilized, the time series variation in consumption expenditure can be used to explain individual risk profile in a given period. This methodology makes use of two repeated surveys at a time to establish the vulnerability status based on poverty trajectory. The VEP approach has however come under criticism for assuming that cross section variance is a good proxy of individual inter-temporal income variation (Ligon and Schecter, 2003).

The VEU approach which falls in the class of FGT measures defines vulnerability as low expected utility (difference between the utility derived from a certainty equivalent consumption level). It follows the certainty equivalence theorem by choosing a threshold income level above which an individual is considered not to be vulnerable (Ligon and Schecter, 2004). It also includes household individual risks (idiosyncratic and covariate risk components). This approach has however been criticized for basing vulnerability assessment to individual risk preferences (Christiaensen and Subbarao, 2005). Critics also argue that the approach tends to

favour risky individuals who are identified by policy makers as highly vulnerable while it may not be the case hence violating the equality axiom.

Vulnerability under the VER approach is considered to be the inability to smoothen consumption over time in the presence of shocks (Dercon and Krishnan, 2000). This approach investigates the welfare loss from lack of effective risk management tools hence backward oriented. Christiaensen and Subbarao (2005) empirical work established serious shortcomings in this approach for failure to bring out vulnerability among poor households where the fluctuations are low in the lower tail of the distribution. They also argued that due to high probability of adverse shocks attached to risky assets held by non-poor households, they stand a high risk of been wrongly adjudged as vulnerable. Chaudhuri (2003) also perceives all vulnerability measures pegged on consumption smoothing as improper since they treat all shocks as symmetrical. This method is therefore unsuitable for this study since the vulnerability to shocks isn't dependent on individual or household consumption (Ligon and Schechter, 2003).

Morduch (1994) describe vulnerability as that point where the expected consumption expenditure fall above the poverty line while the households are stochastically under the poverty line. Heitzman et al. (2002) introduced a new perspective of measuring vulnerability by classifying it as a risk chain comprising of unexpected occurrences, risk management and outcomes such as loss of welfare. Effective management of the unexpected occurrences (shocks) by individuals and the government is what pools someone out of the vulnerability state.

However the estimation follows Bourguignon and Goh (2004) whose analysis is based on repeated cross sectional data. Despite the availability of cross sectional data for VEP analysis, use of cross sectional variance to proxy inter-temporal consumption expenditure variation has its own challenges. VER distinguishes

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shocks facing households against those affecting the entire population. This approach has faced stiff criticism for assuming that individuals have perfect knowledge about their preferences yet their occurrence is a stochastic process hence uncertain (Kanbur, 1987).

Cafiero and Vakis (2006) and Alwang, Siegel and Jorgenson (2001) argue that vulnerability measures are not forward looking but are based on the past actions such as welfare outcomes and shocks hence recommend use of simple basic poverty line. This critique however cannot match the benefits of FGT class of indices. The FGT related indices are preferred since they operate without necessarily defining individual utility functions which can be difficult to map due to varying preferences. This dynamic approach to poverty measurement which introduces individual risks is forward looking and important for the development agenda. This is especially so because poor people are more prone to risks and yet their means of mitigating against such risks is limited.

Holzmann and Jorgensen (2000) recognizes the need to undertake vulnerability assessments towards the formulation of ex-ante and ex-post strategies for alleviation and prevention of poverty. This study employs a pseudo panel estimation to generate a vulnerability line for Kenya for effective assessment of the non-poor persons facing the risk of falling into poverty. The dynamic structure of poverty is supported by Seok (2007) who established a state dependence of poverty from one period to another. A poor person today is highly likely to be poor in the next period.

A comprehensive analysis of welfare outcomes requires a mix of both the traditional poverty measures and vulnerability assessment using modern estimation techniques. If not mitigated against, shocks to the financial system may lead to huge, irreversible losses in the absence of sufficient assets or insurance for consumption smoothing (Jacoby and Skoufias, 1997). Similar sentiments were

echoed by Morduch, 1994 and Dercon, 2000 in relation to income risk, coping strategies and safety nets. Existing literature associates vulnerability risks to reduced adoption of appropriate technology. Carter, 1997; Morduch, 2002; Larson and Plessman, 2002 contend that vulnerability risks leave poor households with limited option of growing low risk but lower return crop varieties as opposed to their rich counterparts who can apply high risk but efficient production technology since they have a range of consumption smoothing options. Holzmann and Jorgensen (2000) admit that failure to tackle the risks exposes vulnerable persons to poverty.

Among the three approaches discussed, this study adapts the VEP approach by (Chaudhuri et al., 2002) in analyzing vulnerability to poverty. The repeated cross sectional surveys are considered to be rich in informing on the current poverty status as well as the probability of falling into poverty in the next period. Although Chaudhuri et al. (2002) argued that vulnerability assessment using a VEP approach can be conducted even with a single cross section survey; this study employs three waves of FinAccess survey to construct pseudo panels for vulnerability assessment. This study emerges as the first to be carried out in Kenya focusing on the effect of vulnerability to poverty using pseudo panel structure.

Pritchett et al. (2000) measure of vulnerability is expressed as the ratio between the populations considered vulnerable based on a predefined threshold and the proportion of the poor. A higher ratio signals a high incidence of vulnerability while a lower ratio indicates that the existing vulnerability affects just a few people. Each survey represents a cross section which forms the basis of evaluating vulnerability in the next period based on a transition matrix.

The probability threshold to determine vulnerability line is arrived at based on the probability of failing into poverty in the next period given a household consumption per adult equivalent. Other developing countries like India consider

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vulnerability to range between 1.25 and 2 times the national poverty line, National Commission for Enterprises in the Unorganized Sector (NCEUS) (2007). Dang and Lanjouw (2014) in line with Chaudhuri (2002) VEP approach define vulnerability as the lower bound level of income for the non-vulnerable population or the upper bound income level for the non-poor population facing the risk of becoming poor.

This study follows the vulnerability line proposed by Dang and Lanjow (2014) using two waves of cross sectional data which is limited to the non-poor population who risk falling into poverty. This non parametric approach is considered to be more appropriate as compared to the arbitrary scaling of poverty lines by a given factor for the entire population which includes those already in poverty. This approach has several advantages in that it's able to classify the vulnerable population along three groups; the poor, vulnerable and the middle class often considered to be the engine that drives the economy. This chapter borrows heavily from the work of Chaudhuri (2000; 2003) which presents a robust parametric method of measuring vulnerability based on the head count measure of poverty developed by Foster, Greer and Thorbecke (1984).

Karmanou and Morduch (2002) non parametric technique extends the headcount based measure of vulnerability by defining it as the difference in the expected value of a poverty (VEP) measure between the current and future values. The analysis of cross sectional data established that vulnerability can be looked at as the probability that a household will be poor (below poverty line) in the next period if not currently poor or remain poor (Chaudhuri, 2002). Ligon and Schecter (2002) define vulnerability as the sum of losses orchestrated by poverty and exposure to risk is motivated by a utility function.

Whereas poverty is observable, vulnerability is not hence call for drawing of inferences about future consumption patterns. Both VEP and VEU approaches rely

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on the consumption variable often determined by individual characteristics. The level of consumption is influence by idiosyncratic risk factors. Chaudhuri (2002) approach posits that a person who is vulnerable today will be poor at time t + 1 unless there are transfers made to reduce poverty. Vulnerability as expected poverty is founded on the premise that welfare as measured by future consumption will be lower than the poverty line.

Literature on vulnerability to poverty appears to converge on the main determinants. Many studies have adapted the VEP approach by Chaudhuri et al. (2002) in carrying out empirical work. They include; Jha and Dang (2009); Kang et al., (2011); Albert (2007); Kang (2014). McCullouch and Calandrino (2003); Seok (2007) and Kang (2009) for example associate VEP to female headed households, age, education and income fluctuations. Other determinants cited included geographical locations where rural dwellers are considered to have a higher probability of being poor in future especially in they are involved in agriculture as a way of life (Diamond, 1999; McCullouch and Calandrino, 2003).

A more recent study on VEP by Kang (2014) established that the incidence of poverty is higher among female headed households (39.8 percent) as compared to 15.5 percent for male headed households while the probability of falling below poverty line in the next period stood at37.8 percent and 9.9 percent for female headed and male headed households respectively. This probability of falling into poverty or remaining poor in the next period is what raises concern among policy makers (Quisumbing, 2002).

Kang (2015; 2014) on determinants of vulnerability to poverty in Korea considered the characteristics of the household head; age, marital status, gender, education and economic status using OLS estimation. Findings suggest that female headed households, married household heads and high dependency burden had a positive relation with household vulnerability to poverty. The relationship was

however negative among educated households and those with a higher net asset. A high debt to income ratio also appeared to raise vulnerability to poverty risks.

Daressa and Muleta (2008) study on vulnerability to poverty in Ethiopia established a negative relationship between the squared age variable and female headed households. Increase in the age of a household head is associated with an increase in human skills, experience and asset base leading to a fall in vulnerability to poverty. The positive coefficient on the household size variable signals an increase in vulnerability to poverty as more pressure builds up on the consumption basket. The coefficient however changes sign after squaring the household size variable. A fairly large family isn't as bad since it can act as a source of labour manpower. Conversely, vulnerability to poverty fell with increase in literacy levels which is associated with adoption of modern agricultural technologies. In addition, asset ownership such as livestock, oxen and land significantly and negatively influence vulnerability to poverty.

Bidani and Richter (2001) in a study on vulnerability in Thailand also found a strong link between strong chronic poverty and low mean vulnerability on the rise in poverty and vulnerability to poverty. The rural North East residents were particularly found to have a higher probability of falling into poverty as compared to urban Bangkok residents. Increase in education level also appeared to lower the degree of vulnerability to poverty. Asset ownership among farmers yielded interesting results where farmers with small land acreage appeared better off than those with bigger land acreage.

On geographical location, Skoufias (2002) pointed that the degree of vulnerability falls with urbanization. The author also cited dependency ratio as one of the determinants of vulnerability to poverty. Households with smaller children are less vulnerable as compared to families with older people due to the differences in the amount of food intake. Female headed households and poorer households bore a

higher probability of falling or remaining poor in subsequent periods as compared to male headed and richer households.

Dang and Raghbendra (2009) examined vulnerability as expected poverty in select Central Asian countries concluded that vulnerability differs with geographical location, and household characteristics. To be specific, vulnerability to poverty was largely found to be a rural phenomenon in all countries studied. Increase in household size led to a huge increase in vulnerability to poverty especially for households with 5 members and above. The authors however obtained mixed results for the relationship between gender of household head and vulnerability to poverty. The contribution of higher education among household heads on vulnerability was found to be negative. This implies that less educated household heads are more vulnerable to poverty in comparison with highly educated household heads.

The vulnerability rate also fell with both house and land ownership. Asset ownership therefore appears to offer safety nets incase of economic shocks. The positive relationship between household size and vulnerability to poverty was also echoed by Christiaensen and Subbarao (2005). Other determinants of vulnerability cited by Dang and Raghbendra (2009) include; ethnicity, dependency ratio, asset base and transport system in use. Availability of public transport was found to lower the vulnerability probability by increasing average consumption. The under 16 and over 60 year olds are considered vulnerable for holding lower expectations about future consumption. Asset ownership is perceived to be a source of income considered to be critical in raising future consumption.

Dercon and Krishnan (2004) on vulnerability to poverty among Ethiopian rural households established a negative relationship between household asset base, human capital, improved road network and increased urbanization on vulnerability to poverty. Idiosyncratic shocks such as rainfall were also found to lower

vulnerability to poverty through increased consumption. Analysis of rural households by Bigsten and Shimeles (2003) also cited age of the household age, dependency ratio, education, and land ownership as some of the determinants of vulnerability to poverty.

Jalan and Ravallion (1998) on vulnerability in China using panel data provided a strong negative link between asset ownership and age on transient poverty. Ownership of physical assets also appeared to lower chronic poverty though most determinants of transient and chronic shocks differ. This was also echoed by Haddad and Ahmed (2003). Years of schooling appear to have a bigger impact on chronic poverty as compared to transient. The higher the dependency ratio as well as increase in household size, the higher the vulnerability. Woolard and Klasen (2004) cite dependency ratio, household size and female headed households, asset base and education as some of the determinants of vulnerability to poverty.

The reviewed literature provides a close link between shocks in the economy, responses and welfare outcomes. It also raises the need to extend measures of poverty to cover vulnerability to poverty aspects. Poverty studies focus on a static analysis while vulnerability captures a dynamic analysis of poverty. As Chaudhuri. et al. (2002) rightly puts it, forward looking policy anti-poverty interventions that lead to prevention of poverty rather than alleviation can only emanate from studies on vulnerability to poverty. Chaudhuri. et al. (2002) and Christiaensen and Subbarao (2005) VEP approach was identified as the most suitable for this chapter in estimating vulnerability to poverty in Kenya using repeated cross sectional data on financial access for the period 2009 to 2016. The VEP approach considers vulnerability to poverty as an individual probability to fall or remain poor in subsequent periods.

5.3.2 Financial Inclusion (FI) and Vulnerability as Expected Poverty (VEP)

Literature on vulnerability to poverty dates back from early 1980's where a monograph on "Poverty and Dynamics" (Sen, 1981) on landless agricultural labourers were found to have a higher vulnerability risk as compared to the landless sharecroppers despite their similarity in average standard of living due to the 1943 Great Bengal Famine. In the 1990's the World Bank recognized the need to disaggregate poverty further to capture both chronic and transient poverty (World Bank, 1990). The 2000's saw the introduction of the theoretical modeling of household behaviour under risk bringing in the debate on welfare variability. This variability in welfare reflects a dynamic analysis based on consumption per adult equivalent.

The link between financial inclusion and vulnerability to poverty is best explained by modern development theories even though the relationship is characterized by conflicting predictions. Modern development theories focus on the dynamism of and persistence of growth and income inequalities especially under markets characterized by information asymmetry. Galor and Zeira (1993) cite financial market imperfections as the main reason behind poor investment in human capital development despite its high marginal productivity. Efforts should be initiated to reduce the financial market imperfections even though it's often treated as being exogenous. Banjeree and Newman (1993) argued that financial sector development reduce market imperfections which in turn lower the degree of inequality. Financial imperfections raise the degree of income inequality since the financial system limits the flow of capital from the surplus to the deficit units.

Tackling information asymmetry raises financial sector development which in turn promotes pro poor growth and poverty alleviation through creation of an enabling environment for individual participation in financial and credit markets and overall

reduction in income inequality (Kaldor, 1966; Banjeree and Newman, 1993). On the other hand, benefits associated with an improved financial system appear to be more skewed towards the rich. This is reflected in the inverted U hypothesis which then raises the question whether financial inclusion and development is pro poor or it ends up widening the inequality gap between the rich and the poor.

A healthy financial system according to Rajan and Zingales (2003) introduces competition which in turn promotes efficiency and improved livelihoods for the poor. Financial development has immense economic benefits in the long run leading to accelerated economic growth, reduction in inequalities and poverty. Kuznet (1955; 1963) inverted U-curve however posits that inequality rises in the early stages of development due to rapid expansion of financial services and concentration among a few people, before starting to fall as benefits from the development spread out.

The inverted U-shaped relationship between income inequality and financial sector development is also supported by Greenwood and Jovanovic (1990) where developments in the financial sector raise inequality at the initial stages of development since only the few relatively wealthy persons have access to high return investments, before starting to fall as more people join the formal financial system to enjoy the benefits. Despite poverty falling at every stage of financial development, the benefits towards the rich are more leading to more pronounced inequality at the initial stages before it falls back as more development is achieved.

As new financial services such as credit facility are brought into the market, the rich take advantage and borrow more to invest since they can raise the minimum requirements demanded by financial service providers. The U-shaped theory operate on the premise that financial intermediaries provide savers with higher returns at lower risks, but that poor individuals due to their low marginal propensity to save cannot initially afford to make use of these financial

intermediaries, leading to growing inequality. The theory however, assumes that the initial surge in inequality is offset as more people and especially the poor gain access to the financial markets. Expansion of the formal economy through increased pool of financial services helps pull more people into the formal labour market.

Jalilian and Kirkpatrick (2002) using OLS and Panel regressions supported the effect of financial sector development towards the alleviation of poverty in low income countries. Their study concluded that financial development has a direct impact on poverty through enhanced access to financial services and an indirect one through the growth of mean income.

Eswaran and Kotwal (1989) on implications of credit constraints in developed economies established that persons with greater access to credit are better placed to absorb shocks although the effect fizzle out as the capital markets develop further to include everyone. This is especially so in countries where savings rates are high rendering borrowing to smoothen consumption unnecessary. A risk averse individual will therefore dissave or borrow when faced with transitory changes in income or expenditure.

Jalan and Ravalion (1999) and Glewwe and Hall (1998) provided immense contribution to the literature on measurement of vulnerability to poverty based on consumption variability. The longitudinal approach to the analysis of vulnerability is attributed to Townsend (1994) and Udry (1995) who pioneered panel estimation of household consumption insurance against idiosyncratic risks. This was followed by the likes of Dercon and Krishnan (2000) and Morduch (2005). Pritchet et al. (2000) contends that even a two year panel suffices in measuring standard deviation of consumption during vulnerability assessment.

Honohan (2007) employed OLS regression analysis to carry out a cross country analysis of access to financial services for over 160 countries. Econometric

estimates indicate an association between access to finance by households and reduced inequality (Gini coefficient). A 10 percent increase in access to financial services led to a 0.6 percent point lower Gini coefficient. Countries with deep financial systems were found to have low levels of absolute poverty at both US $ 1 and US $ 2 poverty line even though it ceases to be significant when mean income per capita is included in multiple regressions. Financial depth measured in terms of value of private sector credit to GDP ratio appears to have a significant impact on poverty rather than mere access captured by percentage of households with an account.

Morduch (1994) refinement decomposes poverty into two, that is, poverty as a result of bad shocks and exit from the poverty trap as a result of a good shock. This classification helps generate samples for the real non poor and the non poor from the positive shocks. Coping strategies from the vulnerable population offers important insights on how the plight of poverty can be overcome. Literature on coping mechanisms and particularly on the efficacy of informal insurance have been advanced by among others Dercon, 2001; Jalan and Ravallion, 1999; Amin et al., 1999 and Morduch, 2002 in the measurement of vulnerability often associated with imperfect risk sharing from variations in consumption.

Three factors accounting for vulnerability to poverty include; the pattern of shocks, strength of coping mechanisms as well as structural and behavioral impact of decline in consumption. Asset holding provides a possible alternative to consumption when it comes to the computation of vulnerability. Asset holding is seen to provide a good coping mechanism in the wake of adverse shocks. More information is however required to inform on the distribution of shocks. World Development Report 2000/2001 borrows from this approach considered to be a close alternative to consumption given the limitation of panel data.

Chaudhuri (2000; 2003) considers poverty as an ex-post measure of a household's wellbeing or lack thereof. Otherwise stated, it's the current state of deprivation, lack of resources or capabilities to satisfy needs. Vulnerability which also proxies poverty is an ex-ante measure of wellbeing which reflects future prospects of a household rather than how well off a household currently is. It's argued that where there is no risk about uncertainty in future, vulnerability and poverty measures of wellbeing are the same. Exposure to risk is the main determinant of vulnerability and emanates from volatility in consumption (Chaudhuri, 2003). This forces households to adopt mitigating strategies to smooth consumption to avoid irreversible losses from sale of assets in the absence of insurance. Simple savings interventions such as, the use of a lockbox has found to have promising welfare impacts

As a stochastic phenomenon, current poverty differs from future expected poverty raising the need to estimate vulnerability as expected poverty since a static approach to wellbeing limits policy intervention. VEP highlights differences in ex-ante poverty prevention and ex-post poverty alleviation interventions Chaudhuri (2003). This measure of poverty is preferred for factoring in variations across households exposure to risks as well as well as the built it asymmetry measure of poverty which gives more weight to downside risks Exposure to risk and uncertainty affect current wellbeing hence a central tenet of the basic theory of human behaviour (Chaudhuri, 2000; 2003). The author cites limited productive and financial assets as well as limited access to credit and risk management instruments as some of the determinants of poverty and vulnerability

Browning and Lusardi (1995) highlights a number of determinants to vulnerability including; wealth, income, future income expectations, income shocks. All these variables are influenced by the macroeconomic, social and political environment where they operate as well as individual characteristics both observable and

unobservable. Vulnerability to poverty studies helps answer questions like; who is likely to be poor, how likely are they to be poor, how poor are they likely to be, and why they are likely to be poor.

Karlan and Morduch (2009) posits that access to financial services holds the key to poverty reduction and economic development. Poor households with limited access to financial services are said to make costly decisions such as undertaking the sale of valuable assets in response to economic shocks rather than taking advantage of beneficial investments. Simple savings interventions such as, the use of a lockbox has been found to give rise to promising welfare impacts. Besides, improved technology and increased access to financial services have given rise to new opportunities for information delivery, products, incentives and a push for a more effective and informed decision making by individuals.

Burgess & Pande (2005) in their investigation of the impact of rural banks on poverty in India following an instrumental variable technique argued that banks prefer opening branches in richer areas. However, branch expansion into the rural unbanked locations in India significantly reduced rural poverty though it left the urban areas unaffected. This mainly occurred in the savings and credit channels

Mckenzie (2003) and Cunningham and Maloney (2000) challenged the role of education as a major determinant of vulnerability to poverty. In their studies on México, the authors established that less educated household heads appeared more resilient to the 1982 debt crisis and the Tequilla Mexico crisis. Much of the existing literature however tend to agree on the degree of vulnerability in rural areas as high compared to that of the urban population (Gunther and Harttgen, 2009; Chaudhuri et al., 2002; Christiensen and Subbarao, 2005).

Using a pseudo panel approach on repeated cross sections, Christiaensen and Subbarao (2005) sought to measure vulnerability from the 1994 and 1997 Welfare Monitoring Surveys and rainfall data from secondary sources. Findings revealed a

39 percent probability of falling into poverty (vulnerability) for the rural households in Kenya. Vulnerability to poverty was also found to be higher among households residing in arid areas which record highly volatile rainfall patterns. Contrary to expectations, ownership of livestock was found not to be significant in protecting households against covariate shocks to consumption. Instead the study recommended improved access to markets and increased participation in off farm activities to mitigate against vulnerability to poverty.

Cunningham and Maloney (2000) evaluate vulnerability on the basis of exposure to adverse shocks. Such an approach has its own challenges especially in quantifying the shocks. Philip and Rayhan (2004) look at vulnerability as the probability that a household become poor at least once in the next few years. Their study concludes that poverty and vulnerability to poverty have a bi-directional causality where each is a consequence of the other. Due to the complexity of poverty and vulnerability, the study elevates the location factor which should shape the poverty alleviation programs. Such programs should take into consideration the peculiar features that exacerbate poverty and vulnerability in a certain location.

Gender of the household head may also influence vulnerability to poverty. Christiaensen and Boisvert (2000) found a lower vulnerability probability among female headed households in Mali when compared to male headed households. This outcome was also echoed by Jha and Dang (2008) in a study on Central Asia.

Pitt and Khandker (1998) in a study on 87 rural Bangladesh villages in 1991 found credit to be a significant determinant of household expenditure, assets, children's schooling, and labour supply. Innovations like group based credit programs led to significant influence on household spending, asset acquisition and children's schooling. Results showed that an estimated 5 per cent of households who participated were pulled above the poverty line annually. Overall, the impact of

MFIs' credit programmes is positive among the middle to upper income poor but rather unclear to the very poor clients who require an innovative range of financial products.

This outcome was supported by Zaman (2004) who looked at the impact of the various microfinance programs in Bangladesh and concluded that microfinance programs are reasonably successful at reaching the poor, and that access to microcredit contributes to poverty reduction by reducing the poor's vulnerability. He adds that microfinance helps reduce vulnerability through consumption smoothing, emergency assistance during periods of acute natural disasters, and female empowerment the latter enhancing a woman's decision-making role, her marital stability, and her control over resources and mobility.

Xu, Clarke and zou (2006) on finance and income inequality used data from 91 countries between 1960 and 1995 to test the link between financial sector development and income inequality. Using credit to the private sector and claims on the non-financial domestic sector by banks to proxy financial development, they found a negative relationship between financial development and income inequality signaling reduced inequality, even with minimal financial development. Financial inclusion goes hand in hand with financial development.

Bittencourt (2010) in his examination of the impact financial sector development on income inequality in Brazil in the 1980s and 1990s using panel time series analysis established that access to financial services reduces income inequalities as individuals insulate themselves against macroeconomic shocks emanating from inflation. This impact is also attributed to earnings potential from credit. A developed and vibrant financial sector therefore helps in alleviating inequalities hence cushion the economy against unnecessary distortionary taxation.

Berthelemy and Varoudakis (1996) suggest that insufficient financial development exposes a country to a persistent poverty trap which may raise the peoples'

vulnerability to poverty. They argue that, because of increasing returns to scale in the financial sector, a vicious circle can be created, where low levels of financial intermediation result in only a few market players. The lack of competition results in high costs, leading to low real deposit rates and hence low savings, which in turn limits the amount of financial intermediation. They argue that financial sector underdevelopment can therefore be a serious obstacle to growth, even when a country has established other conditions necessary for sustained economic development.

AFI (2011; 2014) revealed that about one in ten adults in Kenya often go without food. The international poverty line set at an average of US $ 2 a day is prone to both upward and downward swings due to fluctuations in household income. The authors cite other risks such as; loss of land, harvest, savings, prices fluctuations among others. World Bank (2001) defines vulnerability as the resilience against such shocks. A vulnerability line according to Pritchett et al. (2000) is defined as that level of income below which individuals experience greater than even chance of experiencing poverty in the near future.

Copestake (2007) suggests that FI provides a platform for reducing poverty especially in the low income countries. Similar sentiments were echoed by McGregor, 2007 who argued that poverty is a consequence of deprivation of a range of resources due to vulnerability to shocks. Access to financial resources or lack of it therefore presents a causal link between resource endowment and vulnerability to poverty (Rutherford, 2000). Dercon (2001) conceptualizes vulnerability to poverty by linking ownership of household assets and improved welfare. Meaningful use of the asset can translate to improved welfare outcome represented by consumption per adult equivalent. Identifying the degree of vulnerability to poverty helps develop interventions that minimize the probability of one becoming poor in the future.

Beck, et al. (2004) performed OLS and Instrumental Variable regressions of changes of a country's poverty and income inequality on the country's average level of financial development over that time. This methodology enabled them to examine long run relationships between the different variables. To measure financial development, they used the ratio of private credit to GDP. They used developed and developing countries to examine income inequality, while they only used developing countries to examine poverty. They found that countries with higher ratios of private credit to GDP recorded a higher percentage reduction income inequality and poverty. Beck et al. (2007) reaffirmed these findings in a cross country analysis covering 245 observations where a robust relationship linking the depth of financial intermediation, accelerated growth and faster reduction in income inequality was established. This positive link between FI, aggregate growth and individual welfare was reaffirmed again in Beck et al. (2008) with a 30 percent reduction in poverty across countries in the wake of financial sector development.

A reduction in financial market imperfections is associated with positive incentive effects and reduction in transaction costs. Their findings suggest that financial development helps raise incomes of the poorest quintile hence lowering income inequality. 40 percent of increase in income growth is attributed to reduction in income inequality while 60 percent is attributed to an increase in economic growth. Similar sentiments were echoed in a recent publication by Park and Mercado (2015) targeting 37 developing Asian economies who established that financial inclusion is instrumental in reducing poverty and inequality in income.

Chibba (2009) on financial inclusion, poverty reduction and millennium development goals (MDGs) claim that FI acts as a tool for providing incremental and complementary solutions for poverty reduction. The study perceives FI in the context of inclusive development as a means through which poverty and inequality

can be tackled to enhance the attainment of MDGs. Financial inclusion, poverty reduction and MDGs nexus is said to be founded on four main pillars namely; private sector development, financial literacy, microfinance and public sector support. Given the immense role played by financial inclusion in private sector development, the study claims that the traditionally shy commercial banks are now developing financial services suited for low wage earners and the poor.

Fadun (2014) and Ayyagari (2013) on the role of financial inclusion and outreach as a tool for poverty alleviation in Nigeria and India respectively established that a reduction in the financially excluded persons helps in alleviating poverty and redistribution of income. This is also echoed by Clarke, Xu and Zou (2006).

Collins, Morduch, Rutherford, and Ruthven (2009) in their analysis of the portfolios of the poor using financial diaries interrogated balance sheets of households, processes of cash flow and turnover, money management practices and decision making processes. Based on the interview conducted on the households twice monthly for two years the study concluded that the 2.5 billion global poor populations is different and dynamic despite being homogenous. The authors challenged the use of headcount measure of poverty citing unpredictability and irregularity of income.

5. 4 Overview of Literature

Establishing the link between FI and vulnerability to poverty stands out as an important undertaking aimed at improving people's livelihoods and especially the underprivileged. Insufficient financial development is considered to be a key catalyst of poverty which exposes households to even more suffering by exposing them to poverty even in the following period. Enhanced access to financial services pulls the adult population within the ambit of the formal financial system which is considered to be safe, secure and more affordable. Focus on poverty by researchers shifts focus from overreliance on headcount poverty considered to be

static by the policy makers. This helps in creating forward looking anti-poverty policy interventions whose focus is poverty eradication rather than mere alleviation.

Even though several approaches have been highlighted in the literature on the measurement of vulnerability, use of the VEP approach is considered to be superior due to its ability to explain poverty ex post. Other measures discussed include vulnerability as expected utility (VEU) and vulnerability as uninsured exposure to risk (VER). The approach helps in predicting the probability of falling into the poverty trap in the following period. Access to financial services was found to have a strong positive and consistent effect towards the reduction of VEP. Access to credit services for example was found to be critical in countering significant transitory changes in income. The need to generate Kenya's transition matrix on households shift from one welfare state to another elevates the importance of this study.

5.5 Construction of a vulnerability index

According to Chaudhuri et al., (2002), estimation of individual welfare standard distribution to derive the probability of expected poverty requires estimates for mean and variance of consumption drawn from pseudo panel data. Longitudinal data helps generate the household inter-temporal variance of consumption. Chaudhuri (2003) whose work follows Bourguignon, Goh and Kim's (2004) mean based approach considers the variance to be of an exponential type. Stochastic properties of inter-temporal income (proxied by consumption expenditure) variation (idiosyncratic shocks in assumption) are important in explaining vulnerability to poverty. Vulnerability assessment is based on the estimation of both the expected income and its variation over time.

Bourguignon, Goh and Kim's (2004) estimation follows an autoregressive process of order one (AR(1)) where current values of individual earnings are estimated

based on the immediately preceding household characteristics in line with the first (mean) and second (variance) moments. Evolution of the mean and variance of earnings within a cohort is considered to be sufficient in estimating the common characteristics of individual earning process. Model parameters recovered from pseudo-panels resonates well with those estimated directly from a true panel. The persistence parameter of consumption shocks (basic consumption dynamic parameter) from one period to the next recovered from repeated cross sectional data (pseudo panel) are not significantly different from those recovered from a true panel. However the measures of vulnerability are only similar in trends but not in the point estimates. The only weakness is that variability in consumption may not be the only source of vulnerability to poverty.

This study employs repeated cross sectional survey data to carry out a vulnerability assessment. A vulnerability index is stochastically constructed by first estimating a consumption function by ordinary least squares (OLS) method to predict the consumption and derive the variance of consumption for each household, make assumptions on the distribution of consumption such as normal or exponential as well as the threshold of both poverty and vulnerability. OLS yields asymptotically efficient parameters. This can be expressed as:

$$\ln c_i = X_i \mathsf{s} + e_i \dotfill (1)$$

where c_i is the per capita consumption expenditure which proxy income; X_i a vector of household characteristics explained by parameter s; e_i is the disturbance term capturing the idiosyncratic factors or shocks which influence per capita household consumption assuming that that the economy is relatively stable over time. In a linear model, the disturbance term is assumed to have zero mean and constant variance $\mathsf{u}_{e,i}^2 = X_{i\prime\prime}$. This assumption may however fail to yield efficient estimates due to heteroscedasticity from the unobserved individual heterogeneity.

ꜱ and ˷ were estimated using the three step feasible generalized least squares (FGLS) procedure after assuming a log normal distribution (Amemiya, 1977). Vulnerability to poverty is estimated as the probability that an individual's future income will fall below the poverty line given the observed household characteristics. Allowing variance of the disturbance term to vary with household characteristics helps to address the problem of heteroscedasticity. This is because assuming constant inter-temporal variance for all households could be wrong.

$$V = \Pr\left(\ln c_{i,t+1} < \ln z \mid \ln c_{i,t+1}, u_{jt+1}^{\hat{2}} \right) = \Phi\left(\frac{\ln z - \ln \hat{c}, t+1}{\hat{u}_{jt+1}} \right) \dots\dots\dots\dots\dots\dots(2)$$

Where; Z – Poverty threshold; Φ - Cumulative distribution function of the standard normal distribution; V – Vulnerability to poverty expressed as the likelihood of poverty of individual i at time t. An individual is considered to be vulnerable if the probability of becoming poor is greater than the sample incidence of poverty. The poverty line is based on the calorie intake expressed in monetary terms.

This implies that a logarithm function of consumption per adult equivalent is first estimated to establish the mean and variance of log consumption. Vulnerability is therefore estimated as a function of expected consumption (mean) at time t+1 and volatility in consumption over time (variance). Using the mean and variance, Monte-Carlo simulations can be used to generate the vulnerabilities in terms of poverty gap poverty depth. This exemplifies the importance of the main economic activity in understanding vulnerability. To be able to draw inference on an individual vulnerability, a threshold probability is arbitrarily set.

Two distinct approaches are applied to determine the vulnerability threshold. The first one is relative vulnerability threshold where current observed population

poverty rate (mean vulnerability) is used. The second approach is based on a 0.50 threshold (high vulnerability threshold). Any person facing a vulnerability risk above the threshold stands a higher chance of becoming poor. A very high vulnerability ratio signals an egalitarian vulnerability distribution while a lower ratio signals a low vulnerability incidence concentrated among a few (Chaudhuri. et al, (2002).

5.5.1 Theoretical Framework

The causal link between FI and vulnerability to poverty is captured in the existing financial development theories and particularly the finance growth nexus. Theory and evidence present both a direct and indirect link between financial inclusion and poverty. The indirect link is transmitted through the economic growth channel while the direct link goes straight to poverty alleviation through increased access to financial services.

DFID (2004) in support of the direct link claims that insurance helps in cushioning against shocks while holding savings in a safe environment helps in mitigating against expected and unexpected expenditures and investments, while at the same time providing buffer for smoothening consumption whenever there are fluctuations in both income and expenditure. This is critical since besides lowering vulnerability to poverty, it also helps the poor to cope with risks. In the absence of savings and insurance, the individuals can use the credit facility to invest in the future through education, health, new startups among others.

Remittances play more or less the same role as credit. Conversely, under the indirect link of financial development FI leads to a reduction in absolute poverty through the economic growth channel. Although vulnerability to poverty is considered to be more superior due to its forward looking approach and can be mitigated ex ante, its assessment has received limited attention as compared to

poverty. Poverty is measured ex post; hence policy makers are only interested in how the plight of those who are either currently or formerly poor can be addressed.

5.5.2 Expected Poverty Transition Matrix

A transition matrix will help bring out the graduation of the population either from non-poor to poor status; non-poor to non-poor status; poor to non-poor status or poor to poor status in line with the definition of vulnerability.

Since we are comparing vulnerability based on two periods, let i represent individual consumption per adult equivalent is survey j where j stands for the two waves 2013 and 2016. This linear projection of individual consumption for the two waves is expressed as;

$$c_{i1} = S_1' x_{i1} + V_{i1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$
$$c_{i2} = S_2' x_{i2} + V_{i2}$$

Let z_j be the poverty line in period j. The proportion of the population that were poor in period one and non-poor in period two can be expressed as $P\left(c_{i1} < z_1 and c_{ij} > z_2\right)$ while those poor in period one but graduate top vulnerable lot are derived as $P\left(c_{i1} < z_1 and z_2 < c_{i2} < v_2\right)$.

Figure 5.1: Conceptual Framework
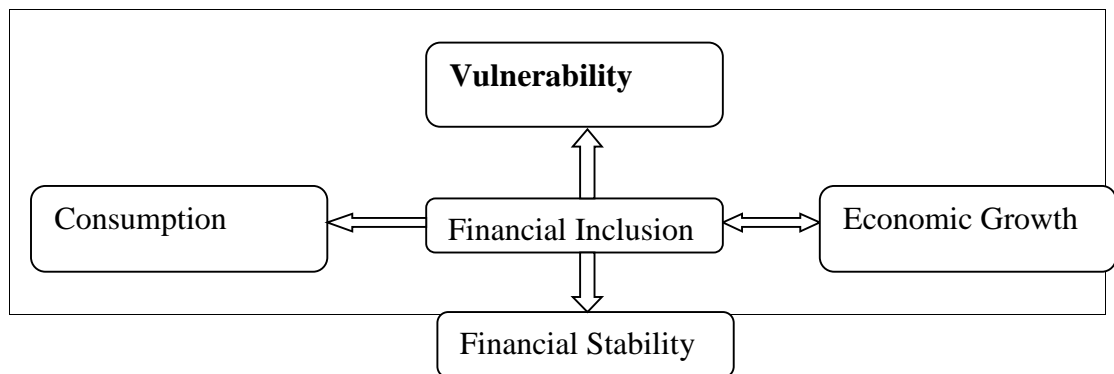
Source: Author, 2016

The impact of FI in the context of this chapter focuses on its impact on vulnerability to poverty even though FI is associated with other welfare and economic impacts.

5.6 Empirical Model

Prediction of the vulnerability to poverty (VEP) probability followed a 3step feasible generalized least squares (3FGLS) based on an OLS estimation. This was followed by an econometric estimation of determinants of VEP probability with the predicted vulnerability probability (VEP) as the dependent variable. FI was included in the vulnerability estimation function as a regressor to establish its marginal effect. Five separate regression models were estimated each representing a specific financial product (transactionary, credit, savings and investment, insurance and pension, IFI).

This is done separately for both rural and urban areas and estimation results compared with the determinants of headcount poverty in both rural and urban areas to establish whether both outcomes are influenced by similar household characteristics. The poverty line for rural and urban clusters is as defined in the KIHBS (2005/06) where absolute poverty line stands at Ksh. 1,562 and Ksh. 2,913 for rural and urban clusters respectively (KNBS, 2006). The twin models of VEP and headcount poverty are expressed as follows.

5.6.1 Vulnerability as Expected Poverty

$$VEP = f(hhsize, hhsizesqrd, age, agesq, femhhhead, married, resid\_own,$$
$$urban, maineconactivity, schooling, foodv, \inf lationrisk, income, FI..........(4)$$

5.6.2 Headcount Poverty

$Headcountpoverty = f(hhsize, age, agesq, femhhhead, married, resid\_own,$
$urban, maineconactivity, schooling, foodv, \inf lationrisk, income, FI).............(5)$

5.7 Description of variables and Apriori Expectations

Variable	Description	Expected sign	Studies reporting evidence of this sign
Poverty	Dependent variable: Measured using Vulnerability as Expected Poverty (VEP) and headcount poverty		
Log Income	A continuous variable capturing per capita income of household head	+	Jacoby and Skoufias, 1997; Chaudhuri, 2002; Cull, Robert, Tilman Ehrbeck, and Nina Holle, 2014; Beck et al, 2007
Age	A ontinuous variable which forms the basis of forming cohorts	+	Demirguc-Kunt and Klapper, 2012; Daressa and Muleta (2008
Age squared	A continuous variable with square age values	-	Demirguc-Kunt and Klapper, 2012; Daressa and Muleta (2008
Female household head	A dummy variable represented by 1 if household head 0 otherwise	-	Christiaensen and Boisvert, 2000; Seok, 2007; Kang, 2009
Household size	A continuous variable capturing the number of family members	+	AFI, 2014; Daressa and Muleta (2008
Household size squared	A continuous variable with squared household size variable	-	AFI, 2014; Daressa and Muleta (2008
Education	Number of schooling years; primary - 8; secondary - 12; tertiary - 14	+	Demirguc-Kunt and Klapper, 2012; Allen et al., 2014
Urban	A dummy variable represented using 1 for urban 0 otherwise	+	McCullouch and Calandrino, 2003; FSD, 2014; Bidani and Richter, 2001; Dang and Raghbendra, 2009; Diamond, 1999
Married	A dummy variable represented by 1 for married 0 otherwise	+	Zaman, 2004
Social	A dummy variable represented	+	Rajan and Zingales, 2003;

capital	by 1 for group membership in a *chama 0 otherwise*		Mwangi and Shem, 2012
Financial Inclusion	Proxied using both single FI measures (transactionary, credit, savings and investment, insurance and pension) and composite FI indicator (IFI)	+/-	Diagne and Zeller, 2001; Bernerjee et al., 2009, Honohan and King, 2012; Demirguc-Kunt et al., 2015; Jovanovic et al., 1990
Own Residence	A dummy variable represented by 1 where the dwelling unit is owned 0 otherwise	-	Dercon and Krishnan, 2004; Jalan and Ravallion, 1998; Daressa and Muleta (2008
Occupation	A 0 1 dummy variable representing sector where household head works; employed, agriculture or business	+/-	McCullouch and Calandrino, 2003; Larson and Plessman, 2002; Diamond, 1999
Inflation risk	A dummy variable represented by 1 if expectations about inflation in the future persist 0 otherwise	+	Huybens and Smith, 1999; Boyd et al., 2001

5.8 Data

The estimation approach applied in this study exhibits superior methodological advantages in dynamic estimation compared to cross sectional or time series data estimation based on a full sample. This technique of forming panels using repeated cross sectional survey data is used to overcome scarcity of panel data in developing countries. Repeated cross sectional surveys are less prone to attrition and non-response bias (Meng et al. 2014). Subgroups were formed based on time invariant characteristics namely; gender, place of residence and birth year from the four FinAccess survey datasets (2006, 2009, 2013 and 2016) totaling 504 observations.

The pseudo panel targeted households born between 1934 and 1994. The 2006 survey includes individuals aged 18 to 62, the 2009 survey, 21 to 65 (3 years older), the 2013 survey, 24 to 68 (6 years older after 2006) and the 2016 survey, 27 to 71 year olds (9 years older after 2006). The first observation, which is cohort one therefore captures individuals aged 18 to 22 in 2006, 21 to 25 in 2009, 24 to

28 in 2012 and 27 to 31 in 2016. This methodological framework by Deaton, 1986 was also used by Ackah et al. (2007) in Ghana. The short age bands may however lead to fewer respondents in a cohort despite the large cross section dimension. Large age cohort bands may also not be good since they reduce the cross section dimension.

Gender variable is disaggregated to generate panels for males and females respectively while the geographical aspect is captured by the seven regions (44 counties), formerly provinces with the exception of North Eastern region which has 3 counties namely; Mandera, Wajir and Garissa for missing in the 2013 wave due to logistical constraints. A key consideration in cohort analysis is the tradeoff between the number of cohorts and number of observations for each cohort. McKenzie (2004) posits that a large number of cohorts minimize errors associated with small samples.

Estimation of Vulnerability as Expected Poverty was based on 126 cohorts generated from the Fin Access survey data on Kenya collected in 2009, 2013 and 2016 by the Financial Sector Deepening (FSD) Kenya, in collaboration with the Central Bank of Kenya and the Kenya National Bureau of Statistics (KNBS). The results were compared with poverty estimates based on 5,233 observations from the latest FinAccess survey data released in 2016. The datasets capture the financial access landscape, usage of financial services by individuals in Kenya and their socioeconomic status including their consumption expenditure. Pritchet et al. (2000) contends that a two year panel is sufficient in measuring standard deviations related to consumption expenditure in vulnerability assessments justifying the use of the two year repeated survey data.

Since the analysis is based on repeated cross sections, a total of 378 cohorts have been generated based on similarities in gender (2 cohorts whether male or female), age (9 cohorts based on 5 year age bands) and location (7 cohorts comprising of

Kenya's old provincial structure excluding North Eastern Province). This pseudo panel technique is considered to be more superior since it's the only way the dynamic estimation of the variable of interest can be measured.

5.9 Discussion of Results

Policy formulation on the improvement of household/individual welfare in developing countries has for a long time relied on poverty assessments based on a headcount index. The sharp focus on this crude measure has however failed to achieve the desired results but has only managed to alleviate poverty only marginally. Those considered poor in the past have either remained poor or transited to non-poor status. The same applies to the non-poor whose status has either remained non poor or turned poor. This ex-post approach of measuring individual welfare is considered to be subsidiary in policy formulation as compared to the ex-ante measure described as being more futuristic.

A person's probability of falling or remaining poor in the future is determined by the nature of shocks whether transitory or permanent. Unlike poverty which is observable through the headcount index, vulnerability to poverty is unobservable. Several mechanisms exist on how to measure it. One main assumption in its measurement is that differences in vulnerability among individuals are associated with their observable characteristics. The empirical measure of vulnerability estimated using the three step GLS estimation procedure by Amemiya (1977), is compared to the observed measure of poverty and presented in a distribution table on the entire population. This model estimation also helps in drawing prediction on the direction of movement of poverty in subsequent periods among Kenyan households.

5.9.1 Diagnostic Tests

Endogeneity in model estimation relating FI and poverty could be emanating from omission of variables, measurement errors or simultaneity bias (Woldridge, 2012). This endogeneity bias leads to wrong policy formulation hence the need to control for it if it's present. Conventionally, the Durbin Wu-Haussman test was conducted by first running a FI model on the four transmission channels (transactionary, credit, savings, insurance) as well as the aggregated FI channel (IFI). The residuals for each FI channel are predicted and included in a reduced form equation as regressors. Wooldridge (2012) suggests that failure to reject the null hypothesis (exogeneity assumption) rules out the presence of endogeneity bias.

Choice of the approach to use in the construction of the vulnerability index is informed by the assumptions made. VEP estimation follows a parametric estimation approach (Chaudhuri, 2002) while Karmanou & Morduch (2002) uses Monte Carlo simulations in a non-parametric approach. VEP estimation is founded on the probability that household consumption level at time t+1 will lie below the poverty line the main assumption being that cross sectional variation is a good proxy for inter-temporal variation. The Monte Carlo technique entails a bootstrapping of the empirical distribution of observable shocks and estimation residuals. This technique was however not used since it assumes that shocks to consumption experienced by different households are drawn from same distribution creating heteroscedasticity for which it has no control.

The GMM estimation applied in this model fits a linear regression fits a linear regression of vulnerability to poverty using bank trust as an instrumental variable for FI. This estimation technique is considered to be more efficient as it yields the smallest variance. Its therefore able to correct the variance covariance matrix for heteroscedasticity and for autocorrelation. To allow for heteroscedasticity, heteroscedastic robust standard errors were included. The autocorrelation test (AR (1)) command failed because we are only dealing with a single period. However,

GMM estimation is unbiased in the presence of autocorrelation. Other tests considered include; the test for correct functional form, test for instrument weakness and over identification test for instrumental variables.

Multicollinearity test was also carried out on the effect of IFI on both rural and urban VEP and headcount poverty in Kenya. Multicollinearity is a violation of the Ordinary Least Squares (OLS) assumption which arises from a correlation of explanatory variables in a model. A high multicollinearity score inflates the variance of OLS estimates leading to a reduction in the t-statistic. A false small t therefore leads to a Type-2 error where the researcher ends up accepting the null hypothesis which otherwise ought to have been rejected. Extreme cases where there is perfect multicollinearity, the estimated parameters are indeterminate and their standard errors infinite. The variance inflation factor (VIF) results are summarized in Table 5.0

Table 5.0: Multicollinearity Test

Variable	Rural VEP VIF	1/VIF	Urban VEP VIF	1/VIF	Rural/Urban Headcount Poverty VIF	1/VIF
Age	506.64	0.00	522.37	0.00	322.73	0.00
Agesqrd	267.48	0.00	208.39	0.00	114.17	0.01
Hhsize	131.00	0.01	42.99	0.02	38.08	0.03
Log income	57.17	0.02	49.84	0.02	51.90	0.02
Hhsizesqrd	41.34	0.02	17.35	0.06	16.20	0.06
Schooling	35.77	0.03	7.19	0.14	7.79	0.13
Own residence	17.15	0.06	14.95	0.07	3.74	0.27
Employed	10.51	0.10	2.48	0.40	2.84	0.35
IFI	9.82	0.10	3.56	0.28	10.24	0.10
Foodv	7.29	0.14	2.61	0.38	1.27	0.79
Agr	6.18	0.16	4.72	0.21	2.51	0.40
Biz	3.32	0.30	2.60	0.38	1.11	0.90
Hhhead	3.07	0.33	2.54	0.39	1.71	0.58
Inflation risk	2.62	0.38	2.00	0.50	1.06	0.95

Mean VIF	74.96	59.33	41.1

Source: Author, 2017

The variables causing multi-collinearity in a model are those with VIF values greater than the mean VIF value. The Variance Inflation Factors (VIF) which also determines the speed at which the variance and covariance increase ruled out the problem of perfect multicollinearity. This is because the VIF for most variables except age and age squared fell below the mean VIF for both headcount poverty and VEP.

5.9.2 Descriptive Statistics

Table 5.1 provides a summary of the measures of central tendencies for the variables used in estimating poverty and vulnerability to poverty among Kenyan households

Table 5.1: Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Hhsize	378	5	2.81	1	20
Age	378	43	13.16	18	68
Schooling	378	8	4.76	0	14
Female hh head	378	0.26	0.44	0	1
Urban	378	0.40	0.49	0	1
Social Capital	378	0.46	0.50	0	1
Consexp	378	6810	19,864	0	263,933
Gross income	378	5133	13,918	0	166,667
Resid_own	378	0.65	0.48	0	1
IFI	378	0.12	0.12	0	0.72
Credit	378	0.11	0.31	0	1
Transactionary	378	0.63	0.48	0	1
Savings	378	0.22	0.41	0	1

Insurance	378	0.24	0.43	0	1
Agriculture	378	0.37	0.48	0	1
Employed	378	0.34	0.47	0	1
Business	378	0.11	0.32	0	1
Married	378	0.66	0.472958	0	1

Source: FinAccess survey 2009, 2013 & 2016

The descriptive statistics table represents the demographic profile of the 378 observations from the 2009, 2013 and 2016 FinAccess surveys. Vulnerability to poverty which forms the gist of this chapter is derived inter-temporary from the consumption expenditure of the cross sectional data for the next period. The per adult equivalent consumption expenditure averaged Ksh. 6,810 and falls between Ksh. 19,864 and 263,933. Education which is captured by the number of schooling years averaged 8 years an indication that a majority of the sampled population are primary completed. The 0.40 mean in the urban variable signify dominance by rural respondents while the 0.66 mean in the married category imply that a majority are married. Mean household size for the tracked cohorts stand at 5 persons. In a bid to understand the profile of sampled households, the study further analyzed the main economic activities on the basis of main income source..

5.9.3 Poverty Status of the Representative Household

Assessment of poverty borrowed heavily from Forster, Greer and Thorbecke (FGT) (1984) where poverty is broken into poverty incidence (fgt0), poverty gap (fgt1) and poverty severity (fgt2). The poverty incidence measure captures the population living below the poverty line and is usually referred to as headcount measure of poverty. This remains the measure that has shaped policy debates for over a decade. The poverty gap measure informs on the depth of poverty among the poor by generating the gap between an individual consumption level and the poverty line. The severity measure on the other hand captures the extent of

poverty. The FGT values for the 2009, 2013 and 2016 cohort data are summarized in Table 5.2. Appendix Tables 5.3 and 5.4 represents the poverty incidence and the distribution of the poor based on income source.

Table 5.2: Vulnerability to poverty classification (FGT Approach)

	2009		2013		2016	
FGT	Rural	Urban	Rural	Urban	Rural	Urban
Headcount ratio - FGT(0)	61	34	73	62	46	41
Poverty Gap - FGT(1)	31	15	51	42	28	29
Poverty Severity - FGT(2)	19	8	39	33	20	23

Source: Author, 2017

It is evident from a closer look at the FGT measures of poverty in the FinAccess survey data for Kenya from 2009 to 2016 that the poverty challenge is far from over especially in rural areas. However, the proportion of the absolutely rural and urban poor population between 2013 and 2016 decreased significantly from 73-46 percent and 62-41 percent respectively.

To understand the dynamics of poverty between 2009 and 2016, a transition matrix is developed based on the generated poverty incidence measures. The transition matrix representing the graduation of individuals from one poverty state to another is expressed in Table 5.5. The transition matrix is based on Chaudhuri (2002) and Pritchet. et al. (2000) vulnerability defined as the probability of becoming or remaining poor in the next period.

Table 5.5: Vulnerability Transition Matrix (Overall Rural and Urban Poverty)

2009 - 2013 Map					2013 - 2016 Map				
Overall (Rural)		**2013**			**Overall (Rural)**		**2016**		

		Non Poor	Poor	Total			Non Poor	Poor	Tot al
	2009	27	73	100		2013	54	46	100
Non Poor	39	**69.44**	**30.56**	100	Non Poor	30	**76.06**	**23.94**	100
Poor	61	**38.89**	**61.11**	100	Poor	70	**76.36**	**23.64**	100
Total	100				Total	100			
Overall (Urban)		**2013**			**Overall (Urban)**		**2016**		
		Non Poor	Poor	Total			Non Poor	Poor	Tot al
	2009	38	62	100		2013	59	41	100
Non Poor	66	**76.99**	**23.01**	100	Non Poor	30	**78.95**	**21.05**	100
Poor	34	**61.54**	**38.46**	100	Poor	70	**83.87**	**16.13**	100
Total	100				Total	100			

Source: Author, 2017

The incidence of absolute poverty among the rural dwellers averaged 61 percent in 2009. Tracking this cohort revealed that 38.89 percent of them managed to pull out of poverty by 2013 while 61.11 percent remained poor (vulnerable). A similar picture was observed in urban areas where 61.54 percent of the 34 percent urban poor managed to pull out of poverty leaving 38.46 percent still trapped. This shows that poverty eradication initiatives employed between 2009 and 2013 such as cash transfer programs may have paid off. The same cohort was tracked in 2016 to establish whether vulnerability to poverty improved over time. This is done by comparing the 2013 and 2016 poverty states to establish the transition matrix. The incidence of absolute poverty among the rural dwellers averaged 73 and 46 percent in 2013 and 2016 respectively. 76.36 percent of the rural poor in 2013 transited to a non-poor state by 2016 while 23.64 percent remained trapped in poverty.

As for urban poverty, year 2013 and 2016 accounted for 62 and 41 percent respectively. Out of these, a whopping 83.87 percent of the 2013 rural poor graduated to non-poor state in 2016 leaving only 16.13 percent in poverty. This

positive transition out of poverty between 2009 and 2016 could be attributed to effective economic policies which may have boosted household consumption. An interesting development however is that despite rural poverty being higher than urban poverty, overall poverty rose in 2013 before falling in 2016. This is represented in fig 5.3.

Fig 5.3: Poverty Transition Map of the Representative Households
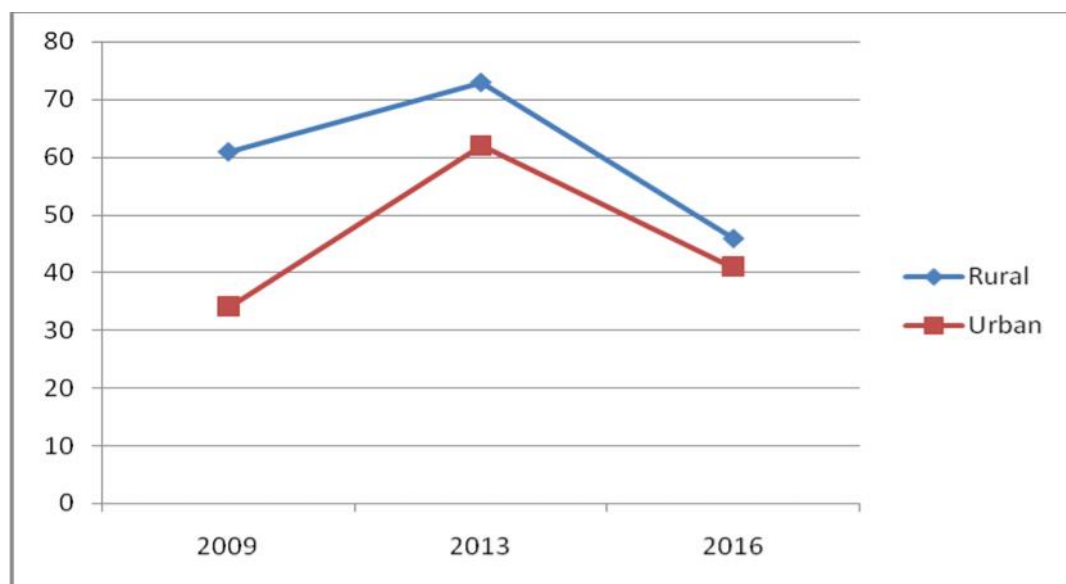
Source: Author, 2017

Figure 5.3 clearly reveal glaring disparities in rural and urban poverty. Poverty shot up in 2009 before assuming a decline from 2013. The incidence of poverty however appear to be more pronounced in the rural areas even though the gap is quickly closing courtesy of the many poverty eradication programs targeting the rural populace as well as positive and significant effect of FI in the rural areas. The reduction in poverty in rural areas can particularly be attributed to devolution of development programs to counties since the promulgation of the new constitution in 2010.

The decline in rural poverty could also be rationalized by the migration from rural to urban areas in search for greener pastures. Migration of the poor could help explain the gradual increase in the urban poverty line prior to 2014. The poverty trend however appear to have shifted after 2013 leading to the declining poverty in urban areas being witnessed today. The total absolute poverty for the entire country currently average 43.5 percent down from 67.5 percent in 2013.

The data further revealed that, 26.09 and 47.5 percent of the population in 2009 was food poor and non-food poor respectively. Food vulnerability appears to have risen marginally by 2013 to 29.87 percent courtesy of increase in inflationary pressures and increased cost of living. Deeper interrogation of the data revealed that household poverty levels vary with the education level of the household head. Fig 5.4 provides a cross tabulation of poverty scores, education level attained and cluster.

Fig 5.4: Poverty and Education status of Household Head
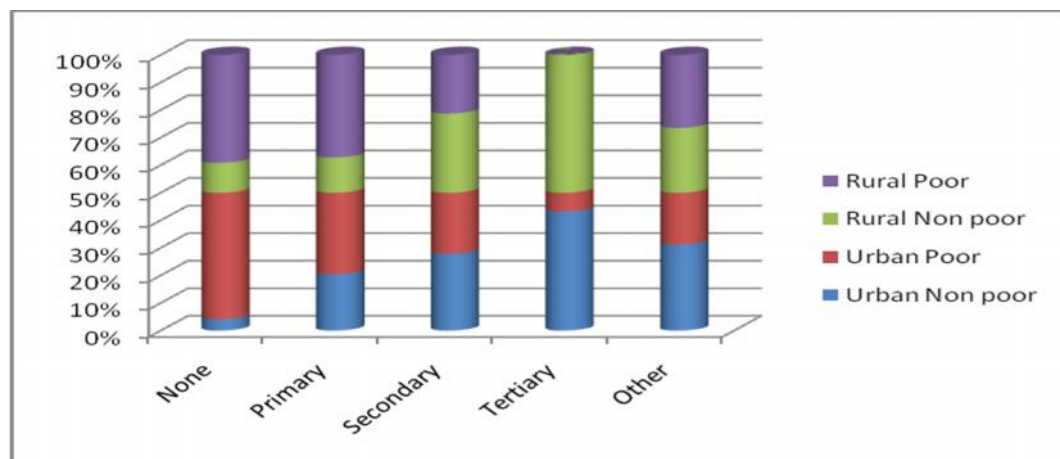
Source: FinAccess survey 2006, 2009, 2013 & 2016

Figure 5.4 revealed that rural and urban poverty shrinks with advancement in education. Conversely, the non-poor population in both rural and urban areas tends

to rise with increase in education level attained. The incidence of poverty among the tertiary education level holders averaged 13.63 and 0 percent for urban and rural areas respectively while it stood at 91.67 and 78.26 percent for those with no education in the urban and rural cluster respectively. Next is a mapping of the incidence of poverty by region.

Fig 5.5: Poverty Incidence by Region
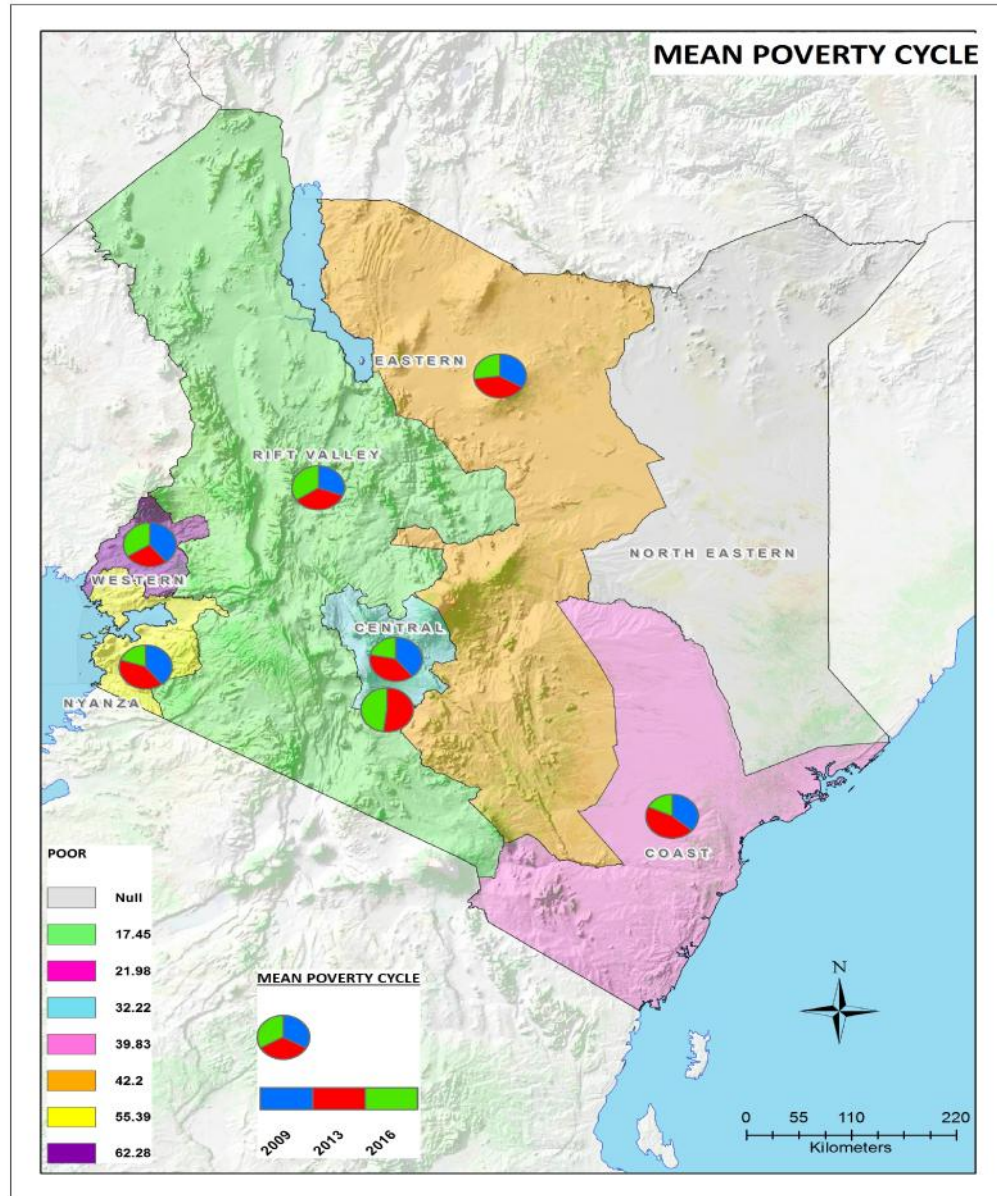
Source: Author, 2017

Figure 5.5 presents a geospatial mapping of poverty incidence in Kenya for year 2016 from the full sample. Appendix Table 5.6 illustrates the status of poverty and consumption expenditure in 2016. The map revealed that indeed poverty varies

across the country with the highest incidence being reported in Western region (62.28 percent followed by Nyanza (55.39 percent) and Rift Valley (48.34 percent) in that order. Poverty was lowest in Nairobi region standing at 21.98 percent followed by Central (32.22 percent) and Coast region (39.83 percent) in that order. However, as mentioned earlier, aggregated figures often mask the true picture on the ground hence the analysis at smaller economic units.

Given the dynamic nature of poverty, analysis of poverty at a point is likely to be flawed leading to wrong inferences for policy. To address this problem, this chapter tried to develop a poverty cycle based on repeated cross sections to understand poverty trends of the representative household in the cohort data (This information is drawn from Appendix Table 5.7 on regional poverty and consumption expenditure cycle between 2009 and 2019.). The pie charts which represent the incidence of poverty over the three repeated cross section surveys have been superimposed on the poverty map to show the poverty trends by region. Virtually all regions except Nairobi experienced acute poverty incidence in 2009 (blue shading). Poverty appear to have stagnated in 2013 but a marked improvement in terms of poverty reduction is observable in Nyanza, Central and Coast region by 2016 (green shading). Figure 5.7 illustrates the link between poverty and FI in Kenya.

Fig 5.7: Geospatial Mapping of the IFI and Poverty using ArcGIS
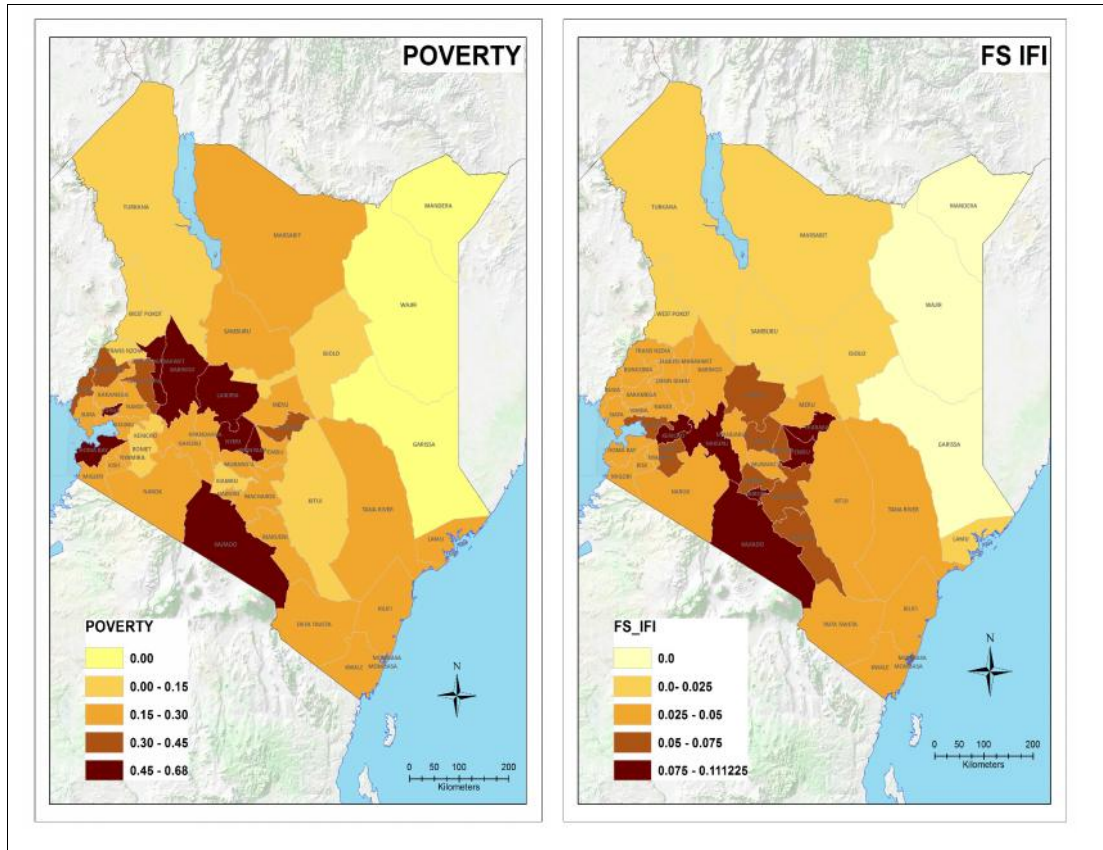
Source: Author, 2017

Figure 5.7 represents a geospatial mapping of FI points using the GPS coordinates (Northings and Eastings) for the sampled respondents. The figure clearly shows the disparities in the portfolio usage (IFI) of financial services in the counties. Kericho, Nairobi and Nakuru took the lions share in the IFI ranking of financial services. Upper Eastern and North Rift counties mainly; Turkana, Marsabit and Samburu reported low IFI. Counties like Kiambu and Kitui are perfect examples where high IFI (dark shading) reported low poverty scores (light shading). The poverty map which was generated on the basis of the headcount poverty from the FinAccess data is placed beside the IFI map to explain this relationship. As expected counties which recorded higher IFI are largely characterized by low poverty incidence although this needs to be investigated further controlling for all

other policy interventions for welfare. The relationship is however mixed in other counties where this inverse relationship between IFI scores and poverty appears does not to hold. A case in point is Kajiado county which recorded a high IFI score and a high poverty score as evidenced by the dark shading in both maps. This relationship however calls for a deeper interrogation of other county characteristics as well as other initiatives on the ground to understand the observed phenomena. As for the direction of causality; the chapter on the determinants of FI will test whether Kenya follows a demand following or supply leading hypothesis based on the coefficient of per capita income.

5.9.4 VEP profile of sampled households

A key question in vulnerability assessment is the threshold of vulnerability to poverty. Two measures have been cited in the literature. One is the proportion of the population with over 50 percent probability of turning poor (extreme vulnerability). The second measure focuses on persons with over 12.39 percent probability of becoming poor (moderate vulnerability). World Bank defines vulnerability as being 2.5 times the traditional poverty line. Chaudhuri et al. (2002) while contrasting vulnerability and poverty describes the former as an ex ante (forward looking) measure and the latter as ex post in the sense that the observed poverty is determined by expenditure shortfall from a preselected poverty line. The computed ex ante vulnerability probability helps draw the expected consumption level in the future, t+1. This probability is determined by among other variables, the exposure and responsiveness to idiosyncratic shocks such as inflationary risks.

The VEP approach to measuring vulnerability to poverty has been adopted in conducting the analysis. This is the probability that the households level of consumption at time t+1 will lie below the consumption poverty line (preset threshold probability). Since Chudhuri et al. (2002) relied on a single cross sectional data to carry out a vulnerability analysis; estimation of the standard

deviation of consumption was based on the assumption that cross sectional variability is a good proxy for inter-temporal variation.

Other studies such as Tesliuc and Lindert (2002) have incorporated risk of natural disasters in estimating vulnerability depending on the geographical location in Guatemala. Kenya being a small open economy is highly vulnerable to changes in the international fuel prices. This is often transmitted into our economy as imported inflation. To internalize this risk, this study has included the risk of inflation as one of the regressors.

Table 5.8: Household Characteristics of the Poor and Vulnerable Population

	Rural-2009		Urban-2009		Rural-2013		Urban-2013	
	poor	vulnerable	Poor	vulnerable	poor	Vulnerable	Poor	vulnerable
Consumption	757	5934	1978	8772	474	9362	857	4728
Gross income	702	2165	1833	3162	1864	5079	570	2719
Hhsize	6	5	3	4	5	4	4	4
Age	49	48	40	47	48	47	49	48
Education	3	4	0	3	7	8	7	7
Own residence	1	1	0	1	1	1	1	1
Female hhhead	0	0	1	0	0	0	1	0
Social capital	0	0	0	0	0	0	0	0
Agriculture	0	0	0	0	0	0	0	0
Inflation risk	0	0	0	0	0	0	0	0
Formal	0	0	0	0	1	1	1	1
Foodvulnerable	0	0	1	0	0	0	1	0

Source: Author, 2017

The mean consumption expenditure in 2013 was found to be Ksh. 474 and Ksh. 9,362 for the rural poor and vulnerable population. The same discrepancy was observed in the urban population where the poor and vulnerable population accounted for Ksh. 857 and Ksh 4,728 respectively. All other factors that

characterize VEP and headcount poverty except gross income appeared to trail each other.

Table 5.9: Profiling Income Group Movement in 2013 and 2016

Income Group 2009		Income Group2013 (Ksh)							Income Group2016 (Ksh)							
		>50 000	0-50 0	500-2000	15000-30000	2000-5000	30000-50000	5000-15000	>50 000	0-50 0	500-2000	15000-30000	2000-5000	30000-50000	5000-15000	
>KSh50 000	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1
KSh 0-500	13	0	5	4	0	3	0	1	0	5	4	0	3	0	1	13
KSh 500-2000	61	1	8	18	5	16	1	12	1	8	18	5	16	1	12	61
KSh15000-30000	3	0	0	0	0	1	0	2	0	0	0	0	1	0	2	3
KSh2000-5000	29	1	6	8	1	8	2	3	1	6	8	1	8	2	3	29
KSh30000-50000	3	0	0	1	1	1	0	0	0	0	1	1	1	0	0	3
KSh5000-15000	16	4	6	0	2	0	4	0	0	4	6	0	2	0	4	16

Source: Author, 2017

Table 5.10 illustrates the computed mean poverty persistence parameter for rural and urban areas based on Bourguignon, Goh and Kim (2004) mean based approach. The parameter is generated using the second moment with an exponential variance following the three step feasible generalized least squares (FGLS) procedure (Amemiya, 1977).

Table 5.10: Bourguignon, Goh and Kim's (2004) Vulnerability Probability

Period	Cluster	Mean	Std. Dev.	Min	Max

		0.29	0.02	0.26	0.33
2013/16	Rural				
	Urban	0.31	0.03	0.27	0.43

Source: Author, 2017

The estimated probability of expenditure shortfall for the representative household in future averaged 29 and 31 percent for the rural and urban clusters respectively for the period 2013/16. This signals a tapering vulnerability risk between the rural and urban areas going forward (Bourguignon, Goh and Kim, 2004). These results are based on the three step FGLS where both the ex-ante mean and ex ante variance are computed before an auxiliary regression of the squared residuals and the regressors is carried out. Imposing a log normal distribution assumption helps generate the first and second moment. The estimation assumes that the variance of the disturbance term (inter-temporal variance of log consumption) is constant for all households. Heteroscedasticity is corrected by allowing the variance of the disturbance term to vary with household characteristics. Pritchett et al., (2000) posit that vulnerability as expected poverty rises with the length of time horizon since uncertainty rises more as you move into the distant future.

The instrumental variable GMM two step procedure was used to estimate a logarithmic expenditure function with IFI as one of the regressors. Based on the vulnerability risk in both rural and urban areas, there is need to interrogate the data further to understand the characteristics of this vulnerable population. This is analyzed econometrically in the next section.

5.9.4 Econometric estimation of Vulnerability

Chaudhuri (2000; 2003) defined vulnerability to poverty as the probability that the population currently lying above the poverty line will fall below it in the next period or those below will still fall below it in the next period based on the consumption per adult equivalent indicator. Given this inter-temporal variation,

vulnerability as expected poverty (VEP) follows an autoregressive process of order one (AR (1)) which in the context of this chapter focused on the population considered to be absolutely poor both in 2013 and 2016. Morduch (1994) offered a simplified definition of vulnerability to poverty as simply operating below the poverty line though this is what is often termed as headcount poverty. The vulnerability measure therefore nets out those people who were poor in 2009 but were able to exit the poverty trap in 2013. Households found poor in two subsequent surveys, say 2009 and 2013 or 2013 and 2016 form the vulnerable population while the non-poor form the reference category.

Prior knowledge about looming vulnerability risks help households adopt mitigation strategies early enough to minimize suffering. A variable capturing the risk of going without food in future was included in the model to test household preparedness in tackling such risks. Sen (1999) however posits that elimination of poverty is not enough; instead, households should focus more on the elimination of vulnerability risks which threaten plunging the household back to poverty due to deprivation.

The coefficient of food vulnerability risk in explaining VEP was found to be negative and significant at 10 percent. This shows that rural households are well able to cushion themselves adequately once they are equipped with information on the looming vulnerability risks. The risk of going sometimes or often without food in the country dropped from a high of 59.1 percent in 2013 to around 41.9 percent in 2016. This indicates that the war against vulnerability to poverty is being won. To counter the shocks, 39.9 and 46.8 percent households in the rural areas and urban areas used savings as the main coping strategy in rural and urban areas respectively while 26.8 and 32.2 percent respectively embraced social capital from their networks. Holzmann and Jorgensen (2000) argue that mitigating vulnerability risks early enough helps in avoiding the poverty trap. Failure to mitigate leads to

huge, irreversible losses which exacerbates poverty especially where households lack sufficient assets or insurance to smoothen consumption (Jacoby and Skoufias, 1997).

FSD (2016) report identified various shocks faced by households in the last two years. The main shocks faced by households included; drought/famine (33.1 percent) followed by loss of property from fire or theft (14.8 percent) and death of a relative (13.8 percent) in that order. To prove that risks faced in urban and rural areas are different, urban households listed death of a relative as the main shock they experienced in the past two years (24.1 percent) followed by loss of property (19.6 percent) and increased cost of basic items (12.8 percent) in that order. The high ranking of risk of property loss among urban households depict how much value they attach to assets. This picture offer insights on the vulnerability risks faced in the country.

Rural households may not be hit hard by inflationary pressure since most products they consume are grown in the farms. This argument is also supported by their low ranking of the risk of loss of income of the main income earner (3.9 percent). Urban households are disadvantaged since despite earning slightly more, they have to spend a huge chunk of their income on household expenses. The risk of loss of the income of main wage earner in the past two years averaged (7.8 percent) and indication that loss of income in the urban areas could have more serious implications on welfare in urban areas as compared to rural areas.

In the list of coping strategies, asset disposal was not left behind with rural and urban households recording 8.9 and 4.6 percent respectively. This explains why savings and asset holding exhibits a positive impact on welfare. Hardly 5 percent of households in either rural or urban areas cut back their expenses or borrowed from banks to mitigate the risks. This explains why the uptake of credit remains

low (14 percent) in Kenya (FSD, 2016). Smoothing of consumption is therefore done through other mechanisms such as liquidating assets.

While Christiaensen and Boisvert (2000) and Jha and Dang (2008) established lower incidences of poverty among female headed households, findings from this study suggest that female headed households run a higher risk of falling into poverty as evidenced by the strong positive coefficient significant at 1 percent confidence level. Findings from the VEP estimation support the work of Kang (2014) who found poverty among female headed households to be higher than that of male headed households.

Daressa and Muleta (2008) argued that increase in the age of household head facilitates an increase in the stock of human capital, wealth of experience and asset base which in turn yields a reduction in vulnerability to poverty. This study on its part revealed that age of the household head despite having a negative relationship with VEP was non-significant. However, age squared variable was found to be positive signaling an increase in vulnerability as old age strikes. This could be attributed to loss of wage income once households hit retirement age. Around this time, households rely on accumulated savings to meet their day to day financial obligations. This expenditure on consumption exposes them to vulnerability risks.

Increase in household size beyond a certain level piles pressure on household income raising the probability of falling into poverty. Results from this analysis however paint a different picture where the lower the family sizes the higher the exposure risk to poverty. This raises a question on how small is small and how big is big, even though the answer to this question falls outside the purview of this study. This indicates that there is an optimal household size. Contrary to findings by Mckenzie (2003) and Cunningham and Maloney (2000) on education where less educated household heads bore a lower incidence of poverty, this study

established that rural poverty indeed falls with increase in schooling years. This elevates the role of human capital development in improving household welfare.

Conventional vulnerability estimation considers two periods at a time. Such an estimation that focuses on the dynamic transition brings out factors that characterize vulnerability in the cohorts being tracked. The next subsection discusses the determinants of VEP probability derived using the three step Feasible Generalized Least Squares (FGLS) technique. Focus is mainly on the impact of FI whose effect on VEP is compared with that of headcount poverty in both rural and urban areas. This approach is considered to be robust due to its ability to inform on how deviations from the mean will affect the predicted vulnerability probability.

The link between FI and vulnerability to poverty is well established by the modern development theories. These theories are mainly concerned with elimination of barriers to FI such as capital market imperfections. Table 5.12a focuses on an econometric estimation of vulnerability as expected poverty (VEP) in the rural areas for year 2013 while Table 5.12b targets the urban population VEP in line with Chaudhuri (2002) and Christiaensen and Subbarao (2005) framework. The main aim of this chapter was to bring out the role of FI and establish whether vulnerability to poverty and headcount poverty are influenced by similar characteristics. The estimation focused on household characteristics in 2013 and consumption expenditure in 2016 following the autoregressive process of order 1 (AR (1)) applied in VEP estimation.

The reported results represent marginal effects (elasticities) as each regressor changes by one unit from its mean. Since the prediction of the VEP probability is founded on moment generating functions where mean and variance is determined first, Bourguignon, Goh and Kim's (2004) mean based approach considers the variance to be of an exponential type. Appendix Tables 5.11a and 5.11b represents the determinants of VEP for rural and urban households respectively before

instrumenting FI. The Adjusted R-squared for the VEP estimation along the various FI channels was above 80 percent symbolizing model fitness for VEP in both rural and urban areas. VEP estimation was based on 126 observations representing household heads drawn from the 2013 FinAccess household characteristics. The econometric estimation of VEP in rural and urban areas based on an instrumenting of FI is represented in Table 5.12a and 5.12b respectively.

Table 5.12a: Determinants of Rural VEP

VARIABLES	(IFI) VEP	(Transaction) VEP	(Credit) VEP	(Savings) VEP	(Insurance) VEP
Log income	0.003***	0.002	0.001	0.002*	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Hhsize	0.008***	0.007***	0.008***	0.009***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Hhsizesqrd	-0.000***	-0.000***	-0.000***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.000	-0.001	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Agesqrd	0.000	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.001***	0.001***	0.012*	0.012**	0.015**
	(0.000)	(0.000)	(0.007)	(0.006)	(0.007)
Own residence	-0.022***	-0.019***	-0.024***	-0.022***	-0.021***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Female hhhead	0.032***	0.034***	0.034***	0.032***	0.031***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Inflation risk	-0.012***	-0.013***	-0.015***	-0.014***	-0.013***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Food vulnerable	-0.014***	-0.014***	-0.016***	-0.015***	-0.015***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Agriculture	0.007**	0.009**	0.012**	0.009**	0.011***
	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)
Employed	0.001	-0.001	0.002	0.004	0.001
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Business	-0.005	-0.004	0.002	0.001	-0.006
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
FI Measure	-0.030	-0.002	0	-0.000	0.004
	(0.023)	(0.005)	(0)	(0.005)	(0.004)

ehat	-0.079**	-0.013	-	-0.033***	-0.013*
	(0.033)	(0.008)		(0.008)	(0.007)
Observations	126	126	126	126	126
R-squared	0.820	0.827	0.803	0.843	0.816

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Instrumental variables (GMM)	Number of obs	23
	Wald chi2(15)	2855.62
	Prob > chi2	0
	R-squared	0.933
GMM weight matrix: Robust	Root MSE	0.00842

Source: Author, 2017

The relationship between FI and Vulnerability to poverty (VEP) in rural areas is weak despite the inverse relationship. This could be explained by the multiple non-FI binding constraints which characterize rural areas ranging from; seasonality in incomes, poor infrastructure, limited finance among others. Similar sentiments were echoed by Beck, 2016 and Banerjee, 2013 who found the impact of microcredit to be limited and heterogeneous. A recent publication by Banerjee et al. (2016) questions the role of microcredit in pulling millions out of poverty through access to credit.

The author found the impact to be modestly positive but with no transformative effects. The effects are actually shaped by borrower characteristics, circumstances and purpose of loan. FSD (2014) already suggested that most FinAccess points are located in densely populated low poverty zones as opposed to poverty prone areas. Bidani & Richter, 2001; Dang & Raghbendra, 2009; McCullouch & Calandrino, 2003; Diamond, 1999 also predict a higher incidence of rural deprivation. Cull et al., (2014) associate the poor with exclusion from wage employment opportunities subjecting them to the operations of the informal economy out of necessity rather than choice.

Bernejee et al. (2009) prediction of the negative link between microcredit and consumption expenditure could also partially explain the weak relationship between FI and rural VEP. Some households often opt to invest in consumer durables whose effect can only be reduced by a decrease in casual income. This negative relationship is also supported by Zinman et al., 2013 and Diagne & Zeller, 2001. Rural households are mostly affected by cream skimming practices by financial institutions who often consider provision of financial products such as savings to the poor to be both non profitable and non-sustainable.

Chaudhuri (2002) consider relative income stability to be key in lowering VEP. This result also supports Jovanovic & Greenwood. (1990) and Kuznet (1955) where FI initially improves lives of the wealthy population mostly in urban areas raising the income inequality before the gains are spread out to the entire population including rural areas. These results also appear to blur the impact of social transfer programs in Kenya. One other challenge facing the rural population is the high degree of information asymmetry which results in high credit rationing. This coupled with reliance on agriculture which is characterized by unpredictable weather conditions and infrastructural deficit worsens the plight of the rural poor. Savings which is often characterized by an inverse relationship with consumption had a positive coefficient, an indication that households savings lower the consumption spending and this effect is what the portfolio usage (IFI) picks. Other control variables found to have a significant relationship with VEP include; inflationary expectations, female headed households, food vulnerability and the main economic activity of the household head.

Table 5.12b: Determinants of Urban VEP

Dependent Variable	(IFI) VEP	(Transaction) VEP	(Credit) VEP	(Savings) VEP	(Insurance) VEP
Log income	-0.012***	-0.001	-0.007***	-0.007***	-0.009***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)
Hhsize	-0.032***	-0.026***	-0.021***	-0.034***	-0.026***
	(0.005)	(0.0017)	(0.005)	(0.004)	(0.007)
Hhsizesqrd	0.003***	0.003***	0.002***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	-0.003**	-0.001*	-0.002	-0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Agesqrd	0.000**	0.000***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.002**	0.001*	0.022***	-0.009	0.018**
	(0.001)	(0.000)	(0.008)	(0.009)	(0.008)
Own residence	-0.021*	-0.037***	-0.023**	-0.005	-0.020
	(0.012)	(0.005)	(0.011)	(0.008)	(0.014)
Female hhhead	0.024***	0.040***	0.018***	0.020***	0.025**
	(0.005)	(0.002)	(0.007)	(0.005)	(0.010)
Inflation risk	0.005	-0.039***	0.014	0.008	0.009
	(0.005)	(0.004)	(0.010)	(0.006)	(0.009)
Food vulnerable	-0.016**	-0.021***	-0.031***	0.000	-0.028***
	(0.007)	(0.002)	(0.009)	(0.006)	(0.008)
Agriculture	0.022***	-0.015***	0.014	0.004	0.001
	(0.008)	(0.005)	(0.016)	(0.007)	(0.016)
Employed	-0.002	-0.032***	-0.000	0.006	-0.011
	(0.011)	(0.004)	(0.013)	(0.006)	(0.013)
Business	0.008	-0.011***	0.004	0.015**	-0.008
	(0.008)	(0.003)	(0.011)	(0.006)	(0.014)
FI	-0.103***	-0.069***	-0.002	0.004	-0.019
	(0.037)	(0.005)	(0.012)	(0.013)	(0.017)
ehat	0.258***	0.116***	-	0.059***	0.033
	(0.080)	(0.010)		(0.016)	(0.029)
Observations	126	126	126	126	126
R-squared	0.933	0.988	0.867	0.944	0.878

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Instrumental variables (GMM)		
	Number of obs	43
	Wald chi2(15)	248.47
	Prob > chi2	0
	R-squared	0.8204
GMM weight matrix: Robust	Root MSE	0.0076

Urban VEP appears to fall significantly with increase in transactionary and portfolio usage of financial services hence supporting findings by Chaudhuri, 2002; Odhiambo, 2010 and Demirguc-Kunt et., al 2015. The same applies to per capita income whose increase led to a significant reduction in the VEP among the urban populace.

A comparison of factors that determine VEP and headcount poverty revealed interesting results. The results challenged Chaudhuri (2002) argument that VEP and headcount poverty are determined by similar characteristics. Given that most policies focus more on the reduction of headcount poverty, the persistence in poverty could be explained by the inability of policy to pick causes of VEP in both rural and urban areas. Schooling, per capita income, asset ownership and FI appear to shape both VEP and headcount poverty in a bigger way. The positive coefficient of residence ownership in the rural headcount poverty shows that asset holding in the rural areas could be a catalyst for a surge in poverty as households cut their consumption to accumulate wealth.

Households ought to build their consumption first before resorting to investment is assets. The difficulty in liquidating assets in rural areas particularly makes the investment in assets not a reliable tool for the eradication of headcount poverty. The government advocates for programs which ride on liquid assets to address poverty. A case is in point is the governments cash transfer programs whose audit report revealed that it's already bearing fruits in transforming the lives of the vulnerable population in 21 sub-counties (GoK, 2014). Table 5.13a presents an econometric estimation of the determinants of rural headcount poverty along the various FI transmission channels based on the full sample data covering 5,233 observations in the 2016 FinAccess survey data.

Table 5.13a: Determinants of Rural Headcount Poverty

Dependent Variable	(Rur Poverty)	(Rur Poverty)	(Rur Poverty)	(Rur Poverty)	(Rur Poverty)
	IFI	Transaction	Credit	Savings	Insurance
FI Measure	-2.778***	-0.267*	0.196	-0.107	-0.063
	(0.960)	(0.146)	(0.194)	(0.144)	(0.159)
Log income	-1.724***	-1.753***	-1.784***	-1.766***	-1.771***
	(0.106)	(0.105)	(0.106)	(0.106)	(0.105)
Hhsize	0.237***	0.238***	0.215**	0.220**	0.219**
	(0.087)	(0.089)	(0.088)	(0.087)	(0.088)
Hhsizesqrd	-0.017**	-0.017**	-0.016**	-0.016**	-0.016**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age	0.019	0.021	0.020	0.018	0.020
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Agesqrd	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.052***	-0.059***	-0.069***	-0.065***	-0.067***
	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)
Own residence	0.869***	0.901***	0.901***	0.891***	0.890***
	(0.161)	(0.161)	(0.161)	(0.161)	(0.161)
Female hhhead	-0.298**	-0.281**	-0.279**	-0.283**	-0.285**
	(0.133)	(0.133)	(0.134)	(0.134)	(0.134)
Inflation risk	-0.038	-0.010	-0.033	-0.047	-0.038
	(0.295)	(0.299)	(0.298)	(0.296)	(0.296)
Food vulnerable	0.223	0.238*	0.250*	0.242*	0.245*
	(0.143)	(0.144)	(0.143)	(0.143)	(0.143)
Agriculture	0.219	0.201	0.213	0.218	0.218
	(0.140)	(0.141)	(0.141)	(0.140)	(0.140)
Employed	-0.401**	-0.459***	-0.483***	-0.458***	-0.460***
	(0.175)	(0.173)	(0.175)	(0.174)	(0.175)
Business	0.540	0.463	0.482	0.498	0.495
	(0.564)	(0.567)	(0.572)	(0.562)	(0.561)
Observations	5,233	5,233	5,233	5,233	5,233

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Logistic regression		Number of obs	3116
		LR chi2(14)	1798.68
		Prob > chi2	0
Log likelihood = -917.77639		Pseudo R2	0.4949

Source: Author, 2017

Determinants of Rural poverty appear to vary with the household's financial product of choice. In line with Odhiambo N.M. (2010) and Jalilian and Kirkpatrick (2002) prediction of the presence of an inverse relationship between financial development and poverty, econometric estimation results established an inverse relationship between transactionary and IFI usage on headcount poverty in rural areas.

The impact of FI on headcount poverty in rural areas was found to be strong especially for transactionary and portfolio usage (IFI) categories. The weak link between insurance usage and poverty could be explained by the low uptake of FI in rural areas since households main economic activity is agriculture which is largely informal hence doesn't attract statutory deductions like in the urban areas where majority are formally employed. The positive coefficient for credit though non-significant points to the weak relationship between extension of loan facilities and welfare. This could be rationalized by the amount of credit rationing dominant in rural areas. Female headed households also reported significantly lower poverty than male headed households. This result supports Christiaensen & Boisvert (2000).

Households whose main economic activity is full time employment reported lower poverty incidence as compared to all other sectors including agriculture. The results also support the role of education in lowering headcount poverty in rural areas. Given that residence ownership in rural areas is almost universal, ownership of residence has a nil effect on reduction in poverty. Homelessness in rural areas is not an issue given that even rentals are not many. This however contradicts Dercon & Krishnan (2004) and Jalan & Ravallion (1998) who found asset holding to have a negative impact on poverty. What differs in the rural areas is actually the quality of housing which could lead to varying impacts on headcount poverty. Table 5.13b presents the estimation of the determinants of urban headcount poverty along the

various FI transmission channels based on the full sample data covering 5,233 observations in the 2016 FinAccess survey data.

Table 5.13b: Determinants of Urban Headcount Poverty

Dependent Variable	(Urb Poor)	(Urb Poor)	(Urb Poor)	(Urb Poor)	(Urb Poor)
	IFI	Transaction	Credit	Savings	Insurance
FI Measure	-0.707	0.332**	-0.376**	-0.041	-0.315**
	(0.702)	(0.153)	(0.177)	(0.134)	(0.150)
Log income	-0.659***	-0.701***	-0.657***	-0.673***	-0.653***
	(0.057)	(0.055)	(0.055)	(0.055)	(0.055)
Hhsize	0.276***	0.253***	0.283***	0.270***	0.277***
	(0.097)	(0.094)	(0.097)	(0.096)	(0.096)
Hhsizesqrd	-0.020**	-0.019**	-0.020**	-0.020**	-0.020**
	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Age	0.015	0.015	0.016	0.015	0.018
	(0.036)	(0.036)	(0.036)	(0.036)	(0.036)
Agesqrd	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.040**	0.024	0.039***	0.036**	0.041***
	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
Own residence	-0.759***	-0.762***	-0.767***	-0.751***	-0.775***
	(0.127)	(0.126)	(0.127)	(0.126)	(0.127)
Female hhhead	0.466***	0.462***	0.469***	0.469***	0.450***
	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)
inflation risk	0.152	0.133	0.149	0.151	0.152
	(0.236)	(0.238)	(0.234)	(0.236)	(0.236)
Food vulnerable	-0.206	-0.192	-0.201	-0.201	-0.208
	(0.141)	(0.141)	(0.141)	(0.141)	(0.141)
Agriculture	-0.851***	-0.836***	-0.846***	-0.852***	-0.838***
	(0.148)	(0.148)	(0.148)	(0.148)	(0.148)
Employed	0.022	-0.012	0.038	0.002	0.050
	(0.137)	(0.135)	(0.135)	(0.135)	(0.137)
Business	-0.408	-0.393	-0.417	-0.423	-0.396
	(0.604)	(0.603)	(0.613)	(0.602)	(0.604)
Observations	5,233	5,233	5,233	5,233	5,233

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Logistic regression		Number of obs	3116
		LR chi2(14)	427.62
		Prob > chi2	0
Log likelihood = -1184.7636		Pseudo R2	0.1529

Headcount poverty in urban areas appears to fall sharply with the increase in FI and housing. FI and housing appear to be the main constraints facing urban households. FI however affects the households differently depending on the product with credit having a negative and significant impact. Access to a loan facility by an urban household lowers their headcount poverty significantly by 3.6 percent and 3.17 percent for insurance uptake.

Transactionary financial product appears to have a positive effect on urban poverty reduction. This could be rationalized by the high uptake of transactionary products in urban areas leading to rapid diminishing returns in the form of an S-shaped production as evidenced by Banerjee & Duflo (2007) where gains from the uptake of transactionary products are high but decrease as more and more transactionary products are taken up.

This probably signals the presence of an optimal transactionary product holding which if exceeded becomes counterproductive as evidenced by the positive coefficient. This positive coefficient could explain the weak link between the portfolio usage (IFI) and urban poverty.

Credit uptake also leads to a reduction in poverty by around 3.6 percent. Contrary to the rural areas where female headed households exhibited lower poverty incidence, urban households headed by females reported higher poverty incidence contradicting Christiaensen & Boisvert (2000). Residence ownership in urban areas significantly led to a reduction in headcount poverty across all financial product categories reinforcing Dercon & Krishnan (2004) and Jalan & Ravallion (1998) findings. Increase in schooling years also appeared to have a nil effect on urban poverty reduction. This could probably be explained by the high education levels in urban areas.

The odds ratios for headcount poverty estimation are summarized in Table 5.13c based on the various FI transmission mechanisms.

Table 5.13c: Odds Ratios for Rural and Urban Headcount Poverty in 2016

Dependent Variable	Rural Poverty					Urban Poverty				
Headcount Poverty	IFI	Trans	Cred	Sav	Ins	IFI	Trans	Cred	Sav	Ins
FI Measure	0.16	0.78	1.33	0.94	0.95	0.66	1.46	0.57	0.98	0.78
Log income	0.08	0.08	0.08	0.08	0.08	0.51	0.49	0.52	0.50	0.51
Hhsize	1.16	1.17	1.14	1.15	1.15	1.59	1.55	1.63	1.59	1.60
Hhsizesqrd	0.99	0.99	0.99	0.99	0.99	0.96	0.96	0.96	0.96	0.96
Age	1.02	1.02	1.02	1.02	1.02	0.97	0.97	0.97	0.97	0.97
Agesqrd	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Education	0.95	0.95	0.94	0.94	0.94	1.05	1.04	1.05	1.05	1.05
Own residence	2.47	2.52	2.56	2.52	2.52	0.33	0.33	0.32	0.33	0.33
Female hhhead	0.69	0.70	0.70	0.70	0.69	1.73	1.70	1.73	1.73	1.70
Inflation risk	0.85	0.88	0.88	0.86	0.87	1.32	1.31	1.33	1.33	1.33
Food vulnerable	1.24	1.27	1.27	1.26	1.26	0.81	0.81	0.81	0.81	0.80
Agriculture	1.18	1.16	1.16	1.17	1.17	0.32	0.33	0.33	0.32	0.33
Employed	0.67	0.64	0.62	0.64	0.64	1.01	0.98	1.05	1.00	1.04
Business	2.65	2.49	2.63	2.62	2.62	0.44	0.47	0.44	0.44	0.45

Source: Author, 2017

Focusing on the odds ratio for FI, the results indicate that credit expansion in rural areas has the highest impact on rural poverty. The odds of persistence in rural headcount poverty are 1.33 lower given a household uptake of credit services compared to exclusion from credit services. In urban areas, transactionary financial products had the biggest impact captured by the 1.46 odds ratio. This probably explains why the marginal returns from the uptake of transactionary products in urban areas are diminishing. Approximately all households in the urban areas have access to the mobile infrastructure that dominates the uptake of transactionary products.

5.10 Conclusions and Policy Implications

The main objective of this chapter was to investigate the impact of financial inclusion of VEP and headcount poverty. This was however preceded by a construction of the VEP probability using Bourguignon, Goh and Kim (2004) mean based approach for rural and urban areas. VEP was computed as the probability that a household's consumption per adult equivalent at time t+1 would fall below the poverty line while headcount poverty was computed as the population living below the poverty line based on KIHBS 2005/06. Contrary to Chaudhuri et al. (2002) who found a close relationship between determinants of headcount poverty and VEP, this analysis found that headcount poverty and vulnerability as expected poverty are independent concepts.

Policies geared towards eradication of poverty should factor in vulnerability probability of the entire population. This outcome is elaborated by the poverty transition matrix where 61.11 percent of the 61 percent found to be rural poor in 2009 remained poor in 2013 as compared to 38.89 percent who transited to non-poor state. Poverty declined between 2013 and 2016 where 23.64 percent of the 70 percent 2013 rural poor remained poor compared to 76.36 percent who transited to non-poor state. The picture is no different when it comes to the urban population even though poverty incidence and vulnerability is lower. Persistence in poverty for the 34 percent urban poor in 2009 averaged 38.46 percent. This shows that 61.54 percent of the 2009 urban poor population pulled out of the poverty. A more significant reduction in the poor population was observed in 2016 where only 16.13 percent of the 70 percent poor population in 2013 remained poor. A whopping 83.87 percent therefore managed to pull out of the poverty trap successfully. An econometric estimation of the determinants of headcount poverty and VEP on the cohort data established mixed results with FI having an inverse relationship with both rural and urban VEP. Save for rural VEP, urban VEP, rural and urban headcount poverty reported a significant relationship with FI implying

that rural households could be facing many other constraints other than financial exclusion which limit their welfare change even with FI.

Asset holding was also found to have impacted positively on VEP among rural households. This shows how rural households tradeoff consumption expenditure with accumulation of illiquid assets like land and house ownership. This illiquid state of assets makes the assets less useful in cushioning poor households against short term liquidity risks. The relationship between residence ownership and VEP is however negative in urban areas an indication that urban households are mainly constrained by lack of credit and housing.

Given the pivotal role played by financial services in lowering *ex-ante* and *ex-post* poverty, the government should encourage financial institutions to increase the range of financial services at least cost to spread the gains. It was also found that effectiveness of FI in rural areas could be curtailed by the many constraints faced there. To this end, the government both at national and county levels should ensure that the number of deprivations in rural areas is reduced by increasing funding towards the development of other support infrastructure such as roads, communication, quality housing among others.

In urban areas, housing and access to finance appear to be the main constraints. The government should therefore ensure that it's able to come up with low cost housing and more competitive financial landscape to bring down the cost of financial services. This way, poverty would be able to fall by a bigger margin.

Tackling VEP in rural areas therefore requires not just FI but a combination of FI and other capabilities such as knowhow, infrastructural development among other interventions. Continuous human capital development through education is critical given the tendency of the educated to migrate to urban areas in search of greener pastures.

Chapter Six: Summary, Conclusions and Policy Recommendations

6.1 Conclusions

The study sought to investigate the dynamics of financial inclusion (FI) and its impact on welfare in Kenya. The role of FI as a tool for enhanced welfare and reduction in vulnerability to poverty cannot be overemphasized. The following section details the conclusions and policy recommendations drawn from the study. Firstly, the study developed both aggregated and single financial product usage indicators to inform on the level and status of FI across the country. This was followed by a stochastic dominance testing to establish which product dominates financial markets and for which households. The measurement of single financial product usage was based on the use of at least one form of transactionary financial service. As for the portfolio usage, Sarma's (2008) was applied to aggregate household financial product usage across all the four categories namely; transactionary, credit, savings and investment, insurance and pension.

Secondly, a determination of drivers of FI was carried out from both the demand and supply side. Determination of single product usage followed panel estimation. Haussmann specification test was applied to test for the most suitable estimation model and this led to the selection of fixed effects model estimation technique since random effects model was found to be inefficient. The system GMM was preferred due to its ability to incorporate lagged dependent variables as instrumental variables and correct for Nickel bias often associated with FE estimation (Woldridge, 2012). Thirdly, the developed measures of FI were subjected to further estimation to establish how they impact on household consumption per adult equivalent. This objective was aimed at unraveling welfare

differences from the use of varied financial instruments. A two-step GMM estimation technique was applied to establish the impact of FI.

Given that FinAccess data is essentially cross sectional, the study developed cohort panel to track households over time in line with Deaton (1985) technique which estimates relationship between variables based on cohort means. Cohorts are tracked in this case due to the difficulty of tracking same households in a true panel especially in developing countries. Repeated cross sections generate successive random samples of households from the cohorts since each household is specifically a member of a single cohort which is tracked over time. Cohort panel helps control for unobserved FE in almost a similar fashion as a true panel. This approach was applied since pooled analysis of raw household data assumes that households in repeated cross sections are independent leading to biased estimates. The unobserved heterogeneity is assumed to originate from the different geographical locations, survey year effects as well as the sector where the household head works. The study therefore controls for the seven provinces; Nairobi, Central, Eastern, Rift Valley, Nyanza, Coast and Western. The sectors considered were Agriculture; non-Agriculture Employment and non-Agriculture Business trading.

Lastly, the research was interested in establishing how FI feeds into the headcount measure of poverty as well as vulnerability to poverty. One other overriding objective was to develop a transition matrix based on the incidence of poverty since 2006. The probability of VEP was predicted using the three step feasible generalized least squares before subjecting the measure to an OLS estimation to establish its determinants. The determinants of headcount poverty were compared to the determinants of VEP to establish whether policy convergence in tackling the twin challenges could be effective. All the chapters made use of the repeated household survey data organized into 126 cohort panels. The ranking of FI was

however based on the county administrative structures. The maiden data was gathered in 2006 to profile developments in the financial sector. Conclusions from the entire report are summarized as follows.

6.2 Summary of Research Findings

This study reported some very interesting results with respect to FI and welfare impacts. The microeconomic analysis of the impact of FI on welfare based on pseudo panel estimation revealed that indeed FI is associated with immense welfare benefits in terms of increased per adult equivalent consumption expenditure, reduced headcount poverty and reduced vulnerability as expected poverty (VEP). The marginal effects however differ by product with transactionary, credit, insurance and a portfolio financial product usage leading to huge positive welfare impacts.

The determinants of FI also vary with the product being examined even though per capital income stood out buttressing the operation of the demand following hypothesis among Kenyan households. The difference in the determinants of poverty and VEP underscores the complex nature of improving household welfare due to the independence of the two concepts. Policies aimed at eradicating poverty should take into account the vulnerability probability of the population as well as household characteristics. Policy formulation should also factor in both single product and aggregated financial product usage indicators so as to bring about targeted interventions.

Findings from this study are therefore instrumental in informing policy on factors that can mitigate the adverse effects of vulnerability to poverty ex ante. An inclusive financial system should therefore go beyond the usage of financial services to incorporate other aspects related to welfare at both the national and county levels. The following section summarizes the findings from the study based on the research objectives.

6.2.1 Measures and Extent of FI in Kenya

- Transactionary products in 2016 took the lion's share (77.64 percent) in the uptake of formal financial services followed by savings and investment (32.43 percent), insurance (26.85 percent) and credit (14.62 percent) in that order.

- Uptake of financial services across the country displayed huge geographical disparities with Kericho, Nairobi and Nakuru leading the pack in the ranking of the index of financial inclusion (IFI). This could be rationalized by the proximity of the urban population to financial access channels.

- Marsabit, Turkana and Samburu trailed all other counties by recording the lowest IFI. In terms of regional government structure, of the seven regions considered, Eastern region trailed while Nairobi region which is largely urban populated was ranked highest in the usage of formal financial services. A substitution effect from the traditional transactionary banking products such as debit/ ATM cards, bank accounts among others to the more flexible and readily accessible mobile money accounts was observed leading to deeper financial markets.

- Similarly, DTM and DTS savings seem to be encroaching the traditional market for bank savings and investments. The same picture is reflected in the use of credit products where uptake of bank loans is falling. However, savings and credit usage has remained low since 2006 and more particularly among the rural populace. Gender disparities in the uptake of financial products since 2006 were also witnessed across the country where the male gender appears to stochastically dominate financial product usage along all the categories. This is also observed in the urban cluster which dominates usage of the more flexible mobile financial products. Insurance

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is dominated by NHIF and NSSF products which takes the lions share. In all the categories of formal product usage, that is; transactionary, credit, savings and insurance, tertiary education to a large extent appear to stochastically dominate the other education levels.

6.2.2 Determinants of FI in Kenya

Demand Side

- Social capital which is largely seen as a variable that can help to overcome information asymmetry through group membership was found to have a positive impact on the transactionary usage of finance. Group affiliation enables members to gain access to various financial services from financial institutions upon securing guarantors from the existing members.

- Financial literacy which is critical in decision making was also found to contribute positively on the uptake of credit and portfolio usage of finance. It is expected that users of credit services will strive to understand more about the implications of taking up the credit, repayment patterns, interest charged among other considerations. This knowledge explains the negative coefficient in the IFI and the credit transmission channels. It's also expected that a financially literate person will only go for those products that yield maximum utility as opposed to hold several products with less economic value. Education which builds on financial literacy was also found to be significant in the uptake of IFI, transactionary, savings and insurance products.

- Trust in commercial banks was also found to be quite significant in explaining IFI and transactionary usage of finance. The positive coefficient indicates that choice of transactionary products as well a portfolio

uptake of financial services is dependent on the trust bestowed on the financial service providers.

- The unobserved survey year effect in 2016 was found to be significant and negative in determining the uptake of credit and insurance products but was positive in the context of transactionary products. This implies that events of 2016 had mixed impact on FI in Kenya.

- The multiplier effect of per capita income and FI was positive and significant at 1 percent in explaining all financial product categories except transactionary financial products. This positive effect emphasizes the critical role played by income per capita in enhancing FI as espoused by the demand following hypothesis

- The results also revealed that geographical location matters when it comes to the uptake of financial services. From the seven regions considered in the model, Households living in Central, Eastern, Nyanza and Rift Valley had a lower probability of accessing transactionary products as compared to their Nairobi counterparts. This could be explained by the nearness to financial service providers in Nairobi as evidenced by the negative coefficient for distance in the formal access strand.

- A household's main economic activity also influences the usage of financial services. Households whose main economic activity was agriculture were found to have a lower probability of accessing insurance services most of which are designed for the formal employees.

- The positive and significant coefficient of household size with respect to IFI, credit and savings transmission channels associate increased usage of financial services to rising household size. This would however need to be investigated further to establish the optimal household size.

Supply side

- The 2016 unobserved year specific effects had a negative impact on the uptake of financial products from the other formal strand but a positive impact on the formal strand. This clearly shows that the events of 2016 largely affected the formal strand and had no effect on the informal strand. Per capita income had a positive impact on product usage from the other formal access strand. This shows that the other formal strand is sensitive to changes in the economy.

- Increase in the distance to the nearest bank also lowered the demand for financial services from both the formal and the formal other strand. This shows that households are sensitive to the distance they have to cover to get to the nearest financial service provider. This could also be rationalized by the negative coefficient in the formal access channel taken up by Central, Eastern, Nyanza and Rift Valley.

- The important role played by the social capital in informal markets was established by the 1 percent positive and significant coefficient. This elevates the value of group membership seen as a critical factor considered by informal financial service providers when designing their products. It's evident also that formal financial service provider is slowly embracing social capital going by the 10 percent level of significance.

- Households involved in agriculture appeared to prefer other formal financial access channel

6.2.3 Impact of FI on Consumption Expenditure in Kenya

- Estimation of both the static and the dynamic welfare functions revealed that the unobservable survey year fixed effects as well as the region and

sector specific effects were instrumental in explaining variation in individual welfare both at a point and over time.

- Transactionary, credit, insurance and IFI were found to impact positively and significantly on household welfare. Looked at from a single measurement perspective, uptake of credit accounted for the highest impact on consumer welfare. This result is consistent with the direct effect of FI on welfare where FI impacts positively on welfare. The portfolio usage of financial services (IFI) was also found to lead to huge welfare gains. This shows that improvement of the entire financial system in critical in enhancing household welfare.

- The conditional effect from the interaction between education and FI implies that while secondary level of education leads to increase in household welfare, FI is not associated with higher welfare conditional on having attained secondary level of education.

6.2.4 Impact of FI on VEP in Kenya

- Contrary to Chaudhuri et al., (2002), findings suggest that VEP and headcount poverty in Kenya are independent concepts. This is also evidenced by the transition matrix which reveals persistence in the poverty cycle over time. What this data is unable to establish however is the exact number of years/months it takes for the effects of vulnerability to poverty to fizzle out completely for the representative household in the cohort given that the surveys are separated by three years. This could be informed by high frequency data.

- In terms of poverty transition, 61.11 percent of the 61 percent found to be rural poor in 2009 remained poor in 2013 as compared to 38.89 percent who transited to non-poor state. A slight improvement was observed in

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2016 where only 23.64 percent of the 70 percent 2013 rural poor remained poor compared to 76.36 percent who transited to non-poor state. The picture is no different when it comes to the urban population even though poverty incidence and vulnerability is lower. Persistence in urban poverty fell by 38.34 in 2009 to 2013 and 16.13 percent between 2013 and 2016. Part of this reduction is attributed to FI.

- An econometric estimation of the impact of FI on VEP and headcount poverty based on the cohort data found mixed results. While FI (credit, savings, insurance and IFI) exhibited a negative and significant relationship with urban VEP, transactionary financial product reported a positive significant relationship with urban VEP symbolizing an S shaped relationship which could be rationalized by diminishing marginal returns. The relationship was also negative across all product categories in the rural areas except insurance even though the relationship was weak. This inverse relationship between FI and VEP confirms that policy makers can target FI when designing policy interventions to improve welfare.

- The demographic characteristics of a household head shape VEP differently with asset ownership and household expectation about future inflation having a negative impact on welfare. Rural household's tradeoff consumption expenditure for asset accumulation. Most of the assets held are also highly illiquid to the point that they may not be useful in cushioning poor households against short term liquidity risks. Development of poverty reduction strategies should therefore consider various household characteristics.

- Expectations about future inflation and food vulnerability portrayed a negative relationship to both VEP and poverty. This signifies the important role that prior information on potential risks plays in preparing households

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to face them. This also raises their ability to cushion against exposure to idiosyncratic shocks. Female headed households were also found to face higher headcount poverty in urban areas as compared to male headed households but lower headcount poverty in rural areas.

6. 3 Contribution to existing knowledge

One of the main contributions from this study is pioneering a ranking of Kenyan counties on the basis of their financial inclusivity. The study established that financial inclusion varies across the country. This could be linked to peculiarities in particular counties which also opens up a window for deeper interrogation to understand the variance. The categorization of formal financial products along transactionary, credit, savings and investment, insurance and pension offers an exhaustive way of capturing access to a broad range of financial services in Kenya.

Secondly, the study established that the observed welfare differences vary with the measure of financial inclusion adopted. The most effective transmission mechanisms in improving welfare were found to be the transactionary and credit channels. An inclusive financial system should go beyond the usage of financial services to incorporate other aspects related to welfare at both the national and county levels.

Thirdly, the study established that targeting poverty to improve household welfare is limiting. Policy makers should consider both headcount and vulnerability as expected poverty (VEP) which can only be analyzed inter-temporally.

Last but not least, the study contributed heavily methodologically by pioneering a dynamic estimation of financial inclusion and welfare using repeated cross sectional data organized in cohorts to form a pseudo panel. This methodology has helped to overcome challenges associated with lack of longitudinal data in developing countries for carrying out dynamic estimations.

Lastly, this thesis is founded on the most recent data on Kenya's financial landscape from the demand side (FinAccess 2016, 2013, 2009 and 2006).

6.4: Recommendations for policy

Due to the establishment of the clear link between FI, welfare and vulnerability to poverty, the study recognized the need to deepen targeted access to financial services especially in low income zones which may not attract financial institutions, increase human capital development through education and financial literacy programs to supplement FI, improve the existing credit information system, increase supply of basic services by the government and increase economic activities towards employment creation which would lead to increase in per capita income.

Increasing the range of formal financial products will lead to a more competitive financial market leading to a reduction in transactionary costs. Financial inclusion maps can help the government identify areas that lag behind in financial development. Given that poverty is a multidimensional phenomenon, data on FI as well as other economic variables can be superimposed on the poverty maps to help tackle it.

The quality of schooling can be enhanced by improving the learning curriculum to accommodate topics touching on financial literacy and resource management. In addition, studies on the development of the index of FI to measure the performance of the entire financial system should be intensified. This could help in the development of an appropriate product weighting formulae to minimize ambiguity in the generated IFI.

Lastly, there is need to develop insurance products for agriculture which is the main economic activity in rural areas. Specific recommendations for each research objective are specified as follows:

6.4.1 Measures and Extent of FI in Kenya

This chapter recommends that the government should encourage even distributions of financial services to all counties to minimize the dominance by certain segments of the population. With the low credit counts reported, the government through the credit information sharing (CIS) Kenya should intensify the compilation of credit reports by extending it to the agriculture sector which is the mainstay of our country's economy to ensure that the rural population mainly involved in agriculture benefit from low cost credit products. In addition, more effort should be put to ensure that DTMs and DTMs get the necessary support to increase their market share in the supply of financial services. Lastly, proper measurement of FI and barriers to it should be made a priority.

6.4.2 Determinants of FI in Kenya

This chapter recommends economic empowerment of masses through increased economic activities by the government and private agencies which would raise per capita income found to be significant in promoting FI. Secondly, human capital development through education and financial literacy programs should be included in school curriculum by the Ministry of Education given its positive and significant impact.

In addition, mainstream financial service providers should factor in social capital when designing credit products given its significant positive contribution in driving access to financial services from the informal strand. Last but not least, given that most rural households rely on agriculture for their survival, financial service providers should be able to design products that meet the needs of this population segment. This is mainly because a majority recorded a negative coefficient with respect to the uptake of insurance services.

Lastly, transparency in the manner in which financial services are handled should be enhanced in both formal and informal financial access channels given the positive and significant coefficient reported for bank trust.

6.4.3 Impact of FI on Consumption Expenditure in Kenya

Given the significant impact of FI on consumption per adult equivalent, this chapter recommends a bigger government involvement to ensure that FI is enhanced. In particular, the government should spearhead a campaign aimed at lowering transactionary costs to raise uptake of financial services.

Due to the significant impact of tertiary education on consumption expenditure, the Ministry of Education should increase investment in higher learning institutions to enhance human capital development. Lastly, the researchers should give priority to studies relating FI to real sector outcomes. This is so because FI is not an objective in itself, but only to the extent that it helps improve individual and aggregate welfare.

The study also established that welfare differences vary with the transmission channel. Given that the credit channel had the fastest transmission; policy makers should pay more attention to the design of credit products and their distribution to maximize gains.

6.4.4 Impact of FI on VEP in Kenya

Given the pivotal role played by financial services in lowering *exante* and *expost* poverty, the government should encourage financial institutions to increase the range of financial services at least cost to ensure the gains are spread out to the larger population. It was also found that effectiveness of FI in rural areas could be curtailed by the many constraints faced there. To this end, the government both at national and county levels should ensure that the number of deprivations in rural

areas is reduced by increasing funding towards the development of other support infrastructure such as roads, communication, quality housing among others.

In urban areas, housing and access to finance appear to be the main constraints. The government should therefore ensure that it's able to come up with low cost housing and more competitive financial landscape to bring down the cost of financial services. This way, poverty would be able to fall by a bigger margin.

Tackling VEP in rural areas therefore requires not just FI but a combination of FI and other capabilities such as knowhow, infrastructural development among other interventions. Continuous human capital development through education is critical given the tendency of the educated to migrate to urban areas in search of greener pastures.

6.5 Limitations of the study and suggestions for further studies

This study provided a detailed analysis of the usage of financial services in the entire financial system and how they impact on household welfare. Whereas an interrogation of the quality of financial services to examine the extent to which the available range of financial products matches clients' needs would have been more informative, lack of the quality dimension in the data limits such an investigation. Future researchers should now explore the quality dimension of financial access to extend FI frontiers further. This should be accompanied by sectoral based stochastic dominance tests to establish the effect of each financial product and its distribution.

Lack of high frequency data also limits dynamic interrogation of vulnerability as expected poverty. The government should increase funding for research and development to guarantee high frequency data that can easily inform on the transition path of vulnerability to poverty as well as draw forecasts and predictions on household vulnerability probability. This should be done alongside studies on

alternative measures of welfare such as deprivation index to supplement use of per adult equivalent consumption expenditure. Poverty being a multidimensional aspect, there is need to investigate what other constraints face rural households by rolling out studies touching on the state of the infrastructure which was missing in this study to understand how they impact on FI.

Geospatial mapping of FI and welfare outcomes was a complicated process which involved alot of cleaning of the GPS coordinates. Several observations had missing GPS coordinates hence were dropped. The lack of consumption expenditure data in 2006 also limited the inclusion of year 2006 survey in the dynamic estimation of welfare. The survey year 2006 had used 25 matches to symbolize the money held by an individual for expenditure in a month. This measure of monthly expenditure was therefore incompatible with the money metric measure used in 2009, 2013 and 2016 data.

Lastly, as much as the study would have wanted to map FI in all the 47 counties, this was limited to 44 counties hence excluding the 3 counties in North Eastern region (Mandera, Wajir and Garissa) which were not sampled in the 2013 survey data due to logistical challenges hence information about their financial landscape was missing.

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Appendices

Appendix for Chapter Two

Fig 2.2: Financial Product Usage Trends
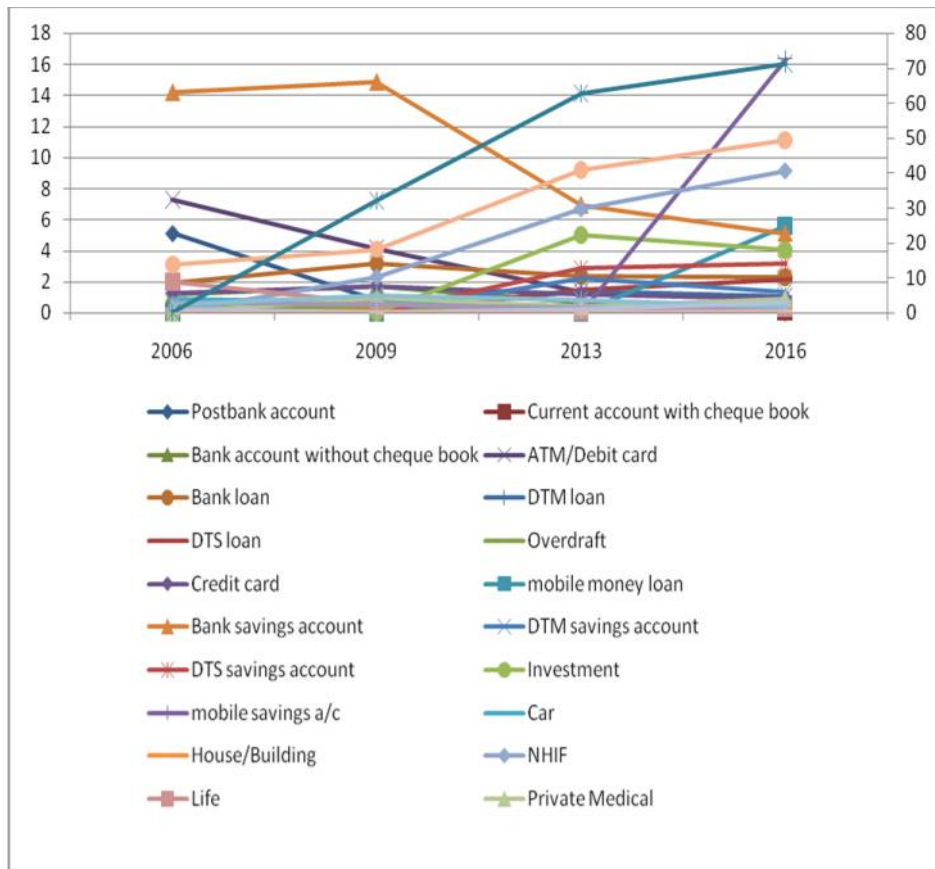
Fig 2.3: Cross tabulations based on demographic profile

Transactionary   **Credit**
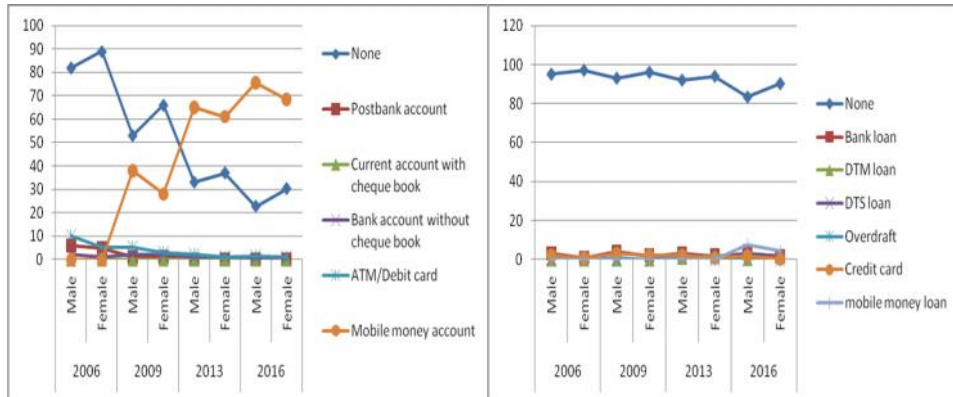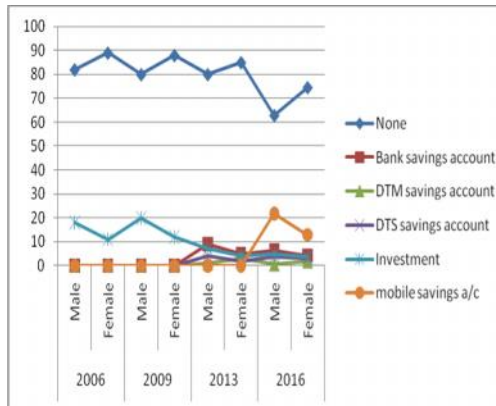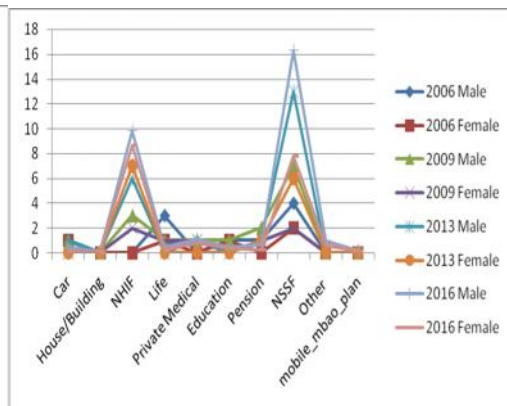
Savings

Insurance

Figure 2.4: Product usage by location

Transactionary

Credit

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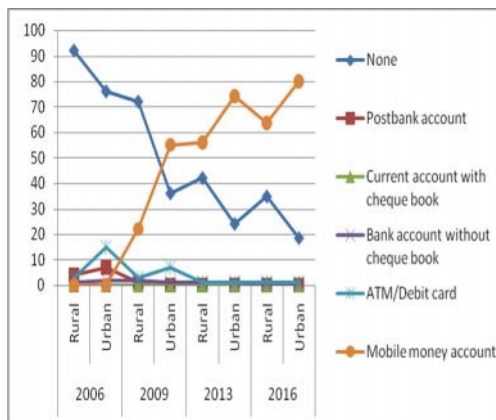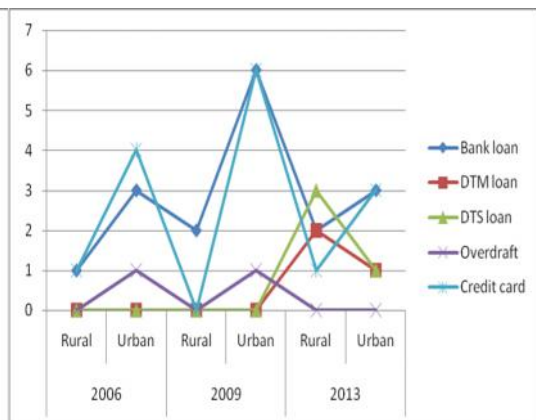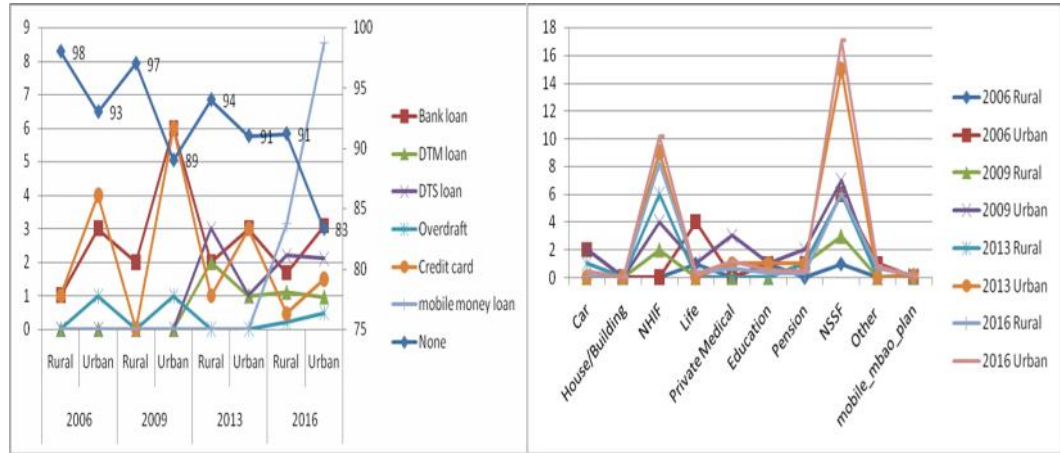
Savings   **Insurance**

Appendix for Chapter Three

Table 3.1: Haussmann Specification Tests

Test: Ho: difference in coefficients not systematic (b-B)'[(V_b-V_B)^(-1)](b-B)								
	IFI	Trans	Credit	Savings	Insurance	Formal	Other formal	Informal
Chi2(15)	23.92	83.00	10.26	23.46	7.90	91.09	13.18	17.28
Prob>chi2	0.07	0.00	0.80	0.07	0.93	0.00	0.59	0.30

Table 3.3: Determinants of Single Product Usage (Full sample static analysis)

Variable	IFI	Transactionary	Credit	Savings	Insurance
Log income	1.026***	1.642***	1.786***	1.621***	1.805***
	-0.001	-0.0509	-0.0756	-0.0522	-0.0619
Age	1.002***	0.987	1.158***	1.005	1.069***
	-0.0005	-0.0179	-0.0357	-0.0197	-0.0212
Agesqrd	1.000***	1	0.998***	1	0.999***
	-5.52E-06	-0.000199	-0.000346	-0.000221	-0.000221
Hhsize	1.010***	1.245***	1.448***	1.203***	1.169***

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	-0.00117	-0.0552	-0.0971	-0.052	-0.058
Hhsizesqrd	0.999***	0.989***	0.980***	0.990***	0.990**
	-9.25E-05	-0.00376	-0.00625	-0.00386	-0.0047
Male	0.998	0.919	0.918	0.992	1.156*
	-0.0021	-0.0753	-0.0975	-0.0748	-0.0939
Education	1.006***	1.141***	1.189***	1.155***	1.192***
	-0.00021	-0.00767	-0.0194	-0.0112	-0.014
Married	1.009***	1.401***	1.301**	1.259***	1.411***
	-0.00219	-0.117	-0.135	-0.0943	-0.12
Bank trust	1.013***	2.122***	1.087	1.296***	1.448***
	-0.00185	-0.153	-0.0956	-0.0835	-0.0939
Urban	1.016***	1.864***	1.129	1.128*	1.127*
	-0.00214	-0.138	-0.102	-0.0785	-0.0793
Social capital	1.015***	2.083***	1.541***	1.480***	1.298***
	-0.0018	-0.138	-0.122	-0.0908	-0.0875
High_int_bank	1.016***	1.526***	1.480***	1.565***	1.575***
	-0.00207	-0.12	-0.121	-0.0964	-0.116
Distance	0.993***	0.880*	0.680***	0.710***	0.764***
	-0.00179	-0.0643	-0.0819	-0.053	-0.0659
Fin literacy	0.992***	0.911	0.671***	0.932	0.812**
	-0.0023	-0.0759	-0.0778	-0.08	-0.0772
2013	1.030***	5.343***	1.593***	1.242**	2.550***
	-0.00281	-0.57	-0.216	-0.123	-0.273
2016	1.164***	6.781***	2.517***	2.142***	2.601***
	-0.0028	-0.687	-0.328	-0.204	-0.267
Observations	18,527	18,527	18,527	18,527	18,527
R-squared	0.643				

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table 3.4: Determinants of Financial Access Channels

Variable	Formal	Formal Other	Informal
Log income	1.632***	1.544***	1.049*

	-0.0505	-0.0515	-0.0299
Age	0.995	1.118***	1.009
	-0.0185	-0.0218	-0.0199
Agesqrd	1	0.999***	1
	-0.000204	-0.000214	-0.00022
Hhsize	1.223***	1.176***	1.165***
	-0.054	-0.0631	-0.0458
Hhsizesqrd	0.989***	0.990*	0.990***
	-0.00374	-0.0052	-0.00337
Male	0.892	1.171**	0.640***
	-0.0737	-0.0923	-0.0509
Education	1.144***	1.124***	1.025***
	-0.00775	-0.00952	-0.00767
Married	1.506***	1.252***	0.972
	-0.13	-0.1	-0.0804
Bank trust	2.138***	1.359***	1.166**
	-0.158	-0.0862	-0.0785
Urban	1.737***	0.877*	0.974
	-0.132	-0.0611	-0.0729
Social capital	2.158***	1.542***	24.37***
	-0.149	-0.0951	-1.615
High_int_bank	1.710***	1.674***	1.073
	-0.147	-0.114	-0.0815
Distance	0.835**	0.642***	0.958
	-0.062	-0.0523	-0.074
Fin literacy	0.875	0.948	1.229***
	-0.0748	-0.0804	-0.0957
2013	5.061***	0.243***	0.367***
	-0.561	-0.0275	-0.037
2016	6.425***	1.125	0.382***
	-0.681	-0.1	-0.0363
Observations	18,527	18,527	18,527

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table 3.5: Determinants of FI (Static Model)

	IFI	Transaction	Credit	Savings	Insurance	Formal	Other formal	Informal
Log income	0.0238***	0.02	0.0612***	0.0692***	0.0835***	0.02	0.0561***	0.02
	0.00	-0.03	-0.01	-0.02	-0.02	-0.03	-0.02	-0.02
Age	0.00	-0.02	0.01	0.01	0.01	-0.02	0.02	0.01
	0.00	-0.04	-0.01	-0.01	-0.01	-0.04	-0.01	-0.01
Agesqrd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hhsize	0.01	-0.04	0.0385*	0.0467*	0.01	-0.03	-0.01	0.02
	-0.01	-0.04	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03
Hhsizesqrd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Male	0.00	-	-0.0582*	0.02	0.06	-	0.04	-0.06
	-0.01		-0.03	-0.04	-0.04		-0.04	-0.05
Education	0.0567***	0.228***	0.119***	0.184***	0.180***	0.271***	0.198***	-0.04
	-0.01	-0.07	-0.04	-0.05	-0.05	-0.07	-0.05	-0.05
Married	0.00	0.10	-0.02	-0.03	0.02	0.111*	0.0895*	0.108**
	-0.01	-0.07	-0.04	-0.05	-0.05	-0.07	-0.05	-0.05
Bank Trust	0.0262***	0.115*	0.05	0.103**	0.107**	0.154***	0.121***	0.06
	-0.01	-0.06	-0.03	-0.04	-0.04	-0.06	-0.05	-0.05
Social capital	0.01	0.107*	0.00	0.0891**	0.02	0.104*	0.01	0.591***
	-0.01	-0.06	-0.03	-0.04	-0.04	-0.06	-0.04	-0.05
Finliteracy	-0.0315***	-0.07	-0.06	-0.04	0.02	-0.05	0.00	-0.03
	-0.01	-0.08	-0.04	-0.06	-0.05	-0.07	-0.06	-0.06
Agriculture	-0.01	0.03	-0.04	-0.02	-0.114***	0.04	0.06	-0.01
	-0.01	-0.06	-0.04	-0.05	-0.04	-0.06	-0.05	-0.05
Urban	0.01	0.00	0.01	0.05	-0.01	-0.04	0.00	0.02
	-0.01	-0.07	-0.04	-0.05	-0.05	-0.07	-0.05	-0.06
Distance	0.00	-0.06	0.00	-0.02	-0.03	-0.11	-0.109**	0.01
	-0.01	-0.07	-0.04	-0.05	-0.05	-0.07	-0.05	-0.05
Central	-0.02	-	-0.127*	-0.08	-0.11	-	-0.03	0.07
	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
Coast	-0.01	-	0.01	0.04	-0.162**	-	-0.01	0.10
	-0.02		-0.06	-0.08	-0.08		-0.08	-0.09
Eastern	-0.03	-	-0.07	-0.09	-0.09	-	0.05	0.04
	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
Nyanza	-0.02	-	-0.02	-0.11	-0.06	-	0.04	0.05
	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
R. Valley	-0.02	-	-0.04	-0.05	-0.07	-	0.04	-0.03

	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
Western	-0.01	-	-0.01	-0.11	-0.13	-	-0.06	0.03
	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
2013	0.0515***	0.359***	0.05	0.122**	0.206***	0.375***	-0.04	-0.167***
	-0.01	-0.08	-0.04	-0.06	-0.05	-0.08	-0.06	-0.06
2016	0.158***	0.398***	0.105**	0.219***	0.180***	0.429***	0.140**	-0.104*
	-0.01	-0.13	-0.04	-0.06	-0.05	-0.13	-0.06	-0.06
Constant	-0.200***	0.51	-0.658***	-0.830**	-0.889***	0.44	-0.851***	-0.10
	-0.06	-1.12	-0.25	-0.32	-0.30	-1.08	-0.33	-0.34
Observations	349	349	349	349	349	349	349	349
Number of cohort	126	126	126	126	126	126	126	126
R-squared		0.346				0.383		

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.6 Determinants of FI (Dynamic Model)

	IFI	Transaction	Credit	Savings	Insurance	Formal	Other formal	Informal
L.ifi	-0.121**	-0.376***	0.02	0.01	-0.105*	-0.309***	0.03	-0.04
	-0.06	-0.05	-0.09	-0.06	-0.06	-0.06	-0.06	-0.04
Log income	0.0229***	0.03	0.0596***	0.0678***	0.0814***	0.02	0.0582***	0.01
	0.00	-0.03	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02
Age	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	0.00	-0.04	-0.01	-0.01	-0.01	-0.04	-0.01	-0.01
Agesqrd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hhsize	0.01	-0.04	0.0394*	0.0459*	0.01	-0.04	-0.01	0.03
	0.00	-0.03	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
Hhsizesqrd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Male	0.01	-	-0.0527*	0.02	0.0767**	-	0.04	-0.05
	-0.01		-0.03	-0.04	-0.04		-0.05	-0.05
Education	0.0591***	0.191***	0.113**	0.176***	0.189***	0.247***	0.206***	-0.05
	-0.01	-0.07	-0.05	-0.06	-0.05	-0.07	-0.05	-0.05
Married	0.00	0.09	-0.01	-0.03	0.03	0.10	0.0896*	0.118**
	-0.01	-0.06	-0.04	-0.04	-0.04	-0.06	-0.05	-0.05
Bank Trust	0.0247***	0.06	0.05	0.0997**	0.105**	0.116**	0.128***	0.06

	-0.01	-0.05	-0.03	-0.05	-0.04	-0.06	-0.05	-0.05
Social capital	0.01	0.09	0.01	0.0967**	0.02	0.111**	0.00	0.593***
	-0.01	-0.05	-0.03	-0.05	-0.04	-0.05	-0.04	-0.05
Finliteracy	-0.0308**	-0.09	-0.06	-0.04	0.02	-0.06	-0.01	-0.03
	-0.01	-0.07	-0.05	-0.05	-0.04	-0.07	-0.06	-0.06
Agriculture	-0.01	-0.02	-0.04	-0.02	-0.115***	0.03	0.06	-0.01
	-0.01	-0.06	-0.03	-0.04	-0.04	-0.06	-0.05	-0.05
Urban	0.01	0.05	0.01	0.05	-0.01	-0.01	0.01	0.01
	-0.01	-0.07	-0.04	-0.05	-0.06	-0.07	-0.05	-0.06
Distance	0.00	-0.04	0.00	-0.02	-0.03	-0.09	-0.108**	0.00
	-0.01	-0.07	-0.03	-0.04	-0.04	-0.06	-0.05	-0.05
Central	-0.03	-	-0.121*	-0.08	-0.11	-	-0.02	0.10
	-0.02		-0.06	-0.09	-0.08		-0.09	-0.09
Coast	-0.02	-	0.02	0.04	-0.171**	-	0.01	0.12
	-0.02		-0.08	-0.11	-0.09		-0.08	-0.09
Eastern	-0.0319*	-	-0.06	-0.09	-0.11	-	0.07	0.05
	-0.02		-0.06	-0.09	-0.08		-0.09	-0.09
Nyanza	-0.02	-	-0.01	-0.11	-0.06	-	0.06	0.07
	-0.02		-0.07	-0.09	-0.08		-0.09	-0.09
R. Valley	-0.03	-	-0.03	-0.05	-0.07	-	0.06	-0.01
	-0.02		-0.07	-0.10	-0.09		-0.09	-0.09
Western	-0.02	-	0.00	-0.11	-0.14	-	-0.04	0.04
	-0.02		-0.07	-0.10	-0.09		-0.09	-0.09
2013	0.0547***	0.443***	0.05	0.123**	0.207***	0.426***	-0.04	-0.159***
	-0.01	-0.08	-0.04	-0.05	-0.05	-0.08	-0.06	-0.06
2016	0.164***	0.592***	0.112***	0.225***	0.197***	0.573***	0.137**	-0.100*
	-0.01	-0.11	-0.04	-0.05	-0.05	-0.12	-0.06	-0.06
Constant	-0.199***	0.20	-0.653***	-0.822**	-0.893***	0.12	-0.864***	-0.09
	-0.05	-1.17	-0.25	-0.34	-0.27	-1.03	-0.32	-0.34
Observations	347	347	347	347	347	347	347	347
Number of cohort	126	126	126	126	126	126	126	126
R-squared	0.712	0.439		0.348		0.453		

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix for Chapter Four

Table 4.5: Consumer Expenditure by Region

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	Mean Consumption	Std. Dev.	Min	Max
Nairobi	49196.42	86262.6	500	375000
Central	17526.04	23431.53	0	100000
Coast	14310.46	26353.07	0	180000
Eastern	10951.3	15575.3	100	80400
Nyanza	12499.89	23067.65	0	160800
RiftValley	11890.35	16540.56	100	74400
Western	8951.593	9811.092	0	40000

Author, 2016

Table 4.4: Main Economic Activity of Household Head

Income source	2006	2009	2013
Pension that you receive	0.48	0.48	0.89
Money from family/friends / spouse	16.2	20.17	6.4
Sell own produce from your farm (Cash crops	5.51	5.92	7.49
Sell own produce from your farm (food crops	19.36	16.27	13.46
Sell output from your cattle/livestock	5.31	5.14	3.11
Sell your livestock (e.g. goat, sheep,	2.65	2.61	4.42
Fish farming/Fishing- aquaculture, fish	0.68	0.65	0.65
Employed on other people's farm fulltime	2.43	8.12	10.42
Employed on other people's farm on a temporarily	5.36	3.13	2.39
Employed to do other people's domestic chores	3.78	3.15	5.95
Employed by the government	4.08	4.79	6.4
Employed in the private sector- 50+ workers	4.21	2.96	3.81
Employed in the private sector- 10-49 workers	2.98	2.99	4.26
Employed in the private sector - <10 workers	3.21	2.75	3.75
Running your own business - manufacturing	1.28	13.97	10.28
Running your own business - trading/ret	14	4.46	4.49
Running your own business - services	5.28	0.18	0.25
Sub letting of land	0.18	0.72	0.54
Sub letting of house/rooms	0.48	0.18	0.14
Earning money from investments, eg shares	0.18	0.55	2.16
Other	0.9	0.83	8.74
Don't Know/Not Mentioned	1.48		

Source: FinAccess survey 2006, 2009 & 2013

Table 4.3: Aggregate distribution of income source by education

Income	Education				
Source	None	Pri	Sec	Tert	Total
Pension that you receive	0.4	0.4	1.2	2.8	0.8
Money from family/friends / spouse	11.1	5.1	5.2	9.1	6.2
Sell own produce from your farm (Cash crops	5.5	8.4	6.5	4.1	7.1
Sell own produce from your farm (food crops	11.7	16.3	13.1	8.7	14.1
Sell output from your cattle/livestock	6.7	2.7	2.4	0.6	2.9
Sell your livestock (e.g. goat, sheep,	16.6	2.7	2.3	0.8	4.1
Fish farming/Fishing- aquaculture, fish	0.1	1	0.4	0.3	0.6
Employed on other people's farm fulltime	7.4	15.2	5.8	0.6	10.1
Employed on other people's farm on a temporarily	1.7	3.2	1.9	0.2	2.3
Employed to do other people's domestic chores	0.9	2.6	9.3	22.5	6.3
Employed by the government	1.4	4.2	9.7	15.1	6.5
Employed in the private sector- 50+ workers	1.9	3	5.6	8.2	4.1
Employed in the private sector- 10-49 workers	2.1	4.5	4.7	3.4	4.1
Employed in the private sector - <10 workers	0.7	4.7	4.4	2.6	4
Running your own business - manufacturing	4.3	10.6	14	6.8	10.5
Running your own business - trading/ret	0.9	4.4	5	7.1	4.5
Running your own business - services	0.7	0.3	0.3	0	0.3
Sub letting of land	1	0.2	1	0.7	0.6
Sub letting of house/rooms	0	0.1	0.2	0.4	0.2
Earning money from investments, e.g shares	15.7	0.3	0.2	1	2.1
Other	9.3	10.1	6.9	4.9	8.5
Total	100	100	100	100	100
Pearson:					
Uncorrected	chi2(63) = 3089				
Design-based	F(43.84, 56512.77) = 22.2268				

Source: FinAccess survey 2006, 2009 & 2013

Table 4.4: Expenditure Distribution by Survey Year

	2009	2013	2016
KSh 0	0	4	2.38
KSh 100-2000	7.94	23.2	17.46
KSh2000-5000	18.25	20.8	23.02

KSh5000-15000	44.44		31.2		30.95					
KSh15000-30000	15.87		10.4		12.7					
KSh30000-50000	7.94		2.4		7.14					
>KSh50000	5.56		8		6.35					

Source: Author, 2016

Table 4.7 Linear static estimation of impact of FI on welfare

Dependent	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)	(Ln Exp)
	IFI	FE	Transaction	FE	Credit	RE	Savings	RE	Insurance	RE
FI Measure	7.936	10.18	0.722	1.138	-2.504	-2.969	0.241	-1.373	3.660	3.995
	(7.729)	(9.472)	(1.168)	(1.252)	(3.288)	(3.254)	(1.255)	(1.899)	(3.124)	(3.916)
Log income	0.328	0.273	0.494***	0.47***	0.77***	0.74***	0.64***	0.74***	0.324	0.247
	(0.211)	(0.249)	(0.090)	(0.098)	(0.164)	(0.159)	(0.117)	(0.179)	(0.296)	(0.372)
Age	-0.139	-0.217	0.001	0.027	-0.015	-0.034	0.001	-0.003	-0.007	-0.005
	(0.176)	(0.248)	(0.112)	(0.125)	(0.061)	(0.068)	(0.040)	(0.047)	(0.076)	(0.079)
Agesqrd	0.001	0.002	0.000	0.0004	0.000	0.0003	0.000	0.000	0.000	0.000
	(0.001)	(0.002)	(0.001)	(0.001)	(0.0019)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Hhsize	-0.41**	-0.4**	-0.28***	-0.3***	-0.065	-0.055	-0.2***	-0.139*	-0.287*	-0.25*
	(0.17)	(0.18)	(0.085)	(0.093)	(0.169)	(0.160)	(0.064)	(0.083)	(0.151)	(0.148)
Hhsizesqrd	0.018**	0.017*	0.012**	0.012**	0.002	0.001	0.008*	0.005	0.014	0.011
	(0.009)	(0.009)	(0.005)	(0.006)	(0.010)	(0.009)	(0.004)	(0.005)	(0.009)	(0.009)
Femhhhead	1.611*	1.301	1.922***	1.740**	0.392	0.481	0.222	0.239	0.371	0.264
	(0.859)	(1.068)	(0.736)	(0.786)	(0.332)	(0.383)	(0.163)	(0.196)	(0.343)	(0.335)
Education	0.223	0.176	0.517	0.537	0.847*	0.791**	0.484	0.832*	-0.362	-0.230
	(0.492)	(0.608)	(0.326)	(0.342)	(0.438)	(0.376)	(0.331)	(0.487)	(0.820)	(0.790)
Married	0.469*	0.300	0.536**	0.507*	0.620*	0.742*	0.453**	0.571**	0.454	0.307
	(0.27)	(0.35)	(0.245)	(0.272)	(0.336)	(0.392)	(0.178)	(0.231)	(0.323)	(0.389)
Social capital	-0.049	0.0103	0.000159	-0.0774	0.319	0.312	0.152	0.185	0.307	0.304
	(0.22)	(0.22)	(0.208)	(0.241)	(0.280)	(0.288)	(0.150)	(0.170)	(0.264)	(0.307)
Own residence	0.173	-0.045	0.0248	-0.0995	-0.602	-0.403	-0.39**	-0.179	-0.0749	-0.352
	(0.28)	(0.29)	(0.225)	(0.257)	(0.420)	(0.335)	(0.154)	(0.221)	(0.358)	(0.366)
Agriculture		-0.030		0.154		-0.147		-0.124		0.0873
		(0.39)		(0.331)		(0.326)		(0.252)		(0.465)
Employed		-0.579		-0.181		0.000		-0.156		-0.880
		(0.49)		(0.307)		(0.399)		(0.262)		(0.777)
Business		-0.517		0.253		-0.0894		0.0327		-0.070
		(0.75)		(0.398)		(0.408)		(0.367)		(0.520)
Central		-		-		-0.609		-0.0942		-0.620
						(0.471)		(0.505)		(0.554)
Coast		-		-		-0.595		-0.279		0.177

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						(0.531)		(0.297)		(0.682)
Eastern		-		-		-0.841*		-0.582*		-0.532
						(0.445)		(0.328)		(0.538)
Nyanza		-		-		-0.554		-0.330		0.107
						(0.488)		(0.301)		(0.662)
RValley		-		-		-0.93**		-0.9***		-0.97*
						(0.450)		(0.345)		(0.566)
Western		-		-		-0.731		-0.476		-0.187
						(0.504)		(0.308)		(0.602)
2013	-0.8***	-0.8***	-0.97**	-1.11**	-0.6***	-0.65**	-0.5***	-0.6***	-0.833**	-0.8**
	(0.27)	(0.30)	(0.417)	(0.446)	(0.218)	(0.257)	(0.157)	(0.190)	(0.377)	(0.387)
2016	-1.719	-2.123	-0.942	-1.214*	-0.413*	-0.385	-0.55**	-0.207	-1.200*	-1.199
	(1.13)	(1.38)	(0.616)	(0.671)	(0.226)	(0.248)	(0.273)	(0.408)	(0.659)	(0.776)
Observations	378	378	378	378	378	378	378	378	378	378
No of cohort	126	126	126	126	126	126	126	126	126	126
Region RE		YES		YES		YES		YES		YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4.8 Linear Static Control Function

Dependent	(Ln Exp) IFI	(Ln Exp) Transactionary	(Ln Exp) Credit	(Ln Exp) Savings	(Ln Exp) Insurance
Log Income	0.509***	0.584***	0.730***	0.710***	0.229
	(0.188)	(0.0886)	(0.083)	(0.147)	(0.165)
Age	-0.007	-0.015	-0.028	0.003	-0.010
	(0.041)	(0.042)	(0.043)	(0.043)	(0.041)
Agesqrd	0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hhsize	-0.212**	-0.183***	-0.077	-0.143**	-0.257***
	(0.093)	(0.065)	(0.070)	(0.061)	(0.074)
Hhsizesqrd	0.009*	0.008*	0.002	0.005	0.011**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
Femhhhead	0.231*	0.218	0.474**	0.224*	0.321**
	(0.125)	(0.134)	(0.210)	(0.131)	(0.135)
Education	0.350	0.429*	0.736***	0.777*	-0.268
	(0.314)	(0.227)	(0.204)	(0.432)	(0.299)
Married	0.473***	0.456**	0.744***	0.557***	0.341**
	(0.155)	(0.179)	(0.229)	(0.186)	(0.149)
Social capital	0.066	0.073	0.291*	0.195	0.303**
	(0.155)	(0.160)	(0.151)	(0.138)	(0.136)

Own residence	-0.251	-0.224	-0.260	-0.268	-0.259
	(0.167)	(0.163)	(0.160)	(0.163)	(0.169)
FI Measure	2.249***	0.296*	0.420**	0.175	0.147
	(0.838)	(0.167)	(0.179)	(0.129)	(0.132)
Ehat	1.316	0.277	-3.204*	-1.321	4.153**
	(6.427)	(1.298)	(1.678)	(1.702)	(1.651)
Central	-0.304	-0.374*	-0.670**	-0.112	-0.670***
	(0.264)	(0.218)	(0.296)	(0.423)	(0.259)
Coast	-0.111	-0.229	-0.661**	-0.242	0.175
	(0.384)	(0.266)	(0.335)	(0.228)	(0.264)
Eastern	-0.546	-0.651***	-0.915***	-0.556**	-0.550**
	(0.333)	(0.248)	(0.286)	(0.257)	(0.232)
Nyanza	-0.174	-0.325	-0.641*	-0.309	0.0863
	(0.360)	(0.239)	(0.334)	(0.236)	(0.255)
R.Valley	-0.651	-0.721*	-0.989***	-0.838**	-0.989***
	(0.412)	(0.379)	(0.351)	(0.336)	(0.347)
Western	-0.345	-0.403	-0.792**	-0.428*	-0.210
	(0.333)	(0.305)	(0.330)	(0.244)	(0.248)
Agriculture	-0.198	-0.165	-0.188	-0.136	0.0180
	(0.210)	(0.194)	(0.197)	(0.190)	(0.186)
Employed	-0.337	-0.289	0.0235	-0.186	-0.922***
	(0.299)	(0.265)	(0.239)	(0.200)	(0.345)
Business	-0.165	-0.0897	-0.108	0.000229	-0.107
	(0.256)	(0.233)	(0.229)	(0.254)	(0.231)
2013	-0.658***	-0.742*	-0.657***	-0.566***	-0.846***
	(0.234)	(0.405)	(0.193)	(0.183)	(0.217)
2016	-1.079	-0.693	-0.384***	-0.241	-1.273***
	(1.100)	(0.514)	(0.138)	(0.343)	(0.339)
Observations	378	378	378	378	378
R-squared	0.758	0.753	0.757	0.750	0.755

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix for Chapter Five

Table 5.4: Distribution of poor by main income source

	Poor	Poor	Poor
Income source	2006	2009	2013
Pension that you receive	-	0.28	0.72
Money from family/friends / spouse	-	23.14	7.3
Sell own produce from your farm (Cash crops	-	5.38	8.02

Sell own produce from your farm (food crops	-	21.34	14.74
Sell output from your cattle/livestock	-	5.61	3.33
Sell your livestock (e.g. goat, sheep,	-	3.04	5.39
Fish farming/Fishing- aquaculture, fish	-	0.46	0.69
Employed on other people's farm fulltime	-	12.51	13.41
Employed on other people's farm on a temporarily	-	4.09	2.69
Employed to do other people's domestic chores	-	0.37	3.25
Employed by the government	-	1.79	4.41
Employed in the private sector- 50+ workers	-	1.15	2.78
Employed in the private sector- 10-49 workers	-	2.21	4.3
Employed in the private sector - <10 workers	-	2.39	3.64
Running your own business - manufacturing	-	10.4	8.41
Running your own business - trading/ret	-	3.59	3.69
Running your own business - services	-	0.23	0.33
Sub letting of land	-	0.28	0.36
Sub letting of house/rooms	-	0.05	0.11
Earning money from investments, e.g shares	-	0.97	3.22
Other			9.19

Source: FinAccess survey 2006, 2009 & 2013

Table 5.3: Poverty Status and Cluster by education (2009-2016)

		None	Primary	Secondary	Tertiary	Other
Urban	Non poor	8.33	40.91	55.81	86.36	62.5
	Poor	91.67	59.09	44.19	13.64	37.5
Rural	Non poor	21.74	25.58	57.5	100	47.06
	Poor	78.26	74.42	42.5	0	52.94

Author, 2016

Table 5.6: Status of Poverty and Consumption expenditure in 2016

	Cohort Means		FULL Sample 2016	
Region	Consumption Expenditure	Cohort Poor	Consumption Expenditure	Poor
Nairobi	12989.86	20	15633	21.98
Central	6947.62	53	6676	32.22
Coast	5401.175	58	7039	39.83
Eastern	2594.741	79	9937	42.2
Nyanza	3990.821	69	3896	55.39

RiftValley	6915.841	72		5746	48.34
Western	7894.085	65		3806	62.28

Author, 2016

Table 5.7: Regional Poverty and Consumption Expenditure Cycle in Kenya

	Mean Consumption Expenditure Cycle			Mean Poverty Cycle		
Region	2009	2013	2016	2009	2013	2016
Nairobi	35047	6164	6654	0	27	25
Central	2334	6318	11068	64	64	36
Coast	5057	1389	8817	67	83	33
Eastern	2386	831	4507	80	93	64
Nyanza	1751	2472	7689	82	85	42
RiftValley	2683	15212	2852	67	75	75
Western	2825	7610	15013	73	50	64

Author, 2016

Table 5.11a: Determinants of Rural VEP in 2013 before instrumenting

VARIABLES	(Rural VEP) Transactionary	(Rural VEP) Credit	(Rural VEP) Savings	(Rural VEP) Insurance	(Rural VEP) IFI
Log income	-0.000546	-0.000578	-0.000885	0.000529	0.000270
	(0.00117)	(0.00123)	(0.00128)	(0.00120)	(0.00124)
Hhsize	0.00334**	0.00364**	0.00317*	0.00431***	0.00346**
	(0.00156)	(0.00168)	(0.00170)	(0.00152)	(0.00152)
Hhsizesqrd	-0.000304***	-0.000305***	-0.000286***	-0.000327***	-0.000300***
	(7.98e-05)	(8.39e-05)	(8.55e-05)	(7.57e-05)	(7.72e-05)
Age	-0.000632	-0.000860	-0.000599	-0.00118	-0.000688
	(0.00112)	(0.00119)	(0.00120)	(0.00107)	(0.00109)
Agesqrd	2.51e-05*	2.75e-05**	2.52e-05*	3.07e-05**	2.51e-05**
	(1.23e-05)	(1.29e-05)	(1.32e-05)	(1.17e-05)	(1.19e-05)
Education	0.000953	0.000504	0.000520	0.000607	0.000807
	(0.000656)	(0.000629)	(0.000658)	(0.000570)	(0.000605)
Own residence	0.0400***	0.0419***	0.0417***	0.0201	0.0398***
	(0.0123)	(0.0127)	(0.0130)	(0.0141)	(0.0120)
Femhhhead	0.0183***	0.0176***	0.0173***	0.0200***	0.0190***
	(0.00407)	(0.00418)	(0.00432)	(0.00391)	(0.00400)
Inflation risk	-0.0257***	-0.0245***	-0.0254***	-0.0245***	-0.0232***
	(0.00585)	(0.00610)	(0.00645)	(0.00548)	(0.00577)
Transaction	-0.00763*				

	(Transactionary)	(Credit)	(Savings)	(Insurance)	(IFI)
	(0.00437)				
Credit		-0.00824			
		(0.00784)			
Savings			8.30e-05		
			(0.00775)		
Insurance				-0.0208**	
				(0.00782)	
IFI					-0.0718**
					(0.0330)
Food vulnerable	-0.0165***	-0.0176***	-0.0173***	-0.0198***	-0.0185***
	(0.00387)	(0.00398)	(0.00417)	(0.00371)	(0.00377)
Agriculture	0.0174***	0.0164**	0.0155**	0.0180***	0.0190***
	(0.00609)	(0.00626)	(0.00667)	(0.00569)	(0.00604)
Employed	0.0124	0.0105	0.00922	0.0134*	0.0141*
	(0.00725)	(0.00738)	(0.00779)	(0.00677)	(0.00718)
Business	0.0219	0.0161	0.0158	-0.00615	0.0170
	(0.0197)	(0.0201)	(0.0206)	(0.0199)	(0.0189)
Observations	126	126	126	126	126
R-squared	0.909	0.903	0.899	0.920	0.914
Sector FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5.11b: Determinants of Urban VEP in 2013 before instrumenting

	(Urban VEP)	(Urban VEP)	(Urban VEP)	(Urban VEP)	(Urban VEP)
VARIABLES	Transactionary	Credit	Savings	Insurance	IFI
Log income	0.00238	0.00530	0.00238	0.00347	0.00112
	(0.00295)	(0.00318)	(0.00320)	(0.00305)	(0.00379)
Hhsize	0.00344	0.00284	0.00245	0.00391	0.00250
	(0.00293)	(0.00330)	(0.00306)	(0.00323)	(0.00308)
Hhsizesqrd	-0.000385*	-0.000277	-0.000279	-0.000352	-0.000290
	(0.000215)	(0.000236)	(0.000218)	(0.000230)	(0.000220)
Age	-0.00218	-0.000777	-0.000727	-0.000914	-0.00136
	(0.00163)	(0.00169)	(0.00155)	(0.00159)	(0.00160)
Agesqrd	3.47e-05*	1.89e-05	1.62e-05	1.90e-05	2.34e-05
	(1.89e-05)	(1.94e-05)	(1.80e-05)	(1.83e-05)	(1.82e-05)
Education	0.00278	0.00319	0.00345*	0.00254	0.00306
	(0.00167)	(0.00196)	(0.00177)	(0.00181)	(0.00175)
Own residence	0.0253***	0.0241**	0.0199**	0.0199**	0.0203**
	(0.00717)	(0.00813)	(0.00781)	(0.00817)	(0.00784)
Femhhhead	0.0335***	0.0409***	0.0363***	0.0376***	0.0345***

	(0.00640)	(0.00793)	(0.00624)	(0.00625)	(0.00678)
Inflation risk	0.0202***	0.0228***	0.0221***	0.0249***	0.0213***
	(0.00597)	(0.00687)	(0.00615)	(0.00670)	(0.00623)
Transaction	0.0162*				
	(0.00835)				
Credit		-0.00560			
		(0.0138)			
Savings			0.0161		
			(0.0104)		
Insurance				0.00808	
				(0.00636)	
IFI					0.0804
					(0.0550)
Food vulonerable	-0.0194*	-0.0192*	-0.0219**	-0.0170	-0.0175*
	(0.00908)	(0.0103)	(0.00967)	(0.00984)	(0.00960)
Agriculture	0.0427**	0.0532***	0.0591***	0.0513***	0.0531***
	(0.0158)	(0.0172)	(0.0164)	(0.0161)	(0.0159)
Employed	0.0217*	0.0261*	0.0304**	0.0234*	0.0281**
	(0.0110)	(0.0122)	(0.0116)	(0.0117)	(0.0114)
Business	0.0343**	0.0386**	0.0470***	0.0377**	0.0453***
	(0.0136)	(0.0152)	(0.0151)	(0.0144)	(0.0149)
Observations	126	126	126	126	126
R-squared	0.879	0.845	0.868	0.861	0.865
Sector FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix for the Entire Thesis

Table 6.1 Cohort Definition, 5 year age bands and FI

Cohort ID	Region	Age in 2009	Age in 2012	Age in 2015	Gender
1	Nairobi	18-22	21-25	24-28	Male
2	Nairobi	23-27	26-30	29-33	Male
3	Nairobi	28-32	31-35	34-38	Male
4	Nairobi	33-37	36-40	39-43	Male
5	Nairobi	38-42	41-45	44-48	Male
6	Nairobi	43-47	46-50	49-53	Male

7	Nairobi	48-52	51-55	54-58	Male
8	Nairobi	53-57	56-60	59-63	Male
9	Nairobi	58-62	61-65	64-68	Male
10	Nairobi	18-22	21-25	24-28	Female
11	Nairobi	23-27	26-30	29-33	Female
12	Nairobi	28-32	31-35	34-38	Female
13	Nairobi	33-37	36-40	39-43	Female
14	Nairobi	38-42	41-45	44-48	Female
15	Nairobi	43-47	46-50	49-53	Female
16	Nairobi	48-52	51-55	54-58	Female
17	Nairobi	53-57	56-60	59-63	Female
18	Nairobi	58-62	61-65	64-68	Female
19	Central	18-22	21-25	24-28	Male
20	Central	23-27	26-30	29-33	Male
21	Central	28-32	31-35	34-38	Male
22	Central	33-37	36-40	39-43	Male
23	Central	38-42	41-45	44-48	Male
24	Central	43-47	46-50	49-53	Male
25	Central	48-52	51-55	54-58	Male
26	Central	53-57	56-60	59-63	Male
27	Central	58-62	61-65	64-68	Male
28	Central	18-22	21-25	24-28	Female
29	Central	23-27	26-30	29-33	Female
30	Central	28-32	31-35	34-38	Female
31	Central	33-37	36-40	39-43	Female
32	Central	38-42	41-45	44-48	Female
33	Central	43-47	46-50	49-53	Female
34	Central	48-52	51-55	54-58	Female
35	Central	53-57	56-60	59-63	Female
36	Central	58-62	61-65	64-68	Female
37	Coast	18-22	21-25	24-28	Male
38	Coast	23-27	26-30	29-33	Male
39	Coast	28-32	31-35	34-38	Male

40	Coast	33-37	36-40	39-43	Male
41	Coast	38-42	41-45	44-48	Male
42	Coast	43-47	46-50	49-53	Male
43	Coast	48-52	51-55	54-58	Male
44	Coast	53-57	56-60	59-63	Male
45	Coast	58-62	61-65	64-68	Male
46	Coast	18-22	21-25	24-28	Female
47	Coast	23-27	26-30	29-33	Female
48	Coast	28-32	31-35	34-38	Female
49	Coast	33-37	36-40	39-43	Female
50	Coast	38-42	41-45	44-48	Female
51	Coast	43-47	46-50	49-53	Female
52	Coast	48-52	51-55	54-58	Female
53	Coast	53-57	56-60	59-63	Female
54	Coast	58-62	61-65	64-68	Female
55	Eastern	18-22	21-25	24-28	Male
56	Eastern	23-27	26-30	29-33	Male
57	Eastern	28-32	31-35	34-38	Male
58	Eastern	33-37	36-40	39-43	Male
59	Eastern	38-42	41-45	44-48	Male
60	Eastern	43-47	46-50	49-53	Male
61	Eastern	48-52	51-55	54-58	Male
62	Eastern	53-57	56-60	59-63	Male
63	Eastern	58-62	61-65	64-68	Male
64	Eastern	18-22	21-25	24-28	Female
65	Eastern	23-27	26-30	29-33	Female
66	Eastern	28-32	31-35	34-38	Female
67	Eastern	33-37	36-40	39-43	Female
68	Eastern	38-42	41-45	44-48	Female
69	Eastern	43-47	46-50	49-53	Female
70	Eastern	48-52	51-55	54-58	Female
71	Eastern	53-57	56-60	59-63	Female
72	Eastern	58-62	61-65	64-68	Female

73	Nyanza	18-22	21-25	24-28	Male
74	Nyanza	23-27	26-30	29-33	Male
75	Nyanza	28-32	31-35	34-38	Male
76	Nyanza	33-37	36-40	39-43	Male
77	Nyanza	38-42	41-45	44-48	Male
78	Nyanza	43-47	46-50	49-53	Male
79	Nyanza	48-52	51-55	54-58	Male
80	Nyanza	53-57	56-60	59-63	Male
81	Nyanza	58-62	61-65	64-68	Male
82	Nyanza	18-22	21-25	24-28	Female
83	Nyanza	23-27	26-30	29-33	Female
84	Nyanza	28-32	31-35	34-38	Female
85	Nyanza	33-37	36-40	39-43	Female
86	Nyanza	38-42	41-45	44-48	Female
87	Nyanza	43-47	46-50	49-53	Female
88	Nyanza	48-52	51-55	54-58	Female
89	Nyanza	53-57	56-60	59-63	Female
90	Nyanza	58-62	61-65	64-68	Female
91	RValley	18-22	21-25	24-28	Male
92	RValley	23-27	26-30	29-33	Male
93	RValley	28-32	31-35	34-38	Male
94	RValley	33-37	36-40	39-43	Male
95	RValley	38-42	41-45	44-48	Male
96	RValley	43-47	46-50	49-53	Male
97	RValley	48-52	51-55	54-58	Male
98	RValley	53-57	56-60	59-63	Male
99	RValley	58-62	61-65	64-68	Male
100	RValley	18-22	21-25	24-28	Female
101	RValley	23-27	26-30	29-33	Female
102	RValley	28-32	31-35	34-38	Female
103	RValley	33-37	36-40	39-43	Female
104	RValley	38-42	41-45	44-48	Female
105	RValley	43-47	46-50	49-53	Female

106	RValley	48-52	51-55	54-58	Female
107	RValley	53-57	56-60	59-63	Female
108	RValley	58-62	61-65	64-68	Female
109	Westrn	18-22	21-25	24-28	Male
110	Wester	23-27	26-30	29-33	Male
111	Wester	28-32	31-35	34-38	Male
112	Westrn	33-37	36-40	39-43	Male
113	Westrn	38-42	41-45	44-48	Male
114	Westrn	43-47	46-50	49-53	Male
115	Westrn	48-52	51-55	54-58	Male
116	Westrn	53-57	56-60	59-63	Male
117	Westrn	58-62	61-65	64-68	Male
118	Westrn	18-22	21-25	24-28	Female
119	Westrn	23-27	26-30	29-33	Female
120	Westrn	28-32	31-35	34-38	Female
121	Westrn	33-37	36-40	39-43	Female
122	Westrn	38-42	41-45	44-48	Female
123	Westrn	43-47	46-50	49-53	Female
124	Westrn	48-52	51-55	54-58	Female
125	Westrn	53-57	56-60	59-63	Female
126	Westrn	58-62	61-65	64-68	Female

Author, 2016

Table 6.2: Summary of Literature for the Four Essays

Journals and Articles Reviewed			
Author (Year)	**Project**	**Methods**	**Poverty Impact/Results**
Measurement of FI			
Amidzic et al., (2014)	Assessing countries Financial Inclusion Standing - A new composite index	Factor analysis based on a weighting methodology	Usage measured based on % of adults with atleast one type of regulated deposit/loan account. Ignored quality indicators during computation for lack of data
Word Bank Global Financial Inclusion (Global Findex, 2012)	financial inclusion index on formal bankedness	macro level based	Financial inclusion index

Chakravarty & Pal (2010)	Measuring Financial Inclusion: An Axiomatic Approach	Index of Financial Inclusion	The index was based on six dimensions; geographic penetration demographic penetration; Deposit accounts per 1000 people; Credit account per 1000 people; Deposit income ratio and Credit income ratio.
Sarma (2008)	Index of Financial Inclusion: three dimensional approach capturing accessibility, availability and usage of financial services	Index of Financial Inclusion	Accessibility is proxied using the bank penetration. The number of bank branches and ATMs measure availability while the ratio of credit plus deposit to GDP measured usage The method simply averages shortfalls of individual attainments from the maximum attainable values
Honohan (2008)	Financial access in 160 countries based on household and institutional data	Index of Financial Inclusion	A non linear aggregation of loan products and transactionary deposit accounts from household surveys exhibit a high correlation with the usage of financial services.
Bawa (1982)	Stochastic Dominance Testing	Kolmogorov-Smirnov (KS) dominance test	KS test provides a comparative analysis of two cumulative frequency distributions at a time.
Demirguc-kunt et al., (2015)	Measuring FI around the world using Global Findex Database 2014	FI indices (over 100) of savings, borrowing, payments and risk management across 140 economies	FI is centered on usage rather than access. 62 percent adults globally enjoy holding an account in a bank or other financial institution or with a mobile money provider up from 51 percent in 2011.
Determinants of FI			
Allen, Franklin, Elena Carletti, Robert Cull, Jun Qian, Lemma Senbet, and Patricio Valenzuela (2014)	Africa financial development and financial inclusion gaps based on global Findex data	OLS regression	Population density as one of the most important variables in Africa. Considerable barriers associated with infrastructural handicaps have been overcome by mobile banking. Measures categorized as; percentage of adults with a formal account; percentage of adults with a formal loan and percentage of adults using mobile banking.
Jalilian and Kirkpatrick (2002)	Financial development and poverty reduction in developing economies for 42 countries	Panel data methods	Market failure and financial market imperfections is the main cause of poverty. A unit change in financial development improves growth prospects of poor people in developing countries by almost 0.4%
Honohan and Michael King in Cull Robert, Demirguc-Kunt & Morduch (2013)	Cause and Effect of Financial Access in Banking the World: Empirical Foundations of FI	Multivariate Probit	Urban population, male gender, education, income, financial literacy, ownership of mobile phone and trust in banks have a positive relationship with financial access
McGregor, 2007	Wellbeing in Developing Countries: From concepts to	Integrated wellbeing model based on outcomes, structures	Wellbeing is considered as an interplay between; resources that a person is able to command, what they are able to

	Methodology	and processes	achieve with those resources and the goals and needs they are able to meet and lastly the meaning that they give to the goals they achieve and the processes
Kempson and Whyley (1999)	Kept out or opted out? Understanding and Combating Financial Exclusion using Family Resources Survey in Britain	Descriptive analysis of the 87 in-depth interviews and focus group discussions data	Credit unworthiness, geographical location, and cultural factors as some of the factors behind financial exclusion. The study further claims that little is known on the nature of financial exclusion
AFI (2014)	Measurable Goals with Optimal Impact: The 2014 Maya Declaration Progress Report	Peer to Peer Exchange	Barriers include; high transaction costs, lack of data, infrastructure constraints such as poor road and communication network, poor security systems, trust, low financial literacy and information asymmetry
AFI (2013)	Putting Financial Inclusion on the Global Map: The 2013 Maya Declaration Progress Report	Peer to Peer Exchange	Country priorities and commitment to the Maya declaration launched in 2011 sought to lower the unbanked 2.5 billion population globally. Bank Negara Malaysia set its FI target at 95% by 2014 while Nigeria set its target at 80% by 2020 based on AFI core set of FI indicators which constitute access, usage and quality indicators
Kalunda (2014)	impact of financial inclusion on small scale farmers in Nyeri	Pearson Chi square	financial inclusion has a huge potential in enhancing agricultural productivity, food security and poverty reduction. The study established a high incidence in terms of usage of bank accounts (93.8%) which is the main indicator of formal financial access against 6.2% without
Beck, et al. (2004)	poverty and income inequality on the country's average level of financial development	OLS and Instrumental Variable regressions	countries with higher ratios of private credit to GDP recorded a higher percentage reduction income inequality and poverty
Beck, et al. (2007)	Financial sector outreach and its determinants covering 245 observations	Cross country analysis	Robust relationship linking the depth of financial intermediation, accelerated growth and faster reduction in income inequality was established.
Beck, et al. (2007a)	Finance, Inequality and the Poor. A cross country analysis	OLS and Panel Instrumental variable (GMM) estimation	Financial development has positive impact on incomes and especially the income of the poorest quintiles. Financial Development helps in alleviation of poverty for the poor. Financial development affects the poor through aggregate growth or through changes in income distribution channels
Demirguc-Kunt et	Financial inclusion	Probit, Mlogit and	Cross country variation in the use of

al., (2013)	and legal discrimination against women: Analysis of the Global Findex data covering 98 countries	Ologit	financial services is attributed to legal discrimination on women and gender norms. Lack of systematic indicators of financial inclusion is the main drawback to the enhancement of gender parity in the formal financial system
Demirguc-Kunt and Klapper, 2012)	financial inclusion in Africa using the 2012 Global Findex covering 148 countries	Descriptive analysis	The financial depth often measured using private sector credit to GDP ratio in 2010 revealed that sub Saharan Africa assumes 24% compared to 172% recorded for high income countries. The proportion of adults with a formal account in the country stood at 42% compared to 54% and 80% for South Africa and Mauritius respectively. Main barriers include; cost, distance, documentation
Aduda & Kalunda (2012)	theoretical and empirical literature on the impact of financial inclusion on financial stability in Kenya	Non analytical	Emphasis on the four key measures of financial inclusion namely; access, quality, usage and impact
Sarma and Pias (2011)	Cross country analysis of financial inclusion and development across countries	OLS regression	Low income groups, ethnic minorities, immigrants and the aged are leading in financial exclusion but also argues that the rural poor located far away from the FSPs have a higher risk of being excluded. Index of FI positively linked to income, adult literacy but inversely related to income inequality and rural population
Agrawal, 2008).	The need for financial inclusion with an Indian perspective	Descriptive analysis	Barriers include; adult literacy, urbanization, infrastructure and especially communication development, distance, cost and identity proof
Park and Mercado (2015)	Financial inclusion, poverty and income inequality in 37 developing Asian economies	Impact assessment from the regression analysis	financial inclusion lowers poverty and income inequality. Barriers include; per capita income, rule of law and demographic characteristics in developing countries
Hannig and Jansen (2010)	Financial inclusion and financial stability	Descriptive analysis	Greater financial inclusion presents opportunities for enhancing financial stability. Need to narrow the gap between documentation threshold required by banks and quality of documentation prevalent among low income clients
Claessens (2006) in Morduch (1999) dimension of access	Access to Financial Services: A Review of the Issues and Public Policy	Comparative analysis	Availability, cost, range, type and quality of financial services can be summarized by the following dimensions of access; reliability, convenience, continuity and flexibility of financial services.

Tanzanias National Panel Survey (TzNPS), 2011	mainly collects data on living standards	Panel data analysis based on repeated households data	Established a direct link between a range of financial services such as use of SACCO, formal bank, and mobile money on household consumption pattern. The wealthiest two quintiles account for the lions share in terms of access to financial services. Access also appears to be skewed towards the urban households
Han and Melecky (2013)	formal financial inclusion in 123 countries covering 124,000 persons	Cross country analysis using panel	Low costs and close proximity to financial intermediaries promote high usage of formal accounts. Elimination of barriers to operation of formal accounts holds the key to increased financial inclusion
Johnson and Nino-Zarazua (2011)	financial access and exclusion using 2006, FinAccess data for Kenya and Finscope Uganda	logistic regression framework	Rather, region specific characteristics appear to shape access hence the authors call for an extensive analysis to identify region specific barriers. Used a food security indicator of poverty capturing the frequency of going without food. Those going without enough food sometimes had a lower probability of financial inclusion though the probability of financial exclusion is not significantly high
Galor and Zeira (1993)	Income Distribution and Macroeconomics	Equilibrium model of open economies	Credit market imperfections and indivisibilities in the investment in human capital accounts for the differences in per capita income across countries
Greenwood & Jovanovic (1990)	Financial Development, Growth, and the Distribution of Income	Financial intermediation model	Financial intermediation and economic growth exhibit reverse causal relationship. Financial sector development initially leads to a higher inequality but later smooth out as the gains from growth spread across the country (Kuznets 1955 hypothesis)
Akudugu (2013)	determinants of FI in formal financial markets in Ghana using Findex data	logit model	40% level of inclusion along the formal strand with money poverty being one of the determinants. Rules and regulations in operations are the main barriers behind formal exclusion among the rural dwellers.
Impact of FI on Consumption/income			
Honohan and Michael King in Cull Robert, Demirguc-Kunt & Morduch (2013)	Cause and Effect of Financial Access	Pooled OLS	Access to formal financial services is associated with improved incomes if access changes only gradually
Fadun (2014)	financial inclusion as a tool for poverty alleviation and income	Descriptive analysis	Reduction in the financially excluded persons helps in alleviating poverty and redistribution of income. Financial

	redistribution in Nigeria		inclusion is dominant in urban areas The main for rural exclusion are; geographical separation from banks, low economic activity and poor literacy rates
Kalunda (2014)	impact of financial inclusion on small scale farmers in Nyeri	Pearson Chi square	Financial inclusion has a huge potential in enhancing agricultural productivity, food security and poverty reduction. The study established a high incidence in terms of usage of bank accounts (93.8%) which is the main indicator of formal financial access against 6.2% without
Dupas and Robison (2013)	Impact of savings on expenditure among female market vendors in rural Western Kenya	Randomized Control Trial	Private expenditure for the users of a savings product increased by 13 percent. Notable though is that the impact also varies with the sampled population given that a similar RCT on rickshaw drivers conflicting results.
Giné Xavier, Townsend Robert M. (2004)	Evaluation of financial liberalization: A general equilibrium model with constrained occupation choice	Randomized Control Trial	Focused on the difference in welfare among intermediated wage earners and non intermediated wage earners established a positive and significant impact between access to financial services and welfare.
Bernerjee et al., (2009)	role of micro credit on household expenditure	Randomized Control Trial	Established no positive link of microcredit on average monthly consumption expenditure per capita 15 to 18 months later. Instead, households expenditure on durables increased. Gains from microcredit are offset by a reduction in casual labour income hence neutralizing the overall consumption effect
Angelucci, Karlan and Zinman, (2013)	Credit to Mexican households	Randomized Control Trial	Although credit to Mexican households revealed a general increase in their wellbeing, no significant effect was established between FI and household consumption
Collins, Morduch, Rutherford, and Ruthven (2009)	Portfolios of the poor: How the world lives on $2 a day	Financial diaries	Interrogates balance sheets of households, processes of cash flow and turnover, money management practices and decision making processes. Challenged the use of headcount measure due to unpredictability and irregularity of income. Argues that the sophistication of the financial dealings is evidenced by the number of instruments they employ whose choice is made rationally
Bauchet et al., (2011)	Randomized Evaluation of	Randomized Control Trial	Microcredit benefits households who successfully grow business and poor households spending patterns.

	Microfinance		However no discernible impact was observed for measures of education, health or female empowerment. It mainly favours the poor who have got no collateral. Most formal service providers don't see the poor as a viable market. FI reduces poverty through consumption smoothing as poor households start or expand businesses, cope with risk and increase/diversify their household income.
Attanasio et al., (2011)	Group Lending or Individual Lending in Mongolia	Randomized Control Trial	Access to group loans has a positive impact on food consumption and entrepreneurship ownership. However individual lending was found not to have a significant relationship on either consumption or entrepreneurship ownership
Buera, F. J., J. P. Kaboski, and Y. Shin (2012	The Macroeconomics of Microfinance	Causality test	The consumption measure of welfare grows by approximately 10 percent with the expansion in credit limit by upto one and a half times the annual wage. Welfare gains of FI is larger among the poor rising by approximately 8 percent of their permanent consumption in a general equilibrium framework
Kaboski and Townsend (2012)	Impact of Credit on Village Economies	Panel Regression	Established a very strong relationship between financial intermediation and consumption. However, the impact appeared to vary with households participation in investment activities and whether one was a borrower or not. Despite the personal income and business income rising with the increased intermediation, actual business startups stalled. Consumption increases by more than one for one with the size of credit expansion
Karlan and Zinman (2010)	Microcredit in theory and Practice: Effects of expanding consumer credit to low income workers in South Africa	Randomized Control Trials	Even though access to credit raised borrower wellbeing as well as income and food consumption, the beneficiaries were subjected to high stress levels. Microloans increase the ability to cope with risks, strengthen community ties and increase access to informal credit. Access to credit extended on the basis of a borrowers risk profile returned positive effects
Quartey (2008)	relationship between financial development, savings mobilization, and poverty reduction in Ghana	Granger causality	Financial sector development has a positive impact on poverty reduction, although the impact is insignificant in view of the fact that financial intermediaries have not adequately channeled savings to the pro-poor sectors of the economy mainly due to

			government deficit financing, high default rate, lack of collateral, and lack of proper business proposals
DFID (2004)	Financial sector development for growth and poverty reduction	Impact assessment	Poor people in developing countries are deprived of formal financial services exposing them to risky and expensive informal financial services hence limiting their market participation and their income
Deaton (1986)	welfare function	pseudo panel technique	shows how cross sections in successive years can be grouped into comparable demographic categories which if differenced produces most of the advantages emanating from differenced individual panel data
Diagne and Zeller (2001)	Microcredit and Smallholder farming in Malawi	Randomized Control Trial	Net income of the treatment group to have benefited from the microcredit was considerably lower than that on the control group
World Bank (2015)	economic update on South Africa	Report	over 12 million South Africans remain unbanked with several other millions remaining under-banked.FI in South Africa is not only pro growth but also pro poor and with potential to lower inequality. The report points to the need for disaggregation of data since the aggregated data which paints a picture of strong access to financial services could be masking significant inequalities in access
Bebczuk (2008)	financial inclusion in Latin America and the Carribean countries	Impact assessment	Links low financial inclusion to reduced demand for financial services. Financial outreach to the poor is insufficient. Usage of credit and deposit accounts by poor households appear to fall by 4.5% and 10% respectively. Even though the data allude to a higher financial exclusion among the poor, the study claims that aggregated figures cannot be relied upon to determine whether poor households face unfair discrimination in financial markets. They conclude that low financial inclusion raises concern when developing poverty reduction policies
Eswaran and Kotwal (1990)	implications of credit constraints for risk behaviour in less developed countries	Von Neumann-Morgenstern utility with risk preferences	Access to credit is important in consumption smoothing since households are able to absorb random shocks in income. For households with identical risk preferences, persons with greater access to credit are better placed to absorb shocks although the effect fizzle out as capital markets develop further to include everyone. A risk averse individual will dissave or

			borrow when faced with transitory changes in income or expenditure
FI and Poverty			
Odhiambo N.M. (2010)	financial development on poverty reduction in Kenya period 1968-2006	Dynamic granger causality model: trivariate causality model	Theres a positive link between financial development and poverty in Kenya. Unidirectional causality of financial development to savings and bidirectional causality between savings and poverty reduction. Lack of access to financial services, adversely affect economic growth and poverty alleviation
Honohan (2007)	cross country analysis of access to financial services for over 160 countries	OLS	A 10% increase in access to financial services led to a 0.6% point lower Gini coefficient. Countries with deep financial systems were found to have low levels of absolute poverty at both US $ 1 and US $ 2 poverty line even though it ceases to be significant when mean income per capita is included in multiple regressions
Chibba (2009)	financial inclusion, poverty reduction and millennium development goals (MDGs)	Explanatory financial inclusion models	FI acts as a tool for providing incremental and complementary solutions for poverty reduction. Traditionally shy commercial banks are now developing financial services suited for low wage earners and the poor
Burgess & Pande (2005)	Do rural Banks Matter? Evidence from the Indian Social Banking Environment	OLS and IV regression	Argues that banks prefer opening branches in richer areas. Branch expansion into the rural unbanked locations in India significantly reduced rural poverty but the urban was unaffected. This was mainly in the savings and credit channels
Estimating Vulnerability to Poverty			
Bourguignon, Goh and Kim's (2004)	Estimating individual vulnerability to poverty with pseudo panel data in Indonesia, Kore and Thailand	mean based approach	The authors estimates vulnerability to poverty based on an autoregressive process of order one (AR(1)) where current values of individual earnings are estimated based on the immediately preceding household characteristics in line with the first (mean) and second (variance) moments. Observing the evolution of the mean and variance of earnings within a cohort is sufficient to estimate the common characteristics of individual earning process.

Chaudhuri (2000; 2003)	Assessing Vulnerability to Poverty: Concepts, empirical methods and illustrative examples	Vulnerability as Expected Poverty	Poverty is a stochastic phenomenon hence current poverty differs from future expected poverty. Emphasis is on the need to estimate vulnerability as expected poverty. A static approach to wellbeing is limited for policy intervention. VEP highlights differences in ex-ante poverty prevention and ex-post poverty alleviation interventions
Christiaensen and Subbarao (2005)	measuring vulnerability from the 1994 and 1997 Welfare Monitoring Surveys and rainfall data from secondary sources	pseudo panel approach on repeated cross sections	Found 3the probability of falling into poverty (vulnerability) for the rural households in Kenya to be 39 percent. Vulnerability to poverty was also high in arid areas. Contrary to expectations, ownership of livestock was found not to be significant in protecting households against covariate shocks to consumption.
Cunningham and Maloney (2000)	vulnerability on the basis of exposure to adverse shocks based on the consumption per adult equivalent	Vulnerability as exposure to risk	Vulnerability to poverty is measured as exposure to negative shocks to welfare or probability or risk today of being in poverty or fall in deep poverty in future
Philip and Rayhan (2004)	Vulnerability and poverty	Interdisciplinary analysis and case studies	The poor are more vulnerable to poverty. Poverty and vulnerability to poverty have a bi-directional causality where each is a consequence of the other. The study elevates the location factor which should shape the poverty alleviation programs
Pitt and Khandker (1998)	Impact of Group Based Credit Programs on 87 rural Bangladesh villages in 1991	Conditional Demand Functions based on fixed effects estimates	Innovations like group based credit programs led to significant influence on household spending, asset acquisition and children's schooling. Annual household consumption expenditure increased by 18 and 11 taka for women and men respectively for every 100 taka borrowed from the credit programs
Zaman (2004)	impact of the various microfinance programs in Bangladesh	Randomized Control Trial	Microcredit contributes to poverty reduction by reducing the poor's vulnerability. Microfinance helps reduce vulnerability through consumption smoothing, emergency assistance during periods of acute natural disasters, and female empowerment
Clarke, Xu & Fou (2006)	Financial development and income inequality tested using data from 91 countries between 1960 and 1995	Panel data	negative relationship between financial development and income inequality signaling reduced inequality, even with minimal financial development
Bittencourt (2010)	Impact of financial sector development on income inequality in	panel time series analysis	access to financial services reduces income inequalities as individuals insulate themselves against

	Brazil in the 1980s and 1990s		macroeconomic shocks emanating from inflation
Berthelemy and Varoudakis (1996)	Policies of Economic takeoff	Growth Analysis	Insufficient financial development exposes a country to a persistent poverty trap which may raise the peoples' vulnerability to poverty